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MODEL WITH LINKAGE CAPABILITY

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SHAYLE DANIEL SHAGAM

has been accepted towards fulfillment
of the requirements for

MS degree in Agricultural Economics

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AN INTERNATIONAL AGRICULTURAL TRADE MODEL WITH LINKAGE CAPABILITY

By

Shayle Daniel Shagam

A THESIS

Submitted to
Michigan State University
in partial Fulfillment of the requirements
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ABSTRACT

AN INTERNATIONAL AGRICULTURAL TRADE MODEL
WITH LINKAGE CAPABILITY

By

Shayle Daniel Shagam

The evolution and expansion of relationships in global agriculture have increased the need for tools to assist in analyzing policy changes and their impacts upon the production and trade of agricultural commodities. The M.S.U. Agriculture Model was developed to provide a simple econometric framework for policy analysis and long-term forecasts of supply, demand and price under various assumptions.

The model presents a world consisting of five exporting regions and six importing regions producing and trading wheat, coarse grains and the soybean complex. It can also be linked to a more complex U.S. crop model and/or a U.S. livestock model.

The model was estimated using annual data with a basic structure for each region modified for any significant differences between regions. The properties of the individual equations, the regional blocks and the entire model were evaluated for absolute and relative accuracy. A baseline and scenario were generated to show the model's capability.

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CHAPTER I

INTRODUCTION

World wheat, soybean and coarse grain production has increased steadily from the early 1960s. During this period, population and income growth, policy changes and technological advances have led to steady increases in commodity trade and in many cases a change in the mix of commodities traded.

However, in the past several years the growth in grain trade has become considerably less stable. A number of countries which had in the past provided ready markets for agricultural products have ceased importing and are now competing with traditional exporters. At the same time, several exporters are attempting to overcome either balance of trade deficits or foreign exchange constraints by aggressively marketing grain and oilseeds. These changes in behavior and the interaction of importers and exporters have had a significant effect on the production and trade relationships of the world agricultural system.

1.1 The Problem

Agriculture is a dynamic system of constantly evolving and redefined internal and external policies. These changes, coupled with changes in the macro economy increase

the difficulty of analyzing policy changes within a country or region. In order to effectively study the impacts of alternative sets of assumptions upon a internationally traded commodity, a caricature of the entire world is required, one simple enough to maintain yet complex enough to provide the richness of detail necessary for analysis.

Within this context, the M.S.U. Agriculture Model was developed to provide a framework for policy analysis as well as long-term annual forecasts of supply, demand and price in the world under various policy and macroeconomic assumptions. The model was initially estimated in the late 1970s and in the ensuing time, a number of significant changes have occurred in the world economy with important implications for both agricultural production and trade. If the model is to continue to provide a reasonable framework for forecasting and policy analysis, the recent changes, linkages, and relationships in agriculture and trade must be represented. This requires that the international component be disassembled, restructured and re-estimated with the most current data.

1.2 Objectives

The objectives of this study are to create a model of world agriculture, one which has its own U.S. region but can also be linked to a more detailed domestic component of the MSU Agriculture Model and provide both forecasts and the framework for performing policy analysis.

There will be four stages in fulfilling these objec-

tives. In the first stage, based upon the structure of agriculture and trade patterns for different economic regions of the world, a model will be constructed. This model will be a very simple representation of world agriculture. It is not meant to be a model of world agriculture in detail but rather a simple, analyst driven model which can be modified to suit a variety of needs. Second, the completed model will be run to provide an ex-post forecast for performance appraisal. Third, a baseline forecast of world agriculture for 1985-94 will be generated and lastly, a policy shock will be introduced to observe the deviations from the baseline.

CHAPTER II

REVIEW OF PREVIOUS MODELING EXPERIENCES

A number of simultaneous models of world agriculture have been estimated, each structured in response to the uses intended for that model. In order to provide a basis for comparison with the structure of the MSU Agricultural Model and to observe the differences in theory underlying international trade models, three models representing different styles of modeling will be reviewed.

2.1 The FAP Model

The largest and most complex of the models which will be considered is the International Institute for Applied Systems Analysis' (IIASA) Food and Agricultural Policy (FAP) model. Construction of the FAP model began in 1976 and in its present form has the capability of performing detailed analysis through a high degree of disaggregation, both in regions and commodities. As described by Abkin and Fischer and Frohberg*,[1], the model covers 21 regions and 10 commodities and is designed for forecasting and policy analysis

---

* All notes which reference quotes or publications will be numbered and appear at the end of each chapter. All notes of clarification or comment will be starred and appear at the bottom of the respective page.

over a 15-20 year time horizon (Table 2.1).

The FAP model is a "Basic Linked System" where a basic

Table 2.1
Comparison of Model Structures

	FAP	GOL		GLOBAL RICE
		FULL	SIMPLE	
Regions	21	5	27	n.a.
Products	10	20	≤20	1
Explicit Livestock	Y	Y	Y	N
Explicit Stocks	N	Y	N	Y
Prices*	NI,RI	RB	RT	RB
Constrained Area	Y	Y	N	Y
LR & SR Elasticity				
Supply	N	N	N	Y
Demand	N	N	N	N
Non-Agriculture	Y	N	N	N
Endogenous Policy	Some	Some	N	N

* NI=Nominal Internal, RI=Real Internal, RT=Real Trade, RB=Real Border*

structure for each region solves for domestic equilibrium in non-traded goods and policy and the individual regions are linked together through excess supply and demand equations. Each individual region consists of two sectors, agriculture and a simple non-agriculture sector each containing three sub-components representing production, consumption and

---

* Real Internal = World prices adjusted for transportation costs, exchange rates, endogenous policies and deflated by a price index.

Nominal Internal = World prices adjusted for transportation costs, exchange rates, and endogenous policies.

Real Trade = Unadjusted world prices deflated by a price index.

Real Border = World prices adjusted for exchange rates, transportation costs, exogenous policies and deflated by a price index.

government policy.

The production component has two stages of decision. The first stage decision provides estimates of total availability of land, capital, labor, and feed concentrates. These estimates are based upon predetermined variables. Total available land is a simple time trend; Fischer and Frohberg[2] state that attempts to estimate total acreage as a function of other economic variables resulted in insignificant t-statistics.

Total labor, capital and fertilizer availability are estimated using a structure where predetermined variables are proxies for expectations. Although the independent variable only appears on the right-hand side in the formulation of labor and capital availability, all other right hand variables are either lagged or exogenous variables. Examples of other variables used in these equations are the lagged share of the total available input used in agriculture (labor and capital), depreciation, the terms of trade between the agriculture and non-agriculture sectors, gross domestic product and lagged government policy (capital) and the current input cost and value of lagged production (fertilizer).

The demand for feed concentrates as an input is a minimization problem where the producer attempts to minimize the costs of feeding subject to the feed requirements of his herd. Therefore, the relevant variables are the requirements of concentrate per animal type, the share of animals

of a given type, the price of feed and a proxy for feed efficiency.

The second stage of production decision making is the allocation of inputs. The producer attempts to maximize total net revenue - defined as the expected price per commodity unit minus the price of the inputs per unit, times the number of units and summed across all commodities. Revenue maximization is subject to the constraint that the amount of input applied to any commodity must be less than or equal to the total available inputs.

The commodity demand component divides income within region into both sectors and classes. In developing countries, there are two income classes dependent upon the sector of employment (agriculture and non-agriculture). In developed countries, there is only one class of income, ie; there is no explicit assumption of income disparity between employment sectors. Expected income is calculated for each class and broken into agricultural and non-agricultural expenditures using a "linear expenditure system with habit formation"[3]. The expenditure for agricultural products is further broken into expenditure for each commodity using the commodity's expenditure elasticity, a non-linear estimate of per capita expenditure.

The models for each region take world prices and adjust them by government policies and the processing margin to derive expected retail prices. Expenditures are then divided by expected prices to determine the quantity of the

individual commodity which is consumed at each income level.

Government policies can be either bounds or targets. The final test in the solution of the domestic models is for the satisfaction of the budget constraint. If the constraint is not satisfied, government policies (taxes, public consumption, trade balance) are adjusted and the model is resolved until the budget constraint is satisfied. At solution, all production not consumed domestically is considered excess supply while a shortfall in production determines excess demand.

In the first iteration, the world price is set equal to the previous period's price. Once the regional models solve, the international model tests to assure that excess supply and excess demand are equal. If they are not the model adjusts world price and resolves the individual models, continuing this process until excess supply and excess demand are equated.

2.2 The Grains-Oilseeds-Livestock (GOL) Model

The Grains-Oilseeds-Livestock (GOL) model, like the FAP model is a linked model which solves individual regions for domestic supply and demand of agricultural commodities in isolation and then attempts to link the regions through excess supply and demand equations. The model solves over a shorter period (1-3 years) but covers more regions and commodities. The regional models can be formulated in either simple/reduced or full standard form depending upon the desired level of detail in analysis. However, Roningen and

Liu have questioned how much is to be gained from the more complex models:

> "A simple structure may have a cost in terms of overall 'goodness of fit' characteristics. However, given the proximate nature of much of the policy data and parameters needed in a policy oriented model, it is not clear that the complexity involved in a model with a better fit is worth the effort."[4]

When estimated as a simple/reduced structure, each individual region contains five components: supply, demand, trade, price, and domestic indicators. The real price facing an individual region under no constraint is the world price divided by an exogenous price index.

However, if the country is bound by an import or export quota there is a mechanism to adjust internal prices below those of the world for an export bound or raise internal prices above world levels if the region faces an import quota. If net trade exceeds the quota, a price adjustment will be defined to be the quota minus the tradeable surplus over the sum of trade and either supply or demand times a convergence parameter. This adjustment coefficient will be positive if imports exceed the quota and negative if exports exceed the quota.

Liu and Roningen[5] define supply as production plus beginning stocks. The formulation of a standard supply equation uses real trade prices, a time trend for technical change and an exogenous supply shifter. The relevant prices are the lagged and current prices for the own and competing crop.

Demand is estimated on a per capita quantity basis as a function of current and lagged own prices, current and lagged other commodity prices and real income. In the specification of the demand equations real income and population are exogenous variables.

For oilseeds, the demand for crush drives both oilseed demand and supply. The demand for crush is estimated as a function of the ratio of the weighted prices of the end products over the price of whole oilseeds. A time trend is include to act as a proxy for changes in crush capacity. The supply of oils and meals are then defined as the exogenous crushing yield times the estimated quantity crushed.

At the initial world price, domestic supply and demand are solved and the excess supply or demand of each region is linked in international trade. If excess supply and demand are not equal, the world price is adjusted and the model is resolved.

The full/standard model is designed to provide more detail by including feed and food demand, stocks, supply, trade and cross commodity influences. Internal prices are modified to account for exchange rate changes, thereby converting international prices to those at the country's border. The trade price can be converted into a supply price by subtracting the trade margins and any production or export taxes; the demand price is the supply price plus the domestic margin and any consumption, production or import

taxes/margins. In this formulation the margins are calculated as functions of current and lagged ratios of a non-agriculture price to the demand price (freight costs for traded goods are included in the price linkage equations), the taxes are exogenously determined.

In the full/standard models there are four equations in the production component. First, an average real return to land is generated by dividing the sum of gross returns per crop (supply price times yield times area) by the sum of the costs of production per crop). The total supply of land is then estimated as a function of the lagged average real return to land and a time trend. Harvested area is a function of lagged real returns from the own and competing crops and the total supply of land cropland with the sum of the areas constrained to equal the total supply of land.

Yields are estimated as a function of a time trend, representing technological change, a ratio of the crop price to an index of input prices, crop area and a supply shifter for weather. Lastly, production is defined as the product of harvested area and yield.

As in the simple/reduced formulations, oilseed production is driven by the demand for crush. The demand for crush is estimated as a function of the ratio of the component product values to cost of oilseeds and a time trend for crush capacity. The quantity of oilseeds supplied is then defined as the share of oilseed weights in meal and oil times the quantity of oilseed crushed.

The GOL model, as its name implies, has a full blown livestock sector in both the simple/reduced and full/standard structures. Livestock production (beef, pork or mutton) has four equations, beginning numbers, additions and slaughter with an additional equation for meat supply. The dairy and poultry subsectors have two equations, animal numbers and product supply.

Beginning livestock numbers are defined as lagged livestock numbers plus lagged livestock additions minus lagged livestock slaughter. Both additions to the herd and livestock slaughter are estimated as percentages of livestock numbers and are functions of one and two year lagged ratios of the supply price of livestock over the cost of feed. Feed costs for each livestock type are defined as the share of feed per animal unit times the price of feed summed across all feeds. The final equation, that for meat supply in carcass weight, is estimated in the same manner as the previous equations but includes a time trend in addition to the lagged price ratios.

In the full/standard models the animal numbers generated in the livestock sector driver the feed demand equations. Livestock numbers and poultry supply are weighted exogenously and summed to derive an aggregate "grain consuming animal unit". The quantity of a feed demanded per grain consuming animal unit is a function of the demand price of own and competing feeds over the livestock price index, where the livestock price index is

defined as the weighted sum of all livestock supply prices.

The equation for per capita demand for food and non-feed grain is estimated as a function of the real price of the own and competing goods and real per capita income. Total demand for the commodity is defined as the sum of feed, non-feed and food demand.

The GOL model includes a stock equation where ending stocks as a share of sum of trade and supply or demand are estimated as a function of the real demand price of the commodity. Where government stock holding policies occur, an additional variable is included to capture these effects. According to Roningen and Liu, the stock equation is a speculative demand equation:

> "The price elasticity is expected to be positive indicating that as the commodity price rises relative to non-GOL prices*, stocks will be depleted"[6]

The solution and testing processes for the full/standard models are the same as those for the simple reduced models. The individual country models solve for supply and demand, the excess supply and demand quantities become the trade equations linking all the countries. If exports and imports do not sum to zero the world price is adjusted and the models are resolved.

However, the price linkages for unrestricted trade in the full/standard models are significantly different from those in the simple/reduced models. In the full/standard

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* The index of prices.

models, the U.S. dollar at U.S. ports is the base, this is adjusted by exogenously supplied exchange rates, taxes and transportation costs to provide a border price.

2.3 Global Rice Model

In several ways, the structure of the global rice model estimated by Mitchell[7] represents a departure from the two previous models. Citing work done by Abbott, Mitchell[8] argues that in a world where governments intervene to drive a wedge between world prices and domestic prices, trade should not be considered a residual but rather estimated directly.

In an attempt to account for the divergence in prices, Mitchell suggests estimating country prices as a function of the world price and economic variables. However, where country price data are unavailable, country prices are defined by the world price, exchange rate and price index.

World price estimates are obtained from estimated equations as opposed to the simultaneous solution of supply and demand. Mitchell estimates world price as a function of a floor (the U.S. loan rate) and global ending stocks of the commodity. This differs from Abbott who estimates the border price for a "price leader"* as a function of population, input prices, production and stocks.[9] Other countries key off this price and adjust it through policy to derive a

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* Based upon the results of his estimation, Abbott supported McCalla's contention that Canada acts as a price setter in the wheat market.

domestic price.

The Global Rice Model has four components, production, consumption, net trade and ending stocks. Production is comprised of harvested area and yield. A Nerlovean partial adjustment structure is imposed on harvested area using predetermined variables (lagged prices and yields). Use of Nerlove's partial adjustment model provides both long-run and short-run supply elasticities, a significant departure from the assumption of the equality of long and short run elasticities in the previous models. As in the FAP model, harvested area is constrained by the growth of the cropland base. Yields are estimated as a simple time trend. Mitchell felt that even though it was imperfect, attempts at estimating yields based upon economic variables, weather or fertilizer led to failure. As in the full/standard models of GOL, production is defined as harvested area times yield.

Net trade in the Global Rice Model is estimated by Mitchell as a net import reduced form equation. He states that if there is a marketing agency: "The decision about imports is made by a government agency and these imports plus the level of domestic production determine domestic consumption."[10] As parameters, Mitchell chooses population, income, lagged and current price and production; although "it is difficult to interpret the individual coefficients"-[11], the signs are expected to be positive for income and population and negative for current and lagged prices and production.

Both Mitchell and Abbott (1979) discuss the advantages and disadvantages of estimating a net import equation. The major problems with the method are a result of the structural form. As mentioned, above, interpretation of the parameters is difficult. Additionally, estimation of a net import equation implicitly assumes that policy decisions are being proxied through the choice of parameters. If the government in question changes policy, the parameters will change as well.

However, estimation of the trade equation permits government policy to be endogenized, those variables such as available domestic supply which would influence policy can be included as explanatory variables. Secondly, this technique does not require detailed knowledge of the trading behavior of an individual country, a task which would be exceedingly difficult if a large number of countries were modeled and nearly impossible to determine if regional aggregations were used.

If imports are directly estimated and consumption is residual, an ending stock equation is required to close the system. Mitchell estimates the ratio of ending stocks to lagged consumption as a function of the farm price. Although he claims that the equation will perform reasonably well , "...(it) will not capture the volatility which is frequently present in stock holdings.[12]

2.4 Conclusions From Modeling Review

Each model provides a view of agriculture with a different amount of detail and as such is suited for different tasks.

The FAP model provides the greatest amount of detail and is very well suited for policy analysis. The model covers a large number of disaggregated regions and links the performance of the agricultural sector with the non-agricultural sector. The model also uses real internal prices. These permit more detailed analysis of the effects of taxes and subsidies.

However, the size of model makes it difficult to maintain and its complexity makes it more difficult to trace through the effects of exogenous shock. That is to say, it would be easier to say that a shock has an effect on a number of variables than to analyze how the variables transmit the effects of the shock. Finally, the model doesn't explicitly model stocks which in times of large buildup will have significant effect on commodity prices and government policy.

The G.O.L. model attempted to solve some of these difficulties by moving to a system of individual small regional models which could be used by country analysts in isolation or linked and run as a large individual model.

However, to simplify the models, a number of assumptions for the full/standard model were relaxed. The G.O.L. model uses real trade prices; this doesn't permit easy

analysis of the effects of exchange rates upon supply and demand of agricultural products. Nor does it explicitly estimate stocks and their effect upon price.

Mitchell simplifies international trade models by estimating import equations directly and assuming a trade hierarchy where one region acts as the residual supplier to the world market. This permits easy solution but places restrictions upon the exporting regions; there must be one passive trader who will accumulate all the error in the model.

Using real border prices permits one to analyze the effects of exchange rate policy but doesn't allow analysis of taxes or subsidies. In general, the Mitchell model places far more responsibility upon the analyst to make the model do what is required.

Each model has advantages and disadvantages, it is impossible to say that one model is "better" than another model. Although the development of the M.S.U. Agriculture followed the relatively simple format laid out by Mitchell, there is room for adaptation. A number of features found in the other two models could increase the capabilities of the M.S.U. model, these will be covered in the final chapter.

Notes to Chapter II

1. Michael H. Abkin, Concepts behind IIASA's Food and Agriculture Model, Agricultural Economics Staff Paper No. 81-78. Michigan State University, December 1981: Gunther Fischer and Klaus Frohberg, "The Basic Linked System of the Food and Agriculture Program at IIASA: An Overview of the National Models," Mathematical Modeling 3 (1982).

2. Gunther Fischer and Klaus Frohberg, "The Basic Linked System of the Food and Agriculture Program at IIASA: An Overview of the National Models," Mathematical Modeling 3 (1982) : 453-466

3. Ibid. Pg. 464

4. U.S. Department of Agriculture, Economic Research Service, The World Grain, Oilseeds, and Livestock (GOL) Model - Background and Standard Components, by Vernon Roningen and Karen Liu, ERS Staff Report No. AGES830317 (Washington, D.C. : Government Printing Office, April 1983), pg. 1.

5. U.S. Department of Agriculture, Economic Research Service, The World Grain-Oilseeds-Livestock (GOL) Model, A Simplified Version, by Karen Liu and Vernon O. Roningen, ERS Staff Paper No. AGES850128 (Washington, D.C.: Government Printing Office, February 1985), pp. 7.

6. Ibid. Pg. 77.

7. Donald O. Mitchell, "Global Rice Model: Conceptualization and Design." Washington, D.C.,1983.

8. Ibid. p. 24.; Philip C. Abbott, "Modeling International Grain Trade with Government Controlled Markets," American Journal of Agricultural Economics 61 (February 1979)

9. Philip C. Abbott, "Developing Countries and International Grain Trade," (Ph.D. dissertation, Massachusetts Institute of Technology, June 1976). p. 149

10. Donald O. Mitchell, "Global Rice Model: Conceptualization and Design." Washington, D.C., 1983. p. 23.

11. Ibid. p. 26.

12. Ibid. P. 28.

CHAPTER III

THE M.S.U.MODEL

Given the need for re-estimating the M.S.U. Agriculture Model, the objective was to build a model of international agricultural production and trade which could provide sufficient detail for forecasting and policy analysis but not be so complex that the impacts of an exogenous shock could not be traced. Furthermore the model had to have the capacity to stand alone or be linked with other components. Finally, with an eye to adapting the model to the micro-computer environment, the model had to simple enough for an individual to maintain and operate.

The previous version of the model, built by Mitchell[1] was designed to solve simultaneously across three commodities. The basic structure was kept intact but the regional coverage was expanded to provide more coverage of regions with different income growth. The model still solved for wheat and coarse grains but the coverage of the soybean complex was expanded from soybean equivalent to soybeans in their component forms.

The size of the model which has been constructed presents a number of problems in presentation. The model consists of approximately 200 behavioral and 100 definitional equations, it would be impractical to discuss the

results of each estimation within the context of this thesis. Therefore in this chapter the theoretical foundations of the model will be presented as a set of generic structures with special discussion reserved for those equations which do not fit the general specification. The predictive capabilities of equations based upon these structures will be analyzed in the following chapter and the statistical results for the individual equations will be presented in an appendix.

The statistical technique used to determine estimates of the parameters of all equations was ordinary least squares. Although the model structure is simultaneous and OLS estimation results in biased and inconsistent estimates, it was felt that the simplicity of procedure outweighed the inconsistencies. Furthermore, Hsu[2] notes additional advantages to more complex estimation procedures. Comparison of the OLS technique against limited or full information estimation techniques with regard to robustness against specification error is favorable and OLS tends to improve relative to limited information maximum likelihood as model size increases.

3.1 Model Structure

The model is based upon the structure presented by Mitchell and Abbott and outlined in the previous chapter. It was necessary to modify this structure to account for differences among the commodities, their uses, policy interactions and the level of aggregation within a region.

Although the Global Rice Model developed by Mitchell had a similar structure of equations within a region, it was a single commodity model. On the other hand, Abbott's model solved simultaneously across more than one commodity but the equation structure within a region was too aggregated for the end uses of this model.

The Agmodel divides the world into 11 regions within three structural models . Two of the models, a model of U.S. livestock supply and demand and a complex model of the U.S. crop sector will not be discussed in any detail. They will be refered to as the "domestic model".

The 11 world regions including a simple U.S. model and the linkages to the domestic model are estimated in a component hereafter referred to as the "international model". The domestic and international models share a price component which will be presented in this chapter and the linkages between the international model and domestic models will be presented on Chapter IV.

The international model estimates production, consumption, net trade and ending stocks for wheat, the soybean complex (soybeans, soymeal and soyoil) and coarse grains (corn, sorghum, barley and oats). Supplies and prices interact to achieve simultaneous solution across all commodities.

Although the commodities covered in this model have significant cross elasticities, there are other non-modeled commodities which influence supply and demand conditions for

wheat, coarse grains and the soycomplex. Demand for feed grains in Asia is being challenged by low priced broken-hull rice while the demand for grains for human consumption in Asia and Africa is affected by conditions in the rice market. Cassava provides a feed substitute for livestock in both the EC and in Japan. The demand for soymeal and soyoil worldwide is affected by supply and demand conditions in other oilseeds. Therefore, it was felt that an attempt should be made to estimate "secondary" commodities which affect supply and demand commodities for the "primary" commodities.

The estimation of rice as a "secondary" commodity is beyond the scope of this work. As the third largest traded agricultural commodity[3], inclusion of rice would require estimation of stocks, production, and trade for each region, in short the addition of an entire sector. Therefore, the only "secondary" commodity whose trade is estimated is roots and tubers and that is limited to imports into the EC (Table 3.1).

On the other hand, alternative oilseeds are generally country specific, ie; domestic production of an alternative oilseed will effect demand for a soyproduct only in that country. There is very little trade in alternative oilseeds. In 1983, trade in all alternative oilseeds combined accounted for only 20% of the trade in total oilseeds. Therefore, simple production equations or exogenous assumptions provide proxies of the availability of alternatives to

soyproducts.

TABLE 3.1
REGIONAL AND COMMODITY AGGREGATIONS

COUNTRY	PRIMARY COMMODITIES	SECONDARY COMMODITIES
EXPORTERS		
Argentina	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	None
Australia	Wheat, Coarse Grains	None
Brazil	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	None
Canada	Wheat, Coarse Grains	None
United States (linked as separate model)	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	None
IMPORTERS		
Developed Markets	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	Rapeseed, Sunflower Roots & Tubers
Soviet Bloc	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	Rapeseed, Sunflower
Newly Industrialized Countries (NICs)	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	None
Oil Exporters	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	None
China	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	Cottonseed, Rapeseed Sunflower, Peanut
Less Developed	Wheat, Coarse Grains Soybeans, Soymeal, Soyoil	Rapeseed, Sunflower, Palm Kernel, Peanut

3.2 Basic Considerations in Regional Aggregation

One of the major problems which must be confronted in determining the structure of a model is the tradeoff between the level of aggregation and the ability to generate a supportable database of variables which captures the relevant relationships in domestic and international markets.

In attempting to aggregate regions, one seeks to define common structures among countries. To this end, similar coefficients are desired for the variables. While it is impractical to estimate each region to determine if there are close coefficients, one could deduce that there is a reasonable probability of similarity among coefficients if the countries of a region exhibit similarities with regard to economy, policy or geography.

Regional aggregation begins with the assumption that there are economic or policy variables shared by countries in a region which can be used as independent variables. Real income, and more importantly, real income growth is obviously a very important determinant of trade. Observation of per capita intake of calories across income (Figure 3.1) indicates that increases in income levels result in significant shifts both in rates of growth of caloric consumption and in the shift of consumption to animal calories. It would appear that rapid growth in caloric consumption begins at about US$ 1800 and slows as incomes approach US$ 10,000. Countries with incomes grouped

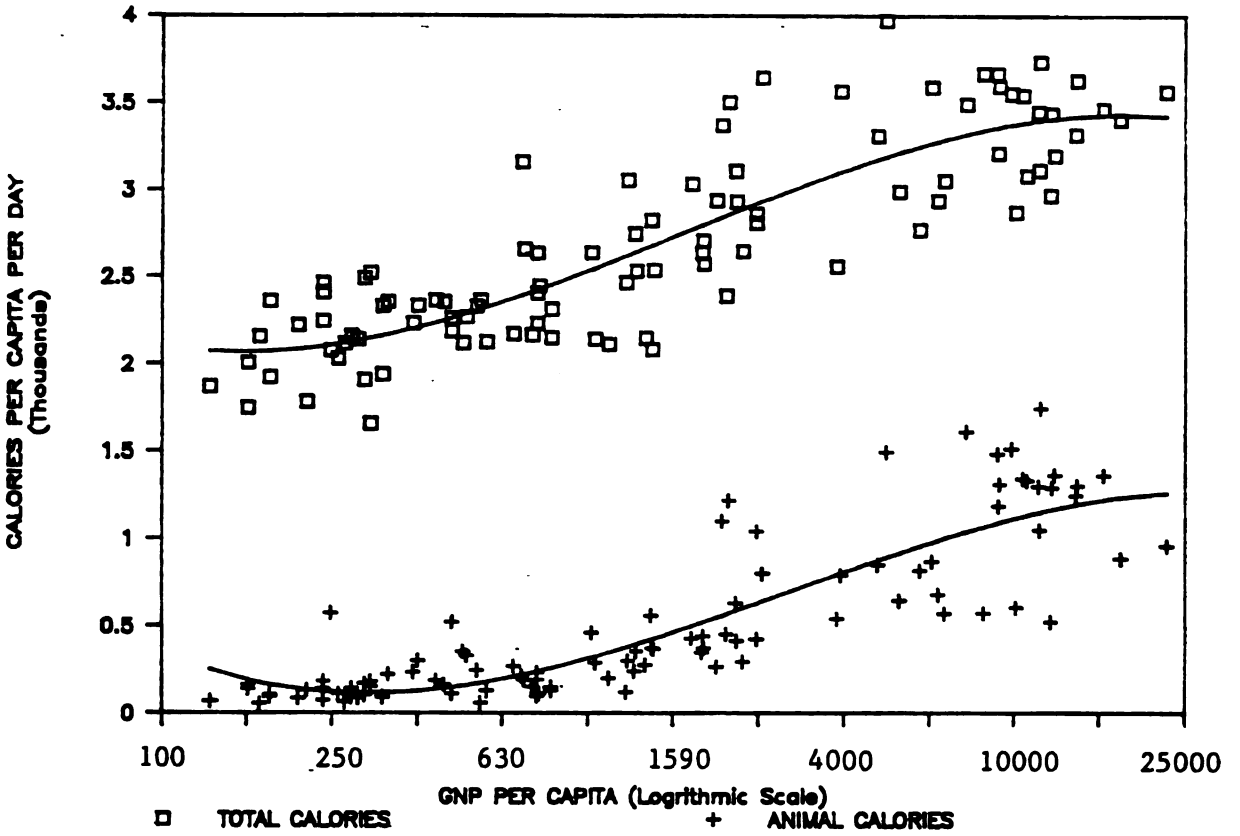

Figure 3.1. Per Capita Food and Feed Consumption Calories per Day - 1983

around one of these turning points could be expected to exhibit a similar coefficient on real income growth.

Another consideration is the level of protection provided to agricultural producers or to consumers. These would effect the real border price elasticities of supply and demand, a protecting country would exclude imports of grain no matter how low the price while a country seeking stable levels consumption might be committed to import no matter how high the price. Policy decisions are closely related to the ability of a country to set policy independent of others. In the case of common markets or power

blocs, aggregation has already occurred. The commonalities which define each region will be presented when the individual regions are introduced.

The final consideration in aggregation is the availability of macro economic forecasts. Although use of computer spreadsheets and tape stripping has eased the derivation of aggregations for the historical period, forecasts of the relevant exogenous variable must be available.

For all regions, there are four essential exogenous variables: population, income, inflation and exchange rate. Forecasts of population for any aggregation are relatively easy to formulate and a number of sources provide forecasts of population growth. However, fewer forecasts of the macroeconomic variables are available. In the case of the Developed Markets, forecasts covering the OECD are available, while the Soviet Bloc is aggregated by the United Nations Statistical Yearbook as "Centrally Planned Economies".

One problem which must be recognized in grouping countries by economic or political behavior is that there is a defacto disregard for similarities inherent in geographical groupings. Geographic groupings tend to aggregate similar climatic conditions or resource availability thereby providing a better indication of a region's ability to expand or contract acreage over time. Political or economic aggregation, which groups regions with differing

endowments, can result in biased supply responses.

Once the regions were aggregated, the international model was divided into three subroutines: an export subroutine (EXPRTS), and import subroutine (IMPRTD) and the shared market clearing subroutine (EXPRTP). The decision to place each region within a subroutine was based on whether the commodities of interest where imported or exported. In the case where a region was an importer of one commodity and an exporter of another, (e.g. Brazil and the Developed Markets) the judgement was made by the analyst. Brazil is more important as a trader of the soybean complex than of wheat and coarse grain (which it has occasionally exported) so was included in the EXPRTS subroutine. The Developed Markets import soybeans, coarse grains and had been an importer of wheat over much of the estimation period so have been included in the subroutine IMPRTD. Regardless, the location of a region in one or the other subroutine is more a convenience and does not affect model performance.

3.2.1 Export Subroutine

The subroutine EXPRTS contains five countries, the United States, Canada, Australia, Argentina and Brazil. These five countries were chosen because with the Developed Markets* as an exporter of wheat they were responsible for 73% of the world grain and soyproduct exports in 1983. The policies of each of these countries has a major effect in

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* Located in the import subroutine.

international grain trade. Therefore, they are modeled as individual regions.

Three of these five countries, Australia, Argentina and Brazil are considered "surplus exporters"; it is assumed that subject to a minimum stock level they are prepared to export all excess production and provide price competition if necessary. The Developed Markets represent something less than pure surplus exporters. Although the European Community would like to minimize its stocks the high intervention price requires a subsidy to lower the European export price to world levels. Therefore, exports by the Developed Markets will be functions of amount of subsidy required to export their surplus and the size of the surplus. The remaining pool of import demand is filled by Canada with the United States performing the function of residual supplier (Figure 3.2).

3.2.2 Import Subroutine

The subroutine IMPRTD consists of six regions. Following the broad considerations of aggregation discussed earlier, observed common traits among countries were felt to justify aggregation into regions.

The Developed Markets (the EC-12, other Western Europe, Japan and South Africa) represent the high income industrialized countries. Their agricultural systems tend to be based upon a cropland base without room for expansion and high levels of protection for domestic producers. Although Japan and Europe have different rates of income growth,

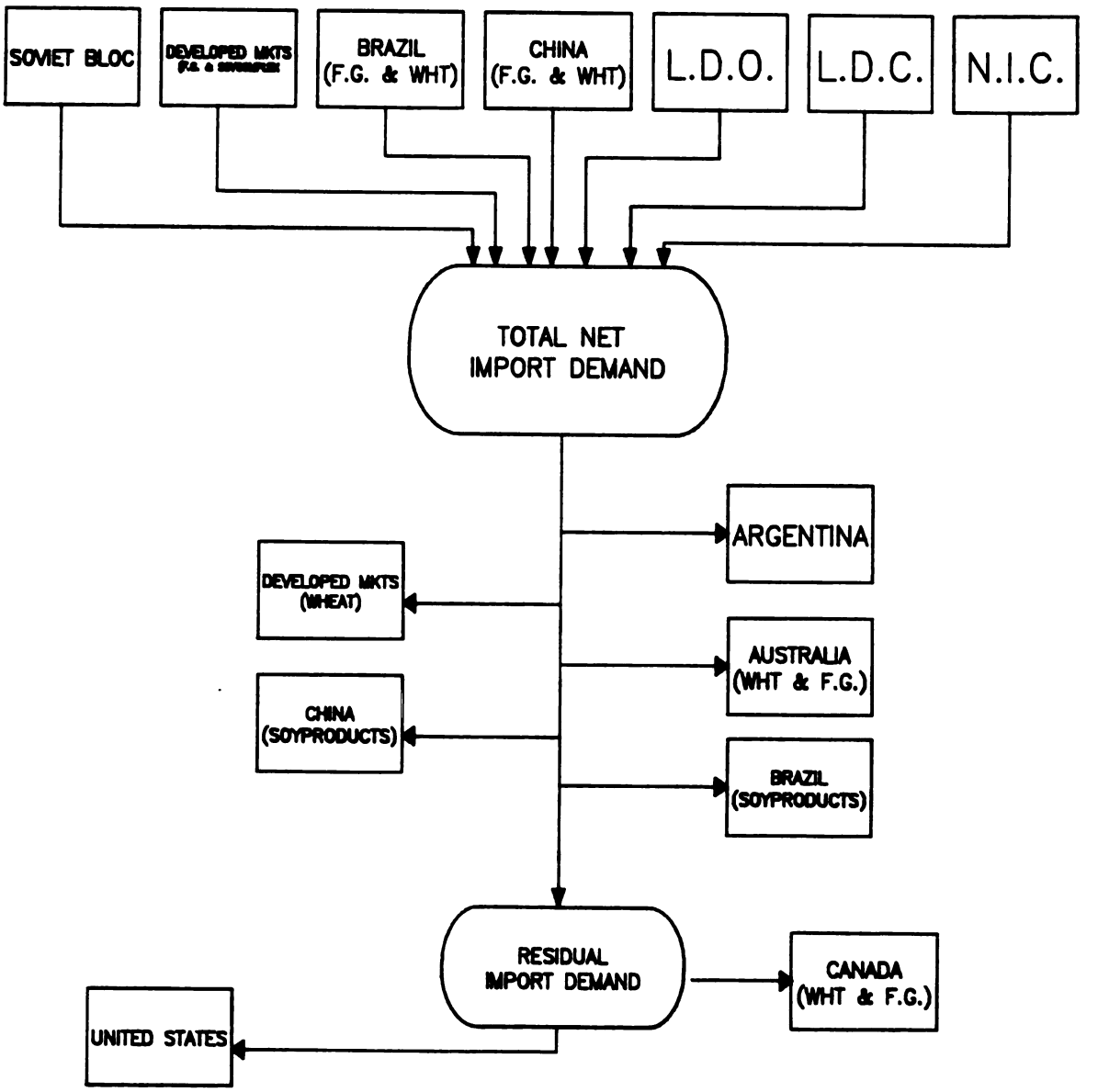

Figure 3.2. World Grain Trade Hierachy

their macroeconomic variables are aggregated by the OECD. In addition, the majority of adjustment from any trade liberalization will occur through the lowering of the level of protection in this region.

The Soviet Bloc (U.S.S.R. & Eastern Europe) is aggregated by membership in COMECON. Although several members of

COMECON have close trade relations with the West, their economic policies are closely tied to those of the Soviet Union. Their access to foreign currency is more closely tied to political policies than for other groups.

A number of studies[4] have concluded that since the early 1970s, the Soviet Bloc, led by the Soviet Union has shifted from a policy of self-sufficiency in production to a marked desire to upgrade diet through increased animal calories. This requires a steady supply of feedstuffs. As a result of erratic yields and often diminishing production the Soviet Bloc has resorted to maintaining stable domestic supplies by importing grain. This has brought greater instability to the international grain markets[5].

The N.I.C.s (Taiwan, South Korea, Hong Kong, Singapore and Malaysia), and L.D.C.s (O.P.E.C. excluding Gabon and including Oman) represent countries experiencing or with the potential for rapid increases in income. Most of these countries are at or given their growth potentials will approach the stage where calorie consumption will increase dramatically. Much of the increase in caloric intake will manifest itself as increased consumption of animal calories. Increased animal production will require increased imports of grain for feeding as opposed to grains for human consumption. Although rice or manioc can be used as a substitute for feed grains in the NICs, it is expected that this income growth will generate an increased demand for both feedgrains and soyproducts.

The nature of economic growth strategies led to the separation of the NICs and LDOs into two regions. The N.I.C.s are experiencing growth along a broad base of industrial and textile production while O.P.E.C.'s economic growth will rise and fall with the demand for petroleum; therefore it was deemed necessary to separate the two regions. Furthermore, the NICs tend to have a more stable agricultural base than that for the LDOs. The growth in production for many of OPEC countries is very closely tied to their ability to support agriculture with petrodollars.

The People's Republic of China is estimated as an individual region for several reasons. The economic policies of China have an effect on the well-being of one-quarter of the world's population and its recent open trade policy has turned it from a hoped for major market for agricultural commodities to a major competitor in the Asian grain market. Under the limited capitalism of the current administration many sectors of Chinese agriculture and industry are experiencing significant increases in productivity.

Historically, China has been an exporter of soybeans and recent increases in agricultural productivity have turned China into a net exporter of both coarse grains and soyproducts. However, economic liberalization has led to increases in incomes which could increase calorie consumption. Under this scenario, the demands made upon the agricultural sector by a more affluent population could reverse the balance of Chinese agricultural trade.

The rest of the world is contained in the L.D.C. region. Although this includes several countries which have relatively high incomes (most notably Israel and New Zealand) the amount produced and traded by these regions were too small to warrant inclusion with the Developed Markets. Therefore, they were placed with the L.D.C.s which represent "the world minus all other regions", basically a collection of countries for which published data are not regularly available.

3.3 Methodology of Data Collection and Aggregation

All data used in the estimation process is from publicly available sources. Most data extends back to 1960 except for the oilseed complex. This data is not available on tape prior to 1964.

All agricultural data is available through the Foreign Agricultural Service/U.S.D.A. both on computer tape and in publications. The individual country data (harvested area, production, consumption net trade and ending stocks) are then summed into the relevant aggregations either within the tape stripping routine or with a spreadsheet program.

CPI, GDP, population and exchange rate (hereafter referred to as macroeconomic data) were gathered from the International Monetary Fund's International Financial Statistics or the United Nations' Statistical Yearbook. In generating aggregated GDP, CPI and exchange rates for the regions, there was a trade-off between the level of aggregation and the effort required to generate more precise

macroeconomic variables. Using the formula developed by Mitchell[6], 5-10 countries which were responsible for 75-90% of total grain trade for a region for the past five years were selected.

The amount of trade for those 5-10 countries are then summed to represent 100% of the region's trade and the weight f^i for each country is equal to percentage of trade for each:

$$f^i = \frac{| \text{ Net Trade}^i |}{\sum_{i=1}^{n} | \text{ Net Trade}^i |}$$

Therefore,

$$XR_t^j = \sum_{i=1}^{n} (f^i * XR_t^i)$$

$$GDP_t^j = \sum_{i=1}^{n} (f^i * GDP_t^i)$$

$$CPI_t^j = \sum_{i=1}^{n} (f^i * CPI_t^i)$$

where: XR_t^j = Exchange Rate for region j at time t (expressed as an index per US$ where 1980=100)

GDP_t^j = Gross Domestic Product for region j at time t (expressed as an index where 1980=100)

CPI_t^j = The Consumer Price Index for region j at time t (1980 = 100)

and: i= 1, ..., n countries whose trade is equal to 75-90% of trade for that region.

j= 1, ..., k regions

The number of countries and the amount of trade would vary depending on the individual percentages of trade for the region. For example, in a small region 5 countries might be responsible for 90% of the region's trade whereas in a large

region of small countries the 10 largest traders might be responsible for only 75% of the region's trade.

While data for GDP for the Soviet Bloc is aggregated in the United Nations Statistical Yearbook, a traded exchange rate and inflation data are not available. Considering that the majority of hard currency is gained through trade with the industrialized countries, S.D.R.s and the O.E.C.D. deflator were chosen as the simplest proxies.

In an attempt to ease calculations the readily available S.D.R. and E.C.U. were also tested as proxies for Developed Market exchange rates. The S.D.R. was not found to track very well against the trade weighted exchange rate derived in the formula above. Although use of the ECU biases the exchange rate weighting by relying solely on European currencies, the results of a comparison of the trade weighted exchange rate and the ECU indicated that historically, the ECU and the weight exchange rate tracked fairly closely. Therefore, the European Currency Unit (ECU) was chosen as a proxy for the Developed Market exchange rate.

3.3.1 Methodological Problems in Aggregation of Data

Several problems exist in data generation by trade weights. First, the I.M.F. data for a country often does not begin until the year of entry into the I.M.F.. It was therefore sometimes necessary to exclude a country important in trade with no historic data in favor of a less important trader for which data was available. Secondly, since

policies and production change over time relative trade by countries within a region the trade weights require periodic revision.

Finally, there is the problem of reconciling the agricultural and macro data sets. Typically, the commodity data are presented on a crop year basis which extends across two calendar years (Figure 3.3). On the other hand, the macro data are presented on a calender year basis. In the interests of ease of data collection, the calendar year of macroeconomic data corresponds to the beginning year of the crop year. The standard practice for reconciling the crop years if a balanced set of trade figures is desired has

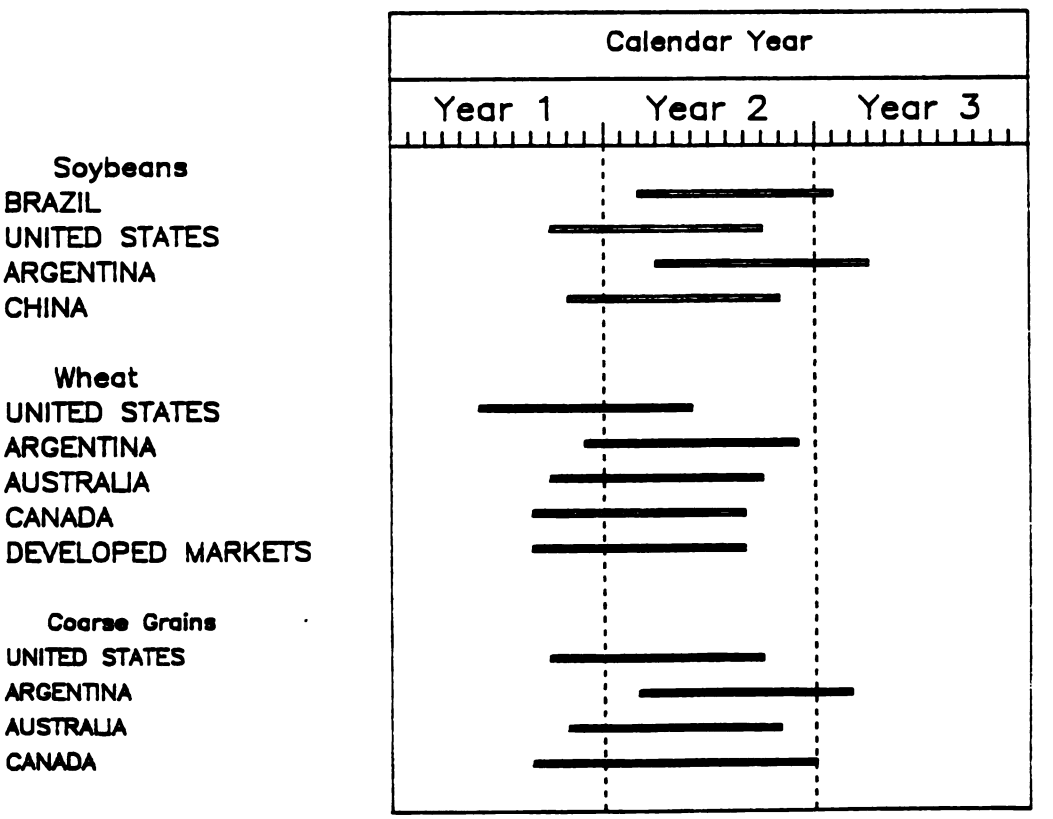

Figure 3.3. Distribution of Crop Years for Major Exporters

beento call each of those crop years Year 1 and assign it to the macroeconomic data corresponding to year 1.

A more serious though similar problem exists in attempting to reconcile trade data for northern and southern hemisphere crop years. In the grain sector the overlap is only 2 months and is not as critical. However, in the soybean sector, the overlap is six months for Brazil and 8 months for Argentina. This presented a special problem in reconciling the soybean data. As a result of the overlap it becomes difficult to get a clear picture of trade within a crop year. The data, however, cannot be handled on a trade year because it would then be impossible to reconcile the domestic markets. Although a number of arguments can be made for setting Brazil and Argentina in Year 2, to maintain a uniform method of data collection, each of the regions will be referred to as Year 1. The implication of this action is that it is impossible to balance the exports and imports because the U.S. cannot perform as a residual exporter. The method by which trade is reconciled will be discussed at the end of Section 3.5.2

3.4 Export Price Subroutine

The subroutine EXPRTP contains the price clearing equations. Using the specification for the price equation developed by Mitchell[7], the world price for wheat and coarse grains in U.S. dollars at the Gulf is estimated as a function of the stock to utilization ratios for Canada, Australia, Argentina and the Developed Markets (for wheat)

and the United States:

$$P_t^{world} = f\left(\sum_{h=1}^{k} \frac{ES_{t-h}}{UTIL_{t-h}^{*}} \quad , \text{U.S. LOAN RATE}_t\right)$$

where the loan rate in the United States establishes the floor on U.S. price. This is set exogenously in response to domestic pressure, and because the United States is the dominant exporter this same support price will also act as a floor on the world price by soaking up and storing excess supply before it goes into export channels. The theory of speculative demand indicates that as available supply tightens relative to demand, it will take a progressively higher price to bring a commodity out of stock and into the market. Conversely, low prices would tend to result in stock accumulation. However, the introduction of the loan rate soaks up excess production if the price falls below the loan rate. Therefore the stock/utilization-price curve will kink at just below the loan rate instead of decreasing asymptotically (Figure 3.4).

Recently, it has become evident that there has been a substantial buildup of stocks in the U.S. The buildup would appear to be the result of the saturation of demand for consumption as opposed to speculative demand. Longmire and Morey[8] claim that this buildup is linked to the change in the value of the dollar. They argue that an appreciation of the dollar will act in the same manner as an export tax:

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* Utilization (UTIL) is equal to domestic consumption (CONS) plus net exports(NE)

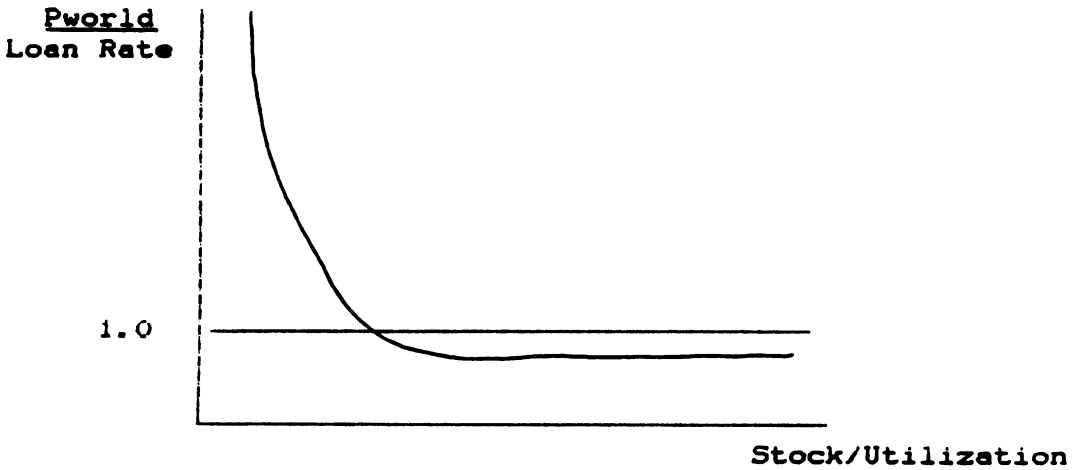

Figure 3.4. Ending Stock-Price Relationship

driving a wedge between the domestic price in the U.S. and the price importers must pay. Since world grain prices are quoted in U.S. dollars there would be a decline in import demand.

In a world of competing, exporters where speculative demand exists, each exporter is faced with a similar speculative demand curve in its own currency (Figure 3.5)

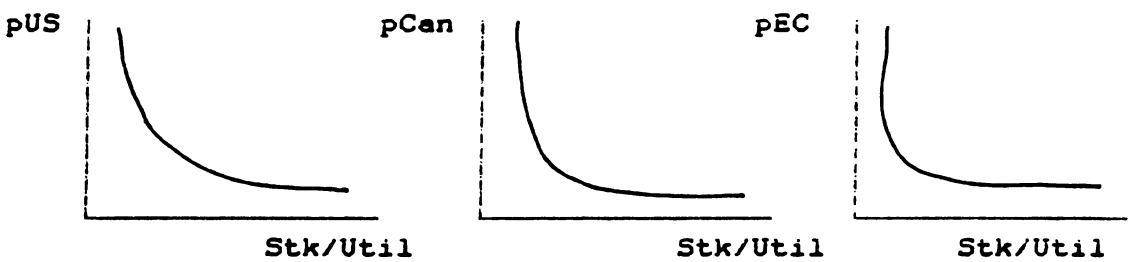

Figure 3.5. Ending Stock-Price Relationship for Competing Exporters

This speculative demand is modeled by estimating exports for non-dumping exporters (Canada and the Developed Markets) as a function of real border prices. The decision to export or

hold stocks is a function of the local currency price facing the exporter. Appreciation of a region's currency vis-a-vis the U.S. dollar will raise the price faced by both exporting and importing regions. Importing regions will decrease the quantity imported and exporting regions will increase the quantity of their exports. Therefore competing exporters will increase their shares of a declining pie and the U.S. will lose market share. Although there was no change in the U.S. dollar price there will be an initial increase in U.S. ending stocks.

The effects that increased stocks have on U.S. prices will depend on whether the stocks are stored under policy rules or as market stocks. Although the government holds stocks to maintain price by soaking up excess production, the knowledge of the quantity and the release price for FOR and CCC stocks discounts its effectiveness. Therefore, the relevant endstock equation for the U.S. is actually somewhere between total ending stocks and freestocks*.

The effects of increased stocks on price will depend upon the degree to which the market views policy stocks as "off the market" and the perceived level of stocks which are needed to smooth market transactions. Empirical testing has indicated that both sets of perceptions have been subject to change.

The market perceives a greater percentage of policy stocks as "off the market" if prices are near the loan rate

---

* Freestocks = Total Ending Stocks - CCC - FOR

and there is an increase in policy stocks. If prices are near the trigger price, the market anticipates their release by lowering the percentage of stocks "off the market".

After the period of high prices in the early and mid-1970's there appeared to be a realization that stocks could be considerably lower relative to utilization ratio before prices increased. This "optimum" has continued to decline over the period since 1977. Therefore the price equation can be specified as:

$$\frac{P_t^{World}}{Loan\ Rate_t} = f\left(\sum_{h=1}^{k} \frac{ES_t^h}{UTIL_t^h}, Shift\right)$$

where: h=1...k exporters

ES_t^h = Ending Stocks of country h at time t (1000 MT)*

$UTIL_t^h$ = Utilization by country h at time t (1000 MT)

SHIFT = The stock/utilization ratio * time if time is greater than the 1978.

Since the world price is estimated as a percentage of the loan rate, it is not necessary to deflate and re-inflate price to derive a nominal world price.

Prices for the soybean complex are assumed to be determined by supply and demand conditions in the United States. World prices (Decatur) for soymeal are calculated and a function of the stock to utilization ratio for soymeal

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* The U.S. uses Freestocks where Freestocks equal total ending stocks minus that percentage of CCC and FOR stocks which the markets recognizes as "off-the-market".

equivalent*. If the international model is linked to the domestic model, soymeal prices are calculated in the domestic price component. Soyoil prices are determined by supply and demand conditions in the domestic component of the model (Decatur price) and then the cost of transportation is added to derive the gulf price or exogenized in the international component. The soybean export price is estimated as a function of the prices of the component products.

To convert these prices to real border prices, they are then multiplied by the exchange rate and divided by the C.P.I. for a region:

$$P_t^J = P_t^{world} * \frac{XR_t^J}{CPI_t^J}$$

where: $j = 1, \ldots, k$ regions

Abbott[9] includes transportation costs in his price mechanism by determining the costs of transportation from all export markets to all import markets and of all import market to the Gulf. The price facing each importing region i would be:

$$P_t^i = P_t^{Gulf} + Freight_t^{Gulf-)i}$$

while the price facing each exporter x in region i would be:

$$P_t^i = P_t^{Gulf} + Freight_t^{i-)x} + Freight_t^{Gulf-)x}$$

where P_t^i = Border import price at time t

P_t^{Gulf} = Price at the Gulf at time t

---

* Soymeal plus the soymeal equivalent of soybeans.

$Freight_t^{Gulf-)i}$ = The cost of transportation from the Gulf to importing region i at time t

$Freight_t^{Gulf-)x}$ = The cost of transportation from the Gulf to exporting region x at time t

$Freight_t^{i-)x}$ = The cost of transportation from importing region i to exporting region x at time t

Use of this equational form would permit determination of the patterns of trade in much the same matter as a spacial equilibrium model. However, the current scheme of regional aggregation by economic consideration would result in considerable problems in aggregation. It was felt that the complexity of determining freight rates would overshadow any benefits from including an exogenous variable. Therefore, transportation costs appear implicitly in estimation of the import and export equations.

3.5 Country/Region Models

The model structure contains both recursive and simultaneous elements. For each of the 11 regions, production is based on relative prices, yields, ending stocks or imports from past periods while prices, consumption and imports are solved simultaneously. In most cases, the structure of the model estimated for countries fitting a class (eg: surplus exporter, residual supplier or importer) will be the same (Figure 3.6). However, in some cases it was necessary to modify the equation structure somewhat.

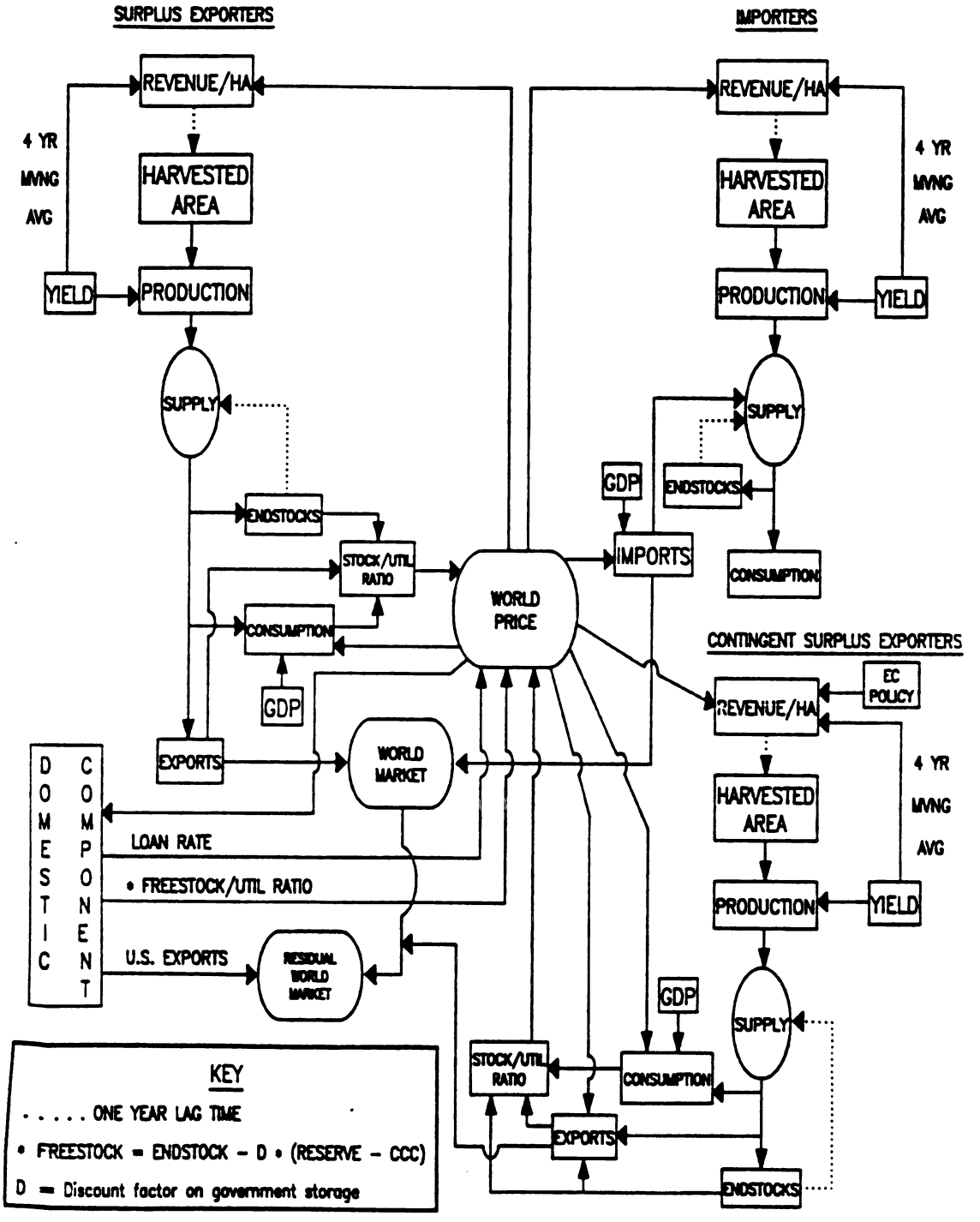


Figure 3.6. International Component - Grains Sector

3.5.1 Domestic Production

Mitchell[10] argues that estimating an aggregate production function is both difficult and often leads to incorrect signs and elasticities. He feels that a greater degree of success can be achieved by considering domestic production for each region to be an identity defined as:

$$PROD_t^i = HA_t^i * YLD_t^i$$

where: $PROD_t^i$ = Production of crop i in year t (1000 MT)

HA_t^i = Harvested area of crop i in year t (1000 HA)

YLD_t^i = Yield of crop i in year t (MT/HA)

and attempting to estimate both yield and production as separate equations.

3.5.1A HARVESTED AREA

Estimation of the harvested area equations follow the general formula of a partial adjustment model suggested by Nerlove. The model assumes that producers adjust their acreage HA_{t-1} toward a desired level HA^*_t in response to expected prices: $HA^*_t{}^i = f(P^*_t{}^i, X_t^i)$

where: $HA^*_t{}^i$ = Desired harvested area of commodity i at time t

$P^*_t{}^i$ = Expected price of commodity i at time t

X_t^i = Other relevant variables

However, expansion to the desired acreage was subject to rigidities in the production function which result in only a partial adjustment to the desired acreage in one period. If it is assumed that farmers base their price expectations upon the last period's price and that HA_t lies

somewhere between HA_{t-1} and HA^*_t, the Nelovian model may be written:

$$HA_t^i = f(HA_{t-1}^i, P_{t-1}^i, X_t^i)$$

where: HA_t^i = Harvested area of commodity i at time t

P_{t-1}^i = Price of commodity i at time t-1

X_t^i = Other relevant variables

This initial formulation was modified by Nerlove and Addison in response to Brandow's argument that non-price variables (ie; yield) not included in Nerlove's original specification had a significant effect on harvested area[11].

In the current specification of the international component, lagged revenue is used in place of lagged price. Revenue will provide a better measure of producer considerations by taking the income generating effects of yield growth into account. Other relevant variables will proxy policy or non-yield technical innovation:

$$HA_t^i = f(HA_{t-1}^i, REV_{t-1}^i, REV_{t-1}^a, X_t^i)$$

where: HA_t^i = Harvested area of crop i in year t (1000 HA)

REV_{t-1}^i = Gross revenue per hectare for crop i in year t-1

REV_{t-1}^a = Gross revenue per hectare for competing crops in year t-1

X_t^i = Other relevant variables for crop i in year t

In its simplest form, per hectare revenue for each of the crops was generated by multiplying the real border price by yield. In tests however, this formulation proved to cause considerable downward bias in lagged revenue following periods of drought. A 4 year moving average of yields for

the crop was found to reduce the bias from year to year droughts while lowering revenue expectations during longer period droughts or downward shifts in yield trends:

$$REV_{t-1}^{i,J} = \frac{1}{4} \sum_{k=t-4}^{t-1} YLD_k^{i,J} * P_{t-1}^{i,J}$$

where: $REV_{t-1}^{i,J}$ = Revenue of crop i in region j at time t-1

$YLD_t^{i,k}$ = Yield of crop i in region j at time k

$P_t^{i,J}$ = Real border price of crop i in region j at time t-1

Although the three year lag corrected downward bias, three degrees of freedom are lost. While this does not necessarily present a problem for estimations based on sample exceeding 20 observations, most soybean data begins in 1964. Under these circumstances, the loss of three data points could result in significant loss of explanatory power. Therefore, in the case of soybeans, the trend yield was determined and used as a proxy for actual past yield.

In countries where a marketing board or similar agency has a monopoly on either grain exports or all deliveries it can drive a wedge between domestic and world prices (Spriggs 1978 & Bray, et. al. 1981). In this case producers respond to a mix of domestic and world prices as well as the policy instruments of the marketing agency (eg: quotas, taxes or subsidies). Spriggs and McCalla and Schmitz[12] agree that ending stock policies of the grain boards in Australia and Canada can have a major effect upon production decisions. Mitchell[13] has also argued that lagged ending stocks can be used as a policy proxy in a production equation:

$$HA_t^i = f(HA_{t-1}^i, REV*_t^i, REV*_t^a, ES_{t-1}^i)$$

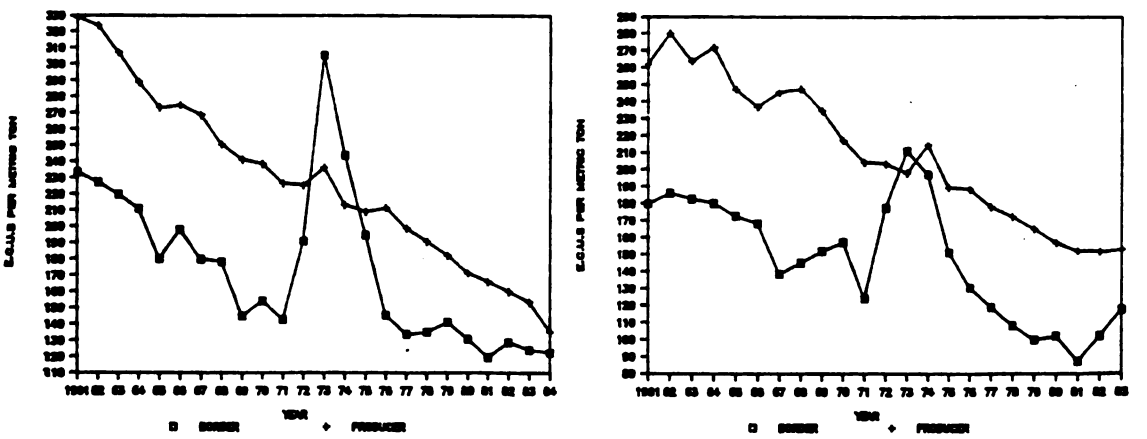
where: HA_t^i = Harvested area of crop i in year t (1000 HA)

$REV*_t^i$ = Expected per hectare revenue for crop i in year t

$REV*_t^a$ = Expected per hectare revenue for competing crops in year t

ES_{t-1}^i = Total ending stocks of commodity i in year t-1 (1000 MT)

In the European Community, the Common Agricultural Policy (CAP) generates prices for producers that bear no relation to the world price. The imposition of tariff barriers and intervention prices has resulted in what Koester refers to as "political prices"[14]. Observation of the real border price facing the EC and EC producer prices indicates that these prices have not moved together and the ratio has actually declined (Figures 3.7a & 3.7b).



a. Wheat b. Coarse Grains

Figure 3.7 a & b. Real Border and Producer Prices for Wheat and Coarse Grains in the Developed Markets.

Therefore, the harvested area equations for the Developed Markets use exogenous policy prices for wheat and corn to generate own and competing crop revenue. Initially, the intervention price was used in the formulation. However, wheat and corn prices were very closely correlated. Producer prices were tested and found to be less correlated but showed the same trends as intervention prices*.

In the Soviet Bloc, the collective farming structure of the Soviet Union greatly influences production. Acreage allocations are determined by policy as opposed to producer response to world price signals. Although it was initially theorized that there might be a price relationship between harvested area and price based on outflows of hard currency for grain imports, when wheat and coarse grain harvested areas were estimated as a function of real border prices unexpected signs and insignificant t-statistics appeared.

Despite the fact that the Soviet Union attempts to reduce domestic instability by making up shortfalls through trade and allowing the major exporters to carry stocks, ending stock policies were found to be an a reasonably effective policy proxy. When a dummy variable for the period 1960-71 (after which there was a shift from self-sufficiency in production) was included, expected signs and significant coefficients occurred in the equation:

---

* Under the CAP, intervention prices would be the floor on producer prices.

$$HA_t^{i,SB} = f(HA_{t-1}^{i}, ES_{t-1}^{i}, ES_{t-1}^{j}, DV6071)$$

where: HA_t^i = Harvested area of crop i in year t (1000 HA)

ES_{t-1}^i = Total ending stocks of commodity i in year t-1 (1000 MT)

ES_{t-1}^j = Total ending stocks of commodity j in year t-1 (1000 MT)

DV60-71 = 1 in the years 60-71, 0 elsewhere

Net imports can also provide a proxy for a government's policy on self-sufficiency in production. If lagged net imports are included on the right-hand side of a harvested area equation a positive coefficient is expected. This formulation was used in estimating harvested areas for the NICs (wheat) and the LDCs (coarse grains).

However, the positive sign on net imports will result in a decline in production if an importing country becomes a net exporter. This was found to be the case in estimating coarse grain harvested area for China. Historically, the equation tracked very well but in an ex-ante forecast the emergence of China as a constant net exporter (negative imports) resulted in a decline in harvested area. A spline was defined such that imports remained positive but the results were inconclusive. Therefore, this formulation was dropped from the Chinese harvested area equations.

The partial adjustment model is applied to all primary crops and the results are summed to generate the cropland base. Double cropping is counted as twice the harvested area. Harvested area equations for secondary oilseed crops were estimated as the function of a time trend and not

included in cropland base. Although the use of trends removes price responsiveness from the equation, the area in question is generally small. As mentioned previously, the purpose of estimating production for the secondary crops is to act as a variable in determining crush capacity and the availability of alternative oils and meals.

Mitchell suggests an alternative method for determining harvested areas. This method begins with assumption that estimating cropland base will provide a variable denoting total land availability. Cropland base can be estimated either under the assumptions of Nerlove's partial adjustment model or as a simple time trend. The harvested areas of the smallest relevant crop(s) are estimated using the partial adjustment model and subtracted from the cropland base to generate a residual harvested area for the largest relevant crop. Estimation of the two smallest regions with the largest taken as a residual results in a smaller percentage estimation error than if the largest area was estimated.

However, this method has several disadvantages. If cropland base is estimated as a time trend, an assumption is made that, subject to the growth in cropland base, the growth of all harvested areas will sum to zero. In other words, if the harvested area of one crop increases at a faster rate than the rate of cropland base it will mean that there is a reduction in the residual area. Estimating the harvested area for each crop will permit a more realistic picture of pasture reduction and movements out of non-

estimated crops.

Estimation of the cropland base as a partial adjustment model would require the addition of a return from alternative uses of the land. Otherwise, introduction of cropland base as a right-hand variable in the harvested area equation will result in multicollinearity if the same revenue variables are used in both the cropland base and acreage equations.

In constructing the international component, all three structures were tested. The results of including cropland base as a function of revenue variables was felt to be rather unstable; this was in keeping with the results noted by Fischer and Frohberg in the IIASA model[15]. When the individually estimated harvested area were summed and compared to the cropland base estimated as a time trend, it was felt that the fit was better and the number of turning point errors were fewer. Although there is a danger of a accidentally imposing an exogenous shock which expands the sum of all harvested areas beyond a reasonable cropland expansion, this can be controlled by bounding the sum of the harvested areas to within historic levels or periods of most rapid growth. Furthermore, the sum of the estimated harvested areas tend to be less than two-thirds of the total cropland base (Table 3.2). Therefore, for the purposes of estimation the harvested area for each crop was estimated seperately.

Table 3.2
Crop Harvested Area as a Function
of Total Cropland Base* - 1980
(1000 Hectares)

	Crop Area	Cropland Base	% Harv. Area
Exporters			
Argentina	12967	35200	36.8
Australia	15569	44400	35.0
Canada	18784	44350	42.4
Brazil	24600	61950	39.7
United States	118981	190624	62.4
Importers			
Developed Markets	46810	105653	44.3
N.I.C.s**	659	6521	10.1
L.D.O.s	10470	64549	16.2
Soviet Bloc	136915	285715	47.9
L.D.C.s	158227	514053	30.8
China	68972	99200	69.5
World	612954	1452215	42.2

3.5.1B Yield

An effort was made to estimate crop yield as something other than simple time trends. Based upon the theory that part of the variation in yield should be associated with the application of fertilizer; yields were estimated as a function of price received per hectare and the border price of fertilizer[16]. The results were inconclusive.

However, simply estimating yield as a time trend:

$$YLD_t^i = f(TIME)$$

represents a good first approximation but is subject to all sorts of errors. In the long-run, the introduction of high yielding varieties or a large scale increase in fertilizer

* Cropland Corresponds to "Arable Land and Permanent Crops - F.A.O. Production Yearbook 1981

** Excluding Taiwan

use during the estimation period, would result in upward bias later in the forecast period if there was been a yield plateau or marginal land was brought into cultivation. In the short-run it is difficult to include the effects of weather.

While it is not possible to alter the error in year to year variation, the longer run error was corrected through the inclusion of harvested area:

$$YLD_t^i = f(TIME, HA_t^i)$$

where in areas of maximum cultivation, the addition of marginal land would result in lower overall yield growth; or use of a log-inverse functional form:

$$YLD_t^i = f(\ln(TIME))$$

to indicate that yields plateau over time. Using a functional form other than linear runs a risk of assuming that you know more about the structure than can be proved. Therefore, yields were estimated as a simple time trend as well as in a log-linear and log-inverse. Comparison of the t-statistics, F-statistics, log-likelihood and the sum of squared residuals indicated that in the majority of the cases using the log-linear format achieved statistics as good as or better than those estimated using a linear form.

3.5.2 Net Exports

The formulation of net export equations is highly dependent upon the manner in which trade is conducted. Under a competitive trade model, price will shift to equate supply and demand thereby clearing the market. Under this

formulation, net trade becomes the residual of production, consumption and stockholding policies for all countries. However, in a world where markets are imperfect and policy intervention occurs this will not be the case. Under this formulation, the market price can remain above that which equates supply and demand and the market must be divided among the exporters. Under a cartel arrangement, members may collude explicitly, a scenario investigated by Mitchell[17] or implicitly, as suggested by Spriggs[18], to divide up market shares.

In the international grain trade no formal agreement exists; the price floor is unilaterally set by the U.S. to satisfy a domestic constituency. As long as the floor is maintained, other exporters can undercut the U.S. price and gain market share.

Since the various exporters have different policy objectives (eg; maximization of sales, greatest sales at the highest price, stability of producer prices or increased foreign exchange earnings subject to low domestic prices[19]), three classifications were created to help explain various forms of trade behavior by the regions. The different classifications of the regions result in three different specifications of the trade equations.

Argentina, Brazil, and Australia have been classified as surplus exporters. Argentina is suffering from a balance of payments deficit which requires that it earn as much foreign exchange as possible. Chiang and Blaich's study of

the Argentine grain marketing system[20] points to the relatively small amount of grain storage capacity available. This lack of storage would indicate Argentine production must move into either domestic consumption or export channels with a few months of harvest. Sharples and Goodloe concur:

> "Argentina attempts to absorb supply shocks through increased exports rather than by accumulating stocks."[21]

Based upon evidence presented by both Spriggs and Sharples et al., Australia may be classified as a surplus exporter in both the wheat and coarse grain markets. Although he hypothesizes that Australia is forced to hold wheat stocks if the price at which Australia is prepared to export wheat falls below a minimum acceptable to the United States and Canada, Spriggs claims that...

> "According to industry people, it appears the AWB aims to have a sufficient carryover to meet domestic requirements and sell the remainder on the export market at the going world price."[22].

Like Argentina, limited storage capacity requires that as much of adjustment from a domestic supply shock as possible be through trade. Brazil, is also suffering from a severe balance of payment crisis. Therefore, in order to earn foreign exchange, Brazil has embarked upon a program of increasing the production of exportable commodities. Williams and Thompson[23] formulated their model in such a manner that the trade-off was between domestic supply and exports. Once the government has insured that domestic needs are met, the balance is exported.

There would appear to be general agreement among the authors that these countries have no interest in holding stocks for speculative purposes. Therefore, these agencies rarely hold stocks at levels above those which assure domestic pipeline supplies. Any shortfall or reasonable increase in production will manifest itself through the variability of exports. In specifying the model for the surplus exporter class, stocks are set as policy or as a function of the size of the domestic supply and all grain not consumed domestically is marketed through export channels. This policy can be expected to result in substantial price competition: therefore exports become the residual equation in the country model with no dependence on price:

$$NE_t^i = ES_{t-1}^i + PROD_t^i - CONS_t^i - ES_t^i$$

where: NE_t^i = Net exports of commodity i in year t (1000 MT)

$PROD_t^i$ = Production of commodity i in year t (1000 MT)

$CONS_t^i$ = Consumption of commodity i in year t (1000 MT)

ES_t^i = Ending stocks of commodity i in year t (1000 MT)

The Developed Markets, led by the European Community are surplus exporters forced to hold stocks as a result of the economics of their protectionist policies. Under ideal conditions, the Developed Markets would accept whatever grain is offered to the marketing agency at the intervention price and export it by subsidizing the cost down to the

world market price. Faced with increasing wheat production in the face of stagnating demand, the European Community was forced to commit more money to export subsidy. Concurrently the high variable levy on coarse grains lead to increased substitution of tariff-free starches and a decrease in CAP revenues. The net export equation for wheat for the Developed Markets is estimated as a function of the domestic supply of wheat and the cost of subsidy:

$$NE_t^{Wht,Dev\ Mkts} = f(SUPL_t^{Wht}, SUBSIDY_t^{Wht})$$

where: $NE_t^{Wht,Dev\ Mkts}$ = Net Exports of wheat from the Developed Markets in year t (1000 MT)

$SUPL_t^{Wht}$ = Domestic supply of wheat (Beginning Stocks + Production) in year t (1000 MT)

$SUBSIDY_t^{Wht}$ = The subsidy on wheat exports ($P_t^{Wht,Dev\ Mkts}$ - the producer price of wheat) in the EC in year t

The remaining exporters, Canada and the United States, are specified as residual suppliers to the world market. They face a residual pool of demand unfilled by the surplus exporters:

$$RES_t^i = \sum_{j=1}^{k} NI_t^{i,j} - \sum_{h=1}^{l} NE_t^{i,h}$$

where: RES_t^i = Residual pool of imports of commodity i in year t (1000 MT)

$NI_t^{i,j}$ = Net imports of commodity i by importer j in year t (1000 MT)

$NE_t^{i,h}$ = Net exports of commodity i by surplus exporter h in year t (1000 MT)

Canada, which seeks to maximize producer returns subject to the cost of storage, will compete with the U.S.

for this pool and increase stock levels during periods of low prices:

$$NE_t^{i,Canada} = f(RES_t^{i,Canada}, P_t, ES_t^i)$$

However, if Canadian stock levels become excessive, Canada will exhibit surplus exporter behavior and market any surpluses aggressively. An example of this behavior occurred in the early 1970's. In that case, ending stocks levels are targeted and net exports become the residual of production, consumption and stocks.

Net exports by the United States are the residual in the series of export equations:

$$NE_t^{i,US} = RES_t^i - NE_t^{i,Canada}$$

As noted previously, there is a separation between crop years for the major exporters. In the wheat and coarse grain sectors, there is enough overlap to assume that the markets for all exporters clear in the same period.

However, in the soycomplex there is about a 6 month difference between crop years in the southern and northern hemispheres. Given such an overlap, there is a question of whether crop year 1 in Argentina and Brazil should correspond to crop year 1 or 2 in the U.S. Either way, it is felt that there will be incomplete clearance in a given year. Therefore, the soyproduct export equations for the U.S. are semi-definitional equations:

$$NE_t^{i,US} = \alpha + \beta * RES_t^i$$

where: $NE_t^{i,US}$ = Net exports of soyproduct i by the U.S. at time t (1000 MT)

RES_t^i = Residual pool of export demand of soyproduct i at time t (1000 MT)

Incomplete clearance is represented by the coefficient $\beta = 1$.

In either equational form, the U.S. cannot directly influence the quantity it exports. However, the U.S. can influence global supply and demand conditions by adjusting domestic agricultural policy variables or macroeconomic policies. The interaction which occurs in the domestic component effects supply and/or demand and is then carried through the price variable into the international component.

3.5.3 Net Imports

As with net export equations, the formulation of the net import equations depend upon the manner in which countries trade. Under conditions of free markets/trade, imports would equate domestic supply and consumption. Under these conditions, imports would be formulated as a residual:

$$NI_t^i = ES_{t-1}^i + PROD_t^i - CONS_t^i - ES_t^i$$

where: NI_t^i = Net imports of commodity i in year t (1000 MT)

$PROD_t^i$ = Production of commodity i in year t (1000 MT)

$CONS_t^i$ = Consumption of commodity i in year t (1000 MT)

ES_t^i = Ending stocks of commodity i in year t (1000 MT)

However, if trade occurs on a more restricted basis with policy interventions driving a wedge between real and

effective demand through taxes and subsidies, then net imports should be estimated directly as a function of price, production and other relevant variables. In that case, consumption becomes the residual equation.

Abbott and Mitchell[24] argue that the realities of international grain trade more closely resemble the second scenario. Almost all less developed countries have parastatials and many of the more developed countries use marketing boards to regulate imports. For many of these countries stable/low food prices are a priority, while for the E.C. stable/high prices are desired to maintain producer income. Both of these cases result in a divergence between domestic and world price. Therefore, it is felt that bias would result from attempting to estimate consumption based upon world prices.

Imports are estimated on a per capita basis to separate the effects upon import demand of prices, production and income from increases in population:

$$NI_t^i = f(SUPL_t^i, P_t^i, P_t^s, P_t^c, PCINC_t)$$

where: NI_t^i = Per capita net imports of commodity i in year t (1000 MT)

$SUPL_t^i$ = Per capita domestic supply (production + beginning stocks) of commodity i in year t (1000 MT)

P_t^i = Price of commodity i in year t

P_t^s = Price of substitute commodities in year t

P_t^c = Price of complementary commodities in year t

$PCINC_t$ = Per capita real G.D.P. in year t

The prices of all goods are in real border prices. This makes imports dependent upon government policies affecting exchange rates as well as domestic supply. Domestic supply will meet a percentage of consumption needs, how much of domestic requirements will be can be filled by domestic production will be an important variable in determining import demand. Income is a measure of improved dietary status and implicitly, the demand for meat (livestock, hogs or poultry) in determining demand for feeds. Derived demand for imports of coarse grain for feed is expected to be a negative function of soymeal price.

In estimating the demand for imports into the Developed Markets, it was expected that the imports of alternative sources of starch into the European Community would have a negative effect on imports of coarse grain for the Developed Markets. When the coarse grain net imports were regressed against the wheat supply, the coarse grain supply, imports of roots and tubers and a dummy variable after 1982 (for the change in wheat feeding policies in Italy), imports of roots and tubers and wheat supply were not found to be significant. When the variable for wheat supply was removed the t-statistic on roots and tuber imports improved; however the Durbin-Watson fell. Subsequent testing indicated a high degree of collinearity between the two. On the basis of comparative tests of fit and turning point errors, root and tuber imports were ignored in favor of domestic wheat supply and the weighted price of cassava and soymeal. This would

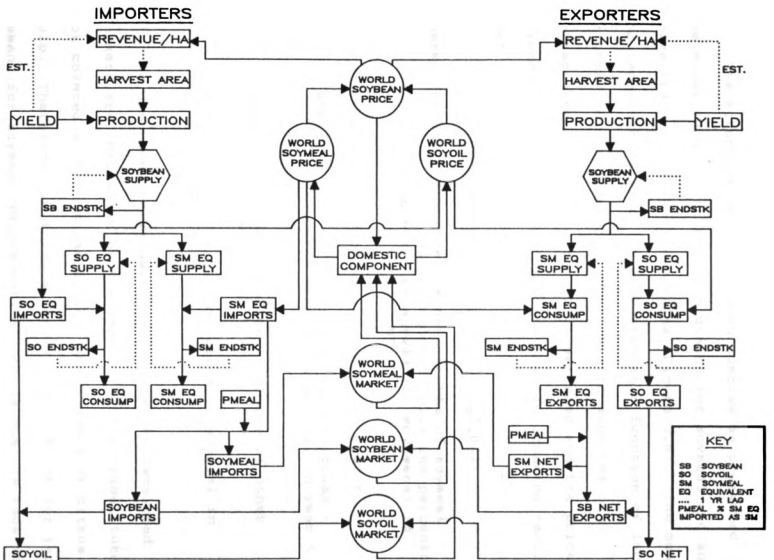


Figure 3.8. International Component - Oilseeds Sector

be in keeping with the findings of Koester:

> "The most important determinant for use of feed-grain seems to be the price ratios between grain and soya and cassava."[25]

The structure of the soybean complex as presented in the model requires that import demand for soymeal and soyoil drive trade in the entire complex (Figure 3.8). The demand for imports of soymeal is presented as a function of income (a proxy for meat demand), the domestic supplies of soybeans/meal, rapeseed and sunflower seed and the price of soybeans in those countries with domestic crushing facilities:

$$PCTSMNI_t = f(PCINC_t, SUPL_t^i, SUPL_t^j, P_t^i)$$

where: $PCTSMNI_t$ = Per capita net imports of soymeal equivalent (soymeal plus the percentage content of soymeal in soybeans) in year t (1000 MT)

$PCINC_t$ = Per capita real G.D.P. in year t

$SUPL_t^i$ = Per capita domestic supply (crush + beginning stocks) of soymeal in year t (1000 MT)

$SUPL_t^j$ = Per capita domestic supply of other meals in year t (1000 MT)

P_t^i = Price of either soybeans or soymeal in year t

As discussed previously, imports by the Developed Markets are influenced by the imports of feed substitutes not covered by the variable levy (eg; cassava or citrus pulp. Therefore, in formulation of the equation for import demand for soymeal equivalent, allowance must be made for the growing importation of cassava which requires greater

amounts of concentrates for feeding:

$$PCTSMNI_t^{Dev\ Mkts} = (PCINC_t, SUPL_t^i, SUPL_t^j, P_t^i, RNI_t)$$

where: $PCTSMNI_t$ = Per capita net imports of soymeal equivalent (soymeal plus the percentage content of soymeal in soybeans) in year t (1000 MT)

$PCINC_t$ = Per capita real G.D.P. in year t

$SUPL_t^i$ = Per capita domestic supply (crush + beginning stocks) of soymeal in year t (1000 MT)

$SUPL_t^j$ = Per capita domestic supply of other meals in year t (MT)

P_t^i = Price of either soybeans or soymeal in year t

RNI_t = Net imports of roots and tubers in year t (1000 MT)

Having determined the demand for soymeal as a whole, a decision must be made whether to import soymeal or import whole soybeans and crush the meal and oil domestically. Therefore, an equation representing the percentage of soymeal equivalent imported as soymeal is required. The most likely determinant of this decision will be the crush margin, the value of the crushed products relative to the value of the whole soybean. If the margin is positive, the value of the products is greater than the value of the bean and the meal percentage of meal equivalent imported will decline. Conversely, a negative crushing margin will encourage increased meal imports at the expense of whole beans. An additional factor influencing the crush decision is extent of utilization of crush capacity, the domestic availability of oilseed meal (rapeseed and sunflower seed)

as a whole and soymeal in particular:

$$PMEAL_t = f(MARGIN_t, OSDSUP_t)$$

where: $PMEAL_t$ = Percentage of meal equivalent imported as soymeal in year t

$MARGIN_t$ = Crush margin $[(P^{Soymeal} .795 + P^{Soyoil} * .175) - P^{Soybean}]$ at time t

$OSDSUP_t$ = Total oilseed meal domestic supply in year t (1000 MT)

Multiplying PMEAL by import demand for soymeal demand will determine the quantity of soymeal imported. The quantity of meal imported as soybeans is defined as the demand of soymeal equivalent times (1-PMEAL). This is then divided by the crush ratio to add the additional volume of oil and waste in uncrushed beans and the final figure is the import demand for soybeans.

The demand for soyoil is estimated in much the same manner. Import demand for soyoil equivalent is a function of income, prices and the domestic supply of oilseeds:

$$PCSONI_t = PCINC_t, SUPL_t^i, SUPL_t^j, P_t^s)$$

where: $PCSONI_t$ = Per capita net imports of soyoil equivalent (soymeal plus the percentage content of soyoil in soybeans) in year t (1000 MT)

$PCINC_t$ = Per capita real G.D.P. in year t

$SUPL_t^i$ = Per capita domestic supply (crush + beginning stocks) of soyoil in year t (1000 MT)

$SUPL_t^j$ = Per capita domestic supply of other meals in year t (1000 MT)

P_t^s = Price of soybeans and/or soyoil in year t

Although the price of competing oilseeds (palm, coconut and marine) probably have a significant impact upon the demand

for soyoil, especially in the less developed countries and the newly industrializing countries of East Asia, it was felt that the effort required to both maintain a database of this additional information as well as collinearity resulting from the high substitutability in oils[26] warranted exclusion of these variables.

The equation determining imports of soyoil in crude form assumes that if a country/region imports soybeans for crushing, the oil released in the crush process will fill a portion of the import requirement. Therefore, by subtracting soybean imports multiplied by the crush ratio from the demand for soyoil equivalent, the imports of soyoil can be determined.

3.5.4 Domestic Consumption

Acceptance of the arguments favoring the estimation of imports requires that consumption becomes the residual in each regional system:

$$CONS_t^i = ES_{t-1}^i + PROD_t^i - NI_t^i - ES_t^i$$

where: $CONS_t^i$ = Consumption of commodity i in year t (1000 MT)

$PROD_t^i$ = Production of commodity i in year t (1000 MT)

NI_t^i = Net imports of commodity i in year t (1000 MT)

ES_t^i = Ending stocks of commodity i in year t (1000 MT)

However, all exporting countries will first satisfy domestic demand before completely committing grain to the export market.

Grain consumption for the exporting countries has been divided into two equations, food (human) consumption and feed (animal) consumption. This will require estimation of different price and income elasticities and a measure of the substitutability of wheat and coarse grain for food and residual consumption.

Estimation of the equation for a commodity's primary use (wheat for food, coarse grain for feed) is relatively straight forward. In keeping with standard demand theory it, can be expected to be a function of the own, alternative and, in the case of coarse grains, complementary commodity price, and income:

$$CONS_t^i = f(P_t^i, P_t^s, P_t^c, PCINC_t)$$

where: $CONS_t^i$ = Per capita consumption of commodity i in year t (MT)

P_t^i = Price of commodity i in year t

P_t^s = Price of substitute commodities in year t

P_t^c = Price of complementary commodities in year t

$PCINC_t$ = Per capita real G.D.P. in year t

Estimation of the commodity's secondary use follows much the same format but often requires the addition of an estimator of the relative availability of the own and competing crop and any relevant policy variables:

$$CONS_t^i = f(P_t^i, P_t^s, SUPR_t^{i,c}, PCINC_t)$$

where: $CONS_t^i$ = Per capita consumption of commodity i in year t (MT)

P_t^i = Price of commodity i in year t

P_t^s = Price of substitute commodities in year t

$SUPR_t^{i,c}$ = Ratio of domestic supplies (production + beginning stocks) of commodity i and competing commodity c in year t

$PCINC_t$ = Per capita real G.D.P. in year t

The specification of a surplus exporter is such that unless production is abnormally large, ending stocks are a constant. This results in almost no variability of stocks for the surplus exporter with real border prices determined by world supply and demand conditions. Therefore, the domestic supply ratio is included in addition to prices as a measure of scarcity facing the domestic producer before the crop moves into the export market.

The estimate of wheat consumption in the Developed Markets includes the subsidy as a policy variable. If the costs of exporting European grain becomes great, the EC might undertake to encourage expanded domestic consumption.

The model is specified so that the consumption of soyproducts is in either a soymeal or soyoil equivalent, despite consumption of whole beans in China and the N.I.C.s, no allowance is made for whole bean consumption. The equation for consumption is defined as:

$$CONS_t^i = ES_{t-1}^i + (ES_{t-1}^{Soybean} + PROD_t^{Soybean} + NI_t^{Soybean} - ES_t^{Soybean}) * \text{crush ratio}^i + NI_t^i - ES_t^i$$

where: $CONS_t^i$ = Consumption of commodity i in year t (1000 MT)

$PROD_t^{Soybean}$ = Production of soybeans in year t (1000 MT)

$NI_t^{Soybean}$ = Net imports of soybeans in year t (1000 MT)

$ES_t^{Soybean}$ = Ending stocks of soybeans i in year t (1000 MT)

NI_t^i = Net imports of commodity i in year t (1000 MT)

ES_t^i = Ending stocks of commodity i in year t (1000 MT)

3.5.5 Ending Stocks

The ending stock equations for each region will depend upon its role in the international market. As discussed in previous sections, the regions designated as surplus exporters will not willingly carry stocks above the pipeline level. If therefore, ending stock quantity is a policy decision, it is necessary to investigate which variables might influence the ending stock level.

Production can have a very great effect upon the level of ending stocks held by surplus exporters:

$$ES_t^{i,\,Surpls\ Exprtr} = f(SUPL_t^i)$$

where: $ES_t^{i,\,Srpls\ Exprtr}$ = Ending stocks of commodity i in year t (1000 MT)

$SUPL_t^i$ = Production of commodity i in year t (1000 MT)

Under this formulation, ending stocks would be a spline function. The floor could either be a constant representing minimum stock policies or a function of demand representing the size of the pipeline. During periods of very large harvests, the infrastructure may be incapable of moving the grain into export channels and involuntary stockholding

could occur.

For example, Argentina has a very poor rail network and only limited storage capacity at the port. Although the marketing system is generally orderly, a large crop can swamp the infrastructure and result in bottlenecks spreading throughout the system. Chiang and Blaich[27] found that in the event of bottlenecks at the port terminals, railcars were used to supplement storage capacity. This increased their turn-around time and shifted bottlenecks back to the railhead.

During several periods, very good wheat crops in Australia have also resulted in increased ending stocks. Constraints on storage capacity led to the institution of delivery quotas in 1969. Although these quotas ended in 1974, the legal power to reinstate them still exists.

If the government or marketing board of a surplus exporter attempts to estimate domestic consumption for the year before allowing exports, and has historically limited exports if actual consumption exceeded estimated, the limiting of exports could increase stocks if actual consumption falls short of estimates:

$$ES_t^{i,\text{Srpls Exprtr}} = f(SUPL_t^i, CONS*_t^i)$$

where: $ES_t^{i,\text{Srpls Exprtr}}$ = Ending stocks of commodity i in year t (1000 MT)

$SUPL_t^i$ = Domestic supply (beginning stocks + production) of commodity i in year t (1000 MT)

$CONS*_t^i$ = Expected consumption of commodity i in year t (1000 MT)

An attempt was made to test this theory by estimating expected consumption as the growth per capita consumption over varying lengths of time adjusting for expected population. In general the results had unexpected signs. Therefore, expected consumption was dropped from all equations with the exception of coarse grain stocks in Argentina.

Ending stocks for Canada and the United States are the market clearing equations for those regions:

$$ES_t^i = ES_{t-1}^i + PROD_t^i - CONS_t^i - NE_t^i$$

where: ES_t^i = Ending stocks of commodity i in year t (1000 MT)

$PROD_t^i$ = Production of commodity i in year t (1000 MT)

$CONS_t^i$ = Consumption of commodity i in year t (1000 MT)

NE_t^i = Net exports of commodity i in year t (1000 MT)

Canadian ending stocks are subject to the constraint that there is a pipeline level below which the Canadians will refuse to export no matter how high the price. Therefore, in a period when ending stocks were a small percentage of utilization, production was chosen and ending stocks were constrained not to fall below that level. If that level is reached net exports become a residual.

In the United States there are two classes of stocks. As mentioned earlier, CCC and FOR stocks are held by the government to provide price stability while the difference between total ending stocks and these policy stocks are the residual. The quantities of grain placed in CCC and FOR are

not a residual but are determined by government programs and producer expectations. Therefore it is necessary to develop equation which establish the rules for accumulation and release of FOR and CCC stocks.

There are three major turning points in the accumulation and release rule (Figure 3.9). If the price is less than the loan rate plus interest and carrying charges the producer has no incentive to redeem his loan and the grain held under CCC or FOR will increase. The lower the expected price relative to the loan rate, the more grain will be stored as a greater number of producers participate

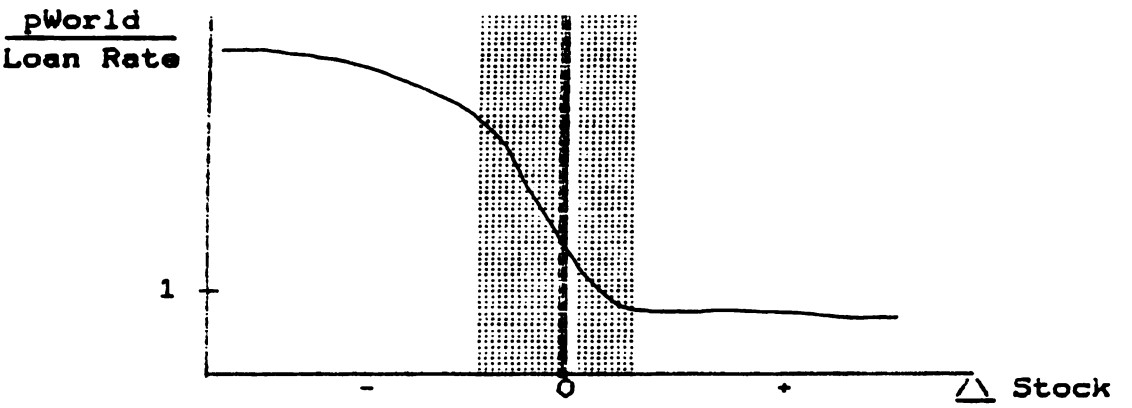


Figure 3.9. Price - Policy Stock Change Relationship

and a greater percentage of crop is entered into the program.

When prices are expected to be above the loan rate plus interest and storage there is little incentive for a producer to enter the program. This would correspond to a "steady-state" (the shaded area in Figure 3.9) where there is relatively little accumulation or release.

If prices rise to a policy established trigger, the

government would begin to release grain onto the market. It is assumed that in the interests of price stability the amount released would be managed. The quantity of grain released would depend upon the upward pressure on price.

Therefore, a cubic function was selected as the form which could provide a smooth curve with the correct shape:

$$\Delta Stock_t^i = f\left(\left[\frac{P_t^{i,w}}{Loan\ Rte_t^i}\right], \left[\frac{P_t^{i,w}}{Loan\ Rte_t^i}\right]^2, \left[\frac{P_t^{i,w}}{Loan\ Rte_t^i}\right]^3 \right)$$

where: $\Delta Stock_t^i$ = Change in policy ending stocks for commodity i at time t (million Bu*)

$P_t^{i,w}$ = World price of commodity i at time t ($/MT)

$Loan\ Rte_t^i$ = Loan rate for commodity i at time t ($/MT)

One of the shortcomings of a cubic form for an ending stock equation is its potential to be explosive if prices are very high or very low. Therefore, it was necessary to restrict the total amount of CCC stocks to be no greater than total ending stocks minus a preset minimum:

$$CCC \leq ES - Min\ ES$$

and FOR stocks are restricted to be no greater than total ending stocks minus the minimum minus CCC:

$$FOR \leq ES - Min\ ES - CCC$$

Release of stocks were constrained to be no more than the total stock level:

$$CCC \geq 0$$

$$FOR \geq 0$$

---

* Policy ending stocks are estimated in million bushels for compatibility with stocks calculated in the domestic model. See Chapter IV for further details on model linkage.

PIK certificates are handled in two ways. The physical release of the certificates is by increasing the minimum level of freestocks by the quantity of PIK certificates whose redemption is expected in a give crop year:

$$CCC + FOR \leq ES - (MIN\ ES + PIK)$$

Secondly, the market will recognize that there an amount of CCC stock equal to the quantity of outstanding PIK certificates which will be released. The market adapts its expectations of grain on the market by adding that quantity of PIK grain to freestocks. In the model this is achieved by increasing the percentage of CCC grain which is included in the stock/utilization ratio. An example of the effects of a one time issuance of 500 million bushels of PIK certificates will be presented in Chapter VI.

Ending stocks for the net importers are primarily a function of either domestic or total supply. However, variables such as income and price should be considered in attempting to estimate the size of ending stocks.

Estimating ending stocks with income as a variable hypothesizes that increases in income which in turn increase consumption will increase the demand for pipeline stocks. Therefore, steady growth in incomes should lead to increases in stock levels over time.

While theory of speculative demand indicates that price should play an important role in the estimation of an ending stocks equation, the manner in which it entered the equation was rather difficult to determine. At first glance it would

appear that the cost of holding ending stocks would be the opportunity cost of either borrowing or lending the capital used in purchasing the grain for storage. To test this theory, the 6 month Eurodollar rate (LIBOR) was selected as a proxy for international interest rates. When ending stocks were regressed against the LIBOR it was not found to be significant for any country/region.

Price itself was included as an independent variable to test the theory of speculative demand. If ending stocks are accumulated during periods of low prices and drawn down during periods of higher prices, it would be expected that price would be negatively signed. Although that was the case for a number importers, a fair number exhibited positive signs. This sign might be expected if some countries seek to minimize domestic instability by holding higher levels of stock during periods of short supply:

$$ES_t^i = f(SUPL_t^i, P_t^i, PCINC_t)$$

where: $SUPL_t^i$ = Per capita domestic supply (production + beginning stocks) or per capita total supply (production + beginning stocks plus imports) of commodity i in year t (1000 MT)

P_t^i = Price of commodity i in year t

$PCINC_t$ = Per capita real G.D.P. in year t

The decision to hold soyproducts either in the whole bean form or as component products will be a function of the decision to crush domestically or import the individual commodity. For the purposes of estimation the crush margin can be used as a proxy of the value of holding oilseeds in

one of its component forms. The total supply of the commodity will be comprised of beginning stocks of the commodity plus the commodity equivalent of beginning stocks, production, imports and ending stocks:

$$ES_t^i = f(MARGIN_t, SUPL_t^i)$$

where: ES_t^i = Per capita ending stocks of soyproduct i at time t (1000 MT)

$MARGIN_t$ = Crush margin $((P^{Soymeal} .795 + P^{Soyoil} * .175) - P^{Soybean})$ at time t

$SUPL_t^i$ = Per capita supply of the soyproduct (beginning stocks + imports + (beginning stocks of soybean + production of soybeans+net imports of soybeans)*crush ratio) of product i in year t (1000 MT)

These variables form a system of equations for each region. The regions build upon past prices for production and interact through prices to determine trade, consumption, and stocks. It must be remembered that this represents only a broad outline for all regions. Individual country/region equations will follow in the statistical appendix.

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CHAPTER IV

MODEL LINKAGE CAPABILITY

The model presented in the previous chapter is a completely self-contained model of the world. However, the MSU Agricultural Model has a two other components, a domestic* crop supply and demand model and a domestic livestock supply and demand model[1] (Figure 4.1). Although these two components lack "stand alone" capabilities (ie; they require the input of endogenous variables from the international component or each other), they provide a far richer policy framework than that which has been included in the simple U.S. region of the international component. Therefore, for domestic policy analysis it was felt that the international component should have the capacity to be linked with either or both of the domestic components.

The solution package used by the model is a Gauss-Seidel Iterative Method (GSIM) created by the Agricultural Economics Programing Office at M.S.U.[2]. The program is written and compiled in Fortran and contains two important features which permit the linkage of the components through switches and "block-if" statements. First, the model is driven by subroutine called XMODL. This subroutine may

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* Domestic denotes U.S. region

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* Domestic denotes U.S. region

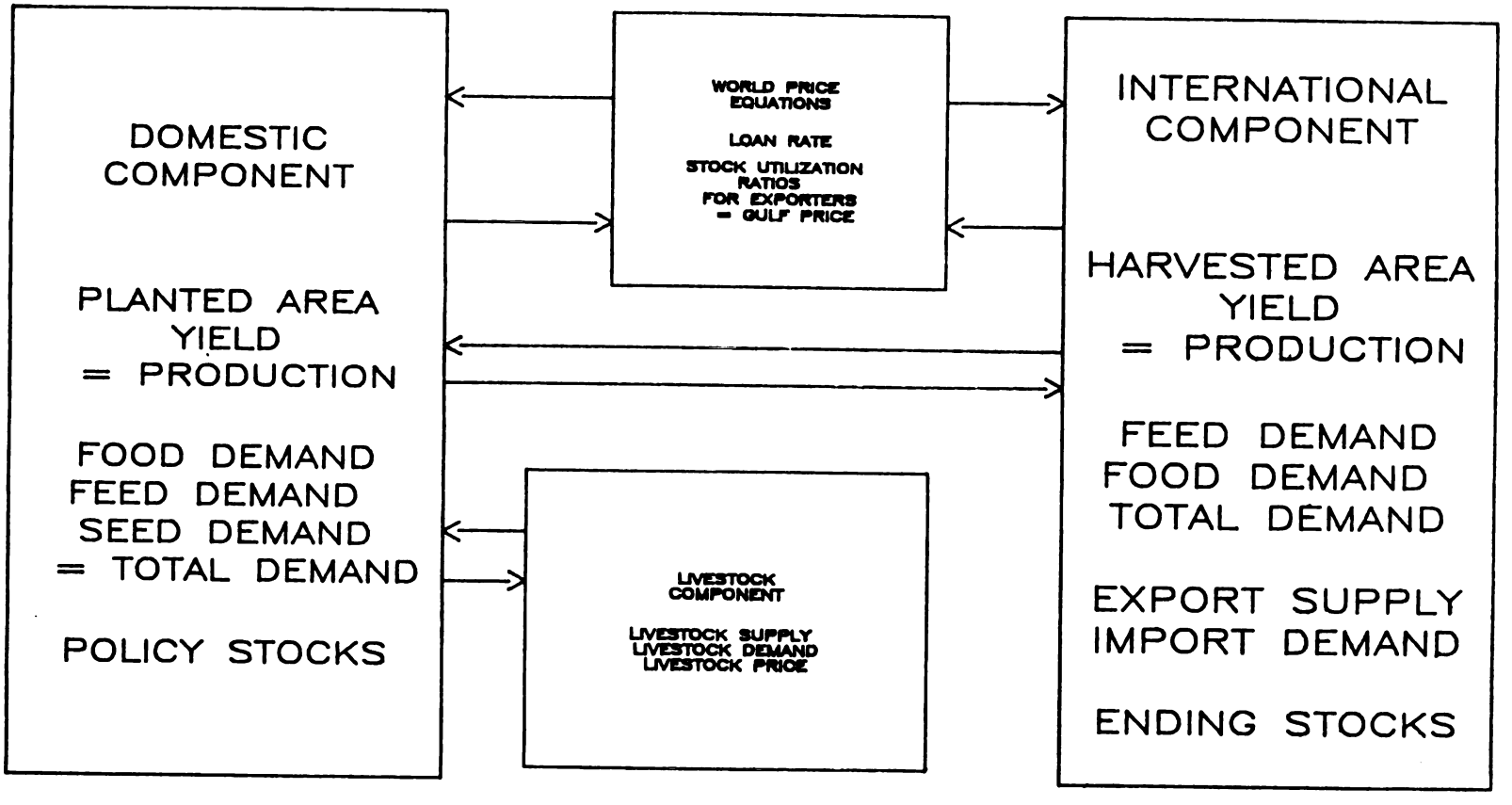

Figure 4.1. Agricultural Model Overview

either contain the coded equations (in a short model) or call a number of subroutines which contain a series of coded equations (in a larger model). Several of these subroutines would then make up a component*. The user may specify, in XMODL, the order in which the subroutines are called; the subroutines are grouped into components which are called as a block.

The second feature of the GSIM package useful in providing linkage capability is a command which permits the selection of components. The SELC command is a switch which permits components to be deactivated during solution. Two SELC commands are used, one links the domestic components to the international component and one links only the livestock component to the international component.

Each SELC command appears twice in the model. The SELC command is used in the XMODL subroutine to call or ignore the components during model solution and is also used in the EXPRTS subroutine to shut off the small U.S. component and convert domestic quantities to metric equivalents if the components are linked. If the international component stands alone, the conversions are ignored and the U.S. region is switched on (Figure 4.2).

Linking the livestock component to the international

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* For example the entire MSU Agriculture Model consists of 26 subroutines divided into 5 components: a 12 subroutine domestic crop component a 2 subroutine livestock component, a 3 subroutine international component and 3 components of 2, 3 and 6 subroutines which are shared by the three major components.

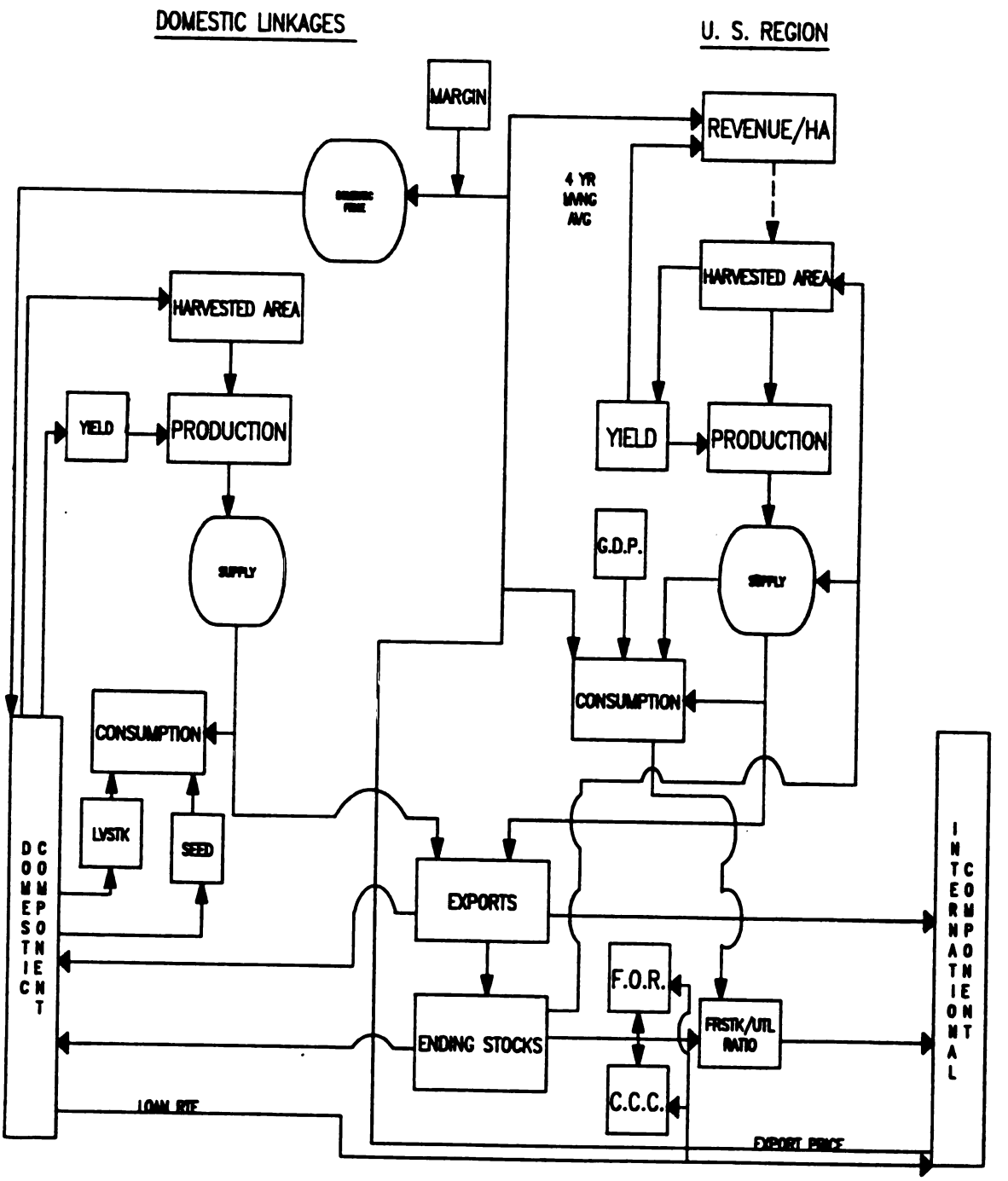

Figure 4.2. International Component Domestic Linkages/ U.S. Region

component required an additional SELC switch and the addition of a new subroutine. The subroutine is called only when the SELC switch is on and links the international component to the livestock component by converting nominal Gulf prices to real producer prices and converting animal supply to metric feed demand. The switch also shuts off only the feed demand equations in the U.S. regions, the equations generating supply, food/seed demand, imports and ending stocks continue to operate (Figure 4.3).

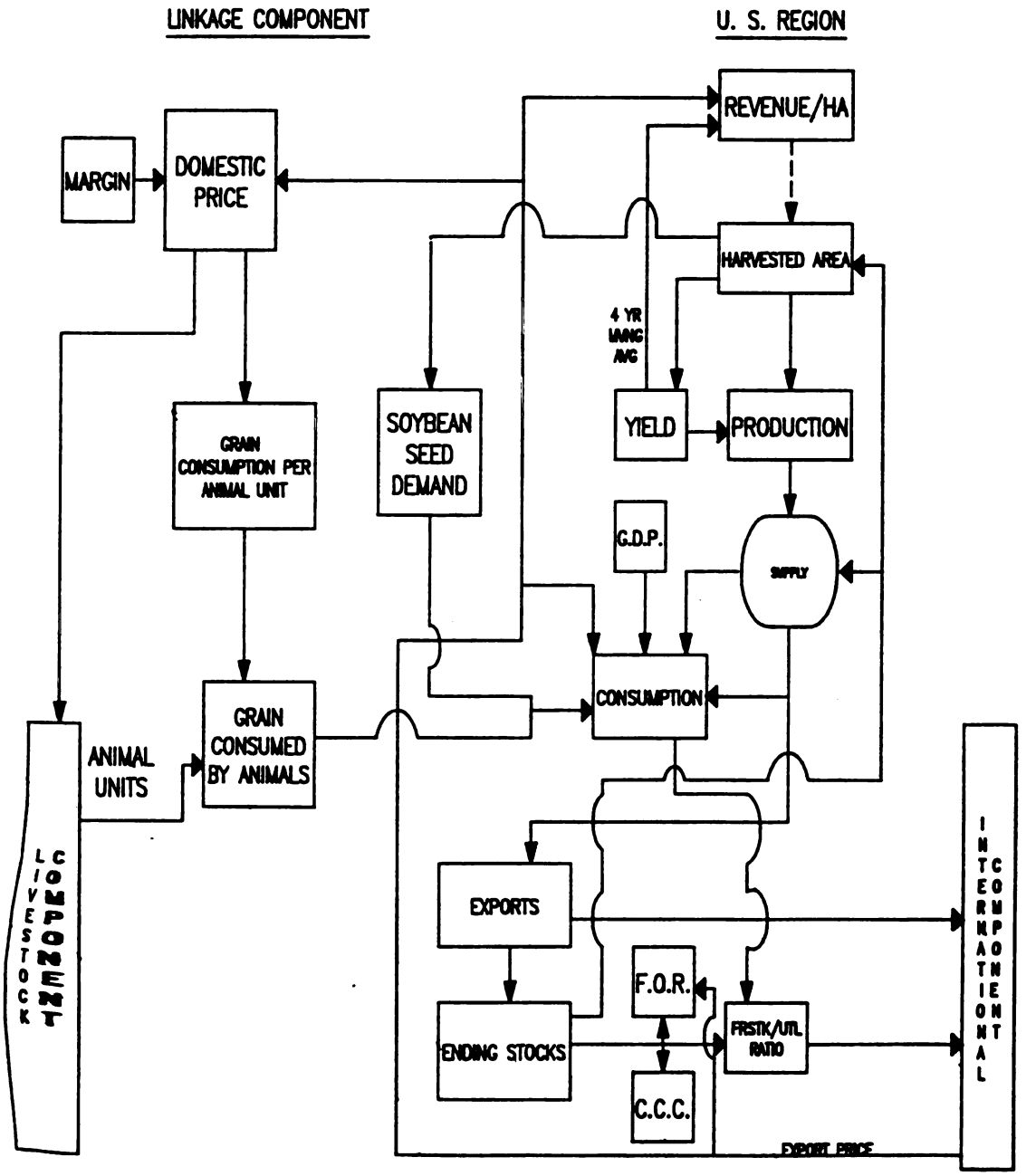

Figure 4.3. U.S. Livestock Model Linkages/ U.S. Region

Notes to Chapter IV.

1. M.D. Ingco, J.H. Hilker and J.R. Black, An Econometric Model of the U.S. Livestock Sector for Policy Analysis and Long-Run Forecasting, Michigan State University, Agricultural Economics Staff Paper No. 86-30. April 1986

2. Chris Wolf, GSIM Reference Manual, Department of Agricultural Economics Programming Office , Michigan State University, June 1979

CHAPTER V

MODEL PERFORMANCE

5.1 Equation Evaluation Procedure

Statistics provided during the estimation of individual equations (R^2, F-statistics, t-statistics, Durbin-Watson statistics) can provide details of an equation's statistical properties but cannot provide details of how it will fit when simulated within a system of estimated equations.

Estimation of the model followed three stages. In the first stage, the equations were estimated and checked for the standard regression statistics mentioned above. A t-statistic of less than 2 for an individual variable did not necessarily disqualify it from inclusion. Although if a very low t-statistic was present the variable would be excluded, a sound theoretical basis and an expected sign would often override the effects of a low t-statistic. If the sign was one which could not be explained theoretically, the variable was excluded. The presence of serial correlation indicates that there is something wrong with the specification of the model and additional work is required. Therefore, an equation with troublesome Durbin Watson statistics was not corrected through an autoregressive error specification. Either the equation was re-estimated or the serial correlation was noted. The statistical properties

for each equation will be presented in appendices.

The second stage of the estimation procedure linked all the equations in a region as a recursive block and the model, consisting of 25-35 equations was solved with historic yields and prices. This was done to test the predictive capability of the region where exogenous factors (world prices) were controlled but errors of internal consistency was not*. The comparative plots of the results compared to the actual appear as "Regional Model Simulations" in the appendicies.

Finally, following the estimation of all equations, the model was constructed and an ex-post forecast was generated. The model was simulated using the GSIM package for the period 1975-1984. The model used actual yields to simulate short-run variability not captured in a trend forecast of yields but removed the controls on price to allow the regional blocks to interact. The results presented below will be those from the ex-post forecast and plots of the actual and forecast values will be presented in the statistical appendices. It should be noted that the plots of the regional simulations and ex-post forecasts cover different time periods and have different scales.

5.2 Measures of Accuracy

Two measures of accuracy can be used to judge the quality of a model. Absolute accuracy can be evaluated by

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* A description of this procedure can be found in Shagam and Ferris.

observation of the predicted values vis-a-vis the observed values. Relative accuracy compares the results of the forecast errors with the errors from an alternative forecasting method. Several alternative forecasting methods have been used in other evaluations. The simplest comparison uses a model of no-change from the previous period. Granger and Newbold[1] suggest that there has been a trend away from no-change models and towards more complex autoregressive or Box-Jenkins models. However, in the interests of simplicity, the no-change model will be used for comparison.

5.2.1 Absolute Accuracy

Three measures of absolute accuracy will be presented in this chapter. Mean absolute percentage errors (MAPE) are defined as

$$\text{MAPE} = \frac{1}{T}\sum_{t=1}^{T}\frac{|Y_t^s - Y_t^a|}{Y_t^a}$$

where: Y_t^s = simulated value of Y
Y_t^a = actual value of Y
T = number of periods in simulation

Calculating a mean absolute percentage error has advantages over calculating a mean percentage error. Mean percentage error estimation will net positive and negative errors thereby presenting a lower estimate of error than if errors were either all positive or negative. However, MAPE has a bias favoring estimates which are below the actual value. A low forecast can never be off by more than 100% but a high forecast has no limit.

A second measure of absolute accuracy is the root-mean-square percentage error (RMSPE) defined as:

$$RMSPE = \sqrt{\frac{1}{T}\sum_{t=1}^{T}\left[\frac{(Y_t^s - Y_t^a)}{Y_t^a}\right]^2}$$

where: Yt^s = simulated value of Y
Y_t^a = actual value of Y
T = number of periods in simulation

As with MAPE, RMSPE measures how closely the variable forecast in question tracks its historical data but penalizes large errors more heavily. This can have serious repercussions if the actual numbers are small.

Although Armstrong[2] presents evidence that Root Mean Square Error and Mean Absolute Error measurements are more popular than their percentage counterparts, they are interval measures which require that the user know the base from which they deviate. The percentage accuracy measures are in ratio format and do not require the reader to know the base.

A third measure of absolute accuracy is to measure the number of turning point errors (TPE). TPEs act as a measure of a model's ability to forecast changes in direction:

		Actual Change +	Actual Change -
Forecast Change	+	a	b
	-	c	d

Positions "b" and "c" in the box above correspond to turning point errors. The usefulness of TPE is somewhat more limited as a measure of accuracy. The fact that a turning point error occurred is not enough evidence to condemn an

equation, the magnitude of the error and the effect that error has upon the entire system will differ from equation to equation.

5.2.2 Relative Accuracy

Relative accuracy can be measured with Thiel's inequality coefficient. Thiel's inequality coefficient provides a measure of forecasting error by computing the RMSPE across the entire forecast period but scaled to fall between 0 and 1:

$$U(1) = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t s - Y_t a)2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t s)2} + \sqrt{\frac{1}{T}\sum_{t=1}^{T}(Y_t a)2}}$$

where: $Y_t s$ = simulated value of Y
$Y_t a$ = actual value of Y
T = number of periods in simulation

If $U(1) = 0$ then $Y_t s = Y_t a$ and there is a perfect fit. If $U(1) = 1$ then the fit is as bad as possible.

It is possible to decompose Thiel's inequality coefficient into proportions of inequality

$$U^M = \frac{(\bar{Y}s - \bar{Y}a)2}{\frac{1}{T}\sum_{t=1}^{T}(Y_t s - Y_t a)2}$$

$$U^S = \frac{(\sigma s - \sigma a)2}{\frac{1}{T}\sum_{t=1}^{T}(Y_t s - Y_t a)2}$$

$$U^C = \frac{2(1-p)\sigma_s\sigma_a}{\frac{1}{T}\sum_{t=1}^{T}(Y_t s - Y_t a)2}$$

where: Y_s and σ_s are the mean and standard deviation of $Y^t s$
Y_a and σ_a are the mean and standard deviation of $Y^t a$

U^M provides a measure of the proportion of error due to

bias. U^S represents the proportion of error due to differences in the variances of the actual and the predicted values. U^C measures unsystematic error. Since

$$U^M + U^S + U^C = 1$$

a desirable equation would have very low values for U^M and U^S and a value close to 1 for U^C. This would indicate that the majority of prediction error was due to random error.

A number of authors[3] argued that U(1), although still often cited, was of questionable use. Granger and Newbold prove that under certain cases, a perfect forecast of X_t can cause U(1)=1. Furthermore, Bliemel argues that when changes are measured all forecasting models will do better than a naive model. For comparison with no-change ("naive") models, they recommended another measure, also developed by Thiel:

$$U(2) = \frac{\sqrt{\frac{1}{T}\sum_{t=1}^{T} (\Delta Y_{ts} - \Delta Y_{ta})^2}}{\sqrt{\frac{1}{T}\sum_{t=1}^{T} (\Delta Y_{ts})^2}}$$

where: Y_{ts} = simulated value of Y
Y_t^a = actual value of Y
T = number of periods in simulation

If U(2) < 1, the model is an improvement over the no-change model: if U(2) > 1, the model is worse than a no-change model.

5.2.3 Using Accuracy Measures to Judge Performance Results

In the sections which follow, the statistics discussed above will be presented along with a narrative for each region. The statistics are presented as a series of

benchmarks, they should not however be taken as the final arbiter of the quality of the model or even of the individual equations.

To make that decision, it is necessary to determine why certain equations failed and how their failure affected other equations in the system. Equations with "bad" statistics may be "good" equations responding well to "small" errors in other "good" equations. The problem might be that a "small" error in the production for instance is "large" relative to ending stocks. Therefore it is necessary to understand the linkages of whole model to completely judge the individual equations.

5.3 Model Performance

Overall, the performance of the international model was good. As a result of large number of equations, the accuracy measures resulting from the simulation will be presented in tabular form and will be classified by region and commodity. Yields will be excluded from these tables because actual yields were used to generate the ex-post forecast. As in the previous chapters, relevant points will be discussed for each equation type.

5.3.1 Performance Results for the United States

Although the equations for United States acreage were generally had low percentage errors, several noticeable

problems exist both in estimation (Appendix A*) and performance (Table 5.1). The majority of equations had MAPEs of less than 20% with half having MAPEs of less then 11%. Of the three which exceeded 20% only one was an estimated equation. However, serial correlation was present in about half the equations and there was a fairly high number of turning point errors.

From an performance standpoint probably the most significant problems in the U.S. are the wheat net export equation (WNEUS) and the wheat harvested area equation (WHAUS). Much of the problem in both equations can be traced to the restriction that the U.S. is the residual supplier to the world market. This forces all the errors in the rest of the model's trade equations into the U.S. As a result, the equation underestimates wheat exports for 8 of the ten year of forecast.

Low exports resultin estimated wheat ending stocks (WESUS) which are almost 50% above actual levels in 1978 and 1979. When lagged ending stocks are included as a proxy for government policies in WHAUS, high ending stocks both mask and compound problems in that equation. The problem in WHAUS is masked by a stock cushion which keeps prices from rising and compounded by putting downward pressure on land expansion. Although the error percentages are low the equation underestimates area for the period 1979-82. The

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* Estimation data for all regions will be found in the appropriately labeled appendicies.

Table 5.1
Accuracy Statistics for United States

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPROUS*	n.a.	n.a.	10.9	12.9	5/10	0.07	1.25	0.15	0.09	0.76
WYUS**	0.69	1.32	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHAUS	0.78	1.55	10.9	12.9	6/10	0.07	1.09	0.15	0.07	0.78
WCONUS*	n.a.	n.a	5.9	8.2	4/10	0.04	0.75	0.14	0.00	0.86
WFEDUS	0.76	2.40	56.3	99.7	5/10	0.17	0.87	0.21	0.00	0.79
WFODUS	0.55	1.97	1.8	2.1	2/10	0.01	0.93	0.11	0.16	0.73
WNEUS*	n.a.	n.a.	16.2	17.8	3/10	0.10	1.38	0.47	0.02	0.51
WESUS*	n.a.	n.a.	22.5	27.9	6/10	0.12	1.30	0.13	0.02	0.85
Coarse Grains										
FPROUS*	n.a.	n.a.	4.0	4.9	2/10	0.02	0.19	0.02	0.20	0.78
FYUS**	0.83	2.01	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHAUS	0.79	1.97	4.0	4.9	3/10	0.02	0.33	0.03	0.24	0.73
FCONUS*	n.a.	n.a.	2.0	2.4	1/10	0.01	0.28	0.08	0.23	0.69
FFEDUS	0.63	1.31	2.1	2.9	1/10	0.01	0.30	0.06	0.44	0.50
FFODUS	0.98	1.00	5.3	6.5	2/10	0.03	0.93	0.01	0.09	0.90
FNEUS*	n.a.	n.a.	12.4	15.5	5/10	0.08	1.52	0.10	0.11	0.78
FESUS*	n.a.	n.a.	18.7	23.8	0/10	0.10	0.36	0.02	0.00	0.98
Soybean Complex										
SPROUS*	n.a.	n.a.	5.4	6.8	2/10	0.03	0.36	0.01	0.02	0.97
SYUS**	0.38	2.33	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHAUS	0.96	2.80	5.4	6.8	6/10	0.03	0.80	0.00	0.01	0.98
SMCOUS	0.94	1.85	1.5	1.9	0/10	0.01	0.30	0.00	0.00	1.00
SOCOUS	0.93	1.42	5.4	6.1	4/10	0.03	1.33	0.03	0.00	0.97
SMNEUS	0.91	1.48	11.2	14.6	1/10	0.08	0.98	0.36	0.49	0.15
SONEUS	0.95	2.70	60.9	71.5	5/10	0.24	2.29	0.76	0.02	0.22
SNEUS	0.99	2.39	7.2	9.5	3/10	0.05	0.61	0.14	0.21	0.65
SMESUS	0.51	2.03	38.0	41.8	7/10	0.20	0.81	0.00	0.24	0.76
SOESUS	0.71	1.84	17.4	20.9	1/10	0.11	0.55	0.17	0.05	0.78
SESUS*	n.a.	n.a.	37.5	43.8	4/10	0.17	0.79	0.00	0.03	0.97

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

system returns to equilibrium in 1981 when estimated wheat stocks fall 22% below actual levels and estimated wheat prices increase 22% above actual levels. This encourages the expansion of wheat area at a time when actual area is falling.

The same spillover problems exist in the coarse grain and soycomplex ending stock equations. However, both the coarse grain harvested area (FHAUS) and the soybean harvested area (SHAUS) equations are better equations. They exhibit fewer and more minor turning point errors and the Thiel statistics indicate that the majority of error in the equations can be traced to random factors. It should be noted however that neither FHAUS nor SHAUS use lagged ending stocks as independent variables. There is currently no soybean set-aside program, therefore no theoretical reason for including lagged stocks in SHAUS. Lagged stocks had expected signs and were significant in FHAUS, however, the model missed badly in the P.I.K. year 1983. When a dummy was included for 1983, multi-collinearity was present. Therefore, FESUS(-1) was dropped from the equation.

It is felt that part of the problem in WHAUS can be eliminated in the wheat sector by developing a better set of proxies for acreage control. An attempt was made to estimate both FHAUS and WHAUS using policy stocks (F.O.R. and C.C.C) instead of total ending stocks. Surprisingly, they were found to have almost no statistical significance. It will be necessary to build a set of more complex, policy

driven equations or simply constrain wheat area based upon "expert opinion".

Unless the concept of balancing the model across all crop years is eliminated, both WNEUS and FNEUS will continue to collect all the errors in the grain sector and distribute them into the U.S. region. The effect of unstable ending stocks on price is greater in the oilseed sector and in coarse grains than in wheat because the U.S. has a larger proportion of total coarse grain and soycomplex stocks.

Even the estimated soybean complex export equations (SMNEUS, SONEUS, SNEUS) are still the residual of errors in other regions. The problem of large errors in soycomplex stocks is simply not as worrisome as the size of the numbers indicate because the quantities stored are rather small. Nonetheless, it is a problem which one has to live with given the specification of the model.

In general, the consumption equation, especially those for the major use of the commodity (wheat for food and coarse grain for feed) have low errors and miss no major turning points. Wheat for food (WFODUS) is the equation with the largest number of TPEs, the total error of missed change* is less than 5% for each turning point. The only notable error is the high percentage error in the wheat for feed consumption (WFEDUS) equation. The equation misses 4 out of 10 turning points and generated the majority of the

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* The sum of missed change can be defined as the absolute value of the change in the actual plus the absolute value of the change in the forecast value.

error when it only declined in one period of the three period decline in wheat feeding during 1979-81. Perhaps the inclusion of a dummy variable during that period could have improved the performance: however, the percentage of fed wheat in total U.S. consumption is small enough not to cause any serious problems in the consumption equation.

5.3.2 Performance Results for Argentina

The Argentine production equations forecast very well considering that the equations were estimated using real border prices as opposed to internal country prices (Table 5.2). Both wheat harvested area (WHAAR) and soybean harvested area (SHAAR) have a very low number of turning point errors, the number for coarse grain area (FHAAR) is higher but are not significant enough to affect the production equation (FPROAR). The only serious miss for FHAAR came in 1984, the result of a coarse grain price shock in 1983.

The consumption equations suffered from the lack of relevant internal price data. Of the six estimated consumption equations, only one (WFODAR) had t-statistics greater than 1 for own and/or competing crop price (Appendix B). In all other cases, prices were either insignificant or had unexpected signs. As noted in Chapter III, a ratio of domestic supplies of the own and competing crop was often used in consumption equations to provide an indication of domestic grain availability. Although these proxies were significant in the Argentine grain consumption equations,

Table 5.2
Accuracy Statistics for Argentina

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPROAR*	n.a.	n.a.	9.9	11.3	2/10	0.06	0.36	0.05	0.38	0.57
WYAR**	0.25	1.42	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHAAR	0.53	2.03	9.9	11.3	1/10	0.06	0.56	0.02	0.16	0.82
WCONAR*	n.a.	n.a.	7.5	9.3	6/10	0.05	0.99	0.04	0.05	0.91
WFEDAR	0.09	1.32	34.2	43.7	1/10	0.40	1.27	0.08	0.80	0.12
WFODAR	0.54	2.16	6.8	9.0	6/10	0.05	1.09	0.00	0.01	0.99
WNEAR*	n.a.	n.a.	19.0	21.5	2/10	0.09	0.36	0.03	0.20	0.77
WESAR	0.78	2.25	35.4	45.9	4/10	0.20	0.81	0.04	0.79	0.16
Coarse Grains										
FPROAR*	n.a.	n.a.	8.7	11.7	1/10	0.06	0.48	0.13	0.12	0.74
FYAR**	0.76	2.17	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHAAR	0.67	1.75	8.7	11.7	6/10	0.06	0.93	0.16	0.18	0.66
FCONAR*	n.a.	n.a.	9.3	11.0	4/10	0.05	0.74	0.12	0.00	0.88
FFEDAR	0.62	2.38	9.3	10.5	4/10	0.05	0.65	0.09	0.00	0.91
FFODAR	0.71	1.52	18.0	23.0	4/10	0.11	3.69	0.12	0.62	0.26
FNEAR*	n.a.	n.a.	14.2	19.0	1/10	0.10	0.53	0.07	0.06	0.87
FESAR	0.68	1.44	51.6	70.1	4/10	0.21	0.74	0.01	0.01	0.98
Soybean Complex										
SPROAR*	n.a.	n.a.	9.8	12.5	2/10	0.05	0.40	0.48	0.03	0.50
SYAR**	0.72	2.15	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHAAR	0.97	2.19	9.8	12.5	1/10	0.05	0.53	0.46	0.03	0.51
SMCOAR	0.85	1.71	20.1	32.2	3/10	0.13	0.72	0.19	0.01	0.80
SOCOAR	0.83	1.87	33.5	54.7	3/10	0.14	0.73	0.21	0.05	0.74
SMEEAR*	n.a.	n.a.	12.0	16.1	1/10	0.05	0.38	0.27	0.00	0.73
SOEEAR*	n.a.	n.a.	14.5	18.8	1/10	0.07	0.41	0.17	0.00	0.83
PMELAR	0.91	2.50	28.7	34.2	0/10	0.16	0.73	0.53	0.03	0.44
SMNEAR*	n.a.	n.a.	30.0	32.8	2/10	0.17	1.05	0.45	0.34	0.21
SONEAR*	n.a.	n.a.	41.9	49.1	5/10	0.19	1.03	0.53	0.15	0.32
SNEAR*	n.a.	n.a.	28.0	39.5	2/10	0.15	0.86	0.52	0.10	0.38
SMESAR	0.76	0.93	190.0	292.0	4/10	0.22	1.28	0.45	0.00	0.55
SOESAR	0.70	0.93	137.0	192.0	5/10	0.22	1.27	0.09	0.40	0.51
SESAR	0.73	2.51	85.3	154.0	6/10	0.26	0.90	0.26	0.00	0.74

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

the high U^S proportions and low Durbin-Watson statistics for FFODAR and WFEDAR would indicate that there is a variable missing from the equations which estimated the consumption of grain for secondary purposes.

Primary consumption of grain (WFODAR, FFEDAR, SMCOAR, and SOCOAR) tended to be better equations from both a statistical and performance standpoint. With the exception of WFODAR all equations exhibited good Durbin-Watson statistics, fair adjusted R^2s and a high proportion of forecast error attributable to random factors. However, the number of turning points errors are high enough to be a cause for concern.

WFODAR represents a problem equation from an estimation standpoint. Despite a good Durbin Watson statistic, the equation exhibits a low adjusted R^2 and missed a significant downturn in consumption in the late 1960s. Initial estimation attempts included real income and the ratio of supply mentioned above. Real income was found to have an unexpected sign and the supply ratio was insignificant. The final estimation used real border prices and a time trend as right hand side variables.

In the ex-post forecast, the equation missed a significant decline in 1976 and exhibits a high degree of volatility in 1982-84, in actuality a period of stable food consumption. While it is possible to explain this variation in 1983-84 as a result coarse grain price volatility, in reality domestic policy buffer the domestic consumer from

price volatility. Again, this problem underscores the need to reformulate consumption equations using internal prices for domestic consumption.

Classifying Argentina as a surplus exporting region forces the estimation of ending stock equations. If a surplus exporting region is prepared to offer grain at below world market prices, the level will be determined by policy. Attempts to develop a set of policy proxies generally resulted in equations which were trend dependent. As a result, a fairly high number of turning point errors were present. Secondly, the level of stocks held by a surplus exporter will be low. The variability of these stocks given their size led to large percentage errors.

With the exception of WFODAR in 1983, the effects of all other errors in the Argentine equations do not appear to spill over into the residual export equations (WNEAR, FNEAR, SMEEAR SOEEAR). The MAPEs are all about 15% and the closeness of the RMSPEs would indicate that there are no individual large errors. There are two or less turning point errors in the residual export equations.

PMELAR, the equation which divides soymeal equivalent exports (SMEEAR) into soymeal and soyoil net exports made all the turning points during the forecast period. Although it tracks well during the first five years of the forecast, over estimation of soybean production in the early 1980's

increases the negative effect soybean supply on crushing*. This widens the error in PMELAR to about 23 percentage points in 1982.

PMELAR times the residual equation SMEEAR determines the breakdown of soymeal equivalent exports into their component parts. Therefore, the error in PMELAR understates soymeal and soyoil exports and overestimates soybean exports. This feeds back into the U.S. region, affecting exports, ending stocks and hence price.

5.3.3 Performance Results for Australia

The performance of Australian equations was hampered by the lack of internal prices in estimation. Still the regional equations performed quite well, with every equation performing better than a no-change model. The most important equations from the model's standpoint, production and exports had low percentage errors and relatively few serious turning point errors (Table 5.3).

The yield equations (WYAU, FYAU) suffered from the restriction of being a time trend in an area which has a great deal of variability. Under normal conditions, a negative adjusted R^2 would not be acceptable for any equation. However almost all of the yield variability is due to weather. As mentioned in Chapter III, a number of other structures were tried but were no more successful.

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* As noted in Chapter III, soybean supply will have a negative coefficient in the PMEAL equation because increased supplies of beans can choke existing crush capacity.

Table 5.3
Accuracy Statistics for Australia

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	U^M	U^S	U^C
Wheat										
WPROAU*	n.a.	n.a.	6.0	6.7	1/10	0.03	0.16	0.68	0.11	0.21
WYAU**	-0.03	2.79	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHAAU	0.85	2.59	6.0	6.7	2/10	0.03	0.98	0.72	0.04	0.24
WCONAU*	n.a.	n.a.	13.3	15.3	3/10	0.08	0.52	0.04	0.19	0.76
WFEDAU	0.65	2.17	19.1	24.1	3/10	0.11	0.58	0.03	0.16	0.81
WFODAU	0.84	1.96	12.2	17.5	3/10	0.07	0.58	0.02	0.48	0.50
WNEAU*	n.a.	n.a.	10.2	12.0	1/10	0.06	0.43	0.58	0.22	0.20
WESAU	0.83	1.22	28.4	41.4	1/10	0.19	0.57	0.24	0.51	0.25
Coarse Grains										
FPROAU*	n.a.	n.a.	10.9	12.3	2/10	0.07	0.38	0.02	0.00	0.98
FYAU**	0.21	2.74	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHAAU	0.92	2.00	10.9	12.3	5/10	0.07	1.19	0.04	0.14	0.82
FCONAU*	n.a.	n.a.	18.8	24.7	4/10	0.10	1.40	0.06	0.01	0.93
FFEDAU	0.49	1.52	20.6	27.3	5/10	0.11	1.28	0.07	0.03	0.90
FFODAU	0.61	1.63	17.6	22.9	4/10	0.10	0.98	0.00	0.05	0.95
FNEAU*	n.a.	n.a.	22.1	29.8	2/10	0.09	0.33	0.02	0.15	0.84
FESAU	0.54	1.51	30.1	39.3	4/10	0.22	0.82	0.00	0.02	0.98

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

The wheat harvested area equation (WHAAU) exhibited better error statistics than those for coarse grain area (FHAAR) despite lower equation statistics and a greater percentage of bias error. The pooled price policies of the Australian Wheat Board drive a wedge between world and producer prices. The equations use real border prices to drive producer expectations; this is probably the source of the bias. Lagged wheat revenue, although correctly signed was not significant in WHAAU. Although FHAAU suffers from four TPEs, only two have large enough to spill over into coarse grain production (FPROAU). In neither case was the spillover effect enough to create over-estimation in coarse grain exports.

As in Argentina, significant problems exist in attempting to model domestic grain demand. Real income was an important factor (Appendix C) but using domestic supplies as proxy for availability of grain on the domestic market was insufficient to capture the variability of demand. Since the marketing board insures stable domestic supplies, a good deal of the variability of feed demand is probably not the result of supply shocks as much as the result of changes in animal numbers. In a country where much of the livestock is produced for export, real income will not be as good a proxy for changes in livestock production. Other variables such as the world price of wool will have a large effect on stock production; as will non-economic variables such as drought.

The performance of the wheat export equation was not

greatly affected by error spillover from the estimated equations. WNEAU had low percentage errors and one turning point error. A fair proportion of forecast error can be traced to bias error in WHAAU. Coarse grain exports (FNEAU) suffered more from variability error than from bias. Although small in absolute size and attributable to random factors, the errors were large relative to the size of Australian exports. This resulted in a high MAPE for FNEAU but is not especially serious from the perspective of the entire model.

5.3.4 Performance Results for Brazil

All but three Brazilian equations performed better than a no-change model. The most serious problems occurred in coarse grains where overestimation of production led to increases in ending stocks and a significant decrease in imports (Table 5.4).

Wheat harvested area (WHABR) is one of the few harvested area equations with a MAPE of more than 10%. Much of this error can be traced to structural factors. Although the equation shows the correct signs for both own and competing lagged revenues, lagged wheat revenue is just barely significant while coarse grain revenue is not significant (Appendix D) at all.

Of the 3 turning TPEs only one, 1979, is significant enough to result in a large underestimation of wheat production. Even though domestic supply is a right-hand side variable in the wheat import equation the under-

Table 5.4
Accuracy Statistics for Brazil

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPROBR*	n.a.	n.a.	19.2	21.5	3/10	0.12	0.78	0.16	0.00	0.84
WYBR**	0.11	2.95	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHABR	0.72	2.45	19.2	21.5	5/10	0.12	0.84	0.25	0.26	0.49
WCONBR*	n.a.	n.a.	8.3	8.9	4/10	0.04	1.54	0.04	0.27	0.69
WNIBR	0.71	1.81	12.2	15.3	5/10	0.07	0.87	0.36	0.08	0.66
WESBR	0.41	2.17	45.5	56.7	3/10	0.33	0.94	0.41	0.32	0.27
Coarse Grains										
FPROBR*	n.a.	n.a.	9.8	15.7	4/10	0.08	1.09	0.04	0.11	0.85
FYBR**	0.62	1.70	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHABR	0.86	1.44	9.8	15.7	5/10	0.08	1.74	0.04	0.27	0.69
FCONBR*	n.a.	n.a.	8.0	10.3	5/10	0.05	1.40	0.04	0.06	0.90
FNIBR	0.71	2.16	178.0	291.0	4/10	0.36	0.67	0.00	0.00	1.00
FESBR	0.82	1.56	134.0	224.0	3/10	0.32	1.02	0.15	0.15	0.70
Soybean Complex										
SPROBR*	n.a.	n.a.	3.3	4.7	1/10	0.02	0.28	0.11	0.03	0.88
SYBR**	0.53	1.38	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHABR	0.97	1.29	3.3	4.7	3/10	0.02	0.66	0.11	0.01	0.88
SMCOBR	0.95	1.78	9.9	12.1	1/10	0.06	0.70	0.07	0.02	0.91
SOCOBR	0.97	1.45	5.4	6.9	2/10	0.03	0.78	0.02	0.04	0.94
SMEEBR*	n.a.	n.a.	4.8	5.6	0/10	0.03	0.33	0.02	0.00	0.98
SOEEBR*	n.a.	n.a.	13.3	18.1	0/10	0.07	0.39	0.01	0.17	0.81
PMELBR	0.84	1.66	9.2	10.4	1/10	0.06	0.88	0.17	0.16	0.67
SMNEBR*	n.a.	n.a.	8.3	9.8	1/10	0.06	0.77	0.07	0.01	0.92
SONEBR*	n.a.	n.a.	21.0	24.8	3/10	0.15	0.87	0.04	0.01	0.95
SNEBR*	n.a.	n.a.	115.0	169.0	1/10	0.27	0.88	0.10	0.22	0.67
SMESBR	0.94	2.34	15.1	16.2	2/10	0.08	0.29	0.11	0.01	0.88
SOESBR	0.81	1.68	20.5	24.2	4/10	0.09	0.43	0.26	0.06	0.68
SESBR	0.77	1.30	44.1	66.6	3/10	0.15	0.92	0.08	0.12	0.80

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

estimatation did not raise imports. Instead there was a decline in WESBR and the residual WCONBR.

The other major error in WHABR is occurred in 1983 when an overestimation in the 1982 wheat price spilled over into Brazilian wheat revenue. Even though WHABR made the turning point, area did not decrease as much as the actual value. In this case the error was small in absolute terms but large relative to the amount of wheat area. Hence the large percentage error.

One would first tend to suspect that the use of real border prices is responsible for the low correlation between the revenues and harvested area. However, neither coarse grain harvested area (FHABR) nor soybean harvested area (SHABR) suffer from high levels of bias error. Therefore, it would seem that WHABR is most likely suffering from a missing variable.

FHABR and SHABR have better performance statistics although the Durbin-Watson for FHABR is in the indeterminant region and the Durbin-h for SHABR indicates the presence of serial correlation. The Theil statistics for both indicate that the largest proportion of forecast error is the result of random factors. However, a fair proportion of forecast error for FHABR is the result of variance error; this is noticeable in the 2 TPEs and the more significant over-estimation in 1982.

In 1980, the turning point error is not enough to significantly increase coarse grain imports (FNIBR). The

error spills over into the residual consumption equation. However, in 1982 FHABR makes the turning point but fails to decrease area as much in history. Again, the increased supply spills over into both consumption and ending stocks. Unlike the 1980 TPE, in 1983 FHABR is on target. Supply is high enough to turn Brazil into an exporter of coarse grains. In the following year (1984) the coarse grain price shock of 1983 increases FHABR when in should fall and Brazilian coarse grain exports increase further. Therefore, even though the majority of the error in FNIBR is random there is significant spillover into the rest of the model.

Wheat net imports (WNIBR) has low percentage errors but suffers from a high number of turning point errors and some bias error. Much of this error can be traced to the inclusion of real wheat prices which although correctly signed is insignificant. Only one turning point error results in an error of more than 1 million tons.

The equations estimating consumption of soymeal equivalent (SMCOBR) and soyoil equivalent (SOCOBR) are the best equations in the region. Both equations have high adjusted R^2s and show no signs of serial correlation. In the ex-post forecast both equations have a low number of turning point errors and the Theil statistics indicate that more than 90% of the forecast error was caused by random factors.

Soybean complex exports are estimated as residual equations. Given the low errors in consumption both soymeal

equivalent exports (SMEEBR) and soyoil equivalent exports (SOEEBR) exhibit small errors and a low number of turning point errors. The high error for soybean exports (SNEBR) and ending stocks (SESBR) was the result of spillover from SHABR.

The two largest errors in SHABR occurred in 1981 and 1982 when the estimate missed two of its three turning points and overshot the estimated values by 7.6% and 9.5%. The increase in domestic supply in 1981 and lowered the percentage of soymeal equivalent exported as meal* and increased soybean ending stocks. The overestimation of soybean production and beginning stocks in 1982 resulted in a similar overestimation of soybean exports in 1982.

Estimation of ending stocks as a function of policy required policy proxies. The most common formulation included supply. While supply was significant in estimation, the spillover from errors in harvested area resulted in large errors in the levels of ending stocks. However, as mentioned earlier, the effects of over-estimations of stock levels were only significant for two periods of coarse grain imports and two periods of soybean imports.

5.3.5 Performance Results for Canada

The equations for Canada performed reasonably well (Table 5.5). Despite a high number of turning point errors, only 7 TPEs have serious implications for the rest of the

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* During 1981 Brazil actually imported soybeans to crush for oil and the residual meal was then exported.

Table 5.5
Accuracy Statistics for Canada

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	U^M	U^S	U^C
Wheat										
WPROCA*	n.a.	n.a.	9.4	12.8	0/10	0.06	0.69	0.00	0.02	0.98
WYCA**	0.47	2.08	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHACA	0.78	2.50	9.4	12.8	1/10	0.07	1.66	0.01	0.01	0.98
WCONCA*	n.a.	n.a.	3.9	4.9	2/10	0.03	0.87	0.00	0.22	0.78
WFEDCA	0.31	1.30	16.4	22.7	5/10	0.09	0.77	0.03	0.21	0.77
WFODCA	0.26	1.44	8.1	9.8	7/10	0.05	0.79	0.02	0.22	0.76
WNECA	0.80	1.04	11.8	14.2	4/10	0.08	1.00	0.01	0.14	0.85
WESCA*	n.a.	n.a.	12.1	17.9	3/10	0.08	0.64	0.20	0.13	0.67
Coarse Grains										
FPROCA*	n.a.	n.a.	8.0	11.1	2/10	0.05	0.87	0.17	0.00	0.83
FYCA**	0.83	1.75	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHACA	0.51	1.29	8.0	11.1	4/10	0.05	1.20	0.18	0.01	0.81
FCONCA*	n.a.	n.a.	5.3	6.8	4/10	0.03	2.04	0.28	0.01	0.71
FFEDCA	0.72	1.12	4.9	6.1	4/10	0.03	1.54	0.28	0.03	0.69
FFODCA	0.28	1.37	14.7	20.3	5/10	0.08	0.99	0.11	0.23	0.66
FNECA	0.76	1.40	22.7	28.1	5/10	0.14	0.80	0.00	0.23	0.77
FESCA*	n.a.	n.a.	27.0	36.1	2/10	0.13	0.78	0.01	0.36	0.64

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

model.

Both wheat harvested area (WHACA) and coarse grain harvested area have U(2) statistics which indicate that they are inferior to a no-change model. However, when coupled with actual yields the statistics improve dramatically. The majority of error can be traced random factors. The largest error occurred in 1984 when the price shock of 1983 raised coarse grain revenue per hectare relative to wheat revenue and encouraged an expansion of coarse grain area at the expense of wheat area.

Wheat consumption, both for feed (WFEDCA) and for food and residual consumption (WFODCA) are superior to no-change models. Coarse grain consumption fairs less well; both food (FFODCA) and feed consumption (FFEDCA) are inferior to no-change models. Both equations have Thiel statistics which indicate the presence of bias. The equations are specified solely as functions of coarse grain supplies (FFEDCA) or income and coarse grain supply (FFODCA), attempts to include prices of own or competing commodities were ineffective (Appendix E). This could be a result of the two tiered price policy administered by the Canadian Wheat Board. A test could be made by using the internal price instead of the world price as a right-hand side variable. The coarse grain consumption equations tend to follow errors in production and ending stocks very closely. The result is a large number of missed turning points.

As discussed in Chapter III, Canadian exports are

function of supply and the size of the residual pool of import demand not filled by the surplus exporting regions. This results in errors which are transfered through the model from other equations. Almost no bias exists in either the wheat export equation (WNECA) or the coarse grain export equation (FNECA). Therefore, the error can be traced to variability and random factors as opposed to poorly specified equations.

Canadian ending stock represent the equations which clear the region. As with the export equations, only a small percentage of error can be found attributable to bias. Variability is a significant problem due to variability in wheat consumption and coarse grain imports.

5.3.6 Performance Results for the Developed Markets

Modeling the policy driven developed market economies presented a number of problems. Nonetheless, the majority of the equations responded well in the ex-post forecast (Table 5.6). However, several problems can be noted, primarily in the soybean complex.

Wheat harvested area (WHADM) and coarse grain area (FHADM) were originally estimated as Nerlovian lags using the same structure as the other regions. However, as a result of discussions concerning a proposal for a European trade liberalization scenario[4] it was determined that a modification of the existing structure would be appropriate.

As a result of the Common Agricultural Policy movement into wheat and coarse grains has been at the expense of

Table 5.6
Accuracy Statistics for Developed Markets

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPRODM*	n.a.	n.a.	2.3	2.7	1/10	0.01	0.19	0.63	0.00	0.37
WYDM**	0.93	1.93	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHADM	0.67	2.22	2.3	2.7	1/10	0.01	0.55	0.59	0.00	0.41
WCONDM	n.a.	n.a.	3.0	3.7	1/10	0.02	0.88	0.57	0.00	0.42
WFEDDM	0.92	2.25	1465	17.6	1/10	0.07	1.08	0.79	0.01	0.20
WFODDM	0.80	0.91	1.5	1.9	5/10	0.01	0.84	0.20	0.46	0.34
WNIDM	0.91	1.07	175.0	493.0	0/10	0.13	0.63	0.00	0.76	0.24
WESDM*	n.a.	n.a.	14.1	16.4	3/10	0.08	0.75	0.05	0.00	0.95
Coarse Grains										
FPRODM*	n.a.	n.a.	2.1	2.9	1/10	0.01	0.28	0.16	0.02	0.82
FYDM**	0.88	1.46	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHADM	0.71	1.69	2.1	2.9	5/10	0.01	1.35	0.16	0.38	0.46
FCONDM*	n.a.	n.a.	1.7	2.5	2/10	0.01	1.04	0.03	0.03	0.94
FNIDM	0.73	1.01	3.6	4.5	3/10	0.03	0.25	0.03	0.22	0.75
FESDM	0.69	1.45	10.3	15.1	1/10	0.06	0.62	0.02	0.13	0.85
Soybean Complex										
SPRODM*	n.a.	n.a.	8.4	11.8	0/9	0.04	0.37	0.13	0.35	0.52
SYDM**	0.62	1.52	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHADM	0.84	2.19	8.4	11.8	3/9	0.04	0.59	0.17	0.29	0.54
SMCODM*	n.a.	n.a.	5.1	5.6	1/9	0.03	0.60	0.10	0.08	0.82
SOCODM*	n.a.	n.a.	4.1	5.1	2/9	0.02	0.68	0.00	0.00	1.00
SMEIDM	0.98	2.42	5.3	5.9	2/9	0.03	0.54	0.11	0.05	0.83
SOEIDM	0.91	1.96	6.5	8.3	2/9	0.04	0.55	0.00	0.13	0.87
PMELDM	0.75	2.20	7.1	8.5	4/9	0.04	0.99	0.69	0.08	0.23
SMNIDM*	n.a.	n.a.	9.5	11.0	2/9	0.06	0.88	0.16	0.02	0.82
SONIDM*	n.a.	n.a.	32.0	38.7	4/9	0.22	2.44	0.34	0.04	0.62
SNIDM*	n.a.	n.a.	5.7	6.7	3/9	0.03	0.54	0.60	0.01	0.39
SMESDM	0.87	2.33	16.6	20.3	4/9	0.10	0.66	0.25	0.15	0.60
SOESDM	0.93	2.26	26.9	30.1	2/9	0.18	0.79	0.66	0.13	0.21
SESDM	0.91	1.48	17.8	21.7	2/9	0.10	0.71	0.00	0.04	0.96

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

pasture land and vegetable crops. In the event of a reduction in the level of support, it was felt that the area planted to wheat and coarse grains would not return to the original use. Therefore, the equation was modeled as a Nerlovian lag with the ratio of own and competing crop revenue providing the mechanism for adjustment (Appendix F).

In the ex-post forecast both equations suffer from a fair degree of bias error. This occurs because the equations are not designed to capture all of the policy rules. Although FHADM exhibits 5 TPE, none causes a error of more the 6%. Even for this "worst" TPE (1984) the growth in production is driven by yield. The difference in growth rates for FPRODM between 1983 and 1984 is only 0.5%. Soybean area (SHADM) also suffers from some bias and has a MAPE greater than 10% but the amount of area is generally less than 250,000 hectares for the entire region.

Since the end of the last decade, the European Community suffered from an overabundance of wheat. Even though historically the Developed Markets have been treated as a importing region, it was necessary to develop a set of equations which capture government attempts to dispose of this surplus, domestically and through export marketing. Therefore, the Developed Markets is the only region with estimated import and consumption equations.

Wheat for feed consumption (WFEDDM) is a Nerlovian lag equation where wheat feeding is adjusted by the domestic supply of wheat, the amount the EC must pay to export grain

and the price of soybean meal. The equation tracks actual feeding very closely; however, the large increase in wheat production in 1980 led to an over estimation of WFEDDM. As domestic supplies of wheat continued to increase WFEDDM remained above actual levels by approximately 12% over actual levels. In retrospect, supply should probably only enter the equation after 1979.

The wheat trade equation (WNIDM) is a very good equation, tracking actual levels very closely. The only period it misses is the bumper crop year 1984 when the EC came under rather severe price competition and fell short of their export targets. The large MAPE in WNIDM is the result of the period when the Developed Markets became exporters. The actual level of exports was 18,000 metric tons, the model indicated that the EC would import 250,000 metric tons. Although these trade figures are insignificant, the calculated error was over 1000%.

The import equations for coarse grains (FNIDM), soymeal equivalent (SMEIDM) and soyoil equivalent (SOEIDM) performed well. Serious problems exist in PMELDM, the equation which divides soymeal equivalent imports into imports of soymeal and soybean. The equation has serious bias error and a U(2) which indicates that it is only marginally better than a no-change model. This problem however, does not seem cause severe problems in the component import equations. Although the MAPE in soyoil imports is rather high the maximum error is less the 500,000 metric tons.

Table 5.7
Accuracy Statistics for Less Developed Countries

	Equation Statistics		Performance Statistics			Theil Statistics				
	R2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPROLD*	n.a.	n.a.	2.7	2.9	2/10	0.01	0.50	0.02	0.16	0.81
WYLD**	0.96	1.19	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHALD	0.93	2.12	2.7	2.9	2/10	0.01	0.98	0.03	0.13	0.84
WCONLD*	n.a.	n.a.	3.9	4.8	3/10	0.02	1.09	0.01	0.10	0.89
WNILD	0.54	1.09	13.7	17.5	5/10	0.08	1.59	0.02	0.19	0.79
WESLD	0.80	0.84	17.5	20.6	4/10	0.10	1.04	0.02	0.00	0.98
Coarse Grains										
FPROLD*	n.a.	n.a.	1.8	2.9	1/10	0.01	0.47	0.02	0.08	0.90
FYLD**	0.92	2.18	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHALD	0.77	1.98	1.8	2.9	6/10	0.01	1.59	0.02	0.26	0.72
FCONLD*	n.a.	n.a.	0.7	0.9	0/10	0.00	0.24	0.18	0.07	0.75
FNILD	0.88	1.94	18.6	26.2	4/10	0.10	0.43	0.02	0.19	0.79
FESLD	0.70	1.80	14.6	19.1	4/10	0.08	0.76	0.04	0.08	0.87
Soybean Complex										
SPROLD*	n.a.	n.a.	7.3	8.7	1/9	0.04	0.48	0.05	0.51	0.44
SYLD**	0.79	1.39	n.a	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHALD	0.97	1.79	7.3	8.7	0/9	0.04	0.53	0.05	0.52	0.44
SMCOLD*	n.a.	n.a.	9.7	12.1	1/9	0.05	0.71	0.28	0.05	0.67
SOCOLD*	n.a.	n.a.	6.4	6.8	3/9	0.03	0.51	0.12	0.00	0.88
SMEILD	0.94	1.76	20.3	25.3	3/9	0.09	0.66	0.15	0.00	0.84
SOEILD	0.89	1.91	9.0	10.0	3/9	0.05	0.69	0.14	0.00	0.86
PMELLD	0.76	1.63	11.9	13.6	5/9	0.07	0.62	0.00	0.16	0.84
SMNILD*	n.a.	n.a.	25.1	33.6	3/9	0.10	0.73	0.13	0.01	0.86
SONILD*	n.a.	n.a.	10.3	11.4	3/9	0.05	0.80	0.24	0.00	0.76
SNILD*	n.a.	n.a.	21.4	29.4	2/9	0.11	0.63	0.09	0.10	0.81
SMESLD	0.92	2.46	97.6	227.0	3/9	0.12	0.62	0.04	0.02	0.94
SOESLD	0.92	1.73	16.2	18.9	2/9	0.09	0.60	0.03	0.12	0.85
SESLD	0.87	1.40	13.4	19.2	1/9	0.09	0.59	0.01	0.13	0.86

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

5.3.7 Performance Results for the Less Developed Countries

The statistical results from the ex-post forecast indicate that the equations for the Less Developed Country region performed very well. It is however, important to note that the magnitude of the data is large. Therefore, a small relative error can have serious spillover implications for the rest of the model.

The equations estimating wheat area (WHALD), coarse grain area (FHALD) and soybean area (SHALD) performed very well across most of the forecast period (Table 5.7). However, the coefficient on coarse grain revenue is almost three times as large as those for soybean or wheat area (Appendix G). Therefore, as a result of the coarse grain price shock in 1983, the wheat and coarse grain harvested area equations were off in 1984*. FHALD missed most badly, over estimating actual area by almost 10,000 hectares (9%). Even so, the overestimation in area in 1984 was lowered by a reduction of coarse grain imports in 1983.

The error in harvested area spilled over into production (FPROLD), exacerbated by a decline in coarse grain yields in 1984. As a result, FPROLD overestimated actual production.

The effects of over and underestimation in production have a significant effect on commodity trade. Imports of wheat and coarse grains are not dependent upon price. As

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* The soybean complex equations can only be compared until 1983. Actual data was not available after 1983.

mentioned in Chapter III, the policy objectives of many less developed countries is to maintain stable patterns of consumption. Therefore, these countries will enter world markets to make up the difference between production and desired consumption levels regardless of price*.

The results of the ex-post forecast indicate that very little of the error in the import equations for wheat (WNILD) and coarse grains (FNILD) can be traced to bias. Although FNILD has a higher number of turning point errors and MAPE, WNILD has a U(2) greater than 1.

The period of worst error for WNILD can be traced to 1983 and 1984. In 1983 spiraling inflation in Peru, Mexico and Israel** caused a dramatic decline in real incomes, one of the drivers of import demand. This problem was first noticed in the estimation procedure. In 1984 WNILD over-estimated imports as a result of the decline in wheat area relative to coarse grain area.

OF the 4 TPES in FNILD only 2 are of any significance. In 1978 FHALD missed a turning point and FNILD overestimated imports. In 1983 the decline in real income had the same depressing effect upon coarse grains as wheat. However, while the model made the required turns, the effects of the 1978 error spilled over to affect import demand in 1979-

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* Grain can be obtained through concessionary sales, outright food aid or purchased with funds borrowed on the international credit markets.

** These three countries are used in the weighting of macro variables.

1980. As a result of increased imports in 1978 ending stocks increased. For the two periods these stocks remained in the system, import demand for 1979 and 1980 remained depressed.

Low import demand reduced government pressure to expand coarse grain area and by 1981 FESLD fell below actual levels. Therefore, when the recession of 1981 reduced incomes in the LDCs, reduced domestic supplies kept FNILD from falling by as much as the actual levels. However, while the import errors in 1979 and 1981 were large in percentage terms (50% for each year), their spillover effect was about 25% of the error in FNEUS in each of the two years.

Imports of soymeal equivalent (SMEILD) and soyoil equivalent (SOEILD) tend to track their actual values fairly closely. It is assumed that soymeal imported will be imported as livestock feed supplements. SMEILD used lagged income as a proxy for the livestock cycle and the supplies of other oilseeds (rapeseed, peanut, palm, etc.) for an indication of available alternatives. The equation forecast well. Although there were 3 turning points errors, none of them generated an error of more than 500,000 Metric tons.

SOEILD had current income as a right hand side variable which acted more like a time trend. Like SMEILD, SOEILD missed three turning points. The effects two of the turning point errors were noticeable but amounted to less than 300,000 Metric tons.

PMELLD, the equation which divides imports of equivalent was estimated as a function of passed and current crushing margins and a time trend. The result was a smooth curve which had considerable variance error. The difference between the forecast value of PMELLD and the actual value varied by as much as 11 percentage points.

The turning point errors in PMELLD were often small but the error in 1981 resulted in the overestimation of soybean imports by 550,000 Metric tons. In the other equations the high MAPEs were the result of the low values of imports or ending stocks.

5.3.8 Performance Results for the Less Developed Oil Exporting Countries

The results of the ex-post forecast indicated that the estimatation of the oil exporters as a regions was less successful than other regions. Although none of the equations suffered from severe bias error, there were a number of turning point errors which spilled into the rest of the model (Table 5.8).

The Theil statistics for the harvested area equations were quite good. All three equations had almost no bias error and only soybean harvested area (SHALO) had any serious variance error.

The equations estimating wheat imports (WNILO) and soyoil equivalent imports (SOEILO) both forecast well. Errors in WNILO can be traced to errors in wheat production (overestimation in 1979 and 1983 and underestimation in 1976

Table 5.8
Accuracy Statistics for Less Developed Oil Exporting Countries

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	U^M	U^S	U^C
Wheat										
WPROLO*	n.a.	n.a.	5.8	6.4	2/10	0.03	0.55	0.00	0.02	0.98
WYLO**	0.59	2.24	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHALO	0.51	2.26	5.8	6.4	3/10	0.03	0.90	0.00	0.00	1.00
WCONLO*	n.a.	n.a.	3.7	4.6	2/10	0.02	0.77	0.00	0.42	0.58
WNILO	0.95	1.82	10.6	12.1	5/10	0.06	0.79	0.01	0.46	0.53
WESLO	0.91	1.95	15.6	19.5	2/10	0.11	1.06	0.27	0.20	0.53
Coarse Grains										
FPROLO*	n.a.	n.a.	4.4	4.6	2/10	0.02	0.62	0.01	0.01	0.98
FYLO**	0.58	0.71	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHALO	0.62	2.00	4.4	4.6	4/10	0.02	0.87	0.01	0.02	0.97
FCONLO*	n.a.	n.a.	4.8	6.1	2/10	0.03	0.72	0.03	0.27	0.70
FNILO	0.95	1.36	22.2	25.8	2/10	0.15	1.45	0.01	0.31	0.68
FESLO	0.83	0.54	20.1	23.5	3/10	0.11	1.20	0.00	0.04	0.96
Soybean Complex										
SPROLO*	n.a.	n.a.	6.2	8.3	4/9	0.04	0.74	0.03	0.32	0.65
SYLO**	0.63	1.59	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHALO	0.70	2.35	6.2	8.3	4/9	0.04	0.79	0.03	0.40	0.57
SMCOLO*	n.a.	n.a.	10.6	14.2	3/9	0.09	1.18	0.14	0.15	0.71
SOCOLO*	n.a.	n.a.	11.0	13.8	3/9	0.06	0.66	0.02	0.22	0.76
SMEILO	0.88	1.72	19.2	24.0	3/9	0.13	1.24	0.15	0.21	0.64
SOEILO	0.88	1.79	14.0	18.5	2/9	0.08	0.68	0.02	0.25	0.73
PMELLO	0.91	1.89	6.8	8.2	3/9	0.04	0.63	0.04	0.01	0.95
SMNILO*	n.a.	n.a.	20.5	27.5	3/9	0.12	1.11	0.10	0.11	0.79
SONILO*	n.a.	n.a.	14.3	20.5	4/9	0.08	0.65	0.00	0.13	0.87
SNILO*	n.a.	n.a.	24.7	28.5	4/9	0.19	1.24	0.25	0.39	0.36

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

and 1981).

As can be noted by observation of the U^S statistic, approximately half of the forecast error for WNILD can be attributed to variance. The errors in 1979 and 1981 are caused solely by the errors in WHALD. However, the errors in 1976, 1983 and especially 1984 are partially the result of errors in the supply of coarse grains. In 1984, high revenue encouraged the expansion of coarse grain area at the expense of wheat. The effect of the increase in wheat supply is so great that it overwhelms the decline in WHALD and wheat imports decline.

SOEILO also tracked the actual values very well. Almost none of the forecast error could be traced to bias and only one turning point error could be considered serious. SOEILO is estimated as a function of real income, soyoil prices and a dummy variable in 1973. Inflationary pressures reduce incomes in 1983 and SOEILO declines when actual imports increase. Although the absolute amount of error is approximately 150,000 metric tons, the error is approximately 12%.

Coarse grain imports are not affected by supply (Appendix H). Imports are a function of the previous period's consumption, wheat prices and current and lagged coarse grain prices. This results in a considerably more volatile import equation. The error is often significant (5.5 million metric tons in 1984) and can be traced to periods when coarse grain prices were severely in error. At

the same time, the use of lagged feed prices as a proxy for the demand for poultry feed among OPEC members worsens wheat price errors in 1984. Based upon the abnormally high price of coarse grains in 1983, the demand for feed declines in 1984.* A decline in imports increases stock levels in the U.S. and Canada and depresses coarse grain price.

SMEILO has three turning point errors, two of which are serious. Both the turning points are affected by over-estimation of soybean prices in 1976 and 1983. The downturn in imports in 1983 is compounded by reduced real incomes.

PMELLO which divides imports of soymeal equivalent into imports of soymeal and soybeans has good performance properties. Almost all of the forecast error is due to random factors and none of the turning point errors account for more than 7 percentage points of error. However, when the errors in SMEILO and PMELLO are combined, the U(2) statistics for the soybean import (SNILO) and soymeal import (SMNILO) equations indicate that they are inferior to no-change models.

Beginning in 1980, PMELLO consistently overestimates the percentage of soymeal equivalent imported as soymeal. Concurrently, the estimated rate of growth of imports in soymeal equivalent is also underestimated. Therefore, the growth in soymeal imports is maintained at the expense of soybean imports which decline during that period. This is a

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* This would result from increased poultry slaughter in 1983.

serious problem from the standpoint of the region but doesn't have a great impact upon world soybean or soymeal trade.

Insufficient data was available on soybean complex ending stocks. It was therefore assumed that stocks are minimal. However, if sufficient stocks are held in the future and it becomes necessary to estimate equations, space has been left in the model of soybean complex stocks.

Both the wheat ending stock (WESLO) and coarse grain ending stock (FESLO) equations are estimated as functions of real income, supply and price. Therefore, both equations miss badly in 1983 when income declines and coarse grain prices rise. The problem continues in 1984 when increased coarse grain production and reduced wheat production caused WESLO to underestimate and FESLO to overestimate. Until 1983, the equations tracked well.

5.3.9 Performance Results for the Newly Industrialized Countries

For the most part the equations for the Newly Industrialized Countries performed well across the forecast period. Although there are six equations which have Thiel statistics greater than 1, the number of turning point errors are generally low and the majority of the errors are concentrated in a few years (Table 5.9 and Appendix I).

The equations forecasting harvested area are acceptable despite a fair bit of bias error in wheat acreage (WHANC) and soybean acreage (SHANC). The coarse grain acreage

Table 5.9
Accuracy Statistics for Newly Industrialized Countries

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPRONC*	n.a.	n.a.	31.1	48.9	1/10	0.14	0.46	0.30	0.10	0.60
WYNC**	0.47	0.83	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHANC	0.96	1.72	31.1	48.9	2/10	0.12	0.56	0.35	0.01	0.64
WCONNC*	n.a.	n.a.	6.4	9.5	3/10	0.05	1.43	0.00	0.10	0.90
WNINC	0.55	2.21	6.3	9.9	4/10	0.06	1.25	0.00	0.10	0.90
WESNC	0.71	1.59	21.0	25.5	4/10	0.14	2.01	0.13	0.33	0.54
Coarse Grains										
FPRONC*	n.a.	n.a.	7.2	8.1	2/10	0.04	0.24	0.00	0.04	0.96
FYNC**	0.72	1.63	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHANC	0.95	2.63	7.2	8.1	3/10	0.04	0.46	0.00	0.01	0.99
FCONNC*	n.a.	n.a.	6.3	7.1	2/10	0.04	0.58	0.00	0.07	0.92
FNINC	0.96	1.77	8.7	11.0	3/10	0.06	0.74	0.05	0.00	0.95
FESNC	0.88	1.56	16.0	17.6	2/10	0.09	0.91	0.01	0.47	0.52
Soybean Complex										
SPRONC*	n.a.	n.a.	3.8	6.2	0/9	0.03	0.57	0.39	0.05	0.56
SYNC**	0.89	1.25	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHANC	0.93	1.86	4.5	6.2	2/9	0.03	0.62	0.39	0.02	0.58
SMCONC*	n.a.	n.a.	9.8	11.6	2/9	0.05	0.93	0.07	0.01	0.92
SOCONC*	n.a.	n.a.	6.2	7.3	1/9	0.03	0.70	0.00	0.24	0.76
SMEINC	0.95	1.81	10.6	14.5	3/9	0.06	0.75	0.04	0.00	0.96
SOEINC	0.93	1.65	7.7	9.8	4/9	0.05	0.55	0.00	0.22	0.78
PMELNC	0.94	2.51	18.1	21.6	3/9	0.11	1.04	0.29	0.00	0.71
SMNINC*	n.a.	n.a.	25.3	31.6	3/9	0.13	0.75	0.09	0.06	0.85
SONINC*	n.a.	n.a.	824.0	1320.0	4/9	0.83	1.56	0.30	0.12	0.57
SNINC*	n.a.	n.a.	9.2	12.9	2/9	0.06	0.81	0.19	0.00	0.81
SMESNC	0.69	1.28	46.6	105.0	3/9	0.28	1.55	0.44	0.33	0.24
SOESNC	0.90	2.55	19.0	25.8	3/9	0.27	1.28	0.00	0.24	0.76
SESNC	0.48	1.61	17.6	24.1	4/9	0.11	0.59	0.20	0.00	0.80

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

equation (FHANC) has only a small proportion of bias or variance error.

Wheat area in the NICs is very small, only an average of 20,000 hectares for the entire region. Therefore, any deviations in area will appear as a large percentage error. WHANC tracks well, there is only one turning point error generating a 10% error. However, in 1984 wheat area declines to 7,000 hectares. WHANC declines as well but to 14,000 hectares. This results in an error of 100%, making the equation appear much worse than it actually is.

Soybean area in the NICs, although larger than wheat area has trended down over time. SHANC is estimated as a function of lagged area, soybean revenue and a logarithmic time trend. Ln(time) was chosen to represent a slowing in the rate of decrease as the area approached zero. It will not however, prevent SHANC from going negative.

Like soybean area, coarse grain area has also declined steadily over time. Therefore, FHANC was estimated with a time trend in addition to wheat and coarse grain revenues and lagged ending stocks. The time trend, wheat revenue and lagged ending stocks have negative coefficients. Wheat revenue is insignificant and there is a high degree of correlation between time and lagged area.

Although production is less than a million metric tons in wheat and soybeans, the fact that two of the harvested area equations required time trends indicates that a shift is occurring which is not being caught by the other vari-

ables. Rice is the major staple in this region and government policies are geared to providing stable production through high support prices. If the model is to capture more detail in the NICs rice supply and price policies should be included in the estimation procedure.

Any forecast errors in the production equations appear to be too small to have an effect upon the import equations. None of the import equations suffer from bias error. Wheat imports have only one period when the error is greater than 10% and that can be traced to 1984 when overestimation of wheat price and underestimation of coarse grain price resulted in a dramatic decline in imports.

Only real income and coarse grain price was found to be significant in the estimation of coarse grain imports (FNINC). The elasticity of price is considerably lower for coarse grain imports than it is for wheat imports. The effects of price shocks were not as great on FNINC.

The equations for soymeal equivalent imports (SMEINC) and soyoil equivalent imports (SOEINC) were estimated as functions of real income, domestic supplies of oil and meal equivalent and the price of soybeans (SMEINC) and soyoil (SOEINC). This made the equations more susceptable to internal errors. However, these demand equations were driven primarily by income which acted as a trend over time. The effect were relatively smooth curves with fairly high numbers of turning point errors. The largest errors for both equations occurred in 1978. These errors occurred in

estimation as well and are the results of a missing variable as opposed to spillover from other equations.

Despite a high adjusted R^2, PMELNC appears to be suffering from a missing variable. PMELNC was estimated as a function of imports of soymeal equivalent, lagged soymeal ending stocks and a dummy variable from 1974 on. The majority of error in PMELNC can be traced to errors in the soymeal ending stocks (SMESNC). Overestimation of soymeal ending stocks in 1975-1977 results in serious underestimation in PMELNC in the early period.

This problem is modified by including total soymeal equivalent supply* as one of the independent variables in SMESNC. However, stockpiling of soymeal equivalent is a fairly recent event and the quantities stored are very small. The volatility of this equation breaeds further instability by spreading into both soymeal equivalent imports and the percentage imported as products. Although the effects of errors in the import equation is small relative to the entire model, this equation should be re-estimated as soon as a sufficient time series is available.

5.3.10 Performance Results for the Soviet Bloc

For a number of reasons, the Soviet Bloc represents one of the most serious problems in the entire model. Generally the regional model is driven by policy decisions as opposed to recognizable economic theory (Appendix J). Despite high

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* Total soymeal equivalent supply equals domestic soymeal equivalent supply plus soymeal equivalent imports.

Table 5.10
Accuracy Statistics for Soviet Bloc

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WPROSB*	n.a.	n.a.	5.5	7.1	2/10	0.03	0.37	0.01	0.06	0.93
WYSB**	0.66	2.01	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHASB	0.72	2.24	5.5	7.1	6/10	0.03	1.27	0.01	0.65	0.33
WCONSB*	n.a.	n.a.	4.5	5.7	3/10	0.03	0.93	0.00	0.05	0.95
WNISB	0.87	1.26	16.7	20.9	0/10	0.07	0.52	0.00	0.06	0.94
WESSB	0.81	1.74	88.6	142.0	5/10	0.34	0.60	0.00	0.30	0.70
Coarse Grains										
FPROSB*	n.a.	n.a.	2.4	3.3	1/10	0.02	0.22	0.09	0.14	0.77
FYSB**	0.55	2.08	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHASB	0.92	2.53	2.4	3.3	6/10	0.02	0.65	0.12	0.70	0.17
FCONSB*	n.a.	n.a.	3.7	4.3	2/10	0.02	0.47	0.11	0.00	0.88
FNISB	0.91	2.01	25.0	34.4	3/10	0.13	0.60	0.00	0.04	0.96
FESSB	0.63	1.04	29.4	42.3	5/10	0.14	1.02	0.13	0.13	0.74
Soybean Complex										
SPROSB*	n.a.	n.a.	6.7	7.9	2/9	0.04	0.56	0.75	0.01	0.24
SYSB**	0.61	2.03	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHASB	0.93	1.73	6.7	7.9	4/9	0.04	1.49	0.76	0.13	0.11
SMCOSB*	n.a.	n.a.	12.4	14.8	3/9	0.06	0.84	0.58	0.04	0.37
SOCOSB*	n.a.	n.a.	23.4	29.8	2/9	0.11	1.33	0.73	0.10	0.17
SMEISB	0.94	2.17	17.0	21.8	4/10	0.09	1.22	0.52	0.00	0.48
SOEISB	0.95	1.93	28.7	37.9	2/10	0.12	1.30	0.70	0.11	0.18
PMELSB	0.79	2.37	13.6	14.2	3/10	0.08	1.70	0.90	0.00	0.09
SMNISB*	n.a.	n.a.	11.2	13.8	4/10	0.08	0.71	0.00	0.01	0.99
SONISB*	n.a.	n.a.	28.8	37.8	5/10	0.19	0.75	0.22	0.46	0.32
SNISB*	n.a.	n.a.	58.5	64.8	5/10	0.22	2.60	0.90	0.00	0.10

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

adjusted R^2s the area equations suffer from considerable bias and variance error and this error spilled over into the import demand and ending stock equations (Table 5.10).

Secondly, the amount of production and imports is large in absolute quantity. Therefore, a small percentage error in trade could have serious implications for the rest of the model.

There were a number of problems in the estimation of the harvested area equations for the Soviet Bloc. First, the expansion and contraction of acreage is a "top down" policy decision. When estimation was attempted as a function of border price revenues, revenue was not found to be significant. It was therefore necessary to find a simple policy proxy. Initially, lagged imports were chosen as a proxy for the Soviet government's desire to minimize foreign currency transactions. However, a problem inherent in using lagged imports as variables in the harvested area equation is that if a policy decision is made to limit imports (even during a period of production shortfall) there is the risk of a contraction in acreage the following year*5.

Therefore, despite reservations about the reliability of Soviet ending stock data, lagged stocks of own and competing crops were used as right-hand side variables.

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* This problem became apparent during a scenario analyzing the effects of livestock slaughter due to nuclear contamination in the Ukraine. The initial livestock slaughter reduced the demand for imports of feed. The following year, coarse grain area decreased. For further details on the methods of correction see Shagam and Hilker.

With the exception of low t-statistics for wheat ending stocks in the wheat acreage equation, the signs and other t-statistics were acceptable.

Although there was little bias error present, the wheat harvested area equation (WHASB) was inferior to a no-change model. Much of this error can be traced to 1983 and 1984 and was the result of drought. According to the U.S.D.A.[6], low moisture resulted in the reseeding of wheat acreage to coarse grains. This reseeding could not be forecast by WHASB. The error in WHASB spills over into WPROSB but the error in production is not large enough affect the wheat import equation.

The coarse grain acreage equation (FHASB) performs quite well. More bias is present in the equation and the number of turning point errors is large but the percentage error is small little error spills over into the production equations.

Both wheat import (WNISB) and coarse grain import (FNISB) equations perform well. Neither shows any bias error and FNISB has only 1 major turning point error. The percentage errors are rather large but in the case of wheat the errors didn't cause significant problems in the international market. The effects of the coarse grain errors were considerably more significant. FNISB has errors of almost 10 million tons in 1978 and 1983. In 1978 this is almost three quarters of error in U.S. coarse grain exports in that year. In 1982 the FNISB also represents over three-quarters

of the error in U.S. coarse grain exports. The potentially disastrous effects of both of these forecasting errors were masked by U.S. production errors in the opposite direction. This kept U.S. ending stocks high and prevent major price distortions.

Estimation results for ending stock equations of wheat (WESSB) and coarse grains (FESSB) were highly unsatisfactory. Stocks are determined by policy and policy decisions are difficult to include in the context of this model. Both equations originally used supply and price. Both were positively signed, the positive price is in keeping with Sharples and Goodloe's contention that the Soviet Union transfers instability to the world market[7]. However it was the statistical results indicated that a proxy variable was missing. WESSB was re-estimated and the lagged stock to utilization ration was included. The results were considerably better but the equation still misses badly in 1982-84.

The entire soybean sector is very poor. Despite high adjusted R^2s and no serial correlation, all estimated soybean complex equations show high percentages of bias error and are inferior to no-change models.

With the exception of soyoil equivalent net imports, world prices were not found to be significant in any soybean complex equation. This would indicate that all facets of soybean production and use is determined by policy.

Soybean acreage (SHASB) is estimated as a function of

lagged soybean imports and a time trend. This formulation functioned quite well until the model missed the decline in soymeal equivalent imports in 1982 and 1983. Errors in the soymeal equivalent imports (SMEISB) and percentage meal equations caused an overestimation of soybean imports (SNISB) and the effects spilled over into the harvested area equation.

Imports of soymeal equivalent and the decision to import equivalent as soymeal or soybeans is a primarily a function of the available supply of other oilseed (sunflower and rapeseed). Both these are estimated are crudely estimated so they miss year to year fluctuations. The equations missed the large sunflower crop of 1982 which reduced soybean imports in 1983. The tracking errors for the two equations are in opposite directions for the entire ex-post forecast. PMELSB underestimates and SMEISB overestimates; the result is a correct forecast for SMNISB and a shift of all the error to SNISB which badly overestimates soybean imports.

5.3.11 Performance Results for China

The quality of the Chinese equations was surprising. It was expected that, like the Soviet Bloc the equations would require a large number of policy variables (Appendix K). However bias error was not a problem in any estimated equations (Table 5.11).

The majority of the equations forecast well. The only significant problems in the grain sector occurred in 1983

Table 5.11
Accuracy Statistics for China

	Equation Statistics		Performance Statistics			Theil Statistics				
	R^2	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	U^M	U^S	U^C
Wheat										
WPROCH*	n.a.	n.a.	1.3	1.6	0/10	0.01	0.10	0.05	0.14	0.80
WYCH**	0.87	0.62	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
WHACH	0.91	1.77	1.3	1.6	4/10	0.01	0.67	0.10	0.08	0.82
WCONCH*	n.a.	n.a.	3.4	4.3	1/10	0.02	0.36	0.02	0.09	0.88
WNICH	0.66	2.02	27.4	32.4	4/10	0.13	0.88	0.00	0.01	0.99
Coarse Grains										
FPROCH*	n.a.	n.a.	4.8	5.8	2/10	0.03	1.00	0.06	0.16	0.78
FYCH**	0.96	0.74	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
FHACH	0.89	2.18	4.8	5.8	4/10	0.03	0.77	0.05	0.01	0.94
FCONCH*	n.a.	n.a.	4.6	5.8	2/10	0.03	1.00	0.06	0.07	0.87
FNICH	0.73	1.98	465.0	871.0	1/10	0.28	0.52	0.00	0.01	0.99
Soybean Complex										
SPROCH*	n.a.	n.a.	3.4	3.9	3/10	0.02	0.50	0.01	0.02	0.97
SYCH**	0.59	1.96	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
SHACH	0.86	1.56	3.6	3.9	4/10	0.02	0.64	0.01	0.01	0.98
SMCOCH	0.83	1.37	5.0	5.5	2/9	0.03	0.63	0.07	0.16	0.77
SOCOCH	0.69	1.42	5.9	6.7	2/9	0.03	0.74	0.12	0.19	0.69
SMEECH*	n.a.	n.a.	781.0	2020.0	2/9	0.42	0.90	0.01	0.18	0.81
SOEECH*	n.a.	n.a.	442.0	613.0	2/9	0.68	3.59	0.92	0.06	0.02
SMNECH	0.95	1.89	104.0	209.0	0/9	0.15	0.82	0.20	0.00	0.80
SONECH*	n.a.	n.a.	973.0	1460.0	5/9	0.72	7.76	0.97	0.01	0.01
SNECH*	n.a.	n.a.	180.0	291.0	6/10	0.54	0.95	0.01	0.51	0.48

* Definitional Equation
** Ex-Post forecast used actual yields to simulate weather variability.

and 1984 and can be traced to the coarse grain price shock. The overestimation of coarse grain prices in 1983 resulted in overestimation of wheat imports (WNICH) and underestimation of coarse grain imports (FNICH). In 1984 overestimation of coarse grain acreage can be traced to increased coarse grain revenue relative to wheat.

Despite what appear to be appalling performance statistics, there are only minor problems in the soybean sector. China has fluctuated between being an exporter and importer of soymeal equivalent. As the residual of production and consumption, SMEECH and SOEECH collect the residual error. The absolute error for each equation is less than 375,000 metric tons; however, relative to the quantity of exports the error is extremely large in two years. This biases the MAPEs. SONECH is the market clearing equation for the Chinese oilseed sector. Therefore, it contains the sum of all error. ALthough the equation estimation doesn't come close to the actual level of exports, the error spilling over into the international oilseed market is less than 400,000 metric tons.

5.3.12 Performance Results for the Price Equations

Although the price equations were inferior to no-change models, the error is the result of accumulation of all the model error in the residual U.S. ending stock equations (Table 5.12).

The largest fluctuations in the price forecasts can be traced to periods when U.S. stocks were over or under-

Table 5.12
Accuracy Statistics for Prices

	Equation Statistics		Performance Statistics			Theil Statistics				
	$\bar{R}^2$	D.W.	MAPE	RMSPE	TPE	U(1)	U(2)	UM	US	UC
Wheat										
WP	0.78	1.91	14.4	18.4	4/10	0.08	1.24	0.00	0.01	0.99
Coarse Grains										
FP	0.91	1.90	18.2	20.9	3/10	0.11	1.47	0.01	0.42	0.57
Soybean Complex										
SMP	65.1	2.11	16.1	20.1	2/10	0.11	1.10	0.00	0.27	0.73
SP	98.1	1.93	9.6	11.7	1/10	0.06	0.63	0.02	0.13	0.85

estimated. This would indicate that the equation is too responsive to changes in the stock/utilization ratio. In previous price modeling experiences dummy variables were included for the periods of great fluctuation (1973-75, 1983). This resulted in low coefficients for the stock/utilization variables but it was also felt that "everything interesting" had been dummied out. The model might be a fine ex-post model, put would lack responsiveness in ex-ante forecasts. Therefore, the more responsive equations were selected (Appendix L).

There is also another factor which affected the performance of the price equations in an ex-post forecast. As discussed in Chapter III, the stock/utilization ratio is comprised of consumption, exports and ending stocks in the U.S. where the relevant stock numbers for the U.S. are freestocks. The equations which forecast accumulation and release of government held stocks were estimated as rules as opposed to based upon historic data. Due to potential instability, it was recommended that the actual values for policy stocks be used in the ex-post forecast. In periods of low price the government would have accumulated stocks; in periods of high prices stocks would have been released. This would have had an definite smoothing effect on the performance of the price equations, the question is how much.

There were no ex-post tests performed upon the policy stock rules. They were used in the baseline and scenario

forecasts (covered in the following chapter) and appeared to perform satisfactorily. This tends to indicate that with policy stocks acting as a smoothing factor (as they are supposed to in the real world) the price equations are acceptable.

Notes to Chapter V.

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CHAPTER VI

BASELINE FORECAST AND SCENARIO ANALYSIS

Having run the model in an ex-post forecast over 10 years the next logical step is to run an ex-ante forecast for the next 10 years. Once a baseline forecast has been generated a short policy scenario will be run to analyze the model's ability to forecast policy shocks.

6.1 Exogenous Model Assumptions

The Agriculture Model requires a number of exogenous assumptions to forecast a baseline. Exogenous forecasts for four of these variables: income, inflation, exchange rates and population must be for prepared for each region in the model. In addition three other exogenous variables must be forecast for the United States. The loan rate for wheat and corn is determined by legislation and is available from outside sources. The price of soyoil is determined in the domestic component when the international model is linked to the domestic model. Since the components are not linked, the world soyoil price must be exogenously forecast.

6.1.1 Macro-Economic Assumptions

As mentioned in Chapter III, the model does not generate income, inflation, exchange rates or population.

Forecasts of these variables can be obtained from a variety of sources. The usual procedure is to generate a trend forecast of the past ten years and modify that trend by "expert opinion" which can be found in the O.E.C.D. Outlook, the World Bank's World Development Report, U.N. population forecasts and private sector forecasts. Based upon these sources the exogenous assumptions have been derived for each region (Tables 6.1-6.4).

Table 6.1
Population Assumptions (% Growth)

	1986	1987	1988	1989	1990	1991-95
U.S.	0.88	0.91	0.90	0.90	0.89	0.80
Argentina	1.08	1.08	1.08	0.97	0.97	0.97
Australia	1.15	1.05	0.98	0.98	0.98	0.98
Brazil	2.20	2.20	2.07	2.07	2.07	2.07
Canada	1.34	1.34	1.13	1.13	1.13	1.13
Dev. Mkts.	0.49	0.48	0.48	0.48	0.48	0.48
L.D.C.s	2.20	2.20	2.20	2.20	2.20	2.20
L.D.O.s	2.59	2.59	2.59	2.59	2.59	2.59
N.I.C.s	1.52	1.52	1.52	1.52	1.52	1.52
Soviet Bloc	0.74	0.74	0.62	0.62	0.62	0.62
China	1.24	1.20	1.19	1.19	1.17	1.15

Table 6.2
Real Gross Domestic Product Assumptions (% Growth)

	1986	1987	1988	1989	1990	1991-95
U.S.	2.10	2.10	2.10	2.10	2.10	2.10
Argentina	3.57	3.57	3.57	3.57	3.57	3.57
Australia	0.32	0.32	0.32	0.32	0.32	0.32
Brazil	3.60	3.60	3.60	3.60	3.60	3.60
Canada	3.16	3.16	3.16	3.16	3.16	3.16
Dev. Mkts.	2.13	2.08	2.13	2.13	2.13	2.13
L.D.C.s	3.77	3.77	3.77	3.77	3.77	3.77
L.D.O.s	4.25	4.25	4.25	4.25	4.25	4.25
N.I.C.s	5.65	5.65	5.65	5.65	5.65	5.65
Soviet Bloc	3.00	3.00	3.00	3.00	3.00	3.00
China	6.00	6.00	6.00	6.00	6.00	4.00

Table 6.3
Consumer Price Index Assumptions (% Growth)

	1986	1987	1988	1989	1990	1991-95
U.S.	3.6	3.0	3.9	4.5	4.7	4.9
Argentina	227.3	227.3	227.3	227.3	227.3	227.3
Australia	10.7	10.7	10.7	10.7	10.7	10.7
Brazil	132.5	132.5	132.5	132.5	132.5	132.5
Canada	4.9	4.8	4.8	4.8	4.8	4.8
Dev. Mkts.	6.4	6.4	6.4	6.4	6.4	6.4
L.D.C.s	202.3	202.3	202.3	202.3	202.3	202.3
L.D.O.s	8.1	8.1	8.1	8.1	8.1	8.1
N.I.C.s	9.3	9.3	9.3	9.3	9.3	9.3
Soviet Bloc	6.4	6.4	6.4	6.4	6.4	6.4
China	8.0	8.0	8.0	8.0	8.0	8.0

Table 6.4
Exchange Rate Assumptions (Nat. Currency/US$ - % Growth)

	1986	1987	1988	1989	1990	1991-95
Argentina	223.5	223.5	223.5	223.5	223.5	223.5
Australia	10.7	10.7	10.7	10.7	10.7	10.7
Brazil	132.5	132.5	132.5	132.5	132.5	132.5
Canada	3.0	0.7	0.7	0.7	1.4	1.1
Dev. Mkts.	-9.2	-1.0	-1.05	-0.2	-0.1	0.0
L.D.C.s	13.4	13.4	13.4	13.4	13.4	13.4
L.D.O.s	8.1	8.1	8.1	8.1	8.1	8.1
N.I.C.s	6.8	6.8	6.8	6.8	6.8	6.8
Soviet Bloc	-9.2	-1.0	-1.05	-0.2	-0.1	0.0
China	12.0	10.0	8.0	8.0	8.0	8.0

6.1.2 U.S. Agricultural Assumptions

The 1985 Farm Bill established the basis for loan rate assumptions for wheat and corn for the next five years. Although the Secretary of Agriculture has the authority to lower these rates by up to 20% and has indicated his intention to exercise his authority, the model will use the 1986 loan rates for the first five years of the forecast. Beyond that time the real loan rates will remain fairly constant but the nominal rate will increase by the rate of expected inflation (Table 6.5).

Table 6.5
Loan Rate Assumptions ($/Bushel)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Wheat	2.40	2.40	2.40	2.40	2.40	2.52	2.64	2.77	2.91	3.05
Corn	1.92	1.92	1.92	1.92	1.92	2.01	2.11	2.22	2.33	2.44

Based upon large soyoil stocks and stocks of competing oils, it is forecast that real soyoil prices will remain low throughout the entire forecast period. Prices will be within the $.20-$.35 per pound range (Table 6.6).

Table 6.6
Nominal World Soyoil Price Assumptions (cents/lb)

1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
20.92	22.07	23.25	24.71	26.19	27.94	29.70	30.60	32.00	33.41

6.2 Forecast Results

Reduction of the loan rates for corn and wheat in 1986 reduces acreage in both commodities. However, the growth in consumption and import demand lag behind production growth and ending stocks continue to increase for all commodities. This depresses prices through the end of the decade. Although nominal prices begin to increase in the second half of the forecast period, real prices continue to trend downward.

6.2.1 Wheat

Despite the decline in wheat prices relative to coarse grains, global wheat production continued to increase at approximately 2.5% per year through the forecast period

(Table 6.7). During the same period, net trade increased by approximately 1.75% per year. Most of the weakness in import demand was the result of increased domestic supplies in both the LDC region and the Soviet Bloc.

An expansion of the land base in the LDCs led to increases in wheat area. Production of wheat increased by approximately 4.5% per year, reducing LDC dependence upon the outside sources for wheat. Although wheat imports increased slightly in 1986 and 1988, there was a steady decline in imports during the rest of the period.

Improved moisture conditions in 1986 will permit the Soviet Union to begin sowing winter wheat in area recently planted to coarse grains. Although the increases in area are minimal, (less than 2% per year), a return to trend yield growth expands production by more than 2%. It should be noted that most of this increase occurs in the first half of the forecast period and tends to represent more of a return to the trends of the late 1970's than a major policy shift. Later in the period the growth of production tends to slow and although wheat imports do increase more rapidly than in the last half of the 1980's they do not approach the growth rates of the late 1970's.

As a result of the slow growth in import demand, there is an increase in wheat ending stocks by all major exporters. The U.S. continues to lose market share, primarily on the weakness of the export market in general and the strength of EC exports in particular.

TABLE 6.7 WORLD WHEAT AND WHEAT FLOUR BALANCE SHEET, IN MILLION METRIC TONS, CROP YEARS /1.

	ACTUAL		PRELIM	FORECAST								
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE, $/MT.	153.40	148.25	126.17	113.16	111.94	113.82	113.90	112.44	114.55	117.43	121.46	126.69	132.14
NET EXPORTS													
CANADA	21.8	16.9	17.2	20.4	21.4	21.8	21.7	21.8	22.1	22.6	23.0	23.3	23.7
AUSTRALIA	13.3	15.1	15.5	13.7	12.2	13.0	13.6	14.2	14.7	15.1	15.5	15.8	16.2
ARGENTINA	7.9	8.3	3.9	6.4	7.3	7.4	7.1	6.8	6.5	6.8	7.3	7.6	7.8
DEVELOPED MARKETS	6.7	10.6	7.4	8.2	6.4	7.4	8.7	9.5	10.1	10.9	11.5	12.4	13.2
SUB-TOTAL	49.6	50.9	43.9	48.8	47.3	49.6	51.1	52.3	53.5	55.4	57.2	59.1	60.8
U.S.	38.8	38.7	28.1	37.5	36.6	36.9	37.0	37.6	38.2	38.7	39.2	39.7	40.6
TOTAL /2	88.4	89.6	72.0	86.3	83.9	86.5	88.2	89.9	91.7	94.1	96.4	98.9	101.4
NET IMPORTS													
SOVIET BLOC	21.4	24.5	16.2	22.9	22.3	22.2	22.4	23.0	23.6	24.3	25.0	25.7	26.5
LDC'S	34.2	33.6	23.8	25.4	22.6	23.7	23.5	22.9	22.2	22.1	21.9	21.7	21.6
CHINA	9.6	7.5	7.4	14.1	15.4	16.5	17.4	18.2	18.9	19.6	20.3	21.1	21.9
MIDDLE INCOME'S	23.3	24.0	24.6	23.9	23.7	24.1	24.9	25.9	27.0	28.1	29.2	30.3	31.4
BRAZIL	4.2	4.9	3.6	4.8	4.6	4.5	4.6	4.9	5.2	5.5	5.8	6.0	6.2
OPEC	15.1	14.7	17.0	15.2	15.1	15.6	16.3	17.1	17.8	18.6	19.5	20.3	21.3
NIC'S	4.0	4.4	3.9	3.9	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.9
TOTAL /2	88.4	89.6	72.0	86.3	83.9	86.5	88.2	89.9	91.7	94.1	96.4	98.9	101.4
PRODUCTION													
CANADA	26.6	21.2	23.9	30.1	30.4	28.4	27.4	27.7	28.7	29.4	29.8	30.0	30.4
AUSTRALIA	21.8	18.6	16.1	15.2	16.3	17.1	17.9	18.5	19.2	19.7	20.2	20.7	21.2
ARGENTINA	12.3	13.2	8.5	10.9	11.8	11.9	11.7	11.3	11.1	11.4	11.9	12.3	12.5
U.S.	65.9	70.6	66.0	63.9	65.0	66.8	69.5	72.3	74.2	75.2	75.9	76.7	77.8
SOVIET BLOC	114.4	114.3	120.5	134.9	141.7	145.9	149.0	151.7	154.2	156.6	159.1	161.5	164.0
DEVELOPED MARKETS	70.4	89.9	78.2	74.0	77.8	80.6	82.4	83.6	85.0	86.5	87.7	89.3	90.7
LDC'S	87.6	88.3	89.1	89.3	94.0	98.4	102.8	107.4	112.2	116.9	121.7	126.5	131.3
CHINA	81.4	87.7	85.3	73.9	74.8	76.3	78.2	80.1	82.0	84.3	86.7	89.3	92.1
MIDDLE INCOME'S	10.0	10.1	5.5	12.0	12.9	13.1	13.3	13.2	13.2	13.1	13.0	13.0	13.0
BRAZIL	2.1	1.9	4.3	2.9	3.3	3.5	3.6	3.5	3.3	3.2	3.1	3.0	3.0
OPEC	7.8	8.1	1.2	9.0	9.5	9.5	9.6	9.7	9.8	9.8	9.9	9.9	10.0
NIC'S	.1	.0	.1	.1	.1	.1	.1	.1	.1	.1	.0	.0	.0
WORLD TOTAL /3	490.4	513.8	493.1	504.1	524.8	538.7	552.2	565.9	579.7	593.1	606.1	619.4	633.0
DOMESTIC UTILIZATION													
CANADA	5.7	5.9	5.6	5.9	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9
AUSTRALIA	2.6	3.1	3.7	3.7	3.8	3.9	4.1	4.2	4.3	4.5	4.6	4.7	4.9
ARGENTINA	4.8	4.9	4.5	4.4	4.5	4.5	4.5	4.5	4.5	4.6	4.6	4.6	4.7
U.S.	30.2	32.3	27.8	29.6	30.5	31.1	31.7	32.4	33.2	33.9	34.6	35.2	35.8
SOVIET BLOC	136.1	138.5	139.0	157.7	163.1	167.6	171.2	174.6	177.7	180.8	183.9	187.0	190.2
DEVELOPED MARKETS	67.4	71.8	71.7	72.2	72.1	72.5	73.2	74.1	74.8	75.4	76.0	76.7	77.4
LDC'S	112.1	118.8	112.7	114.4	115.0	120.2	124.3	128.1	132.2	136.9	141.5	146.1	150.9
CHINA	91.0	95.2	92.7	87.9	90.1	92.8	95.5	98.2	100.8	103.8	106.9	110.3	114.0
MIDDLE INCOME'S	32.1	33.8	33.0	34.4	35.9	36.9	37.9	39.0	40.0	41.0	42.1	43.1	44.2
BRAZIL	6.4	6.5	8.1	7.7	7.8	8.0	8.2	8.4	8.6	8.8	8.9	9.1	9.3
OPEC	21.6	22.9	20.9	22.9	24.1	24.9	25.8	26.6	27.5	28.4	29.3	30.2	31.1
NIC'S	4.1	4.4	4.0	3.9	4.0	4.0	4.0	3.9	3.9	3.9	3.9	3.8	3.8
WORLD TOTAL /3	482.0	504.2	490.8	510.2	521.1	535.8	548.8	561.5	574.1	587.5	601.0	614.7	629.0
ENDING STOCKS													
CANADA	9.2	7.6	8.7	12.6	15.4	15.8	15.2	14.8	14.8	15.0	15.2	15.1	14.9
AUSTRALIA	7.4	8.5	5.4	3.1	3.4	3.7	3.9	4.0	4.2	4.4	4.5	4.6	4.7
ARGENTINA	.7	.7	.9	.9	.9	.9	.9	.9	.9	.9	.9	1.0	1.0
U.S.	38.1	38.8	48.9	45.8	43.7	42.5	43.2	45.5	48.3	50.9	53.0	54.7	56.1
SOVIET BLOC	2.5	2.8	5.5	.6	.3	.8	1.0	1.0	1.2	1.3	1.5	1.8	2.1
DEVELOPED MARKETS	13.2	20.7	19.8	13.4	12.8	13.5	14.0	14.1	14.2	14.4	14.6	14.8	14.9
LDC'S	22.3	25.3	25.5	25.8	27.4	29.3	31.3	33.4	35.5	37.6	39.7	41.7	43.8
CHINA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MIDDLE INCOME'S	5.1	5.3	2.4	3.8	4.5	4.9	5.1	5.3	5.4	5.6	5.7	6.0	6.2
BRAZIL	.4	.6	.4	.5	.5	.6	.6	.5	.4	.4	.3	.3	.3
OPEC	4.2	4.2	1.4	2.8	3.3	3.5	3.7	3.8	3.9	4.0	4.1	4.2	4.3
NIC'S	.5	.5	.5	.6	.7	.8	.9	1.0	1.1	1.2	1.3	1.5	1.6
WORLD TOTAL /3	98.5	109.8	110.1	104.9	108.5	111.4	114.7	119.0	124.5	130.1	135.1	139.7	143.7

/1 CROP YEAR BASIS. TYPICALLY JULY-JUNE. HOWEVER, AUSTRALIA & ARGENTINA USE DECEMBER-NOVEMBER.
/2 NET EXPORTS MAY NOT EQUAL NET IMPORTS DUE TO ROUNDING ERRORS. EXCLUDES INTRA-REGIONAL TRADE.
/3 CORRESPONDS TO USDA SERIES REPORTED IN THE WORLD GRAIN SITUATION OUTLOOK.

Given the high levels of support under the CAP, Developed Market production continues to expand at just over 2% per year. However, with import demand increasing only modestly, the EC must either expand its export market share or drown in its surplus. Although exports by the Developed Market increase by almost 7% per year, this is insufficient to prevent continued stock accumulation.

The market shares of Canada, Australia and Argentina remain fairly constant during the period. Decreases in per acre coarse grain revenue relative to wheat revenue encouraged a slight increase in the area planted to wheat in the first 4 years of the forecast. However, as wheat prices decline in the middle part of the forecast, there is a return to coarse grain area. Argentina increases soybean area at the expense of wheat in the early 1990's and at the end of the period. This prevents Argentine wheat production from increasing by more than an annual average of 1.5%.

As the residual exporter, the United States sees only a slight increase in the quantity of grain exported. The U.S. government absorbs the majority of the stock increase, by the end of the period almost all U.S. wheat ending stocks are under C.C.C. loan. However, despite substantial wheat acreage reduction in 1986 and further reductions in the last half of the forecast, trend yield growth boosts wheat production every year of the forecast. Even with record government stockpiling, wheat prices fall below the loan rate in the early 1990's and remain there through the end of

the forecast period.

6.2.2 Coarse Grains

The coarse grain picture looks equally bleak with real prices falling through the end of the decade (Table 6.8). Trade growth is somewhat more robust, increasing at approximately 4.2% per year. This is faster than the 1.5% annual growth of world coarse grain production. However, ending stock accumulation in the United States remains a increasing burden with over 8 billion bushels of corn under government loan program by the end of the forecast period.

Steady income growth among the middle income countries* (especially the NICs) and a continuation of the Soviet policy of upgrading diets led to increased imports of coarse grain. Although not approaching the levels of the late 1970's Soviet Bloc imports of coarse grain increased at an average annual rate of almost 7% per year. Two factors are responsible for this. First, there was a decline in the rate of growth in production as lands recently planted to coarse grain were returned to wheat production. Secondly, the wheat coarse-grain price ratio favors coarse grain imports; therefore, there is an incentive to reverse the recent trend and use import more coarse grain for animal feed.

In the NICs, low prices coarse grain prices and steady

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* The middle income countries are defined as Brazil, the LDOs and the NICs in the grain sector and the LDOs and NICs in the oilseeds sector.

TABLE 6.8 WORLD COARSE GRAIN BALANCE SHEET, IN MILLION METRIC TONS, CROP YEARS /1.

	ACTUAL		PRELIM	FORECAST									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE, $/MT	144.60	117.00	111.33	91.09	99.63	103.45	103.82	103.23	108.21	113.04	118.38	124.63	131.88
NET EXPORTS													
CANADA	5.9	3.2	4.3	5.0	5.1	5.1	5.2	5.2	5.3	5.4	5.5	5.6	5.7
AUSTRALIA	5.7	5.4	4.6	4.6	4.5	4.9	5.2	5.5	5.8	6.2	6.6	6.9	7.2
ARGENTINA	9.8	11.8	10.8	12.5	13.3	14.3	15.1	15.5	15.9	16.5	17.1	17.6	18.0
SUB-TOTAL	21.4	20.4	19.7	22.1	22.8	24.3	25.5	26.2	27.0	28.1	29.2	30.1	30.9
U.S.	55.0	57.5	59.2	63.0	66.8	67.7	69.2	72.0	75.2	78.3	81.6	85.4	89.7
WORLD TOTAL	76.4	77.9	79.0	85.2	89.6	92.0	94.7	98.2	102.2	106.4	110.7	115.5	120.6
NET IMPORTS													
SOVIET BLOC	12.7	26.6	25.3	26.5	27.8	29.2	30.8	32.6	34.5	36.5	38.6	40.8	43.1
DEVELOPED MARKETS	30.8	19.7	23.0	27.0	28.8	29.1	28.9	28.7	28.8	29.1	29.4	29.9	30.4
LDC'S	13.4	12.3	10.8	11.2	11.4	11.8	12.1	12.4	12.9	13.4	13.9	14.4	15.0
CHINA	.0	-3.5	-2.8	-2.0	-2.0	-2.0	-1.9	-1.8	-1.8	-1.8	-1.8	-1.9	-1.9
MID-INCOME'S	19.6	22.7	22.6	22.6	23.6	23.9	24.9	26.2	27.8	29.2	30.7	32.3	34.1
BRAZIL	.2	.9	.7	.6	.5	.0	-.1	.0	.3	.5	.6	.8	1.1
OPEC	10.1	12.5	10.7	10.0	10.4	10.5	10.8	11.2	11.6	11.9	12.2	12.6	13.0
NIC'S	9.3	9.3	11.2	11.9	12.6	13.4	14.2	15.1	15.9	16.9	17.8	18.9	19.9
WORLD TOTAL /2	76.4	77.9	79.0	85.2	89.6	92.0	94.7	98.2	102.2	106.4	110.7	115.5	120.6
PRODUCTION													
CANADA	20.2	21.3	24.7	25.2	24.7	24.9	25.1	25.1	25.2	25.6	26.0	26.4	26.8
AUSTRALIA	9.3	8.4	7.8	7.8	7.6	8.3	8.8	9.1	9.4	9.8	10.2	10.5	10.8
ARGENTINA	17.3	19.2	18.3	19.8	20.9	22.2	23.4	24.0	24.6	25.3	25.9	26.6	27.2
U.S.	136.4	236.3	274.3	256.4	261.9	264.7	271.1	275.0	279.6	286.4	292.9	299.3	305.6
SOVIET BLOC	158.7	158.9	162.8	163.4	163.1	165.2	168.0	171.1	174.3	177.4	180.6	183.8	187.0
DEVELOPED MARKETS	88.1	107.4	109.7	104.1	104.8	106.2	108.3	110.3	111.9	113.2	114.7	115.9	117.2
LDC'S	110.3	108.5	111.9	115.0	116.4	118.6	120.6	122.3	123.9	125.7	127.6	129.5	131.4
CHINA	92.6	95.4	84.4	80.7	80.0	80.3	80.9	81.6	82.2	83.1	84.2	85.4	86.7
MIDDLE INCOME'S	38.6	39.4	37.2	38.1	36.6	38.7	39.8	41.0	40.9	41.9	42.6	43.1	43.2
BRAZIL	21.5	20.5	20.2	21.5	20.4	22.4	23.4	24.6	24.5	25.3	25.9	26.3	26.2
OPEC	15.9	17.7	16.0	15.7	15.5	15.7	15.8	15.8	15.9	16.1	16.4	16.6	16.8
NIC'S	1.1	1.2	1.0	.8	.7	.6	.6	.5	.4	.4	.3	.2	.1
WORLD TOTAL /3	671.6	794.7	831.2	810.3	815.9	829.2	846.0	859.7	872.0	888.4	904.8	920.6	936.0
DOMESTIC UTILIZATION													
CANADA	18.6	18.0	18.8	19.7	19.8	19.9	20.0	20.1	20.1	20.3	20.5	20.7	21.0
AUSTRALIA	3.1	3.0	3.2	3.3	3.2	3.4	3.5	3.6	3.6	3.6	3.6	3.6	3.7
ARGENTINA	7.5	7.4	7.2	7.5	7.6	7.9	8.3	8.5	8.6	8.8	8.9	9.0	9.2
U.S.	147.3	164.8	165.4	174.7	182.7	188.6	193.5	197.7	200.6	203.6	207.0	210.4	213.7
SOVIET BLOC	172.3	184.0	186.6	190.1	191.0	194.4	198.7	203.7	208.6	213.8	219.1	224.5	229.9
DEVELOPED MARKETS	122.7	122.8	130.7	131.6	133.6	135.1	136.8	138.7	140.5	142.1	143.9	145.6	147.4
LDC'S	120.4	121.3	121.9	124.8	127.6	130.2	132.5	134.7	136.9	139.2	141.6	144.0	146.5
CHINA	92.6	91.9	81.6	78.6	77.9	78.3	79.0	79.8	80.3	81.2	82.3	83.5	84.8
MIDDLE INCOME'S	57.9	62.2	59.8	60.5	60.6	62.4	64.6	66.9	68.7	70.9	73.1	75.3	77.2
BRAZIL	21.4	21.2	21.2	22.1	21.3	22.1	23.2	24.4	24.9	25.7	26.4	27.1	27.4
OPEC	26.2	30.4	26.5	25.6	25.9	26.2	26.5	26.9	27.4	28.0	28.6	29.2	29.7
NIC'S	10.4	10.6	12.1	12.8	13.4	14.1	14.8	15.6	16.4	17.2	18.1	19.1	20.0
WORLD TOTAL /3	742.4	775.4	775.1	790.8	804.0	820.1	836.9	853.7	868.0	883.4	899.9	916.7	933.4
ENDING STOCKS													
CANADA	3.7	3.8	5.5	6.0	5.8	5.7	5.6	5.5	5.3	5.3	5.3	5.4	5.5
AUSTRALIA	.7	.6	.6	.6	.5	.5	.5	.6	.5	.6	.6	.6	.6
ARGENTINA	.6	.6	.9	.8	.8	.8	.8	.9	.9	.9	.9	.9	.9
U.S.	31.5	48.8	98.5	117.1	129.5	138.0	146.4	151.7	155.5	160.0	164.3	167.8	170.0
SOVIET BLOC	3.9	5.4	6.9	6.6	6.5	6.6	6.7	6.7	6.9	7.0	7.1	7.3	7.4
DEVELOPED MARKETS	9.3	13.6	15.6	15.1	15.1	15.3	15.6	16.0	16.3	16.5	16.7	16.9	17.2
LDC'S	9.8	9.3	10.2	11.6	11.8	12.0	12.1	12.2	12.1	12.0	11.9	11.8	11.7
CHINA	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
MIDDLE INCOME'S	3.1	3.0	3.0	3.1	2.7	2.9	3.0	3.1	3.3	3.5	3.7	3.8	3.8
BRAZIL	.6	.8	.4	.5	.1	.4	.5	.7	.6	.7	.9	.9	.8
OPEC	1.2	1.1	1.3	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.8	1.8
NIC'S	1.3	1.2	1.2	1.2	1.1	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1
WORLD TOTAL /3	62.6	85.2	141.2	160.8	172.6	181.7	190.8	196.8	200.8	205.7	210.6	214.5	217.1

/1 CROP YEAR BASIS. TYPICALLY OCTOBER-SEPTEMBER. HOWEVER, AUSTRALIA & ARGENTINA USE DECEMBER-NOVEMBER.
/2 NET EXPORTS MAY NOT EQUAL NET IMPORTS DUE TO ROUNDING ERRORS. EXCLUDES INTRA-REGIONAL TRADE.
/3 CORRESPONDS TO USDA SERIES REPORTED IN THE WORLD GRAIN SITUATION OUTLOOK.
/4 INCLUDES BRAZIL.

income growth encourage increased feeding of coarse grain. Coarse grain imports average approximately 5% per year. Import growth increase rapidly until the 1990 and then as prices begin to rise, increase at a decreasing rate.

Brazilian producers, faced with higher revenue from soybeans relative to wheat or coarse grains, increase soybean area at the expense of wheat and coarse grains. Lower per capita supplies of both commodities as well as low coarse grain prices encourage imports of coarse grain. However, import growth will continue to be limited by foreign exchange constraints and continued debt burdens. Therefore, the increase in imports by Brazil doesn't represent an increase in per capita consumption levels as much as a maintenance of current standards given the decrease in grain production.

Abundant supplies of grain in the LDCs and the Developed Markets depress import demand by both regions. Low soymeal prices and abundant wheat supplies encourages the over feeding of protein to livestock in the EC. While there is still some growth in import demand for coarse grains, primarily by Japan, the quantity imported grows approximately 3% per year.

The increase in LDC land area translated into an increase in coarse grain cultivation. Production increases an average of 1.7% per year or 19.5 million tons for the forecast period. This increase, coupled with foreign exchange constraints, encourage consumption of domestic

grain. Therefore, there is a increase of less than 4% per year in import demand. Consumption is maintained through increased production and by some drawdown of coarse grain ending stocks.

Coarse grain production by competing exporters remains fairly constant. Canadian agriculture suffers a retrenchment similar to that experienced by the U.S. There is a decline in the total cropland base until the beginning of the 1990's. Most of this decline manifests itself in an average annual decline in coarse grain area of just under 1%. Although the decline in area is more than offset by yield increases, the increase in production is matched by an increase in domestic livestock feeding. Therefore, there is very little extra for movement into export channels at low world prices.

Australian and Argentine coarse grain production increase annually by approximately 3.8% and 5% respectively. As in the case of Canada, low coarse grain and soymeal prices encourage increased domestic feeding of coarse grain. Although Australian and Argentine exports increase, the total growth in exports between 1986 and 1995 is less than 1.6 million metric tons for AUstralia and 5.5 million metric tons for Argentina.

In the case of the U.S., the increase in world import demand is somewhat offset by increased Argentine exports. Although coarse grain exports by the U.S. increase by almost 5% per year, the U.S. share of the world coarse grain market

remains approximately 74% for the entire forecast period.

However, while the rate of growth in U.S. exports exceeds the rate of growth in production, the growth in quantity of production (49.2 MMT) exceeds the growth in quantity exported (26.7 MMT). Therefore despite a decline in coarse grain area, U.S. ending stocks continue to increase and despite increased grain under government loan. corn prices fall. Like wheat prices, corn prices increase more slowly than the loan in the last half of the forecast period. Although they never fall below the loan rate, they are sitting on the loan by the end of the period.

6.2.3 Soybean Complex

Substantial carryover from the bumper soybean crop of 1985 keeps soybean stocks high despite a reduction in production in 1986 and exerts downward pressure on both soybean and soymeal prices. Low coarse grain prices stimulates import demand, this draws stocks down and increases prices though the end of the decade. However, in the last half of the forecast period continued reduction in wheat and coarse grain prices relative to soybean price encourages expansion of soybean area in all exporting regions. As Brazil and Argentina increase their share of the soybean complex export market, ending stocks of soybeans in the U.S. accumulate to record levels. This depresses soymeal prices to a period low of $145.35 per metric ton in 1993 before staging a slight recovery (Table 6.9-6.11).

As a result of low prices, import demand for soymeal

TABLE 6.9 WORLD SOYBEAN BALANCE SHEET. IN MILLION METRIC TONS. /1.

	ACTUAL		PRELIM	FORECAST									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE ($/MT.)	299.00	227.00	205.76	174.77	189.95	210.37	236.28	252.80	244.09	239.44	239.42	252.45	274.71
NET EXPORTS													
U.S.	20.1	16.3	19.0	18.2	18.9	19.2	19.4	19.0	18.4	18.1	18.2	17.9	17.3
ARGENTINA /2	3.1	3.0	4.1	4.2	4.5	4.1	4.1	4.5	5.3	6.3	6.8	7.7	8.9
BRAZIL /2	1.6	3.4	.8	2.7	2.0	2.4	2.5	2.7	2.8	2.7	2.5	2.2	2.0
CHINA	.7	1.0	.6	.3	.4	.5	.5	.5	.6	.6	.6	.7	.7
TOTAL EXPORTS	25.6	23.6	24.5	25.3	25.8	26.1	26.4	26.7	27.2	27.7	28.1	28.6	28.9
NET IMPORTS													
DEVELOPED MARKETS	18.2	18.0	17.0	17.5	17.7	17.9	18.0	18.2	18.4	18.6	18.8	19.0	19.2
LDC'S	2.3	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.1
MID-INCOME'S /3	3.1	2.6	2.5	2.6	2.6	2.5	2.4	2.3	2.2	2.1	2.0	1.9	1.7
SOVIET BLOC	1.8	1.4	3.7	3.8	4.1	4.3	4.6	4.9	5.3	5.7	6.0	6.4	6.8
TOTAL IMPORTS	25.3	23.4	24.4	25.2	25.7	26.0	26.3	26.6	27.1	27.6	28.0	28.5	28.8
PRODUCTION													
U.S.	44.5	50.6	57.1	52.6	51.5	50.4	50.4	52.0	54.5	56.0	57.1	54.7	53.4
ARGENTINA	6.8	6.5	7.3	7.4	8.1	8.4	9.3	9.3	10.3	11.2	11.9	12.9	13.9
BRAZIL	15.2	17.2	13.4	16.9	17.9	19.4	21.2	23.1	24.9	26.1	26.9	27.4	27.8
DEVELOPED MARKETS	.4	.4	.4	.4	.4	.4	.4	.4	.4	.5	.5	.5	.5
LDC'S	2.7	3.1	3.3	3.5	3.7	3.9	4.1	4.3	4.5	4.6	4.8	5.0	5.2
MID-INCOME'S	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.2
SOVIET BLOC	1.2	1.3	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.7	1.7	1.8
CHINA	9.8	9.7	10.5	9.7	10.0	10.2	10.3	10.4	10.5	10.5	10.5	10.4	10.2
WORLD TOTAL	81.6	89.9	94.5	93.0	94.2	95.3	98.3	102.3	107.9	111.8	114.6	113.9	114.1
ENDING STOCKS													
U.S.	4.8	8.7	11.2	11.7	9.7	7.0	4.8	4.1	5.9	8.7	11.5	11.2	8.7
ARGENTINA	.1	.2	.3	.3	.3	.4	.4	.4	.4	.5	.5	.6	.6
BRAZIL	.6	.7	1.6	.9	1.4	1.2	1.3	1.3	1.4	1.4	1.4	1.3	1.3
DEVELOPED MARKETS	1.4	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2
LDC'S	.4	.4	.5	.5	.5	.5	.5	.5	.6	.6	.6	.6	.6
MID-INCOME'S	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.2	.2	.2
WORLD TOTAL	7.5	11.4	14.9	14.8	13.4	10.6	8.4	7.7	9.6	12.6	15.4	15.0	12.6

/1 DATA IS REPORTED ON A OCT-SEP CROP YEAR AS REPORTED IN THE USDA FAC - WORLD OILSEEDS. EXCLUDES INTRA-REGIONAL TRADE.

/2 ARGENTINA AND BRAZIL DATA HAVE BEEN CONVERTED TO AN OCT-SEP BASIS

/3 INCLUDES OPEC, NIC'S.

TABLE 6 10 WORLD SOYMEAL BALANCE SHEET. IN MILLION METRIC TONS. /1.

	ACTUAL		PRELIM	FORECAST									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE ($/	208.00	139.00	159.11	114.83	128.01	147.64	172.79	185.89	165.50	150.15	145.35	154.44	175.25
NET EXPORTS													
U.S.	4.9	4.5	8.2	6.5	6.4	5.1	4.0	3.8	3.4	3.3	3.4	3.7	4.4
ARGENTINA /2	2.5	2.9	1.8	1.8	2.1	2.6	3.2	2.9	2.9	2.8	2.9	2.8	2.6
BRAZIL /2	7.7	8.4	5.8	8.3	8.6	9.9	10.9	12.2	13.4	14.4	15.1	15.7	16.2
CHINA	.6	.6	.7	.7	.8	.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6
TOTAL EXPORTS	15.7	16.4	16.5	17.3	17.9	18.6	19.3	20.0	20.9	21.8	22.8	23.8	24.8
NET IMPORTS													
DEVELOPED MARKETS	7.9	8.5	7.5	7.8	8.0	8.1	8.2	8.4	8.6	8.8	9.0	9.2	9.3
LDC'S	1.2	1.2	1.2	1.3	1.5	1.6	1.7	1.8	1.9	2.1	2.2	2.3	2.5
MID-INCOME'S /3	2.2	2.5	2.3	2.6	2.9	3.1	3.4	3.7	4.1	4.6	5.0	5.5	5.9
SOVIET BLOC	4.3	4.0	5.1	5.3	5.4	5.5	5.7	5.9	6.0	6.2	6.4	6.6	6.8
TOTAL IMPORTS	15.6	16.2	16.2	17.0	17.7	18.3	19.0	19.8	20.6	21.6	22.6	23.6	24.5
CONSUMPTION /4													
U.S.	18.3	19.7	19.9	20.1	20.7	21.5	22.1	22.7	23.4	24.1	24.8	25.4	26.0
ARGENTINA	.6	.4	.6	.7	.8	.8	.9	.9	1.0	1.0	1.1	1.2	1.3
BRAZIL	2.9	3.1	3.4	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.3	4.4
DEVELOPED MARKETS	22.4	20.7	21.3	22.0	22.4	22.7	22.9	23.1	23.5	23.9	24.3	24.7	25.0
LDC'S	4.8	4.8	4.8	5.1	5.3	5.6	5.9	6.1	6.4	6.7	6.9	7.2	7.5
MID-INCOME'S	5.1	4.9	5.2	5.6	5.8	6.0	6.3	6.5	6.9	7.2	7.6	7.9	8.3
SOVIET BLOC	6.7	6.2	9.1	9.4	9.8	10.2	10.6	11.0	11.5	12.0	12.5	13.1	13.6
CHINA	6.6	6.9	7.2	6.7	6.8	6.8	6.8	6.7	6.7	6.6	6.4	6.2	5.9
WORLD TOTAL	67.4	66.5	71.5	73.1	75.2	77.3	79.2	81.2	83.4	85.7	87.9	90.0	91.9
ENDING STOCKS													
U.S.	.2	.4	.3	.3	.3	.3	.2	.2	.3	.3	.4	.4	.3
ARGENTINA	.2	.1	.2	.1	.2	.2	.2	.2	.2	.3	.3	.4	.4
BRAZIL	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3	.3
DEVELOPED MARKETS	.7	.5	.5	.6	.6	.6	.6	.6	.6	.6	.6	.7	.7
LDC'S	.4	.2	.3	.3	.3	.3	.4	.4	.4	.4	.4	.5	.5
MID-INCOME'S	.2	.2	.2	.2	.2	.2	.2	.2	.2	.1	.1	.1	.1
WORLD TOTAL	1.9	1.6	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.1	2.2	2.3	2.4

/1 DATA IS REPORTED ON A OCT-SEP CROP YEAR AS REPORTED IN THE USDA FAC - WORLD OILSEEDS. EXCLUDES INTRA-REGIONAL TRADE.

/2 ARGENTINA AND BRAZIL DATA HAVE BEEN CONVERTED TO AN OCT-SEP BASIS

/3 INCLUDES OPEC, NIC'S.

/4 SOYMEAL EQUIVALENT CONSUMPTION INCLUDES SOYMEAL AND EQUIVALENT SOYBEAN.

TABLE 6.11 WORLD SOYOIL BALANCE SHEET. IN MILLION METRIC TONS. /1.

	ACTUAL		PRELIM	FORECAST									
	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE ($/	673.00	650.00	440.94	461.21	486.45	512.57	544.74	577.39	615.90	654.92	674.68	705.52	736.43
NET EXPORTS													
U.S.	.8	.7	1.8	1.8	1.8	1.7	1.5	1.5	1.5	1.5	1.5	1.6	1.8
ARGENTINA /2	.5	.5	.4	.3	.4	.5	.7	.6	.6	.6	.6	.6	.5
BRAZIL /2	.8	.8	.4	.9	.9	1.2	1.4	1.6	1.8	2.0	2.2	2.3	2.4
CHINA	.0	-.2	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5	-.5
TOTAL EXPORTS	2.1	1.8	2.1	2.5	2.6	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2
NET IMPORTS													
DEVELOPED MARKETS	-.9	-.7	-.5	-.5	-.5	-.4	-.4	-.4	-.3	-.3	-.2	-.2	-.2
LDC'S	2.0	1.7	1.9	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.2
MID-INCOME'S /3	.6	.5	.6	.6	.7	.8	.8	.9	1.0	1.0	1.1	1.2	1.3
SOVIET BLOC	.3	.5	.2	.2	.2	.2	.2	.2	.1	.1	.1	.0	.0
TOTAL IMPORTS	2.0	1.6	2.2	2.6	2.7	2.9	3.1	3.3	3.5	3.7	3.9	4.1	4.3
CONSUMPTION /4													
U.S.	4.5	4.6	4.6	4.6	4.7	4.7	4.6	4.7	4.8	5.0	5.2	5.3	5.3
ARGENTINA	.2	.1	.2	.2	.2	.2	.3	.3	.3	.3	.3	.3	.4
BRAZIL	1.5	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.1
DEVELOPED MARKETS	2.4	2.6	2.6	2.7	2.7	2.9	2.9	2.9	3.0	3.1	3.2	3.2	3.3
LDC'S	2.7	2.5	2.6	3.0	3.1	3.3	3.4	3.5	3.7	3.8	3.9	4.1	4.3
MID-INCOME'S	1.3	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.6	1.6	1.7	1.7	1.8
SOVIET BLOC	1.8	1.0	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.5	1.5
CHINA	1.6	1.7	1.8	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.7	1.7	1.7
WORLD TOTAL	15.0	15.2	15.8	16.4	16.8	17.2	17.5	17.9	18.4	19.0	19.5	20.0	20.3
ENDING STOCKS													
U.S.	.3	.4	.5	.5	.5	.5	.4	.4	.5	.5	.6	.6	.6
ARGENTINA	.0	.1	.0	.0	.0	.1	.1	.1	.1	.1	.1	.1	.1
BRAZIL	.1	.1	.1	.2	.2	.2	.2	.2	.2	.3	.3	.3	.3
DEVELOPED MARKETS	.2	.1	.0	.0	.1	.1	.1	.2	.2	.2	.2	.2	.2
LDC'S	.4	.4	.4	.4	.4	.4	.4	.4	.5	.5	.5	.5	.5
MID-INCOME'S	.0	.0	.1	.0	.1	.1	.1	.1	.1	.1	.1	.1	.1
WORLD TOTAL	1.1	1.1	1.1	1.1	1.1	1.4	1.3	1.4	1.6	1.7	1.8	1.8	1.8

/1 DATA IS REPORTED ON A OCT-SEP CROP YEAR AS REPORTED IN THE USDA FAC - WORLD OILSEEDS. EXCLUDES INTRA-REGIONAL TRADE.

/2 ARGENTINA AND BRAZIL DATA HAVE BEEN CONVERTED TO AN OCT-SEP BASIS

/3 INCLUDES OPEC, NIC'S.

/4 SOYOIL EQUIVALENT CONSUMPTION INCLUDES SOYOIL AND EQUIVALENT SOYBEAN.

equivalent increases approximately 3% per year. However, steady demand in the soyoil sector keeps soybean prices somewhat higher than those for the individual components. This results in a worsening crush margin and imports of soymeal at the expense of soybeans. Lead by growth in Soviet Bloc and Developed Market demand, soybean imports increase at an annual rate of 2%.

Although the Soviet Bloc and the Developed Markets increase imports of soymeal slightly, the majority of growth in soymeal imports is driven by the LDCs and NICs. The increase in soymeal demand favors Argentina and Brazil. Both regions have expanded crush capacity and the increase in domestic supply allows them to aggressively market soymeal. The U.S. share of the soymeal export market declines from 38% in 1986 to just under 18% by 1995.

6.3 Scenario Analysis: The Effects of P.I.K. Certificates on International Grain Markets

As grain ending stocks held by the U.S. government increase, their disposal becomes a major problem. Unlike the 1950's, the U.S. can longer dispose of surpluses with export enhancements. The potential export markets no longer exist and there are now more competitors.

One scheme for the disposal of surplus grain is the issuance of Payment-in-Kind (PIK) certificates as payment for participation in government programs. PIK certificates are essentially promissory notes offering producers grain from government stocks in lieu of cash. The PIK program was

initially established in 1983 when producers were offered corn PIK certificates in exchange for participating in acreage reduction programs.

Under the provisions of the 1985 farm bill, PIK certificates will be issued as part of the program payments made to participating farmers. These certificates will be similar to those issued in 1983 with three differences. First, the life of the certificate will be shorter, generally requiring redemption with a year and secondly, the certificate will be denominated in dollar value as opposed to bushel values. Third, the certificates will be generic, good for any CCC owned commodity other than peanuts or tobacco.

The certificates will have value in trade and can be bought and sold like grain. This has serious implications for the grain marketing system. If government stocks of grain are "off" the market until the trigger price is realized but certificates good for off-the-market grain are freely traded, is the grain on or off the market? The answer is that while the grain is physically off-the-market until the certificate is redeemed, the market anticipates its release by trading certificates.

The MSU Agriculture model will attempt to explore the impacts of the issuance PIK certificates on the grain markets. This scenario will measure the changes caused by a single issuance of 500 million bushels of corn PIK certificates redeemed after one year.

This scenario will represent a simplification of the problem. In reality the certificates would be for $500 million and would be converted to bushels at the market rate. Although the model could have been programed to convert a dollar amount to bushel equivalent, to save iterative steps a bushel equivalent value was pre-entered. In this simple representation the certificates can be redeemed for either wheat or coarse grain. For illustrative purposes it is assumed that half of the certificates will be redeemed for wheat and the other half for coarse grains.

6.4 Effects of a One Year Release of PIK Certificates

The overall effects of a one time release in PIK certificates redeemed at the end of a year is minimal. Although the release of CCC grain into "free stocks" generates some production and consumption shifts, the existing quantities of freestocks tend to cushion the price decline. Although there is a 7% decline in wheat prices in 1987, tne percentage declines in coarse grain and soybean prices are considerably less and by 1991 all prices deviate from the baseline by less than 1%.

There is some noticeable substitution between coarse grain and wheat consumption. However, these deviations pretty well work themselves out of the system by the third year of the forecast.

6.4.1 Coarse Grains

Given the levels of corn ending stocks in 1986, the release of the equivalent of 250 million bushels corn from CCC stocks has very little effect on the grain markets (Table 6.12). Corn prices in 1987 decrease $3.10 per metric ton ($.08/bu) from the baseline level. The price decline is limited by an increase of approximately 180 million bushels in farmer owned reserves.

Although there is a substitution of relatively cheaper wheat for coarse grains for feed consumption in both the Soviet Bloc and in China, the decrease in U.S. exports and subsequent increase in total U.S. ending stocks are insufficient to produce any downward pressure on corn prices.. The Soviet Bloc decreases imports by 200,000 metric tons and China increases exports by the same amount.

In the year following the redemption of the certificates, coarse grain prices remain $1.10 a ton ($.03/bu) below baseline levels. The decline in wheat revenue per hectare relative to coarse grain has encouraged a shift into coarse grain area by almost all major exporters and despite increased world-wide consumption the U.S. continues to loses market share when compared to the baseline. As a result of increased ending stocks, the burden of price adjustment falls to the government. Although CCC stocks remain over 160 million bushels below baseline levels, there are 180 million bushels more in FOR.

In 1989 low coarse grain revenue per hectare relative

Table 6.12

Effects of 500 Million Bushel PIK Certificates on Coarse Grains - Deviations From the Baseline (1000 MT)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
WORLD PRICE ($/MT)	0.0	-3.10	-1.10	.02	-0.61	-0.6	-0.59	-0.52	-0.45	-0.34
% Change	0.00	-3.11	-1.06	-0.02	-0.60	-0.56	-0.52	-0.44	-0.36	-0.26
NET EXPORTS										
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	2.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.70	0.00	0.68	0.63	0.00	0.00	0.00	0.00
U.S.	0.0	-0.4	-0.2	0.0	-0.1	0.0	-0.1	0.0	0.1	0.0
% Change	0.00	-0.60	-0.30	0.00	-0.14	0.00	-0.13	0.00	0.12	0.00
NET IMPORTS										
Soviet Bloc	0.0	-0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	-0.72	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LDCs	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	-0.1	0.0	0.0
% Change	0.00	0.00	-0.85	-0.83	0.00	0.00	-0.75	-0.72	0.00	0.00
China	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Middle Income*	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.0
% Change	0.00	0.00	0.42	0.40	0.00	0.00	0.34	0.33	0.31	0.00
PRODUCTION										
Canada	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	0.0	0.0	0.2	-0.1	0.1	0.0	0.0	0.0	0.0	0.1
% Change	0.00	0.00	2.41	-1.14	1.10	0.00	0.00	0.00	0.00	0.93
Argentina	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.1	0.0	0.1
% Change	0.00	0.00	0.90	0.00	0.42	0.00	0.00	0.39	0.00	0.37
U.S.	0.0	0.0	0.5	-0.5	0.3	0.1	0.0	0.1	0.0	0.1
% Change	0.00	0.00	0.19	-0.18	0.11	0.04	0.00	0.03	0.00	0.03
Soviet Bloc	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	-0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LDCs	0.0	0.0	0.2	-0.1	0.0	0.1	0.1	0.0	0.0	0.0
% Change	0.00	0.00	0.17	-0.08	0.00	0.08	0.08	0.00	0.00	0.00
China	0.0	0.1	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.12	0.25	0.00	0.12	0.00	0.00	0.00	0.00	0.00
Middle Income*	0.0	0.0	0.2	-0.2	0.1	0.0	-0.1	-0.1	-0.1	-0.1
% Change	0.00	0.00	0.52	-0.50	0.24	0.00	-0.24	-0.23	-0.23	-0.23
CONSUMPTION										
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U.S.	0.0	0.0	0.3	0.2	0.0	0.0	0.1	0.1	0.1	0.1
% Change	0.00	0.00	0.16	0.10	0.00	0.00	0.08	0.05	0.05	0.05
Soviet Bloc	0.0	-0.2	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0
% Change	0.00	-0.10	0.00	0.00	-0.06	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LDCs	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	-0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
China	0.0	-0.1	0.2	0.0	0.1	0.1	0.1	0.0	0.0	0.0
% Change	0.00	-0.13	0.26	0.00	0.13	0.12	0.12	0.00	0.00	0.00
Middle Income*	0.0	0.0	0.2	0.0	0.1	0.1	0.0	0.0	-0.1	0.0
% Change	0.00	0.00	0.32	0.00	0.15	0.15	0.00	0.00	-0.13	0.00
ENDING STOCKS (Exporters)										
Canada	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	1.89	0.00	0.00	0.00	0.00
Australia	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00
U.S.	0.0	0.3	0.6	-0.1	0.2	0.2	0.3	0.3	0.2	0.1
% Change	0.00	0.23	0.43	-0.07	0.13	0.13	0.19	0.18	0.12	0.06

* Includes Newly Industrialized Countries, Oil Exporters and Brazil.

to both wheat and soybeans encourage a shift out of coarse grain area. This reduces U.S. ending stocks below baseline levels. Coupled with levels of domestic consumption above baseline levels, coarse grain prices approach baseline levels.

For the remainder of the forecast period, prices remain slightly below baseline levels as lower wheat and soybean revenues encourage a slight shift into coarse grain area in 1990. However, the price declines inherent in a stock buildup are dampened by continued the growth of government stocks. By the end of the period, coarse grain prices are only $.34 per metric ton below baseline levels.

6.4.2 Wheat

As a result of lower absolute ending stocks, the effects of a release of 250 million bushels of CCC wheat onto the open market are greater than those occurring in the coarse grain market. Despite an increase in wheat placed into FOR relative to the baseline, wheat export prices in 1987 are $7.67 per metric ton ($.21/bu) below baseline levels (Table 6.13).

Lower wheat prices stimulate some increases in demand for wheat for feed, primarily in the Soviet Bloc and the E.C.; however the increase in demand is filled primarily through stock reductions within those regions. There is a very slight increase in U.S. and Canadian exports but the reduction in stocks is too small to significantly alter the market's perception of the looseness of the market.

Table 6.13

Effects of 500 Million Bushel PIK Certificates on Wheat Deviations From the Baseline - (1000 MT)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
WORLD PRICE ($/MT)	0.0	-7.67	-0.10	-1.05	1.02	-0.31	-1.13	-0.95	-0.86	0.20
	0.00	-6.88	-0.09	-0.92	1.00	-1.14	-0.96	-0.96	-0.68	0.15
NET EXPORTS										
Canada	0.0	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.47	0.92	0.00	0.46	0.48	0.00	0.00	0.00	0.00
Australia	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	-0.77	0.00	-0.70	-0.64	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	-0.1	0.0	0.0
% Change	0.00	0.00	-1.35	0.00	1.47	1.54	0.00	-1.37	0.00	0.00
Developed Mkts	0.0	-0.1	0.0	-0.1	0.0	0.0	-0.1	0.0	-0.1	0.0
% Change	0.00	-1.56	0.00	-1.15	0.00	0.00	-0.92	0.00	-0.81	0.00
U.S.	0.0	0.1	0.3	0.0	0.1	0.0	0.1	0.1	0.1	0.1
% Change	0.00	0.27	0.81	0.00	0.27	0.00	0.26	0.26	0.25	0.25
NET IMPORTS										
Soviet Bloc	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	-0.45	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LDCs	0.0	0.0	0.0	-0.2	0.0	-0.1	-0.1	0.0	0.6	0.0
% Change	0.00	0.00	0.00	-0.85	0.00	-0.45	-0.45	0.00	2.84	0.00
China	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
% Change	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.49	0.00	0.00
Middle Income*	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
% Change	0.00	0.00	0.41	0.00	0.39	0.37	0.36	0.34	0.33	0.32
PRODUCTION										
Canada	0.0	0.0	0.2	0.2	0.1	0.0	0.0	0.1	0.1	0.1
% Change	0.00	0.00	0.70	0.73	0.36	0.00	0.00	0.34	0.33	0.33
Australia	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	-0.1
% Change	0.00	0.00	0.00	0.00	0.00	-0.52	0.00	0.00	0.00	-0.47
Argentina	0.0	0.0	-0.1	0.0	0.1	0.1	0.0	-0.1	-0.1	-0.1
% Change	0.00	0.00	-0.84	0.00	0.88	0.90	0.00	-0.84	-0.81	-0.80
U.S.	0.0	0.0	-0.1	0.4	0.3	0.2	0.1	0.1	0.1	0.1
% Change	0.00	0.00	-0.15	0.56	0.41	0.27	0.13	0.13	0.13	0.13
Soviet Bloc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0
% Change	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.11	0.00	0.00
LDCs	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
% Change	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.08
China	0.0	0.0	-0.5	-0.2	-0.2	-0.1	-0.2	-0.1	-0.1	-0.1
% Change	0.00	0.00	-0.64	-0.26	-0.25	-0.12	-0.24	-0.12	-0.11	-0.11
Middle Income*	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	-0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CONSUMPTION										
Canada	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Australia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U.S.	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1
% Change	0.00	0.33	0.32	0.32	0.31	0.00	0.29	0.29	0.28	0.28
Soviet Bloc	0.0	0.4	-0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.25	-0.18	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
% Change	0.00	0.28	0.00	0.00	0.00	0.00	0.13	0.13	0.00	0.00
LDCs	0.0	-0.2	0.2	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
% Change	0.00	-0.17	0.17	-0.08	0.08	0.00	0.00	0.00	0.00	0.00
China	0.0	0.1	-0.5	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
% Change	0.00	0.11	-0.54	-0.10	-0.10	-0.10	-0.10	-0.09	-0.09	-0.09
Middle Income*	0.0	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0	0.0
% Change	0.00	0.28	0.00	0.26	0.00	0.25	0.24	0.00	0.00	0.00
ENDING STOCKS (Exporters)										
Canada	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.66	0.00	0.66	0.00	0.00	0.00	0.00
Australia	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	-2.27	0.00	0.00	0.00
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
U.S.	0.0	-0.3	-0.6	-0.3	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2
% Change	0.00	-0.69	-1.88	-0.69	-0.44	-0.21	-0.20	-0.38	-0.37	-0.36
Developed Mkts	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
% Change	0.00	-0.78	-0.74	0.00	0.00	0.00	0.00	-0.68	0.00	0.00

* Includes Newly Industrialized Countries, Less Developed Oil Exporters and Brazil

Production decisions for 1988 are based upon prices received in 1987. Since revenue expectations for wheat have fallen relative to coarse grain in the scenario there is shift out of wheat area and into coarse grain in most regions.

Lower production in most exporting countries results in a 300,000 metric ton increase in wheat imports over baseline levels in 1988. Coupled with reduced wheat exports from both Australia and Argentina, respective Canadian and U.S. exports of wheat are 200,000 and 300,000 metric tons higher than those in the baseline. Therefore, even though CCC wheat stocks in the U.S. remain 190 million bushels below the baseline level, the exporter stock to utilization ratio is 19.5% below the baseline level. Wheat prices per metric ton in 1988 increase to $.10 below baseline levels.

In 1989 the situation is reversed as higher expected returns per acre for wheat relative to coarse grains results in increased wheat production and decreased coarse grain production when compared to the baseline. Again, wheat prices fall and coarse grain prices increase. The lower levels of U.S. wheat stocks relative to exporter consumption tends to increase the size of the wheat price deviations relative to those for coarse grain.

For the remainder of the forecast period wheat prices remain below baseline levels, gradually increasing until 1995 when they are $.20 per metric ton above the baseline.

6.4.3 Soybean Complex

The soybean complex, although not directly affected by the issuance of generic certificates is affected by both increases in production as revenue expectations change and as changes in wheat and coarse grain feeding change the quantities of soymeal required in an animal ration.

The initial impacts of the decline in wheat and coarse grain prices are very slight. In 1987 there is almost no change in the soymeal consumed and very little change in either soybean or soymeal prices (Table 6.14).

However, low coarse grain prices of encourage an expansion of soybean area in both China and the United States. Soybean production increases by 300,000 metric tons above baseline projections in the U.S., almost all of the increase manifests itself higher stock levels and reduced prices relative to the baseline.

Soybean complex prices reach their maximum deviations in 1989 and subsequently return to baseline levels as the U.S., Argentina and Brazil shift land into coarse grain toward the middle of the forecast period. U.S. soybean equivalent ending stocks decline to levels below those in the baseline for the remainder of the forecast period which results in slight upward deviation in prices for the last four year of the forecast.

6.5 Scenario Conclusions

The release of use PIK certificates for one year had only marginal long term effects on the grain market. The

Table 6.14

Effects of 500 Million Bushel PIK Certificates on Soybean Equivalent - Deviations From the Baseline (1000 MT)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
U.S. EXPORT PRICE										
SOYBEAN ($/MT)	0	-1.34	-2.09	-4.07	-3.66	-0.33	0.17	0.11	0.21	0.45
% Change	0.00	-0.71	-0.99	-1.72	-1.53	-0.14	0.07	0.05	0.08	0.16
SOYMEAL ($/MT)	0	-1.73	-2.66	-5.18	-4.93	-0.42	0.22	0.13	0.27	0.58
% Change	0.00	-1.35	-1.80	-3.00	-2.65	-0.25	0.15	0.09	0.17	0.33
NET EXPORTS										
U.S.	0.0	0.1	-0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.0
% Change	0.00	0.38	-0.38	0.41	0.42	0.43	0.45	0.00	0.43	0.00
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.1	-0.6
% Change	0.00	0.00	0.00	0.00	0.00	0.00	-1.02	0.00	0.92	-4.96
Brazil	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	0.0	0.0	-0.1
% Change	0.00	0.00	0.00	-0.66	0.00	-0.56	-0.53	0.00	0.00	-0.49
China	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	8.94	0.00	0.00	0.00	0.00	0.00
NET IMPORTS										
Developed Mkts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LDCs	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	0.0	0.0
% Change	0.0	0.0	0.0	0.0	0.0	1.8	3.4	0.0	0.0	0.0
Middle Income*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soviet Bloc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PRODUCTION										
U.S.	0	0	0.3	0.2	0.1	-0.1	0	0	0.1	0.1
% Change	0.00	0.00	0.60	0.40	0.19	-0.18	0.00	0.00	0.18	0.19
Argentina	0	0	0	0	0	-0.1	0	0	0	0
% Change	0.00	0.00	0.00	0.00	0.00	-0.97	0.00	0.00	0.00	0.00
Brazil	0	0	0	0	-0.1	-0.2	-0.1	-0.1	-0.1	0
% Change	0.00	0.00	0.00	0.00	-0.43	-0.80	-0.38	-0.37	-0.36	0.00
Developed Mkts	0	0	0	0	0	0	0	0	0	0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LDCs	0	0	0	0	0	0	0	0	0	0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Middle Income*	0	0	0	0	0	0	0	0	0	0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Soviet Bloc	0	0	0	0	0	0	0	0	0	0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
China	0	0	0.2	0.1	0.1	0.1	0.1	0	0	0.1
% Change	0.00	0.00	1.96	0.97	0.96	0.98	0.95	0.00	0.00	0.96
CONSUMPTION										
U.S.	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.37	0.36	0.35	0.00	0.00	0.00	0.00
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brazil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Developed Mkts	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
LDCs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Middle Income*	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	-2.35	0.00	0.00	0.00	0.00
Soviet Bloc	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
China	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1
% Change	0.00	0.00	1.16	0.00	1.18	0.00	0.00	0.00	0.00	1.32
ENDING STOCKS (Exporters)										
U.S.	0.0	0.0	0.3	0.4	0.2	0.0	-0.1	-0.1	-0.2	-0.1
% Change	0.00	0.00	3.83	7.44	4.24	0.00	-1.05	-0.80	-1.64	-1.04
Argentina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brazil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
% Change	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

* Includes Newly Industrialized Countries and Less Developed Oil Exporters

anticipation of the release from government stocks exerted downward pressure on prices in the grain and oilseed markets. However, lower prices reduces grain supplies in the following year and caused some minor fluctuation in grain price relative to the baseline forecast through the middle part of the forecast.

Lower grain prices relative to the baseline during this period resulted in a slight production shift into oilseeds increasing downward pressure on soybean and soymeal prices. Thereafter, the fluctuations stabilize and the model returns to approximate baseline levels by the end of the forecast period.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

Having run the international component of the M.S.U. Agriculture Model to generate an ex-post forecast, an ex-ante forecast baseline and a scenario, it should be possible to draw a set of conclusions from the model performance. In depth studies of the capability of the model in scenario work will be covered in forthcoming works.

7.1 Conclusions From Evaluation of Model Performance

In general, the model performed quite well. Significant problems exist in a number of regions, most notably in the Soviet Bloc where the spillover of error causes severe distortions in the rest of the model. Other regions have internal spillover problems but, for the most part the absolute error values are small and the spillover into the model is minimal.

However, one cannot simply say that because the model consists of a number of minimal errors, there is nothing wrong with the model. Senator Everett Dirkson is quoted as commenting about the defense budget: "A billion dollars here and a billion dollars there and pretty soon you're talking about real money." The same logic applies to the measurement of error in the model. Over three-quarters of the

error in U.S. coarse grain exports in 1982 can be traced to an error in Soviet Bloc imports, the other quarter of the error is still 3 million metric tons.

The restrictions of the passive supplier and stock holder placed upon the model by using a trade hierarchy force all the errors into the ending stocks of the United States. This breeds instability, especially in the coarse grain and soybean sectors where prices are determined by the stock to utilization ratio with the vast majority of stocks held by the United States. Wheat is less of a problem because a larger proportion of stocks are held by competing exporters.

Some of the errors in individual regions can be traced to the use of real border prices as opposed to internal country prices. Although the estimation of import equations based upon real border prices worked well for importers, the efficiency of consumption equations for exporters and production equations for all regions was reduced by tne use real border prices.

A number of factors speak in favor of using real border prices: ease of collection, simplicity in not having to determine taxes and subsidies and compactness of the model. However, since it is price policies which drive agriculture in most of the regions, it is difficult to analyze the effect of changes in government policies without looking at the prices faced by producers and consumers in exporting countries.

Another source of regional error in the model can be traced to estimation of ending stocks. As Mitchell noted, is very difficult to capture the variability of stocks. In most regions, the ending stock equations tended to have the greatest percentage error. This error spills over into domestic supply, a variable in the import equations of almost every region. If the quantity of stocks held is small (as in the case of the NICs or LDOs) the effects of the spillover do not have a significant impact upon the model. However, if the variation is significant (Brazil) or the quantities of stocks are large (LDCs or Soviet Bloc), the spillover of error can be significant.

Finally, the modeling of soybean complex trade through the estimation of equations for import demand of equivalents and the estimation of an equation for decision to crush domestically had mixed results. Generally, the import demand equations were good. The PMEAL equations were spotty; in cases where policies were easily modeled (the Developed Markets) the results were quite satisfactory. In other cases, where policy was not as clear or the import of soybeans was a relatively recent phenomenon (China or the Soviet Bloc) the results ranged from poor to inestimable. The combination of the two equations often created large errors in the component identities. Fortunately most of the regions with large percentage errors played a small role in trade.

7.2 Recommendations for Further Ennancement

Given the specific observations in the previous chapter and the general comments presented above, it is possible to recommend a number of modifications to the model. Given manpower constraints and the enthusiasm of the analyst, some of these modifications may be less practical than others. All of them are worthy of consideration.

To be enable the analyst to perform a higher degree of policy analysis, especially relating to issues of free trade the model should follow the example of the F.A.P. model and move to internal country prices. Although the collection of this data presents difficulties, the advantages of exploring the effects of taxes and subsidies would be tremendous. Secondly, using real internal prices would permit the estimation of consumption equations for both importers and exports. Since consumption varies less than ending stocks, ending stocks could become the residual and create a more stable model.

The aggregation of several regions should be reconsidered. Japan and the European Community no longer are constrained by the same policies. Although both offer considerable protection to their producers, the EC must now consider surplus disposal, a problem not facing the modeled commodities in Japanese agriculture. Therefore, a better aggregation would place Japan with the NICs and place South Africa with the LDCs. This would create a geographic/-economic unit consisting of The European Community and the

remaining countries of Western Europe. Japan and the NICs would correspond more closely to East Asia.

These new aggregation has several advantages. Data collection would be simplified because much of the data printed in circulars is aggregated by geographic region. Secondly, the new aggregations would more closely follow economic and agricultural policies and consumption patterns common to that region.

There does not seem to be any agreement on the "correct" way to estimate area. There seemed to be general agreement among the authors of the models described in Chapter II that it is not practical to estimate cropland base as anything other than a time trend. The M.S.U. model attempted to sidestep the issue by estimating all the harvested area equations individually. This was successful in most cases. However, in Australia the difference in the relative size of the areas generated a very large cross elasticity in the smaller of the two areas. The coefficient on wheat revenue in the wheat area equation is 443.1 while the coefficient on coarse grain revenue is -2110.0. Given the size of the cross coefficient it was noticed that it was possible for a simultaneous and proportional decline in coarse grain and wheat prices to increase total area by causing explosive growth in wheat area..

It is obvious that wheat and coarse grains are not truly competing commodities in land use. In the absence of variables representing those competing commodities it is

necessary to restrict the area of that crop not to be more than a set percentage of total area.

The role rice plays in the world grain market raises another consideration for research. In much of the world, rice not wheat competes with coarse grains both for human and feed consumption. As some point either the price or available supply of rice will become a determining factor in the production and import decisions of a number of regions. Some consideration should be given to including rice if not as seperate primary commodity, at least with in a region.

Finally, as this modeling exercise as shown, the use of a trade hierarchy is not without its limitations. The U.S. accumulates all the error in the model through the export equations. The error is then passed into the ending stock equations and from there into price.

The equation estimation and performance statistics for the price equations indicate that the majority of the forecast error lies in variability and random factors. This in turn is traced back to the variability in the ending stock equations.

This points to the need for a set of equations which stabilize the levels of stock considered in the price determination equation. The model contains two such equations which were not used in the ex-post forecast.

As discussed in Chapter III the stock/utilization equation does not consider all U.S. ending stocks. The model estimates three specific stocks, FOR, CCC and the

remaining free stocks. Only a percentage of the FOR and CCC stocks are considered. The percentage is estimated as a simple time and price dependent variable. High prices relative to the loan rate would increase the percentage of policy stocks considered. Low prices would decrease the percentage and the high/low percentages changed over time.

Since the equations determining policy stocks were estimated as a rule and not through the use of actual data points, it was felt that it would be harder to track error if the equations were tested in the ex-post forecast. Therefore actual levels of CCC and FOR stocks were used. Since these rules could adjust stock levels to smooth the wide swings which occurred in the price equations, it is hard to say how bad the stock/price equations really are. In the ex-ante forecasts and the PIK scenarios both equations functioned quite well.

One problem with the policy stock equation is that given a cubic functional form, policy stock equation are inherently unstable. At very low or very high prices, the model will be sitting at that very elastic part of the curve where small changes in price will cause large amounts of grain to be accumulated or released. This can cause massive gyrations and prevent the model from converging.

A second problem is that tne equation determining the percentage of stocks considered in the stock/utilization formula is not a smooth functional rule but rather the

choice of one of two percentages*. If a smooth functional rule could be estimated, the price equation will be considerably smoother.

The other option for smoothing the stock/utilization ratio would be to estimate a speculative stock demand equation for the U.S. This would contain all the stocks considered by the market in price determination. The remaining stocks would not be considered by the market in determining price. They could be divided into CCC and FOR according to the rules cuurently used. Although this formulation would not provide an accurate forecast of the actual levels of stock held under loan, it would provide a forecast of shadow stocks under the PIK certificate program.

7.3 Concluding Observations

The international component of the M.S.U. model is not without its shortcomings. However, it was not designed to be a perfect forecasting model. It was designed to be a tool for understanding the inter-relationships in international agriculture and how the effects of policy or exogenous shocks will impact upon particular regions and global agriculture as a whole.

Although large in format and number of equations the model is simple enough to trace the effects of a shock through the system. Its simplicity also permits the model to be modified or tricked into performing a broad spectrum

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* Several attempts were made to derive a smooth function but all attempts failed.

of policy analysis with very little set-up time. In its current form, the model has been used to analyze the effects of a 5% reduction in U.S. production, the reduction of CAP taxes and subsidies in the EC, three specific GATT proposals for agricultural quota reductions in the U.S. and the EC, the long term abandonment of agricultural land and livestock destruction in the Soviet Union as a result of nuclear contamination and most recently, the implications of the use of PIK certificates. As an example of the speed at which the model can be set-up for scenario analysis, the PIK exercise was run and a draft section generated within 12 hours.

In addition to its basic functions the international component has the capacity to be linked with other, more complex models for in depth analysis. Chapter IV, presents the linkages between the international grain model and a U.S. grain model and/or a U.S. livestock model, there is no reason why it cannot be linked with models of other regions in the same manner.

From a forecasting standpoint the simplicity of model has its disadvantages. The model does not deal explicitly with most of the policy interactions (taxes and subsidies) which drive agriculture in much of the world, though these are implicit in the production and trade equations. Modifications must be made the analyst based upon his skills and judgement. The M.S.U. Agriculture Model was designed to be an analyst controlled model. Its strength is in the

latitude provided to an analysist in formulating the questions. The model will not produce a prescription, but rather a set of reactions which can be interpreted to provide a clearer understanding of complex agricultural interactions.

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AN INTERNATIONAL AGRICULTURAL TRADE MODEL WITH LINKAGE CAPABILITY

VOLUME II

By

Shayle Daniel Shagam

A THESIS

Submitted to
Michigan State University
in partial Fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Agricultural Economics

1987

APPENDICIES

APPENDIX A

EQUATION STATISTICS - UNITED STATES

Wheat

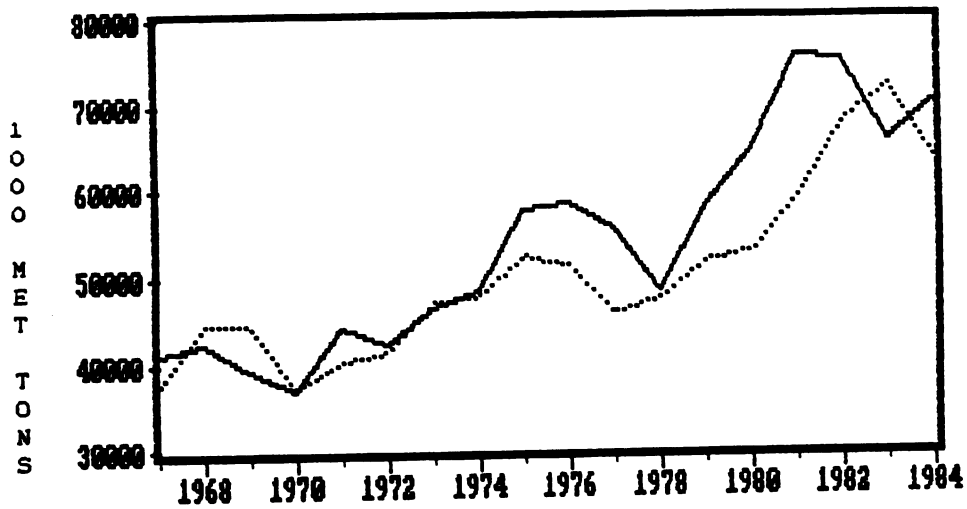
WPROUS.....Production
WHAUS.....Harvested Area
WYUS.....Yield
WCONUS.....Total Consumption
WFEDUS.....Feed Consumption
WFODUS.....Food & Residual Consumption
WNEUS.....Net Exports
WESUS.....Ending Stocks

Coarse Grain

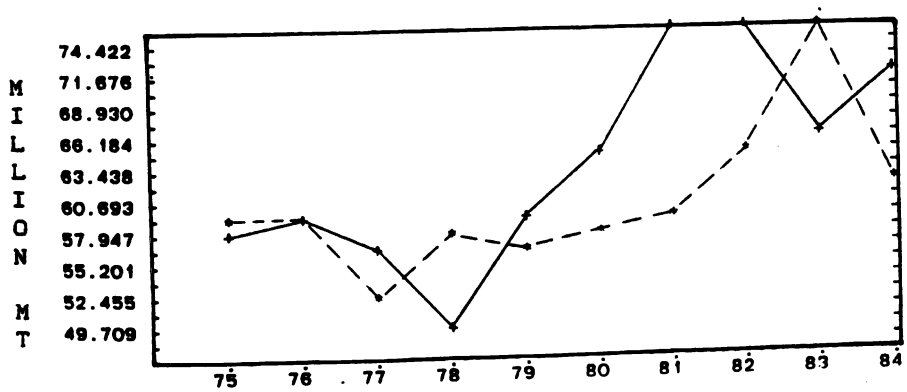
FPROUS.....Production
FHAUS.....Harvested Area
FYUS.....Yield
FCONUS.....Total Consumption
FFEDUS.....Feed Consumption
FFODUS.....Food & Residual Consumption
FNEUS.....Net Exports
FESUS.....Ending Stocks

Soybean Complex

SPROUS.....Production
SHAUS.....Harvested Area
SYUS.....Yield
SMCOUS.....Soymeal Equiv. Consumption
SOCOUS.....Soyoil Equiv. Consumption
SMNEUS.....Soymeal Net Exports
SONEUS.....Soyoil Net Exports
SNEUS.....Soybean Net Exports
SMESUS.....Soymeal Ending Stocks
SOESUS.....Soyoil Ending Stocks
SESUS.....Soybean Ending Stocks



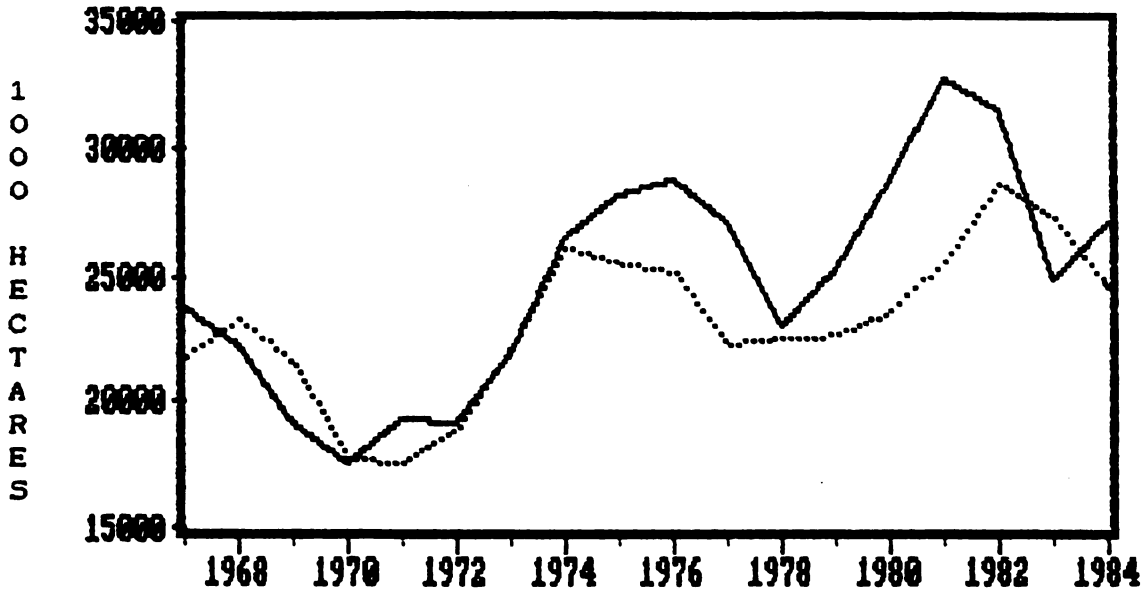
REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.1.a & b. Wheat Production - United States



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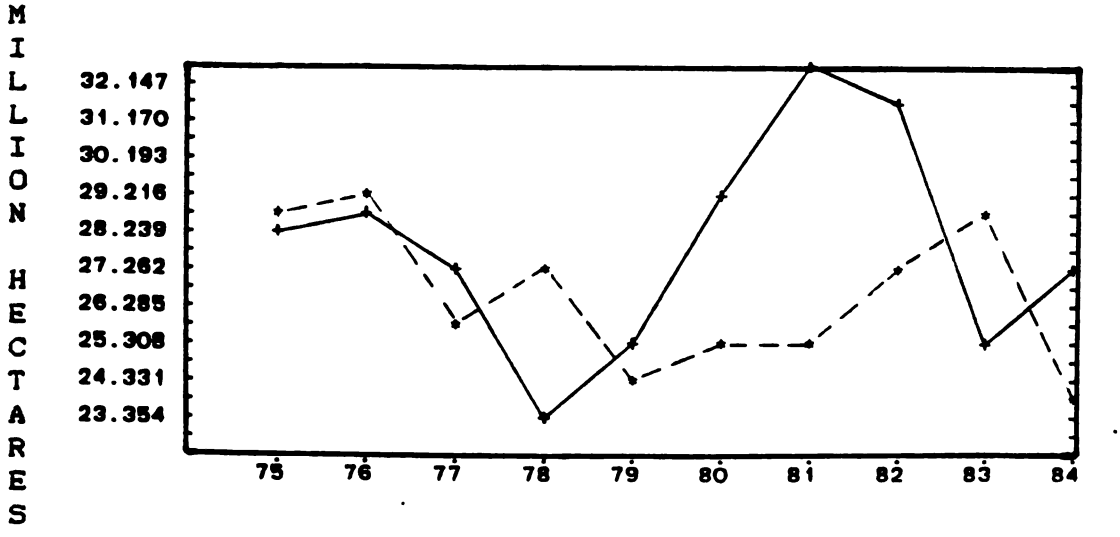

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1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.2.a & b. Wheat Harvested Area - United States

United States
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHAUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-13058.906	7991.7217	-1.6340541	0.123
WHAUS(-1)	0.4989765	0.1701590	2.9324129	0.010
WRUS4(-1)	1340.5239	1315.9541	1.0186708	0.325
FRUS4(-1)	-828.19941	1082.6908	-0.7649455	0.456
WESUS(-1)	-0.2049423	0.1188862	-1.7238533	0.105
YEAR	413.68557	189.97844	2.1775396	0.046

R-squared	0.832975	Mean of dependent var	24119.90
Adjusted R-squared	0.777299	S.D. of dependent var	4385.952
S.E. of regression	2069.782	Sum of squared resid	64259956
Durbin-Watson stat	1.548786	F-statistic	14.96133
Log likelihood	-186.6039	TPE	4/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	2794.31	20162.0	17367.7
	1965	1251.78	20080.0	18828.2
	1966	-10.9166	20080.0	20090.9
	1967	1964.18	23644.0	21679.8
	1968	-1240.17	22186.0	23426.2
	1969	-2198.40	19068.0	21266.4
	1970	-1200.85	17651.0	18851.9
	1971	-339.912	19298.0	19637.9
	1972	-1589.61	19143.0	20732.6
	1973	-777.717	21913.0	22690.7
	1974	-1574.67	26454.0	28028.7
	1975	-385.304	28126.0	28511.3
	1976	93.3374	28692.0	28598.7
	1977	882.985	26993.0	26110.0
	1978	-2433.19	22865.0	25298.2
	1979	11.1898	25275.0	25263.8
	1980	1357.79	28784.0	27426.2
	1981	4041.57	32635.0	28593.4
	1982	537.584	31540.0	31002.4
	1983	-2985.91	24844.0	27829.9
	1984	1801.93	27085.0	25283.1

INDEPENDENT VARIABLES

WHAUS = Wheat Harvested Area (1000 HA)

WRUS4 = Wheat Revenue per Hectare ($/HA)
(WYUS(-3)+WYUS(-2)+WYUS(-1)+WYUS)/4*WP/CPIUS

FRUS4 = Coarse Grain Revenue per Hectare ($/HA)
(FYUS(-3)+FYUS(-2)+FYUS(-1)+FYUS)/4*FP/CPIUS

WESUS = Wheat Ending Stocks (1000 MT)

YEAR = 1960=60, 1961=61, ...

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHAUS	24119.905	4385.9520	32635.000	17651.000
WHAUS(-1)	23707.333	4499.1261	32635.000	17651.000
WRUS4(-1)	3.5121849	1.1722003	7.1384770	2.2408970
FRUS4(-1)	6.0653571	1.5957396	9.8191280	4.3012950
WESUS(-1)	24144.190	8182.7951	41232.000	9253.0000
YEAR	74.000000	6.2048368	84.000000	64.000000

	Covariance	Correlation
WHAUS,WHAUS	18320548.	1.0000000
WHAUS,WHAUS(-1)	14892172.	0.7924198
WHAUS,WRUS4(-1)	2876.2352	0.5874190
WHAUS,FRUS4(-1)	4249.3819	0.6375132
WHAUS,WESUS(-1)	2519352.2	0.0737077
WHAUS,YEAR	19361.810	0.7470351
WHAUS(-1),WHAUS(-1)	19278224.	1.0000000
WHAUS(-1),WRUS4(-1)	1402.1194	0.2791543
WHAUS(-1),FRUS4(-1)	2432.5289	0.3557600
WHAUS(-1),WESUS(-1)	15038365.	0.4289040
WHAUS(-1),YEAR	20522.429	0.7718973
WRUS4(-1),WRUS4(-1)	1.3086224	1.0000000
WRUS4(-1),FRUS4(-1)	1.6639332	0.9340311
WRUS4(-1),WESUS(-1)	-4564.8566	-0.4997041
WRUS4(-1),YEAR	2.0907354	0.3018257
FRUS4(-1),FRUS4(-1)	2.4251285	1.0000000
FRUS4(-1),WESUS(-1)	-4655.0892	-0.3743291
FRUS4(-1),YEAR	4.4950321	0.4766830
WESUS(-1),WESUS(-1)	63769653.	1.0000000
WESUS(-1),YEAR	25015.667	0.5173320
YEAR,YEAR	36.666667	1.0000000

United States
Wheat Yield (Metric Tons per Hectare)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is WYUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-1.0051382	0.2275371	-4.4174699	0.000
WHAUS	-3.149D-05	7.255D-06	-4.3400859	0.000
YEAR	0.0523670	0.0045842	11.423341	0.000

R-squared	0.897014	Mean of dependent var	2.052137
Adjusted R-squared	0.887206	S.D. of dependent var	0.290773
S.E. of regression	0.097656	Sum of squared resid	0.200269
Durbin-Watson stat	1.319740	F-statistic	91.45565
Log likelihood	23.37924		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.07490	1.60637	1.53147
	1962	-0.00474	1.67980	1.68454
	1963	-0.01936	1.69459	1.71395
	1964	0.02033	1.73182	1.71149
	1965	-0.02755	1.73889	1.76644
	1966	-0.03654	1.78227	1.81881
	1967	-0.02431	1.73465	1.75896
	1968	0.05276	1.90999	1.85723
	1969	0.05180	2.05958	2.00778
	1970	-0.02018	2.08458	2.10476
	1971	0.17745	2.28272	2.10527
	1972	0.03573	2.19825	2.16252
	1973	-0.00290	2.12477	2.12766
	1974	-0.20382	1.83322	2.03704
	1975	0.02140	2.05817	2.03676
	1976	-0.03286	2.03844	2.07131
	1977	-0.11427	2.06291	2.17717
	1978	-0.24555	2.11397	2.35952
	1979	-0.03808	2.29792	2.33600
	1980	-0.02666	2.25122	2.27788
	1981	0.11352	2.32251	2.20899
	1982	0.09003	2.38586	2.29583
	1983	0.09178	2.65082	2.55904
	1984	0.06713	2.60798	2.54085

INDEPENDENT VARIABLES

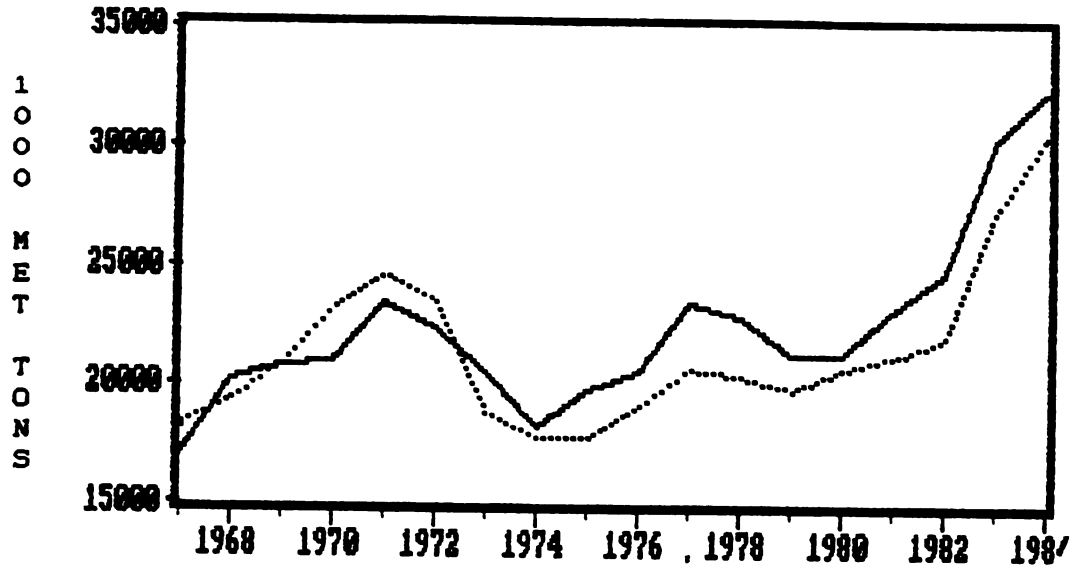
WHAUS = Wheat Harvested Area (1000 HA)

YEAR = 1960=60, 1961=61, ...

SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYUS	2.0521367	0.2907730	2.6508210	1.6063670
WHAUS	23480.042	4467.9198	32635.000	17651.000
YEAR	72.500000	7.0710678	84.000000	61.000000

	Covariance	Correlation
WYUS, WYUS	0.0810260	1.0000000
WYUS, WHAUS	631.24509	0.5070164
WYUS, YEAR	1.7674866	0.8970166
WHAUS, WHAUS	19130544.	1.0000000
WHAUS, YEAR	23557.271	0.7780688
YEAR, YEAR	47.916667	1.0000000



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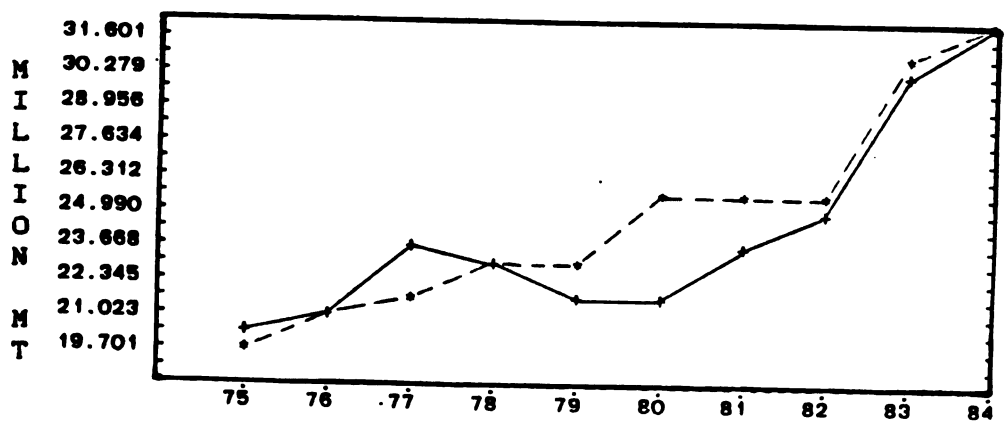
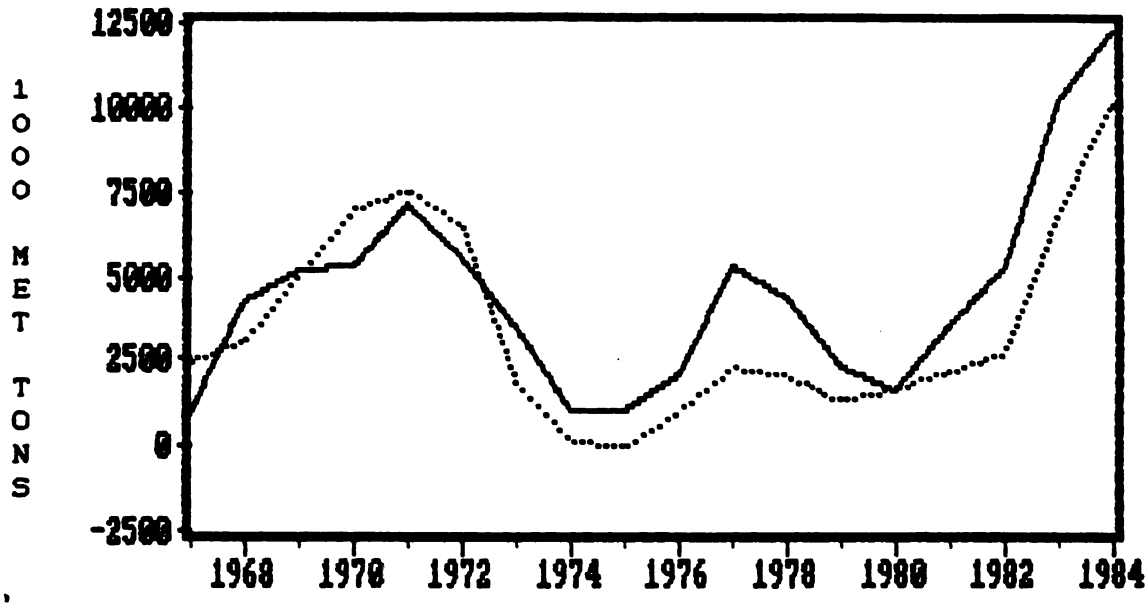


EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.3.a & b. Total Wheat Consumption - United States



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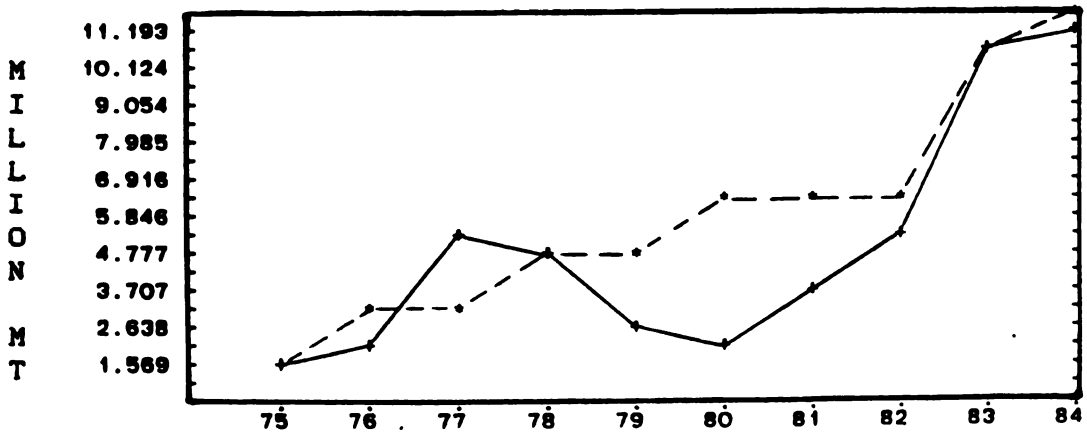


EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.4.a & b. Wheat Feed Consumption - United States

United States
Per Capita Wheat Feed Consumption (1000 MT)

24 Observations
LS // Dependent Variable is PCWFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-7.1685312	13.381653	-0.5356985	0.598
PCWFED(-1)	0.8245366	0.1210876	6.8094222	0.000
WFSUPR	85.113058	32.568937	2.6133201	0.017
WPUS	-9.7014369	2.7722305	-3.4995058	0.002

R-squared	0.793703	Mean of dependent var	17.71663
Adjusted R-squared	0.762759	S.D. of dependent var	12.67804
S.E. of regression	6.175146	Sum of squared resid	762.6486
Durbin-Watson stat	2.403436	F-statistic	25.64924
Log likelihood	-75.55945	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-4.32458	6.51641	10.8410
*	1962	-6.10231	5.10346	11.2058
*	1963	-4.14131	4.02663	8.16794
*	1964	-0.04162	7.80134	7.84296
*	1965	9.66774	20.4478	10.7800
*	1966	-4.16170	13.8482	18.0099
*	1967	-7.98125	4.93181	12.9131
*	1968	13.3383	21.1499	7.81165
*	1969	0.40720	25.2418	24.8346
*	1970	-3.97463	25.6181	29.5928
*	1971	6.66059	34.3783	27.7177
*	1972	-3.43883	26.0600	29.4989
*	1973	9.28490	16.3749	7.08998
*	1974	-3.71593	4.97545	8.69138
*	1975	0.66916	4.78770	4.11854
*	1976	-2.55971	9.36067	11.9204
*	1977	7.50077	23.8512	16.3505
*	1978	-1.80284	19.4393	21.2422
*	1979	-4.37645	10.4017	14.7781
*	1980	-7.09622	7.05190	14.1481
*	1981	-0.32812	15.7320	16.0602
*	1982	1.46143	22.8405	21.3791
*	1983	5.16858	43.5150	38.3464
*	1984	-0.11315	51.7450	51.8581

INDEPENDENT VARIABLES

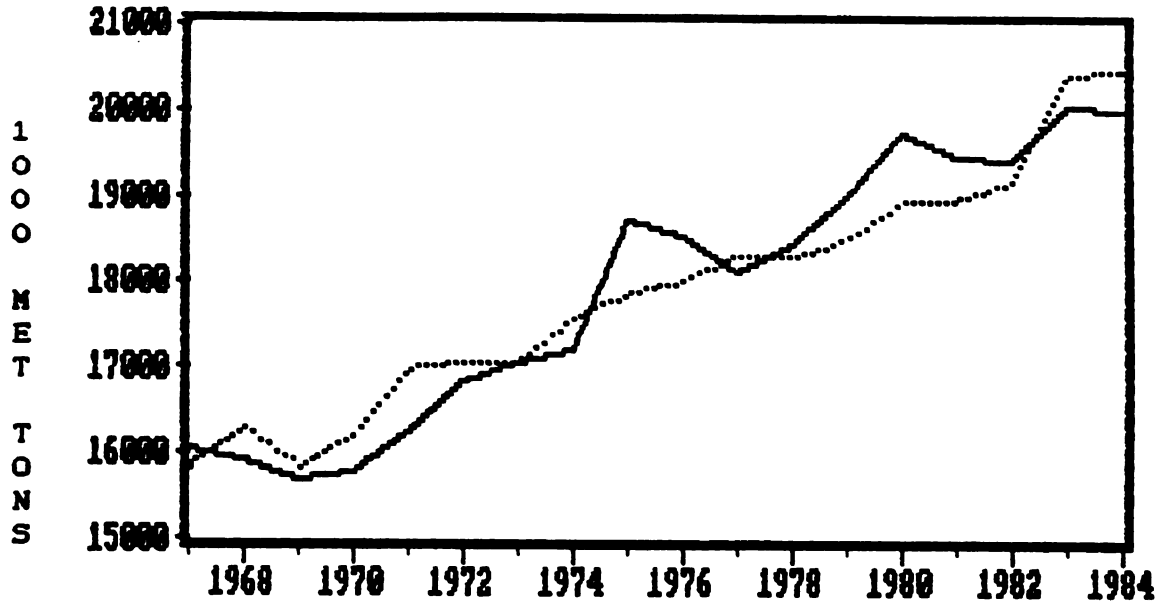
WFSUPR = Wheat/Coarse Grain Supply Ratio
(WPROUS+WESUS(-1))/(FPROUS+FESUS(-1))

WPUS = Real U.S. Wheat Price ($/MT)
WP/CPIUS

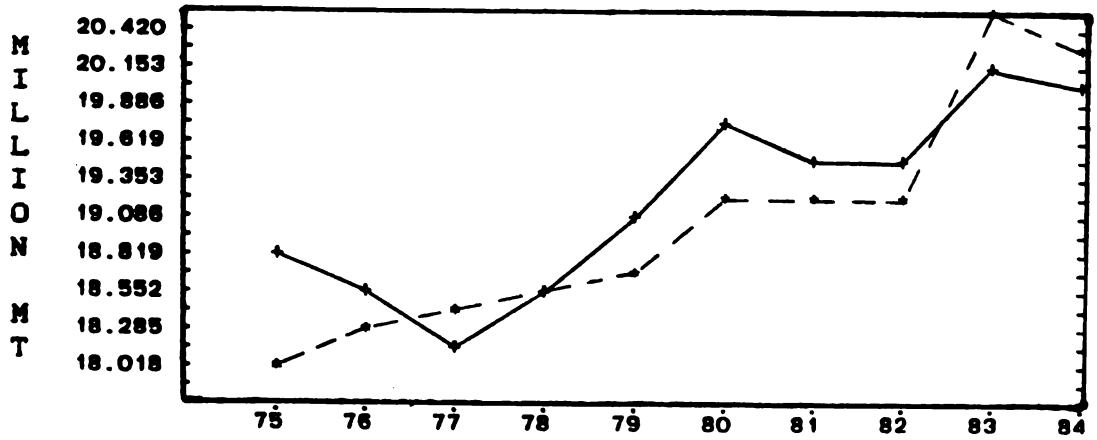
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFED	17.716631	12.678041	51.744970	4.0266330
PCWFED(-1)	15.748769	10.673484	43.514970	4.0266330
WFSUPR	0.3347871	0.0412576	0.4581131	0.2786135
WPUS	1.7105742	0.4862454	3.2857140	1.1756540

	Covariance	Correlation
PCWFED, PCWFED	154.03553	1.0000000
PCWFED, PCWFED(-1)	93.577269	0.7215981
PCWFED, WFSUPR	0.1889461	0.3769339
PCWFED, WPUS	-2.9911903	-0.5063138
PCWFED(-1), PCWFED(-1)	109.17646	1.0000000
PCWFED(-1), WFSUPR	-0.0035317	-0.0083686
PCWFED(-1), WPUS	-0.3976598	-0.0799527
WFSUPR, WFSUPR	0.0016313	1.0000000
WFSUPR, WPUS	-0.0054648	-0.2842471
WPUS, WPUS	0.2265831	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.5.a & b. Wheat Food and Residual Consumption - United States

United States
Per Capita Wheat Food and Residual Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	62.795726	4.6029837	13.642396	0.000
WFSUPR	24.272589	11.086266	2.1894287	0.041
YEAR	0.1555663	0.0648671	2.3982321	0.026
DV6970	-4.2878837	1.4684377	-2.9200311	0.008

R-squared	0.609330	Mean of dependent var	81.84311
Adjusted R-squared	0.550729	S.D. of dependent var	2.936265
S.E. of regression	1.968109	Sum of squared resid	77.46908
Durbin-Watson stat	1.968147	F-statistic	10.39803
Log likelihood	-48.11642	TPE	5/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	1.75802	82.9060	81.1480
	1962	1.30821	82.3041	80.9959
	1963	-1.11702	79.5445	80.6615
	1964	1.26330	82.1617	80.8984
	1965	-3.83097	76.6186	80.4496
	1966	1.94011	82.0971	80.1570
	1967	0.82486	80.8062	79.9813
	1968	-1.41194	79.1939	80.6058
	1969	0.64559	77.3535	76.7079
	1970	-0.64559	76.8398	77.4854
	1971	-3.07383	78.1084	81.1823
	1972	-1.26284	80.1096	81.3724
	1973	-0.73645	80.4445	81.1810
	1974	-1.98757	80.4723	82.4599
	1975	3.66161	86.5722	82.9106
	1976	1.45963	84.8835	83.4239
	1977	-1.34846	82.2966	83.6450
	1978	0.53104	82.8833	82.3523
	1979	2.09232	84.2886	82.1963
	1980	2.61344	86.5197	83.9063
	1981	0.20042	84.4766	84.2762
	1982	-0.30644	83.3871	83.6936
	1983	-1.42610	85.4012	86.8273
	1984	-1.15134	84.5657	85.7170

INDEPENDENT VARIABLES

WFSUPR = Wheat/Coarse Grain Supply Ratio
(WPROUS+WESUS(-1))/(FPROUS+FESUS(-1))

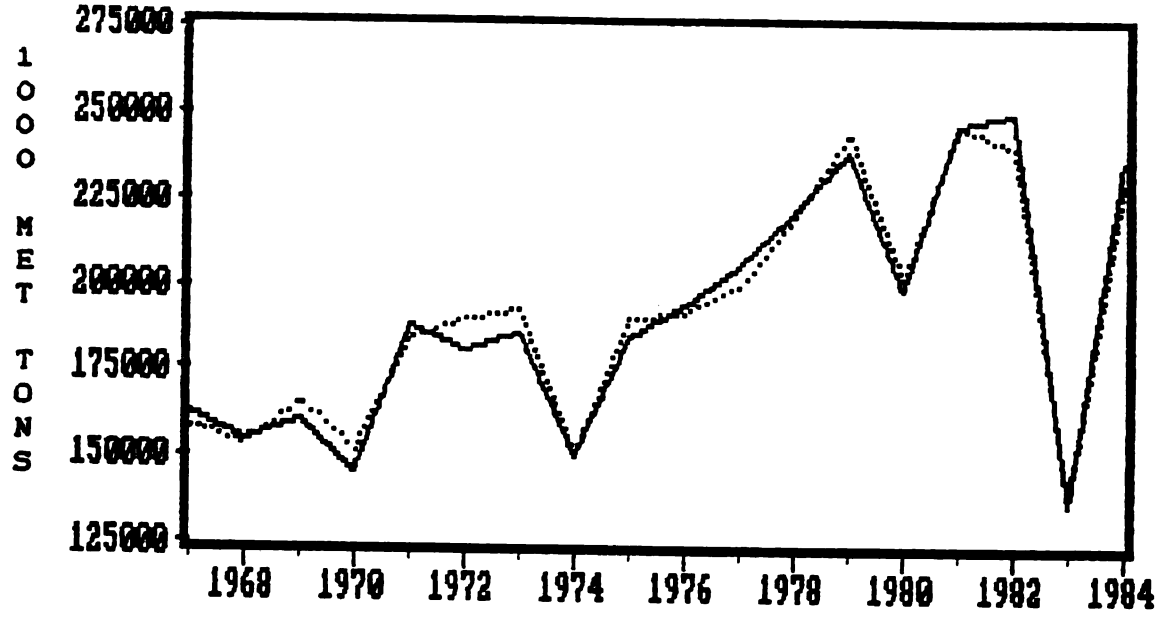
YEAR = 1960=60, 1961=61, ...

DV6970 = 1 (If YEAR .EQ. 69 .OR. YEAR .EQ. 70)
0 Otherwise

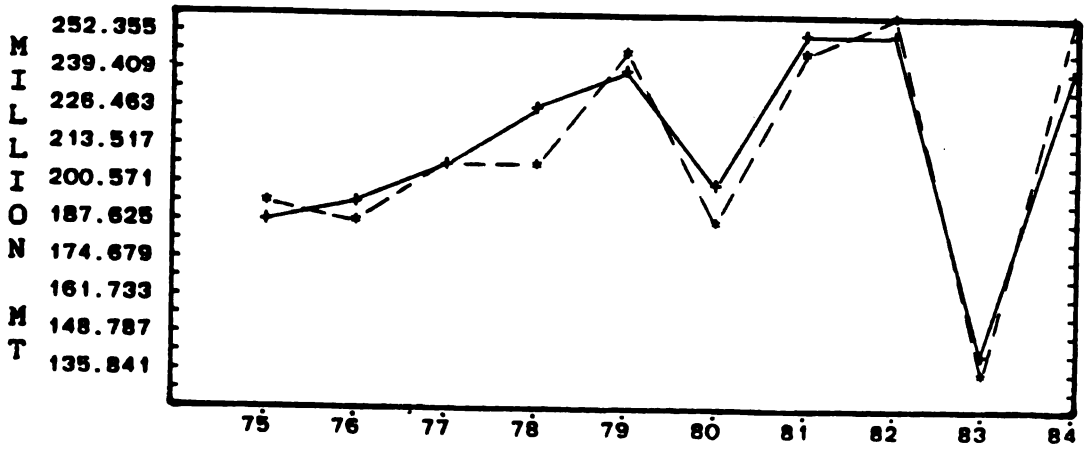
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFOD	81.843112	2.9362646	86.572210	76.618630
WFSUPR	0.3347871	0.0412576	0.4581131	0.2786135
YEAR	72.500000	7.0710678	84.000000	61.000000
DV6970	0.0833333	0.2823299	1.0000000	0.0000000

	Covariance	Correlation
PCWFOD, PCWFOD	8.2624145	1.0000000
PCWFOD, WFSUPR	0.0638164	0.5496881
PCWFOD, YEAR	11.503245	0.5781274
PCWFOD, DV6970	-0.3955402	-0.4978769
WFSUPR, WFSUPR	0.0016313	1.0000000
WFSUPR, YEAR	0.1226508	0.4386973
WFSUPR, DV6970	-0.0011990	-0.1074058
YEAR, YEAR	47.916667	1.0000000
YEAR, DV6970	-0.2500000	-0.1306717
DV6970, DV6970	0.0763889	1.0000000



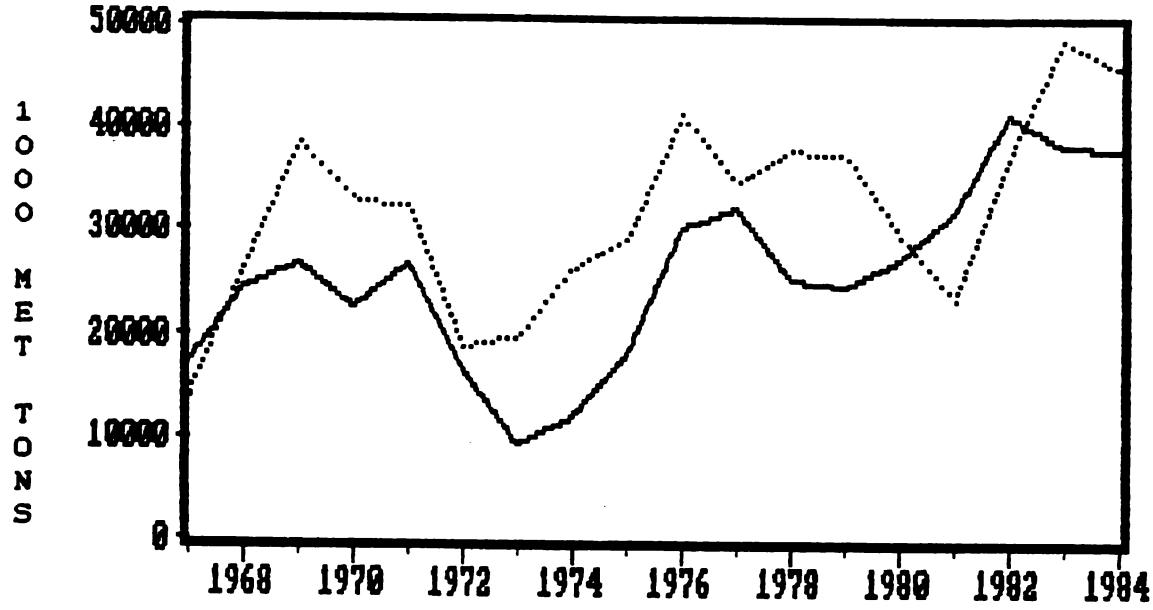
REGIONAL MODEL SIMULATION



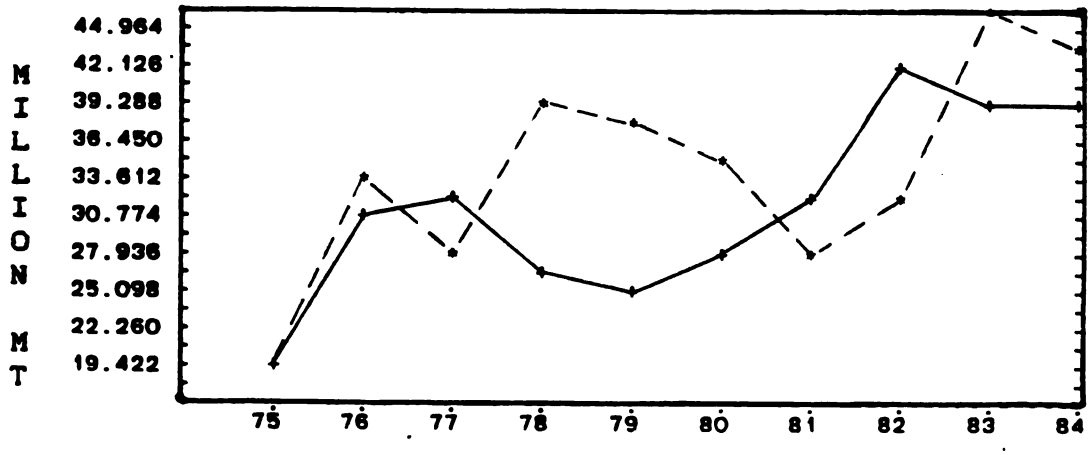
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.6.a & b. Wheat Net Exports - United States



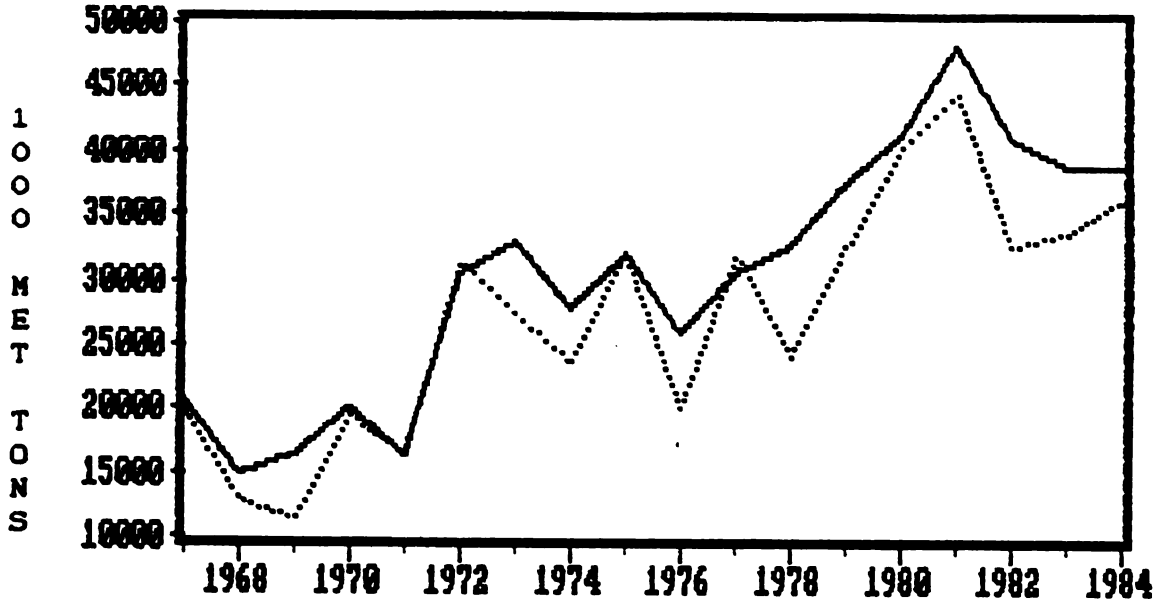
REGIONAL MODEL SIMULATION



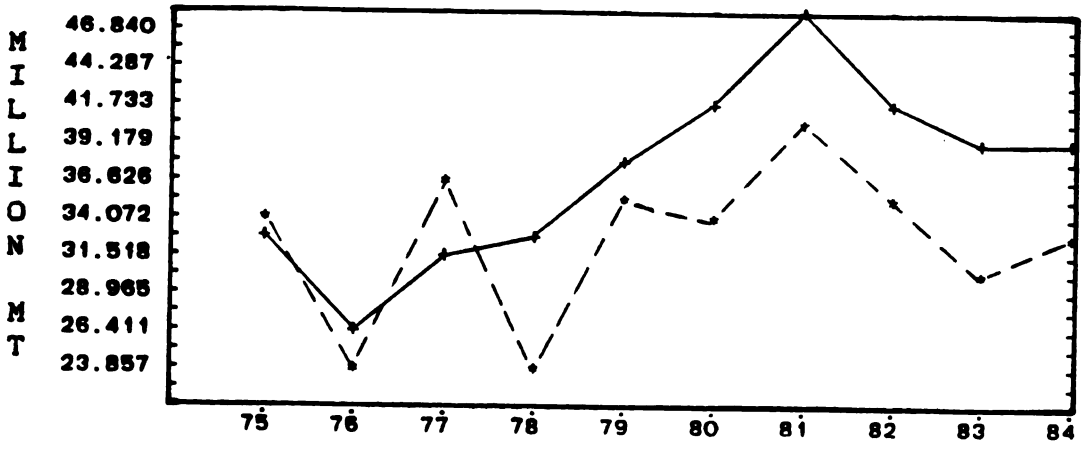
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.7.a & b. Wheat Ending Stocks - United States



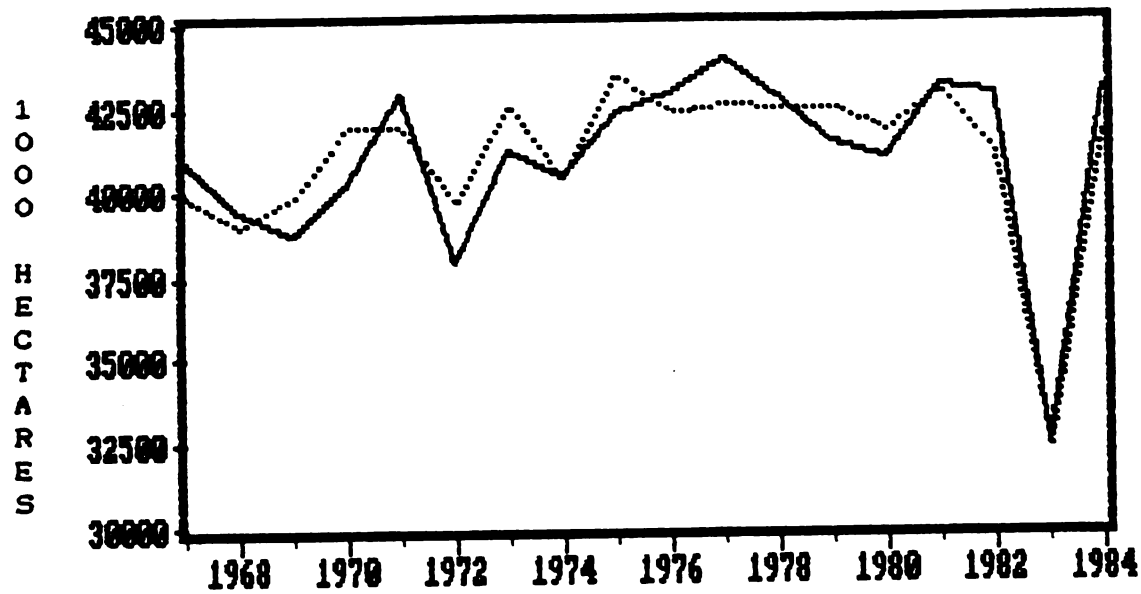
REGIONAL MODEL SIMULATION



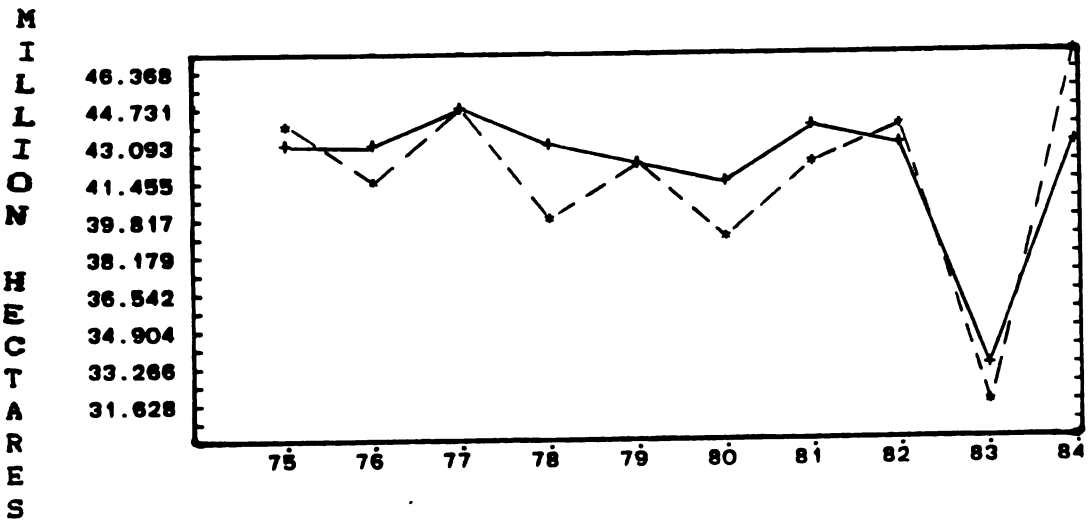
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.8.a & b. Coarse Grain Production - United States



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.9.a & b. Coarse Grain Harvested Area - United States

United States
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is FHAUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	30898.626	4674.0101	6.6107317	0.000
FHAUS(-1)	0.1267840	0.1100682	1.1518675	0.266
FRUS4(-1)	2524.3969	504.42082	5.0045454	0.000
WRUS4(-1)	-2912.5755	693.30235	-4.2010178	0.001
DV83	-9656.9634	1269.3302	-7.6079207	0.000

R-squared	0.830371	Mean of dependent var	40745.33
Adjusted R-squared	0.787964	S.D. of dependent var	2578.996
S.E. of regression	1187.560	Sum of squared resid	22564766
Durbin-Watson stat	1.967972	F-statistic	19.58091
Log likelihood	-175.6152	TPE	6/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	453.683	39314.0	38860.3
	1965	-187.665	38894.0	39081.7
	1966	-782.866	39636.0	40418.9
	1967	1063.64	40881.0	39817.4
	1968	332.448	39379.0	39046.6
	1969	-1109.18	38665.0	39774.2
	1970	-1561.39	40158.0	41719.4
	1971	1295.86	42928.0	41632.1
	1972	-1802.98	37952.0	39755.0
	1973	-1090.18	41242.0	42332.2
	1974	244.514	40368.0	40123.5
	1975	-1079.96	42330.0	43410.0
	1976	827.827	42977.0	42149.2
	1977	1350.47	43949.0	42598.5
	1978	147.750	42782.0	42634.3
	1979	-1031.81	41485.0	42516.8
	1980	-601.374	41032.0	41633.4
	1981	261.114	43159.0	42897.9
	1982	1840.10	42948.0	41107.9
	1983	9.1D-13	32491.0	32491.0
	1984	1430.00	43082.0	41652.0

INDEPENDENT VARIABLES

FHAUS = Coarse Grain Harvested Area (1000 HA)

FRUS4 = Coarse Grain Revenue per Hectare ($/HA)
(FYUS(-3)+FYUS(-2)+FYUS(-1)+FYUS)/4*FP/CPIUS

WRUS4 = Wheat Revenue per Hectare ($/HA)
(WYUS(-3)+WYUS(-2)+WYUS(-1)+WYUS)/4*WP/CPIUS

DV83 = 1 If(YEAR .EQ. 83)
0 Otherwise

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
FHAUS	40745.333	2578.9962	43949.000	32491.000
FHAUS(-1)	40719.095	2556.7418	43949.000	32491.000
FRUS4(-1)	6.0611351	1.5960460	9.8191310	4.3012970
WRUS4(-1)	3.4871811	1.1745398	7.1384760	2.2408970
DV83	0.0476190	0.2182179	1.0000000	0.0000000

	Covariance	Correlation
FHAUS,FHAUS	6334496.7	1.0000000
FHAUS,FHAUS(-1)	-771758.27	-0.1228947
FHAUS,FRUS4(-1)	1351.4383	0.3447382
FHAUS,WRUS4(-1)	635.01729	0.2201184
FHAUS,DV83	-393.06349	-0.7333494
FHAUS(-1),FHAUS(-1)	6225646.1	1.0000000
FHAUS(-1),FRUS4(-1)	203.93835	0.0524754
FHAUS(-1),WRUS4(-1)	360.82088	0.1261614
FHAUS(-1),DV83	106.13832	0.1997489
FRUS4(-1),FRUS4(-1)	2.4260597	1.0000000
FRUS4(-1),WRUS4(-1)	1.6778108	0.9397647
FRUS4(-1),DV83	-0.0091121	-0.0274708
WRUS4(-1),WRUS4(-1)	1.3138512	1.0000000
WRUS4(-1),DV83	-0.0186913	-0.0765723
DV83,DV83	0.0453515	1.0000000

United States
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is FYUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.5761224	1.7809247	-2.0080144	0.058
FHAUS	-1.811D-05	4.858D-05	-0.3728298	0.713
YEAR	0.1198725	0.0121868	9.8362343	0.000
DV83	-1.5858272	0.6157695	-2.5753585	0.018

R-squared	0.856075	Mean of dependent var	4.307472
Adjusted R-squared	0.834486	S.D. of dependent var	0.854732
S.E. of regression	0.347734	Sum of squared resid	2.418373
Durbin-Watson stat	2.017941	F-statistic	39.65378
Log likelihood	-6.515020		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.01100	2.97524	2.96424
	1962	0.00892	3.11808	3.10916
	1963	0.07512	3.28067	3.20555
	1964	-0.28756	3.09612	3.38368
	1965	0.17478	3.68594	3.51116
	1966	0.02089	3.63848	3.61760
	1967	0.25548	3.97040	3.71492
	1968	0.06593	3.92793	3.86200
	1969	0.16697	4.16177	3.99480
	1970	-0.47266	3.61497	4.08763
	1971	0.22868	4.38602	4.15734
	1972	0.40962	4.77696	4.36733
	1973	0.08599	4.51360	4.42762
	1974	-0.83611	3.72721	4.56332
	1975	-0.27629	4.37137	4.64766
	1976	-0.24230	4.51351	4.75581
	1977	-0.18648	4.67160	4.85808
	1978	0.17909	5.17818	4.99909
	1979	0.59172	5.73417	5.14245
	1980	-0.44780	4.82272	5.27053
	1981	0.35205	5.70393	5.35188
	1982	0.35073	5.82630	5.47557
	1983	3.4D-16	4.19901	4.19901
	1984	-0.22777	5.48512	5.71289

INDEPENDENT VARIABLES

FHAUS = Coarse Grain Harvested Area (1000 HA)

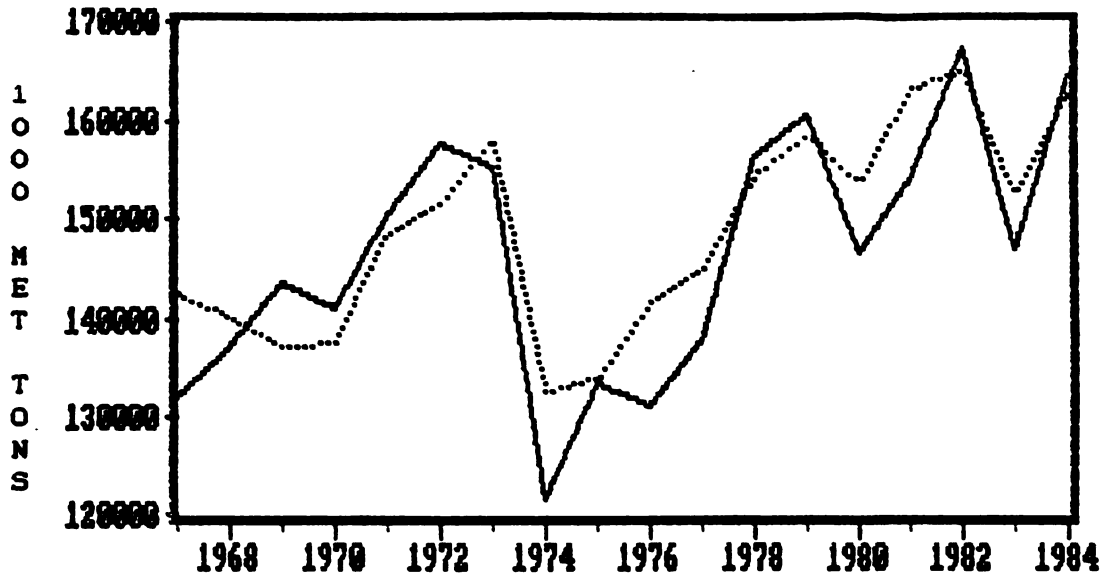
YEAR = 1960=60, 1961=61, ...

DV83 = 1 If(YEAR .EQ. 83)
0 Otherwise

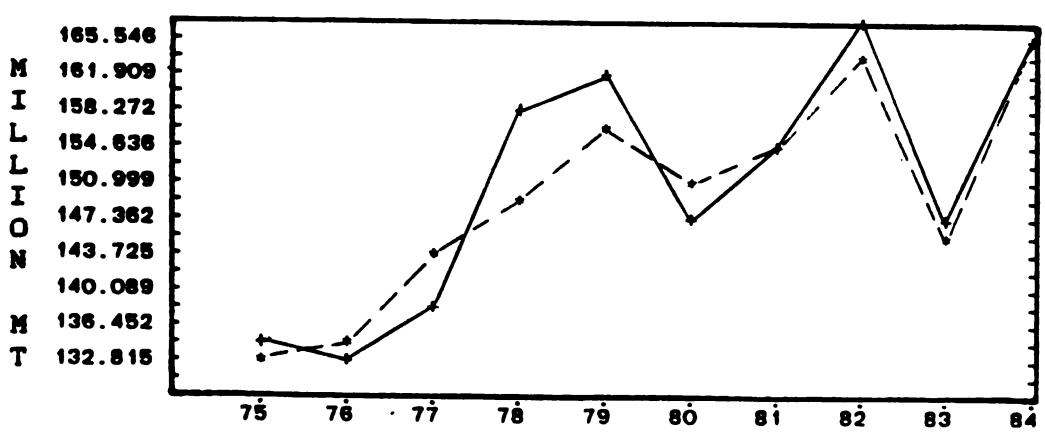
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYUS	4.3074716	0.8547316	5.8263020	2.9752450
FHAUS	40918.083	2460.4590	43949.000	32491.000
YEAR	72.500000	7.0710678	84.000000	61.000000
DV83	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
FYUS, FYUS	0.7001258	1.0000000
FYUS, FHAUS	589.56168	0.2925275
FYUS, YEAR	5.0292705	0.8683077
FYUS, DV83	-0.0045193	-0.0270289
FHAUS, FHAUS	5801614.4	1.0000000
FHAUS, YEAR	1149.6250	0.0689507
FHAUS, DV83	-351.12847	-0.7295229
YEAR, YEAR	47.916667	1.0000000
YEAR, DV83	0.4375000	0.3162875
DV83, DV83	0.0399306	1.0000000



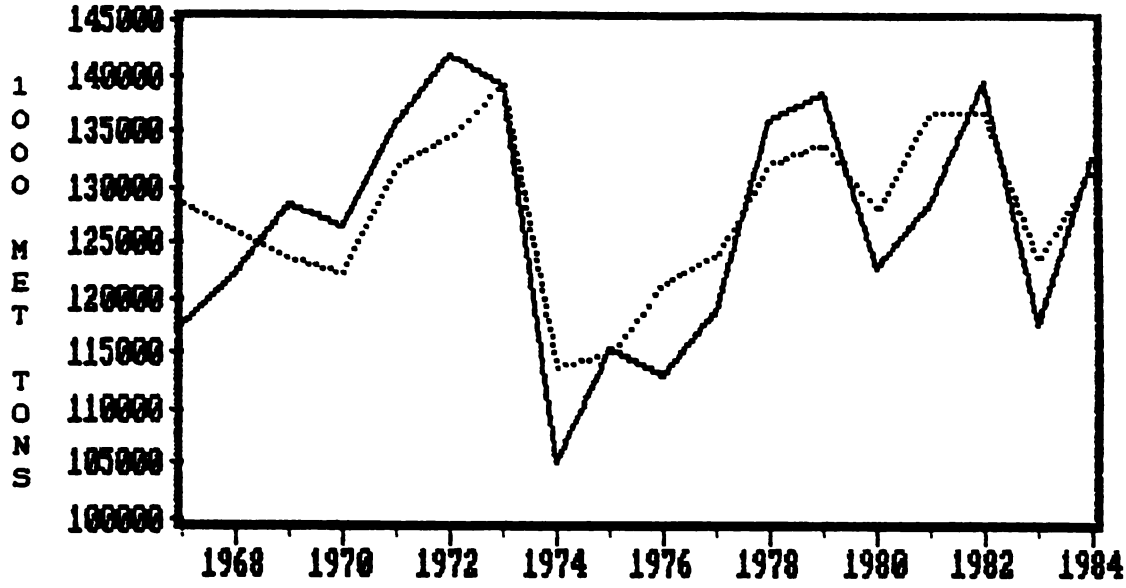
REGIONAL MODEL SIMULATION



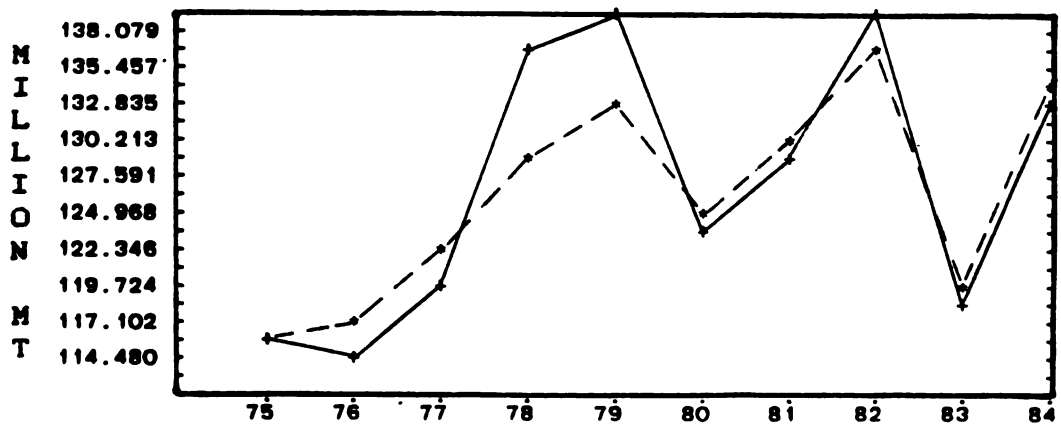
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.10 a & b. Total Coarse Grain Consumption - United States



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.11.a & b. Coarse Grain Feed Consumption - United States

United States
Per Capita Coarse Grain Feed Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	274.35879	82.247061	3.3357884	0.003
PCRGDP	2.3150881	0.8312866	2.7849458	0.012
FPUS	-30.640328	20.233790	-1.5143148	0.146
FWSUPR	48.205718	25.387464	1.8988001	0.073
DV74ON	-82.612249	24.250796	-3.4065789	0.003

R-squared	0.692411	Mean of dependent var	582.3424
Adjusted R-squared	0.627656	S.D. of dependent var	49.14943
S.E. of regression	29.99099	Sum of squared resid	17089.74
Durbin-Watson stat	1.308554	F-statistic	10.69269
Log likelihood	-112.8727	TPE	5/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	59.8392	605.798	545.959
	1962	25.0028	581.634	556.631
	1963	-9.21568	559.771	568.986
	1964	-40.6569	534.666	575.323
	1965	-2.38042	595.682	598.062
	1966	-32.7401	586.462	619.202
	1967	-46.8344	592.235	639.069
	1968	-25.6507	610.244	635.894
	1969	1.57191	634.700	633.128
	1970	1.93021	617.220	615.290
	1971	9.50522	652.938	643.432
	1972	39.2742	675.960	636.686
	1973	20.3546	657.185	636.830
	1974	-32.2812	492.079	524.360
	1975	7.85842	534.542	526.683
	1976	-21.7495	519.029	540.778
	1977	-10.6311	540.547	551.178
	1978	25.0630	610.868	585.805
	1979	23.7314	614.774	591.042
	1980	-6.75968	539.273	546.033
	1981	1.75982	558.633	556.873
	1982	39.9432	599.914	559.971
	1983	-25.2025	500.998	526.200
	1984	-1.73192	561.070	562.802

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPUS/CPIUS/POPUS

FPUS = Real U.S. Coarse Grain Price ($/MT)
WP/CPIUS

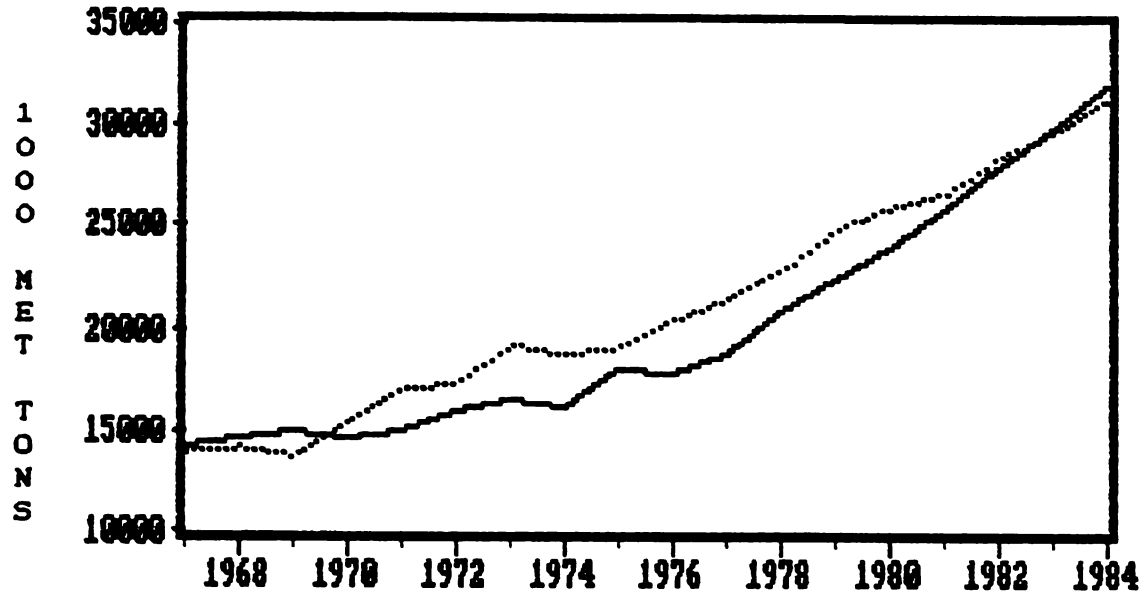
FWSUPR = Coarse Grain/Wheat Supply Ratio
(WPROUS+WESUS(-1))/(FPROUS+FESUS(-1))

DV74ON = 1 If(YEAR .GE. 74)
0 Otherwise

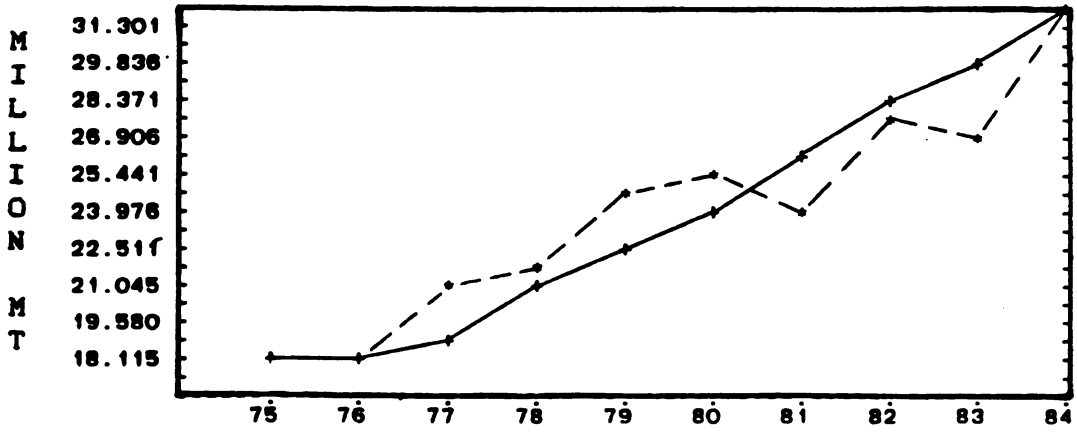
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFED	582.34242	49.149429	675.96000	492.07860
PCRGDP	105.09844	12.663592	121.26510	78.090000
FPUS	1.4155481	0.3204774	2.2714290	0.9278351
FWSUPR	3.0267839	0.3413846	3.5892020	2.1828670
DV74ON	0.4583333	0.5089774	1.0000000	0.0000000

	Covariance	Correlation
PCFFED, PCFFED	2315.0136	1.0000000
PCFFED, PCRGDP	-40.404113	-0.0677382
PCFFED, FPUS	-0.8492752	-0.0562621
PCFFED, FWSUPR	10.800118	0.6716600
PCFFED, DV74ON	-13.918406	-0.5805718
PCRGDP, PCRGDP	153.68463	1.0000000
PCRGDP, FPUS	0.0112078	0.0028817
PCRGDP, FWSUPR	-0.4447754	-0.1073552
PCRGDP, DV74ON	4.5321783	0.7337278
FPUS, FPUS	0.0984264	1.0000000
FPUS, FWSUPR	0.0261150	0.2490766
FPUS, DV74ON	-0.0106727	-0.0682753
FWSUPR, FWSUPR	0.1116875	1.0000000
FWSUPR, DV74ON	-0.0877111	-0.5267390
DV74ON, DV74ON	0.2482639	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.12.a & b. Coarse Grain Food and Residual Consumption - United States

United States
Per Capita Coarse Grain Food and Residual Consumption
(1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-107.81004	12.309028	-8.7586151	0.000
YEAR	2.5742390	0.1295610	19.868938	0.000
FPUS	-21.074819	6.4151844	-3.2851462	0.004
WPUS	11.360457	4.0937067	2.7751030	0.012
PCFES(-1)	0.0712349	0.0092907	7.6673612	0.000
DV84	20.078491	4.5046965	4.4572350	0.000

R-squared	0.974790	Mean of dependent var	85.21155
Adjusted R-squared	0.967788	S.D. of dependent var	20.47556
S.E. of regression	3.674904	Sum of squared resid	243.0885
Durbin-Watson stat	0.997290	F-statistic	139.2030
Log likelihood	-61.83899	TPE	4/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-3.24144	67.6793	70.9207
	1962	0.30516	67.1009	66.7957
	1963	2.84777	68.6166	65.7688
	1964	-0.79573	68.2579	69.0536
	1965	5.96272	70.3448	64.3821
	1966	5.06884	70.5688	65.4999
	1967	1.64223	71.4207	69.7784
	1968	-2.23422	72.5275	74.7617
	1969	-0.08173	73.4508	73.5325
	1970	-4.56442	70.8851	75.4496
	1971	-5.31851	71.9445	77.2630
	1972	-2.33174	75.8790	78.2107
	1973	-2.57065	77.4291	79.9997
	1974	0.85110	75.4080	74.5569
	1975	5.04900	83.8172	78.7682
	1976	0.56549	81.7648	81.1993
	1977	-2.95926	85.5022	88.4614
	1978	-3.01870	93.4139	96.4326
	1979	-4.08974	99.2358	103.326
	1980	-0.59280	104.747	105.340
	1981	3.97372	112.225	108.252
	1982	3.49326	120.546	117.053
	1983	2.03964	126.964	124.924
	1984	7.5D-15	135.347	135.347

INDEPENDENT VARIABLES

YEAR = 1960=60, 1961=61, ...

FPUS = Real U.S. Coarse Grain Price ($/MT)
WP/CPIUS

WPUS = Real U.S. Wheat Price ($/MT)
WP/CPIUS

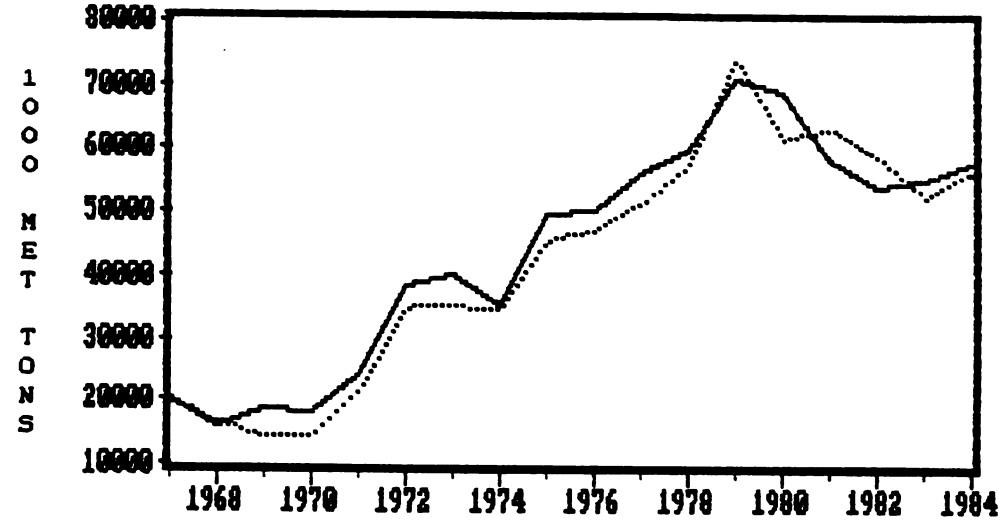
PCFES = Per Capita Coarse Grain Ending Stocks (1000 MT)
FESUS/POPUS

DV84 = 1 If(YEAR .EQ. 84)
0 Otherwise

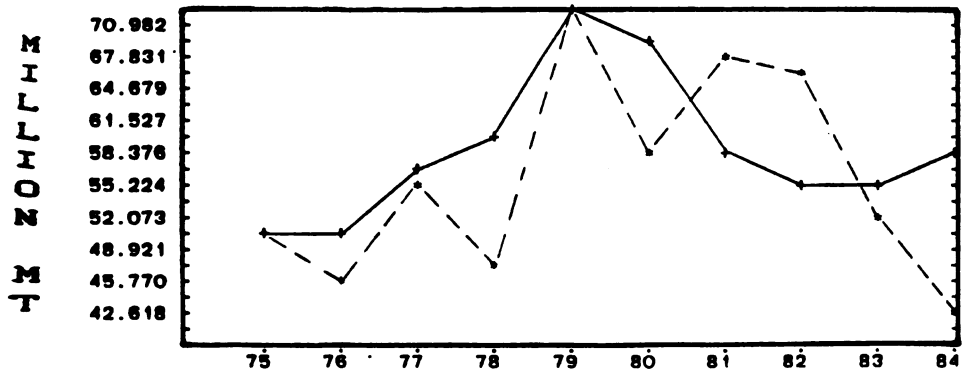
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFOD	85.211548	20.475556	135.34730	67.100890
YEAR	72.500000	7.0710678	84.000000	61.000000
FPUS	1.4158963	0.3202990	2.2714290	0.9199048
WPUS	1.7324270	0.4711303	3.2857140	1.1973030
PCFES(-1)	220.55555	97.312941	426.51100	71.601590
DV84	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
PCFFOD, PCFFOD	401.77973	1.0000000
PCFFOD, YEAR	123.53768	0.8903528
PCFFOD, FPUS	-2.6093835	-0.4151739
PCFFOD, WPUS	-1.6276090	-0.1760584
PCFFOD, PCFES(-1)	-67.524958	-0.0353624
PCFFOD, DV84	2.0889899	0.5215424
YEAR, YEAR	47.916667	1.0000000
YEAR, FPUS	-0.4025719	-0.1854754
YEAR, WPUS	-0.0223633	-0.0070048
YEAR, PCFES(-1)	-247.94425	-0.3759948
YEAR, DV84	0.4791667	0.3464102
FPUS, FPUS	0.0983168	1.0000000
FPUS, WPUS	0.1290137	0.8921187
FPUS, PCFES(-1)	-7.7457089	-0.2593095
FPUS, DV84	-0.0206663	-0.3298348
WPUS, WPUS	0.2127153	1.0000000
WPUS, PCFES(-1)	-14.679051	-0.3340948
WPUS, DV84	-0.0110557	-0.1199594
PCFES(-1), PCFES(-1)	9075.2331	1.0000000
PCFES(-1), DV84	-3.5963520	-0.1889212
DV84, DV84	0.0399306	1.0000000



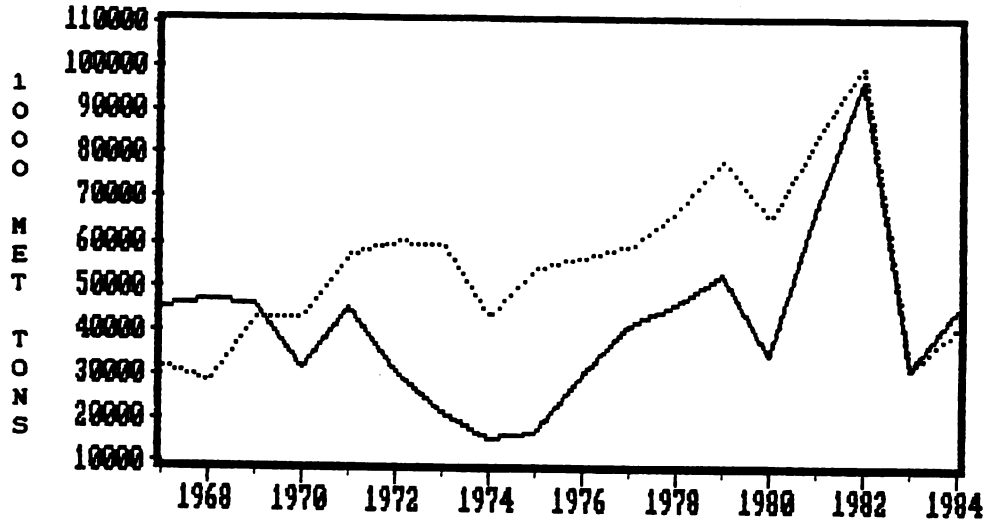
REGIONAL MODEL SIMULATION



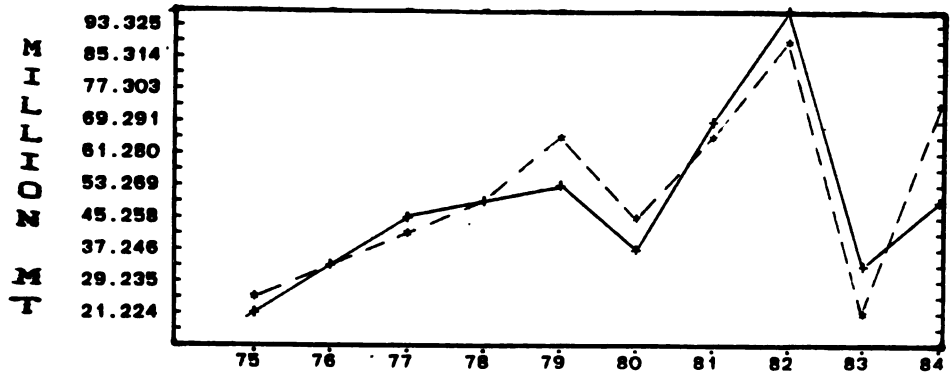
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.13.a & b. Coarse Grain Net Exports - United States



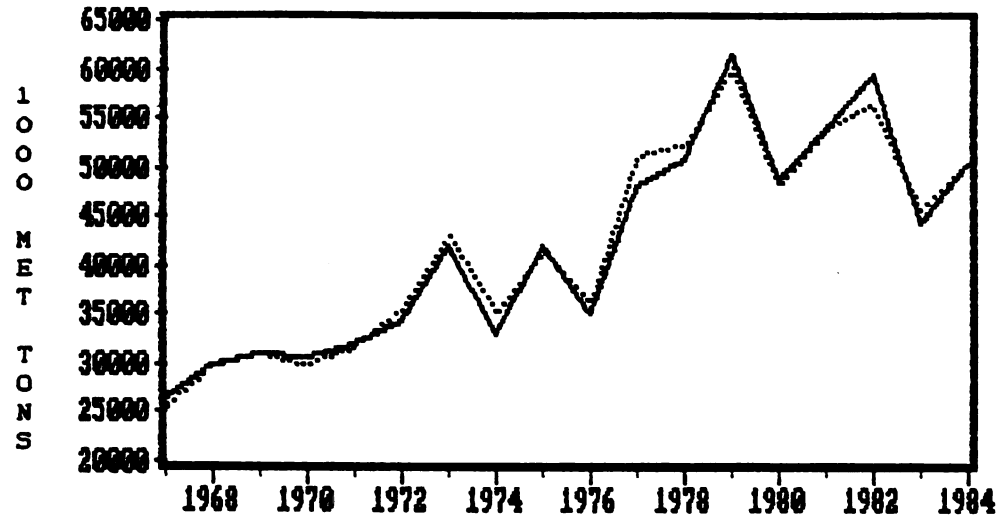
REGIONAL MODEL SIMULATION



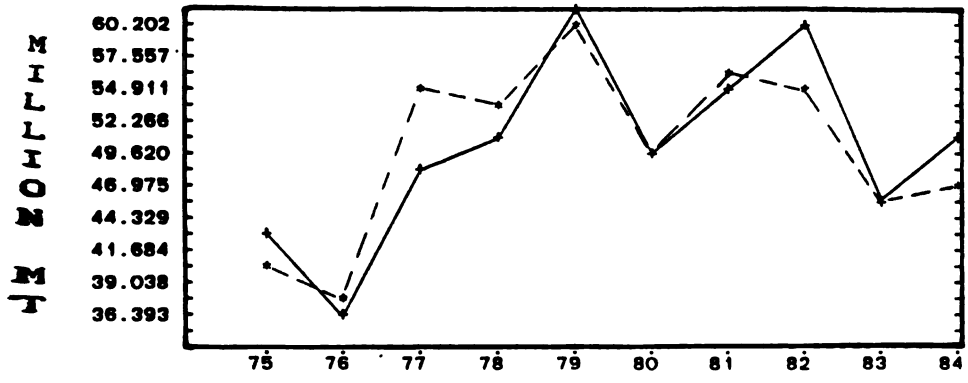
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.14.a & b. Coarse Grain Ending Stocks - United States



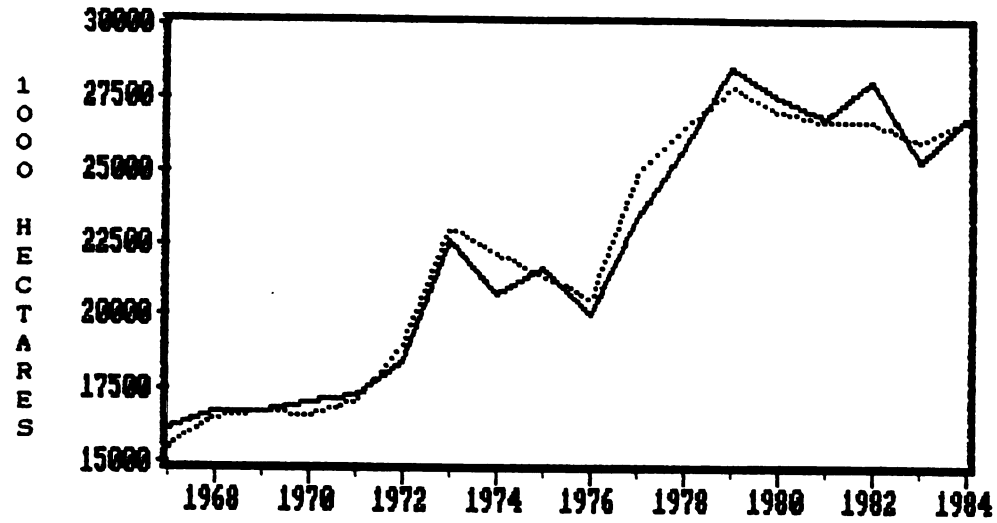
REGIONAL MODEL SIMULATION



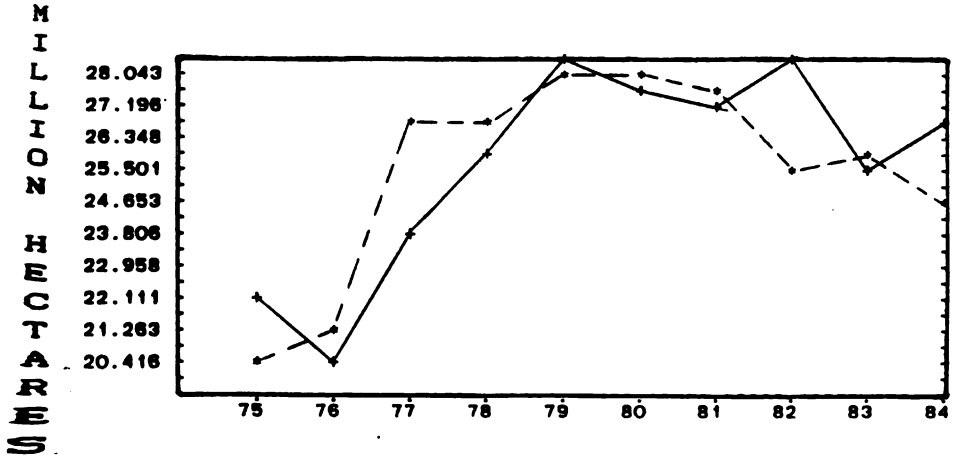
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.15.a & b. Soybean Production - United States



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.16.a & b. Soybean Harvested Area - United States

United States
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is SHAUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-12606.843	6583.7903	-1.9148306	0.075
SHAUS(-1)	0.7470792	0.1605477	4.6533164	0.000
FRUS4(-1)	-1195.7803	258.12424	-4.6325766	0.000
SRUS4(-1)	1416.9235	247.37556	5.7278234	0.000
YEAR	242.04820	127.89711	1.8925229	0.078

R-squared	0.971519	Mean of dependent var	21409.85
Adjusted R-squared	0.963924	S.D. of dependent var	4843.252
S.E. of regression	919.9106	Sum of squared resid	12693532
Durbin-Watson stat	2.796430	F-statistic	127.9169
Log likelihood	-161.9875	TPE	8/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	182.323	13941.0	13758.7
	1966	-137.978	14790.0	14928.0
	1967	609.765	16109.0	15499.2
	1968	-149.285	16751.0	16900.3
	1969	-184.597	16729.0	16913.6
	1970	535.228	17098.0	16562.8
	1971	-210.805	17282.0	17492.8
	1972	-626.421	18488.0	19114.4
	1973	-82.3857	22528.0	22610.4
	1974	-941.063	20777.0	21718.1
	1975	1358.70	21698.0	20339.3
	1976	-871.430	19992.0	20863.4
	1977	-1032.68	23403.0	24435.7
	1978	404.822	25764.0	25359.2
	1979	1225.56	28467.0	27241.4
	1980	-55.9873	27443.0	27499.0
	1981	-165.563	26776.0	26941.6
	1982	1387.57	28102.0	26714.4
	1983	-1747.11	25303.0	27050.1
	1984	501.341	26756.0	26254.7

INDEPENDENT VARIABLES

SHAUS = Soybean Harvested Area (HA)

SRUS4 = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPIUS

FRUS4 = Coarse Grain Revenue per Hectare ($/HA)
(FYUS(-3)+FYUS(-2)+FYUS(-1)+FYUS)/4*FP/CPIUS

YEAR = 1960=60, 1961=61, ...

SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SHAUS	21409.850	4843.2524	28467.000	13941.000
SHAUS(-1)	20695.150	5062.5122	28467.000	12462.000
FRUS4(-1)	6.1415469	1.5932672	9.8191310	4.3012970
SRUS4(-1)	5.5522601	1.4551626	8.6468180	3.9462270
YEAR	74.500000	5.9160798	84.000000	65.000000

	Covariance	Correlation
SHAUS, SHAUS	22284239.	1.0000000
SHAUS, SHAUS(-1)	21882702.	0.9394511
SHAUS, FRUS4(-1)	3194.6395	0.4357853
SHAUS, SRUS4(-1)	2039.3668	0.3045952
SHAUS, YEAR	25746.575	0.9458554
SHAUS(-1), SHAUS(-1)	24347578.	1.0000000
SHAUS(-1), FRUS4(-1)	3744.4111	0.4886582
SHAUS(-1), SRUS4(-1)	1121.6683	0.1602741
SHAUS(-1), YEAR	27190.075	0.9556232
FRUS4(-1), FRUS4(-1)	2.4115753	1.0000000
FRUS4(-1), SRUS4(-1)	1.6604975	0.7539013
FRUS4(-1), YEAR	3.8347083	0.4282389
SRUS4(-1), SRUS4(-1)	2.0116234	1.0000000
SRUS4(-1), YEAR	1.3909026	0.1700699
YEAR, YEAR	33.250000	1.0000000

United States
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is SYUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.6562315	1.5042378	-2.4306207	0.025
LOGT	1.2778286	0.3497022	3.6540485	0.002

R-squared	0.412711	Mean of dependent var	1.839322
Adjusted R-squared	0.381802	S.D. of dependent var	0.167568
S.E. of regression	0.131751	Sum of squared resid	0.329809
Durbin-Watson stat	2.330071	F-statistic	13.35207
Log likelihood	13.81682		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
| * : | :	1964	-0.12738	1.53073	1.65811
| : * | :	1965	-0.02711	1.65081	1.67792
| : |* :	1966	0.01109	1.70852	1.69743
| : * | :	1967	-0.06695	1.64970	1.71665
| : | * :	1968	0.06294	1.79852	1.73558
| : | * :	1969	0.08921	1.84345	1.75423
| : |* :	1970	0.02145	1.79407	1.77262
| : | * :	1971	0.06141	1.85216	1.79074
| : | * :	1972	0.06184	1.87046	1.80861
| : | * :	1973	0.04334	1.86959	1.82624
* : | :	1974	-0.25042	1.59320	1.84363
| : | * :	1975	0.08129	1.94207	1.86078
| :* | :	1976	-0.12350	1.75420	1.87770
| : | : *	1977	0.16076	2.05516	1.89441
| : | * :	1978	0.06314	1.97403	1.91090
| : | : *	1979	0.23410	2.16127	1.92717
* : | :	1980	-0.16061	1.78264	1.94325
| : | * :	1981	0.06265	2.02177	1.95912
| : | :*	1982	0.14640	2.12120	1.97480
* : | :	1983	-0.23089	1.75940	1.99029
| :* | :	1984	-0.11278	1.89281	2.00559

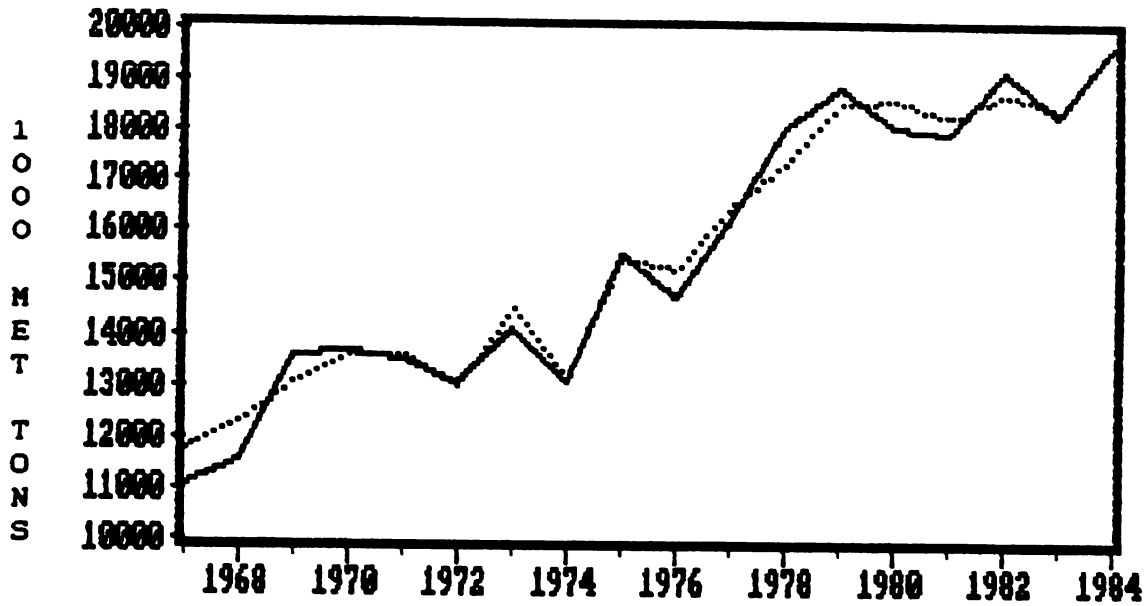
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

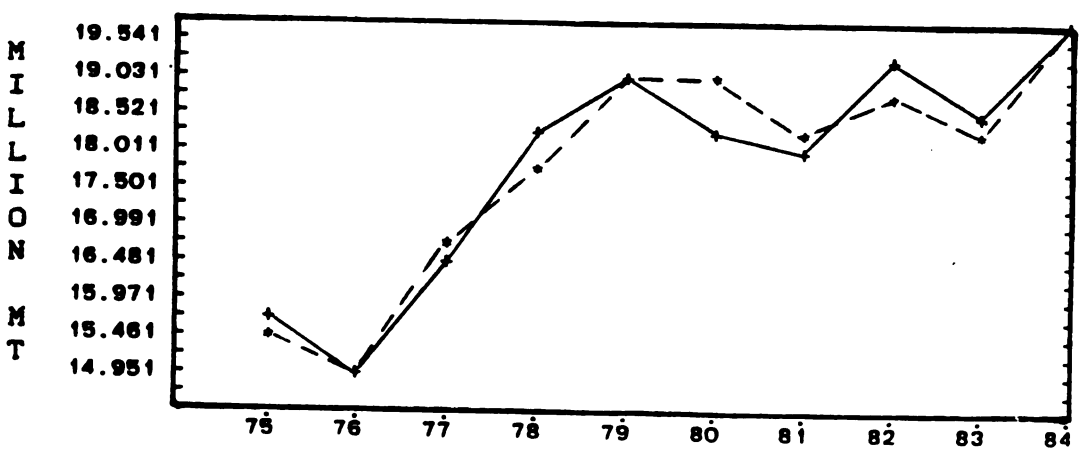
SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SYUS	1.8393221	0.1675677	2.1612740	1.5307330
LOGT	4.3006970	0.0842444	4.4308170	4.1588830

	Covariance	Correlation
SYUS, SYUS	0.0267418	1.0000000
SYUS, LOGT	0.0086370	0.6424262
LOGT, LOGT	0.0067592	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.17.a & b. Soymeal Equivalent Consumption - United States

United States
Per Capita Soymeal Equivalent Consumption* (1000 MT)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is PTSMCO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-40.746312	8.2516378	-4.9379666	0.000
PCRGDP(-1)	0.7299648	0.1504002	4.8534840	0.000
SMPUS	-1.6490650	0.9159329	-1.8004212	0.093
DV74	-12.067977	3.1105040	-3.8797498	0.002
YEAR	0.5208485	0.2350253	2.2161382	0.044
FPUS	-2.0004655	2.5629014	-0.7805472	0.448

R-squared	0.959463	Mean of dependent var	69.51298
Adjusted R-squared	0.944986	S.D. of dependent var	10.10168
S.E. of regression	2.369357	Sum of squared resid	78.59396
Durbin-Watson stat	1.851897	F-statistic	66.27320
Log likelihood	-42.06440	TPE	0/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	3.07657	53.3322	50.2556
	1966	0.63608	55.1194	54.4833
	1967	-3.29965	55.7273	59.0269
	1968	-3.74077	57.3037	61.0445
	1969	2.99718	67.1663	64.1691
	1970	0.95882	66.7770	65.9182
	1971	-0.14179	65.0825	65.2243
	1972	0.66539	62.3586	61.6932
	1973	-1.78921	66.4796	68.2688
	1974	-1.1D-14	61.1247	61.1247
	1975	0.87878	72.2238	71.3450
	1976	-2.40736	67.5485	69.9559
	1977	-0.76255	73.9854	74.7480
	1978	3.36704	81.3534	77.9864
	1979	1.56407	83.8059	82.2418
	1980	-2.04010	79.5098	81.5499
	1981	-1.33498	77.9221	79.2570
	1982	1.86616	82.3576	80.4914
	1983	-0.30116	78.0113	78.3125
	1984	-0.09254	83.0706	83.1631

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPUS/CPIUS/POPUS

SMPUS = Real U.S. Soymeal Price ($/MT)
SMP/CPIUS

DV74 = 1 If(YEAR .EQ. 74)
0 Otherwise

YEAR = 1960=60, 1961=61, ...

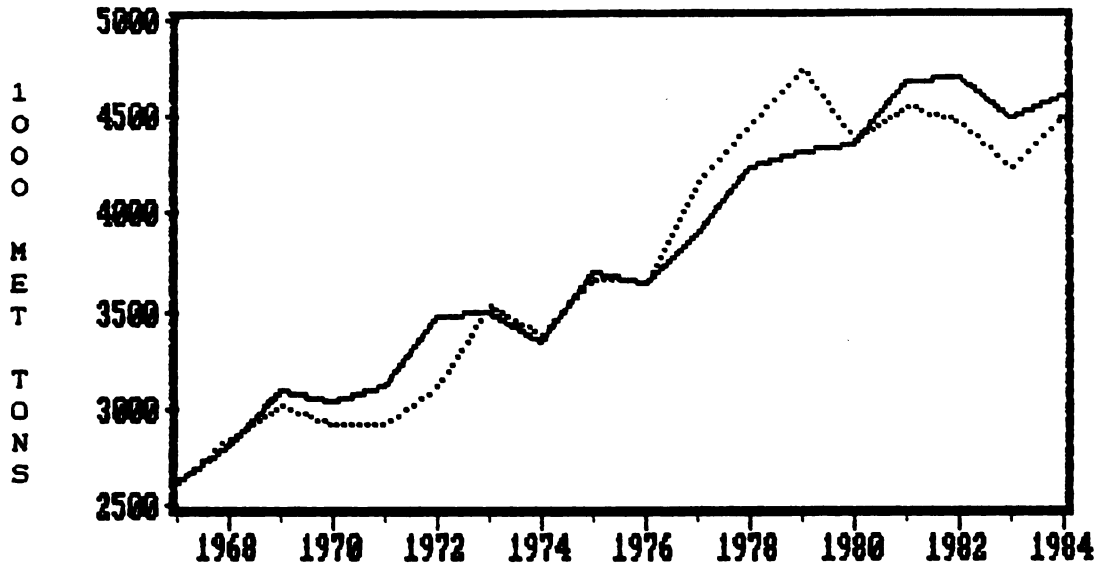
SMPUS = Real U.S. Soymeal Price ($/MT)
SMP/CPIUS

*** Soymeal Equivalent Consumption = (SESUS(-1) + SPROUS - SNEUS - SESUS)*.795 + SMESUS(-1) - SMNEUS - SMESUS**

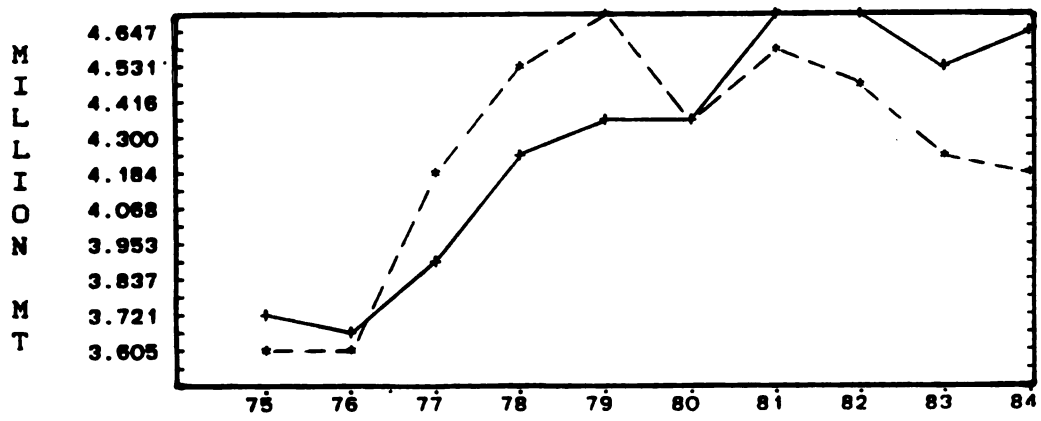
SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMCO	69.512979	10.101678	83.805870	53.332170
PCRGDP(-1)	107.85346	9.0727715	121.06670	87.636090
SMPUS	2.3320899	0.7763454	4.9688980	1.1023000
DV74	0.0500000	0.2236068	1.0000000	0.0000000
YEAR	74.500000	5.9160798	84.000000	65.000000
FPUS	1.4116625	0.3515628	2.2714290	0.9278351

	Covariance	Correlation
PTSMCO,PTSMCO	96.941712	1.0000000
PTSMCO,PCRGDP(-1)	75.957532	0.8723961
PTSMCO,SMPUS	-1.9347699	-0.2596912
PTSMCO,DV74	-0.4194159	-0.1954532
PTSMCO,YEAR	52.426501	0.9234209
PTSMCO,FPUS	-1.0034496	-0.2974237
PCRGDP(-1),PCRGDP(-1)	78.199424	1.0000000
PCRGDP(-1),SMPUS	-0.2355661	-0.0352042
PCRGDP(-1),DV74	0.3436519	0.1783077
PCRGDP(-1),YEAR	44.367445	0.8700953
PCRGDP(-1),FPUS	0.2375894	0.0784080
SMPUS,SMPUS	0.5725766	1.0000000
SMPUS,DV74	0.0040058	0.0242902
SMPUS,YEAR	-0.9200083	-0.2108527
SMPUS,FPUS	0.1455019	0.5611604
DV74,DV74	0.0475000	1.0000000
DV74,YEAR	-0.0250000	-0.0198929
DV74,FPUS	0.0386978	0.5181734
YEAR,YEAR	33.250000	1.0000000
YEAR,FPUS	-0.4512773	-0.2283931
FPUS,FPUS	0.1174166	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.18.a & b. Soyoil Equivalent Consumption - United States

United States
Per Capita Soyoil Equivalent Consumption* (1000 MT)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is PTSOCO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2.7307379	2.6225554	-1.0412508	0.312
PCRGDP	0.1084396	0.0311511	3.4810897	0.003
PCDSOS	0.1976254	0.0282496	6.9956935	0.000

R-squared	0.945675	Mean of dependent var	16.63013
Adjusted R-squared	0.939284	S.D. of dependent var	2.635975
S.E. of regression	0.649520	Sum of squared resid	7.171893
Durbin-Watson stat	1.423481	F-statistic	147.9665
Log likelihood	-18.12314	TPE	2/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	0.23949	11.8971	11.6576
	1966	-0.55208	12.0509	12.6030
	1967	-0.16985	13.1148	13.2847
	1968	-0.60782	13.9701	14.5780
	1969	-0.22145	15.2780	15.4995
	1970	-0.01119	14.7881	14.7993
	1971	0.20327	14.9481	14.7448
	1972	0.92796	16.5074	15.5794
	1973	-0.56631	16.5008	17.0671
	1974	-0.05326	15.6472	15.7004
	1975	0.30279	17.1516	16.8488
	1976	0.08361	16.7043	16.6207
	1977	-0.59019	17.6622	18.2524
	1978	-0.26676	19.0084	19.2751
	1979	-1.60350	19.1538	20.7573
	1980	0.12935	19.1010	18.9716
	1981	0.53227	20.3118	19.7795
	1982	0.59494	20.2347	19.6397
	1983	0.99675	19.1491	18.1523
	1984	0.63199	19.4233	18.7913

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPUS/CPIUS/POPUS

PCDSOS = Per Capita Supply of Soyoil Equivalent (1000 MT)
(SESUS(-1) + SPROUS)*.175 + SOESUS(-1)

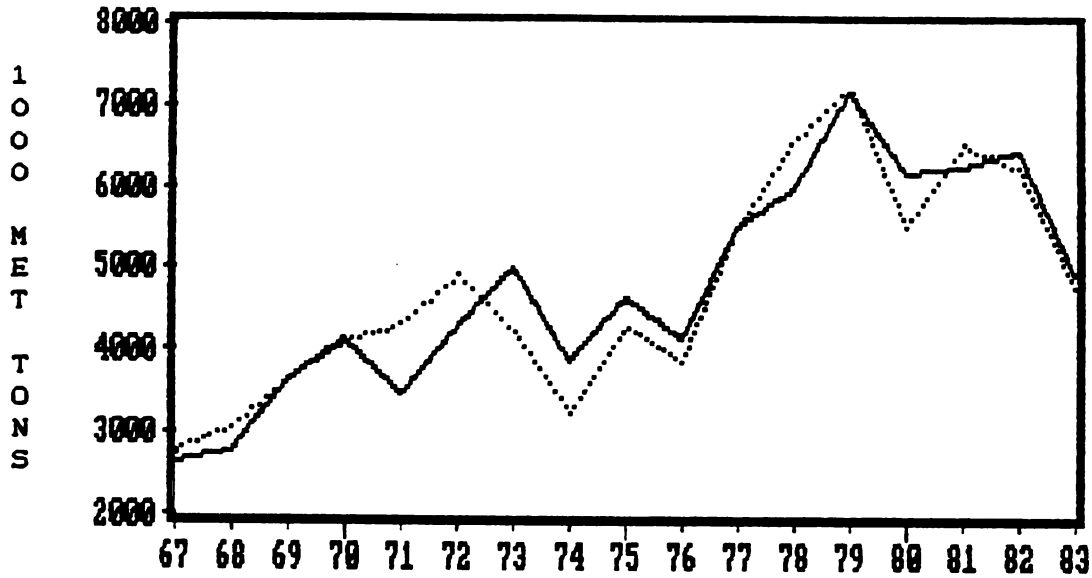
---

* Soyoil Equivalent Consumption = (SESUS(-1) + SPROUS - SNEUS - SESUS)*.175 + SOESUS(-1) - SONEUS - SOESUS

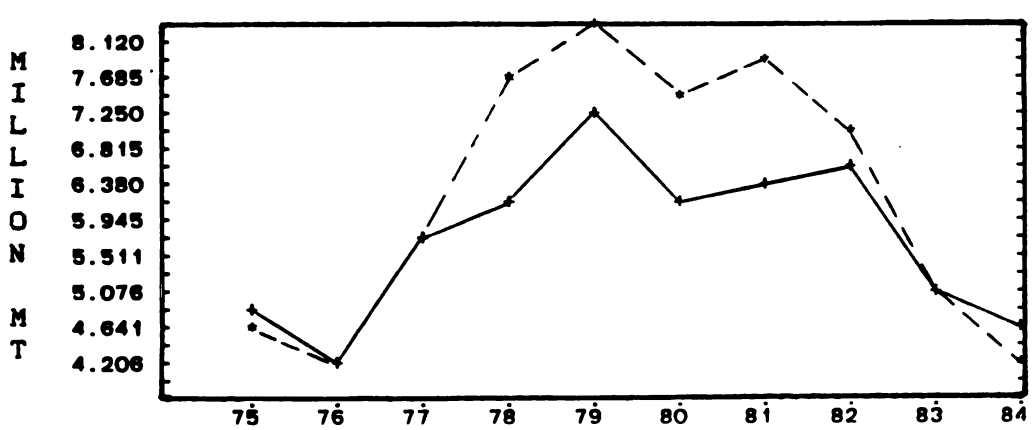
SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSOCO	16.630126	2.6359748	20.311790	11.897070
PCRGDP	109.53491	8.2032499	121.26510	92.316900
PCDSOS	37.864238	9.0457938	53.120060	22.150540

	Covariance	Correlation
PTSOCO,PTSOCO	6.6009448	1.0000000
PTSOCO,PCRGDP	18.250201	0.8884170
PTSOCO,PCDSOS	21.572652	0.9523399
PCRGDP,PCRGDP	63.928643	1.0000000
PCRGDP,PCDSOS	57.268952	0.8123871
PCDSOS,PCDSOS	77.735067	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.19.a & b. Soymeal Net Exports - United States

United States
Soymeal Net Exports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SMNEUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	184.63417	337.29260	0.5474006	0.591
SMRES	1.0154612	0.0802083	12.660306	0.000
DV79	1222.2217	489.07030	2.4990717	0.023

R-squared	0.921601	Mean of dependent var	4390.350
Adjusted R-squared	0.912378	S.D. of dependent var	1546.155
S.E. of regression	457.6777	Sum of squared resid	3560971.
Durbin-Watson stat	1.479618	F-statistic	99.92019
Log likelihood	-149.2769	TPE	3/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-210.145	1847.00	2057.14
	1965	-135.824	2360.00	2495.82
	1966	-318.364	2410.00	2728.36
	1967	-123.751	2630.00	2753.75
	1968	-286.235	2762.00	3048.23
	1969	33.9525	3661.00	3627.05
	1970	45.9022	4136.00	4090.10
	1971	-848.298	3452.00	4300.30
	1972	-592.374	4304.00	4896.37
	1973	818.000	5033.00	4215.00
	1974	673.044	3900.00	3226.96
	1975	391.073	4667.00	4275.93
	1976	289.613	4136.00	3846.39
	1977	-3.86713	5516.00	5519.87
	1978	-564.730	5997.00	6561.73
	1979	1.9D-13	7196.00	7196.00
	1980	640.226	6154.00	5513.77
	1981	-222.617	6266.00	6488.62
	1982	244.712	6449.00	6204.29
	1983	169.682	4931.00	4761.32

INDEPENDENT VARIABLES

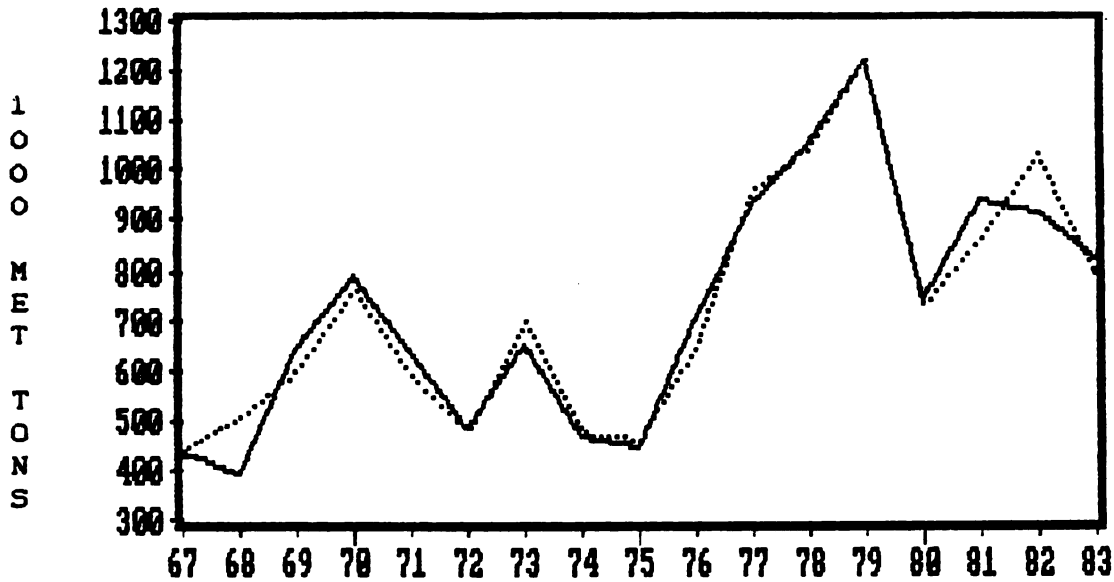
SMRES = Residual Pool of Soymeal Import Demand (1000 MT)
SMNIDM + SMNISB + SMNILD + SMNILO +SMNINI - SMNECH
- SMNEAR - SMNEBR

DV79 = 1 If(YEAR .EQ. 79)
0 Otherwise

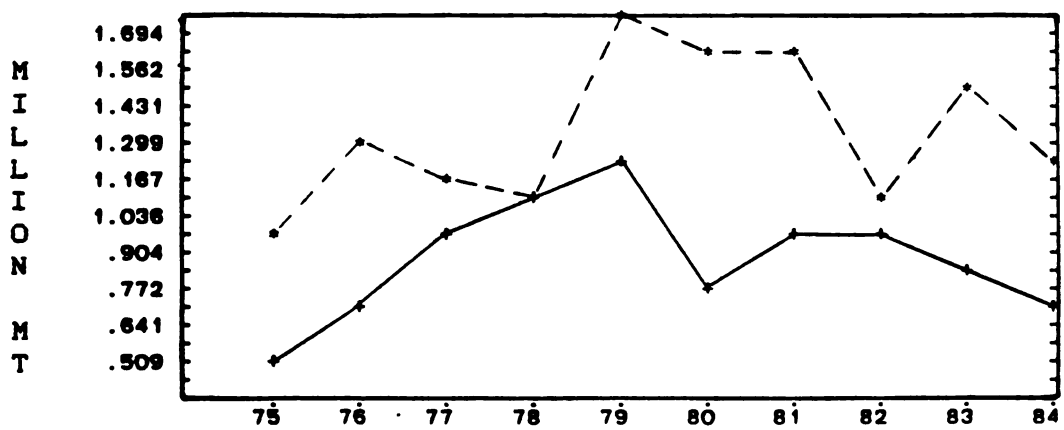
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SMNEUS	4390.3500	1546.1551	7196.0000	1847.0000
SMRES	4081.5000	1363.4436	6280.0000	1844.0000
DV79	0.0500000	0.2236068	1.0000000	0.0000000

	Covariance	Correlation
SMNEUS, SMNEUS	2271065.8	1.0000000
SMNEUS, SMRES	1892303.7	0.9448808
SMNEUS, DV79	140.28250	0.4271121
SMRES, SMRES	1766029.4	1.0000000
SMRES, DV79	80.975000	0.2795794
DV79, DV79	0.0475000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.20.a & b. Soyoil Net Exports - United States

United States
Soyoil Net Exports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SONEUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	172.51954	33.581903	5.1372771	0.000
SORES	0.8510873	0.0543227	15.667258	0.000
DV79	398.95194	56.079436	7.1140505	0.000

R-squared	0.953408	Mean of dependent var	689.8000
Adjusted R-squared	0.947926	S.D. of dependent var	235.5651
S.E. of regression	53.75524	Sum of squared resid	49123.64
Durbin-Watson stat	2.695767	F-statistic	173.9332
Log likelihood	-106.4424	TPE	3/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-5.38276	608.000	613.383
	1965	-70.9751	419.000	489.975
	1966	22.7064	488.000	465.294
	1967	4.04775	437.000	432.952
	1968	-104.337	395.000	499.337
	1969	49.3412	644.000	594.659
	1970	33.6346	790.000	756.365
	1971	49.5542	634.000	584.446
	1972	11.0466	484.000	472.953
	1973	-39.8317	651.000	690.832
	1974	-3.54901	466.000	469.549
	1975	-15.4849	443.000	458.485
	1976	58.8292	702.000	643.171
	1977	-22.5199	933.000	955.520
	1978	16.6692	1059.00	1042.33
	1979	-1.2D-14	1220.00	1220.00
	1980	10.8694	740.000	729.131
	1981	83.5041	942.000	858.496
	1982	-110.713	918.000	1028.71
	1983	32.5911	823.000	790.409

INDEPENDENT VARIABLES

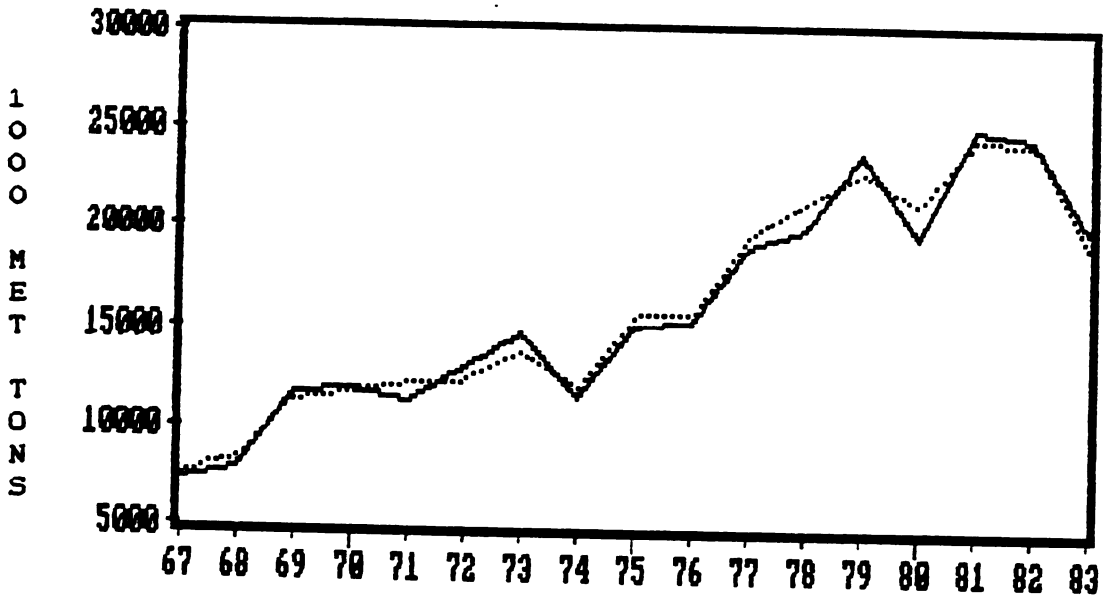
SORES = Residual Pool of Soyoil Import Demand (1000 MT)
SONIDM + SONISB + SONILD + SONILO +SONINI - SONECH
- SONEAR - SONEBR

DV79 = 1 If(YEAR .EQ. 79)
0 Otherwise

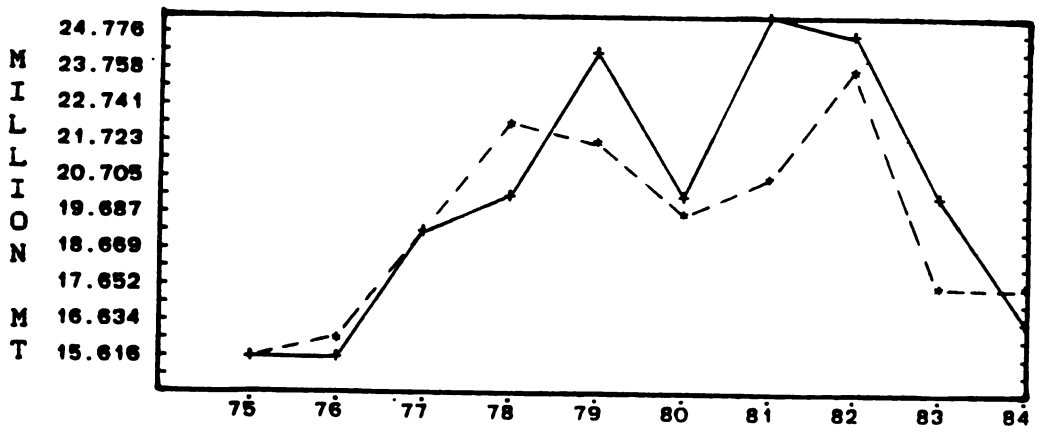
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SONEUS	689.80000	235.56508	1220.0000	395.00000
SORES	584.35000	230.83812	1022.0000	306.00000
DV79	0.0500000	0.2236068	1.0000000	0.0000000

	Covariance	Correlation
SONEUS, SONEUS	52716.360	1.0000000
SONEUS, SORES	46627.370	0.9026074
SONEUS, DV79	26.510000	0.5297735
SORES, SORES	50621.927	1.0000000
SORES, DV79	8.8825000	0.1811420
DV79, DV79	0.0475000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.21.a & b. Soybean Net Exports - United States

United States
Soybean Net Exports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SNEUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	149.90211	439.79767	0.3408433	0.737
SRES	0.9971234	0.0279889	35.625658	0.000

R-squared	0.986016	Mean of dependent var	14605.00
Adjusted R-squared	0.985239	S.D. of dependent var	6245.599
S.E. of regression	758.8047	Sum of squared resid	10364121
Durbin-Watson stat	2.386992	F-statistic	1269.188
Log likelihood	-159.9601	TPE	1/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	131.942	5774.00	5642.06
	1965	208.739	6820.00	6611.26
	1966	103.904	7119.00	7015.10
	1967	-189.857	7255.00	7444.86
	1968	-505.360	7805.00	8310.36
	1969	511.155	11773.0	11261.8
	1970	245.018	11806.0	11561.0
	1971	-790.328	11344.0	12134.3
	1972	786.040	13048.0	12262.0
	1973	1036.01	14673.0	13637.0
	1974	-565.670	11450.0	12015.7
	1975	-396.608	15107.0	15503.6
	1976	-282.234	15351.0	15633.2
	1977	-618.560	19061.0	19679.6
	1978	-1161.95	20117.0	21278.9
	1979	1020.44	23818.0	22797.6
	1980	-1561.96	19712.0	21274.0
	1981	640.763	25285.0	24644.2
	1982	363.684	24634.0	24270.3
	1983	1024.83	20148.0	19123.2

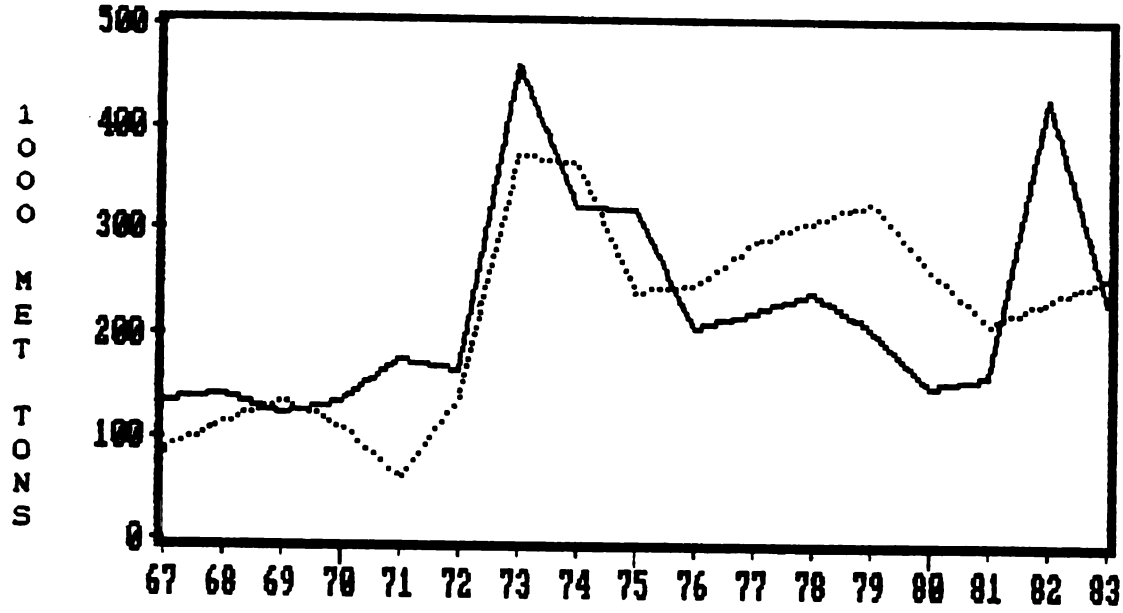
INDEPENDENT VARIABLES

SRES = Residual Pool of Soybean Import Demand (1000 MT)
SNIDM + SNISB + SNILD + SNILO + SNINI - SNECH - SNEAR - SNEBR

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SNEUS	14605.000	6245.5990	25285.000	5774.0000
SRES	14496.800	6219.6679	24565.000	5508.0000

	Covariance	Correlation
SNEUS,SNEUS	37057132.	1.0000000
SNEUS,SRES	36644338.	0.9929834
SRES,SRES	36750055.	1.0000000



REGIONAL MODEL SIMULATION

EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.22.a & b. Soymeal Ending Stocks - United States

United States
Soymeal Ending Stocks (1000 MT)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is SMESUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-536.05241	240.41563	-2.2296904	0.040
SOPUS	27.518746	7.6368906	3.6033967	0.002
SMEES	0.0144446	0.0097126	1.4871978	0.156
YEAR	6.9440412	3.4740301	1.9988431	0.063

R-squared	0.592178	Mean of dependent var	220.7000
Adjusted R-squared	0.515712	S.D. of dependent var	103.9307
S.E. of regression	72.32624	Sum of squared resid	83697.35
Durbin-Watson stat	2.035682	F-statistic	7.744273
Log likelihood	-111.7711	TPE	7/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	3.44589	119.000	115.554
	1966	16.8740	125.000	108.126
	1967	22.8794	132.000	109.121
	1968	-19.2444	142.000	161.244
	1969	-45.3834	124.000	169.383
	1970	-16.0763	132.000	148.076
	1971	53.3814	174.000	120.619
	1972	-15.6445	166.000	181.644
	1973	78.4862	460.000	381.514
	1974	-29.6109	325.000	354.611
	1975	85.9882	322.000	236.012
	1976	-31.0837	207.000	238.084
	1977	-34.0300	220.000	254.030
	1978	-31.1579	242.000	273.158
	1979	-90.5291	205.000	295.529
	1980	-110.404	148.000	258.404
	1981	-53.1700	159.000	212.170
	1982	179.715	430.000	250.285
	1983	-23.6136	231.000	254.614
	1984	59.1776	351.000	291.822

INDEPENDENT VARIABLES

SOPUS = Real U.S. Soyoil Price ($/MT)
SOP/CPIUS

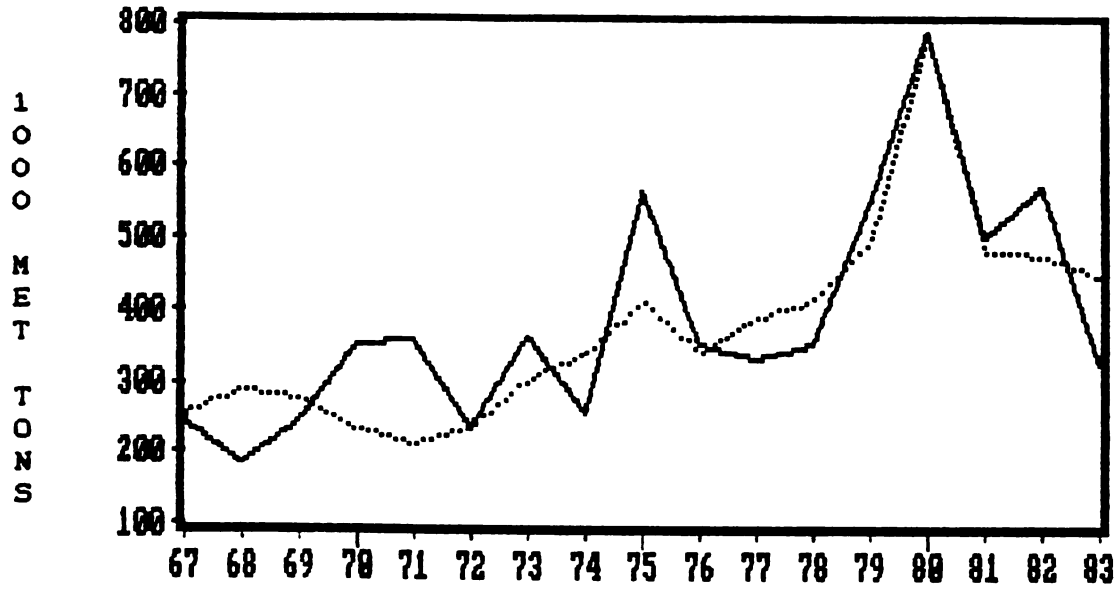
SMEES = Soymeal Equivalent Ending Stocks (1000 MT)
(SESUS(-1) + SPROUS - SNEUS)*.795 + SMESUS(-1) - SMCOUS - SMNEUS

YEAR = 1960=60, 1961=61, ...

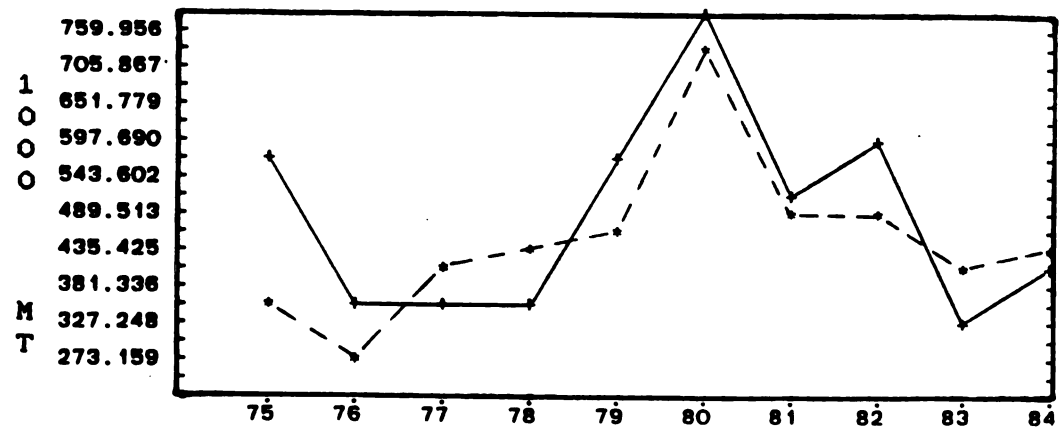
SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SMESUS	220.70000	103.93070	460.00000	119.00000
SOPUS	6.3839409	2.2816819	12.896290	3.7822460
SMEES	4412.9434	2201.0129	7998.0200	867.15050
YEAR	74.500000	5.9160798	84.000000	65.000000

	Covariance	Correlation
SMESUS, SMESUS	10261.510	1.0000000
SMESUS, SOPUS	105.42070	0.4679542
SMESUS, SMEES	77957.255	0.3587290
SMESUS, YEAR	295.15000	0.5052907
SOPUS, SOPUS	4.9457687	1.0000000
SOPUS, SMEES	-1414.7264	-0.2965317
SOPUS, YEAR	-1.4754326	-0.1150553
SMEES, SMEES	4602235.1	1.0000000
SMEES, YEAR	7259.6352	0.5868601
YEAR, YEAR	33.250000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure A.23.a & b. Soyoil Ending Stocks - United States

United States
Soyoil Ending Stocks (1000 MT)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is SOESUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-379.80715	278.55303	-1.3635003	0.192
SOEES	0.0963029	0.0448906	2.1452778	0.048
YEAR	8.2296817	4.1615003	1.9775757	0.065
DV80	289.07152	92.313018	3.1314275	0.006

R-squared	0.752363	Mean of dependent var	372.8000
Adjusted R-squared	0.705931	S.D. of dependent var	152.2113
S.E. of regression	82.54136	Sum of squared resid	109009.2
Durbin-Watson stat	1.842344	F-statistic	16.20355
Log likelihood	-114.4133	TPE	7/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
| : : | * : :	1965	18.3069	210.000	191.693
| : : | * : :	1966	39.3060	270.000	230.694
| : * | : :	1967	-26.4693	245.000	271.469
| * : | : :	1968	-159.824	188.000	347.824
| :* | : :	1969	-71.1468	246.000	317.147
| : | :* :	1970	74.7226	350.000	275.277
| : | * :	1971	84.2177	356.000	271.782
| : * | : :	1972	-28.6171	234.000	262.617
| : | * : :	1973	26.0555	360.000	333.944
| * | : :	1974	-85.9545	254.000	339.954
| : | : : *	1975	162.635	567.000	404.365
| : | * : :	1976	23.4402	350.000	326.560
| : * | : :	1977	-28.6719	331.000	359.672
| : * | : :	1978	-24.5470	352.000	376.547
| : | : * :	1979	61.3741	549.000	487.626
| : * | : :	1980	0.00000	787.000	787.000
| : | * : :	1981	48.3275	500.000	451.673
| : | : * :	1982	63.8238	572.000	508.176
| * | : :	1983	-88.3385	327.000	415.339
| * | : :	1984	-88.6405	408.000	496.641

INDEPENDENT VARIABLES

SOEES = Soyoil Equivalent Ending Stocks (1000 MT)
(SESUS(-1) + SPROUS - SNEUS)*.175 + SOCOUS(-1) - SOCOUS - SONEUS

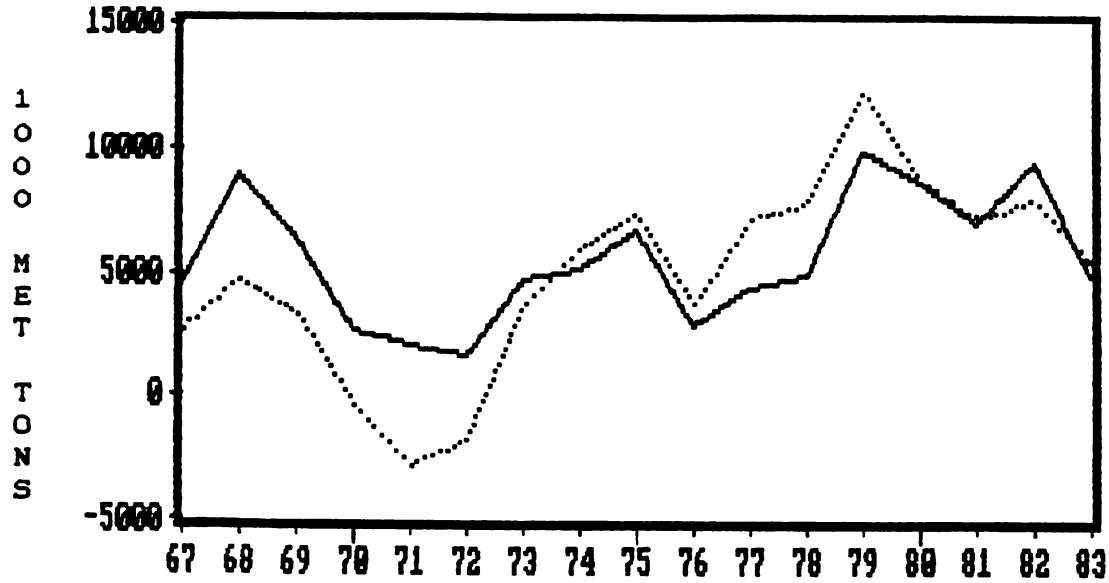
YEAR = 1960=60, 1961=61, ...

DV80 = 1 If(YEAR .EQ. 80)
0 Otherwise

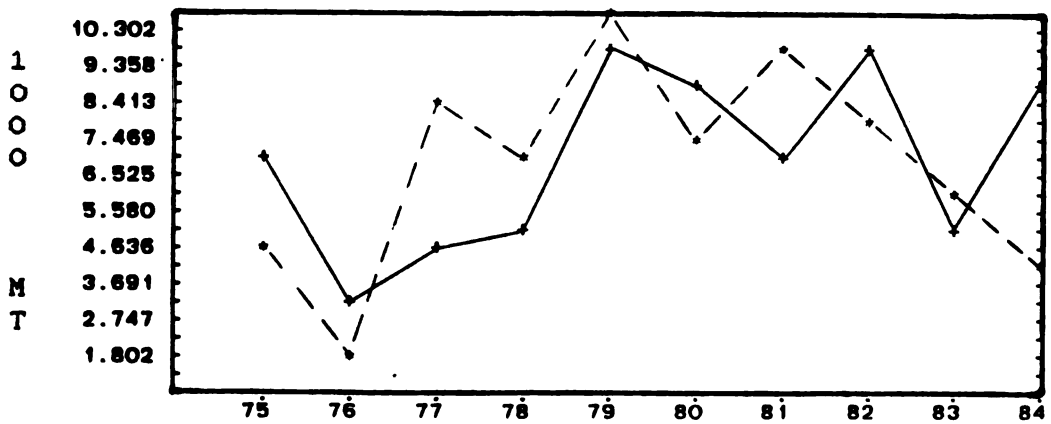
SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SOESUS	372.80000	152.21128	787.00000	188.00000
SOEES	1298.4273	582.68782	2277.8250	379.74920
YEAR	74.500000	5.9160798	84.000000	65.000000
DV80	0.0500000	0.2236068	1.0000000	0.0000000

	Covariance	Correlation
SOESUS, SOESUS	22009.860	1.0000000
SOESUS, SOEES	62413.548	0.7407514
SOESUS, YEAR	554.35000	0.6480068
SOESUS, DV80	20.710000	0.6405081
SOEES, SOEES	322548.84	1.0000000
SOEES, YEAR	2089.4331	0.6380209
SOEES, DV80	48.969881	0.3956257
YEAR, YEAR	33.250000	1.0000000
YEAR, DV80	0.2750000	0.2188215
DV80, DV80	0.0475000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure A.23.a & b. Soybean Ending Stocks - United States

APPENDIX B

EQUATION STATISTICS - ARGENTINA

Wheat

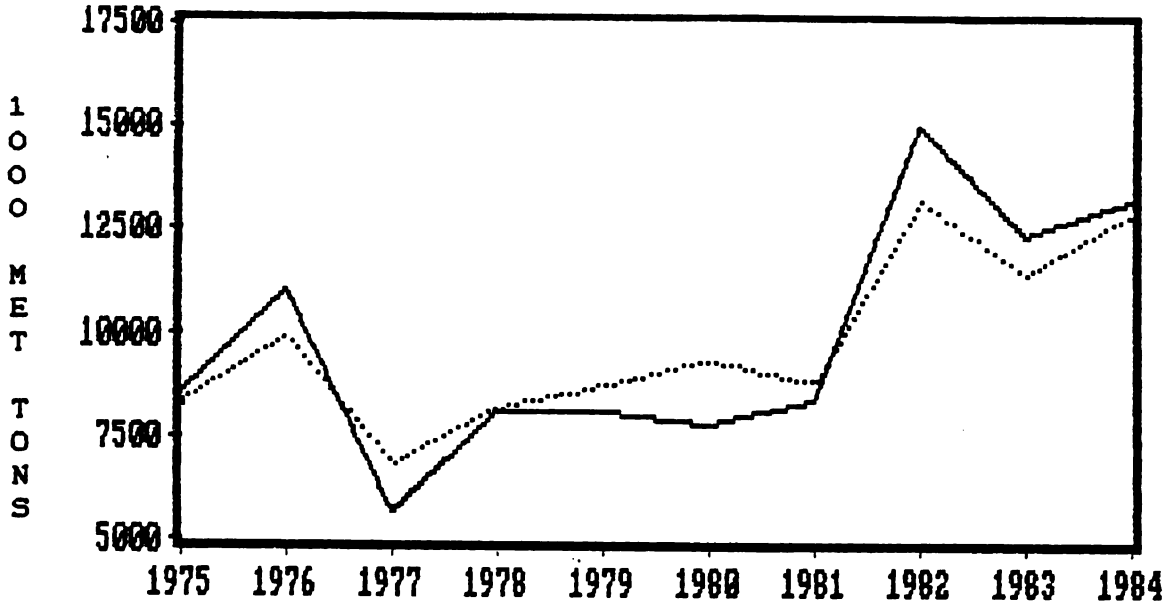
WPROAR.....Production
WHAAR.....Harvested Area
WYAR.....Yield
WCONAR.....Total Consumption
WFEDAR.....Feed Consumption
WFODAR.....Food & Residual Consumption
WNEAR.....Net Exports
WESAR.....Ending Stocks

Coarse Grain

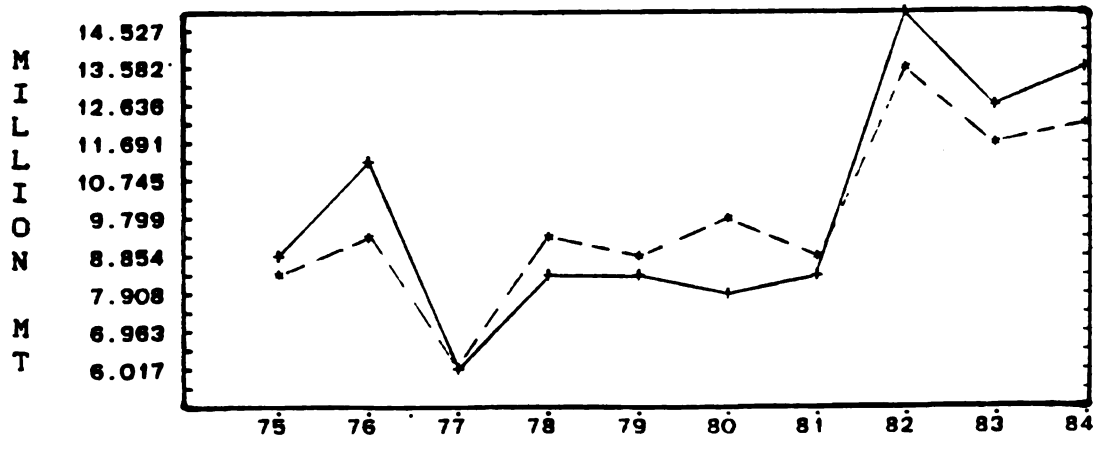
FPROAR.....Production
FHAAR.....Harvested Area
FYAR.....Yield
FCONAR.....Total Consumption
FFEDAR.....Feed Consumption
FFODAR.....Food & Residual Consumption
FNEAR.....Net Exports
FESAR.....Ending Stocks

Soybean Complex

SPROAR.....Production
SHAAR.....Harvested Area
SYAR.....Yield
SMCOAR.....Soymeal Equiv. Consumption
SOCOAR.....Soyoil Equiv. Consumption
SMESAR.....Soymeal Ending Stocks
SOESAR.....Soyoil Ending Stocks
SESAR.....Soybean Ending Stocks
SMEEAR.....Soymeal Equiv. Net Exports
SOEEAR.....Soyoil Equiv. Net Exports
PMELAR.....% SMEEAR Exported as SMNEAR
SMNEAR.....Soymeal Net Exports
SONEAR.....Soyoil Net Exports
SNEAR.....Soybean Net Exports



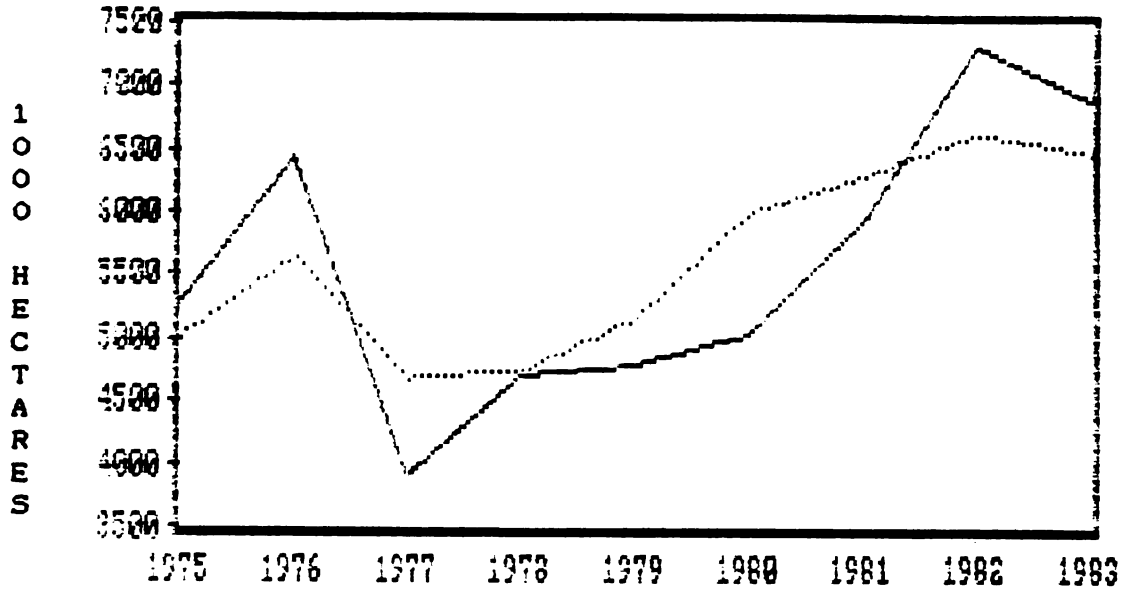
REGIONAL MODEL SIMULATION



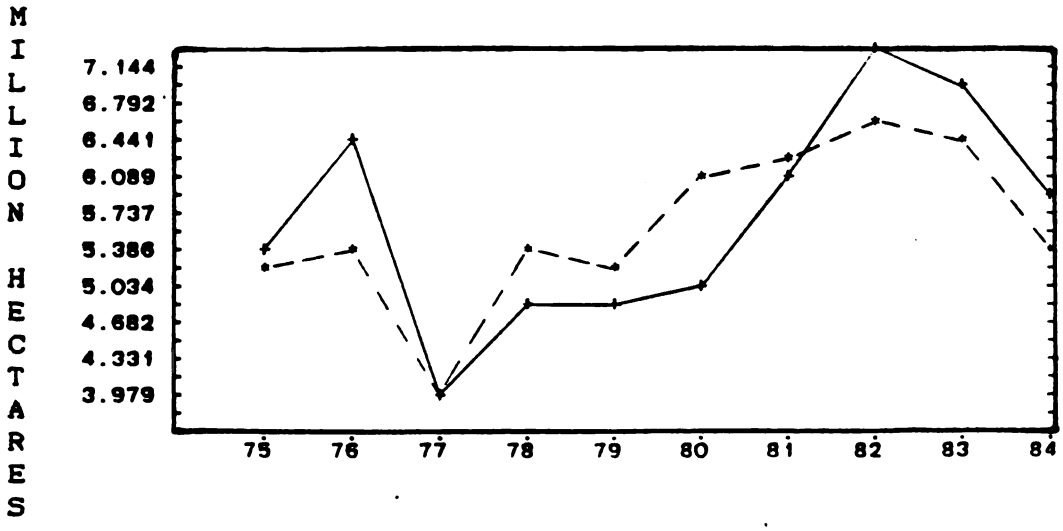
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.1.a & b. Wheat Production - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.2.a & b. Wheat Harvested Area - Argentina

Argentina
Wheat Harvested Area (1000 Hectares)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is WHAAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3646.1842	2257.3488	-1.6152506	0.127
WHAAR(-1)	0.3103960	0.1660468	1.8693283	0.081
SRAR (-1)	-1098.8887	313.93182	-3.5004058	0.003
WRAR(-1)	1679.3264	654.73634	2.5648895	0.022
TIME	102.55369	31.534859	3.2520739	0.005

R-squared	0.608313	Mean of dependent var	5197.050
Adjusted R-squared	0.503863	S.D. of dependent var	990.9997
S.E. of regression	698.0302	Sum of squared resid	7308691.
Durbin-Watson stat	2.034939	F-statistic	5.823976
Log likelihood	-156.4672	TPE	5/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1965	-835.037	4601.00	5436.04
*	1966	402.571	5214.00	4811.43
*	1967	666.207	5812.00	5145.79
*	1968	538.409	5837.00	5298.59
*	1969	90.8862	5191.00	5100.11
*	1970	-1033.39	3701.00	4734.39
*	1971	70.1650	4315.00	4244.83
*	1972	567.570	4965.00	4397.43
*	1973	543.323	3958.00	3414.68
*	1974	-1019.59	4233.00	5252.59
*	1975	180.953	5270.00	5089.05
*	1976	619.029	6428.00	5808.97
*	1977	-934.820	3910.00	4844.82
*	1978	217.495	4685.00	4467.50
*	1979	-327.504	4787.00	5114.50
*	1980	-851.663	5023.00	5874.66
*	1981	4.09860	5926.00	5921.90
*	1982	867.851	7320.00	6452.15
*	1983	233.989	6880.00	6646.01
*	1984	-0.54595	5885.00	5885.55

INDEPENDENT VARIABLES

WHAAR = Wheat Harvested Area (1000 HA)

WRAR = Wheat Revenue per Hectare ($/HA)
(WYAR(-3)+WYAR(-2)+WYAR(-1)+WYAR)/4*WP*XRAR/CPIAR

SRAR = Soybean Revenue per Hectare ($/HA)
(Forecast SYAR)*SP*XRAR/CPIAR

TIME = 1960=60, 1961=61, ...

SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
WHAAR	5197.0500	990.99973	7320.0000	3701.0000
WHAAR(-1)	5209.5500	1001.6533	7320.0000	3701.0000
ZSREV(-1)	1.9243162	0.7646385	3.6577190	1.0466200
WRAR(-1)	1.0126500	0.3409974	1.8079550	0.5368939
TIME	74.500000	5.9160798	84.000000	65.000000

	Covariance	Correlation
WHAAR,WHAAR	932976.45	1.0000000
WHAAR,WHAAR(-1)	418653.52	0.4439562
WHAAR,ZSREV(-1)	-164.79732	-0.2289269
WHAAR,WRAR(-1)	15.056373	0.0468999
WHAAR,TIME	2254.5750	0.4047935
WHAAR(-1),WHAAR(-1)	953143.95	1.0000000
WHAAR(-1),ZSREV(-1)	32.169140	0.0442122
WHAAR(-1),WRAR(-1)	5.7563481	0.0177401
WHAAR(-1),TIME	1447.8750	0.2571911
ZSREV(-1),ZSREV(-1)	0.5554384	1.0000000
ZSREV(-1),WRAR(-1)	0.1634684	0.6599378
ZSREV(-1),TIME	1.5705500	0.3654584
WRAR(-1),WRAR(-1)	0.1104653	1.0000000
WRAR(-1),TIME	0.0721181	0.0376301
TIME,TIME	33.250000	1.0000000

Argentina
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-4.1258569	1.8772008	-2.1978772	0.039
LOGT	1.3140027	0.4400290	2.9861731	0.007

R-squared	0.288423	Mean of dependent var	1.478327
Adjusted R-squared	0.256078	S.D. of dependent var	0.243574
S.E. of regression	0.210085	Sum of squared resid	0.970982
Durbin-Watson stat	1.427074	F-statistic	8.917230
Log likelihood	4.435493	TPE = 7/23	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	-0.15382	1.10031	1.25412
	1961	0.01911	1.29496	1.27584
	1962	0.22482	1.52203	1.29721
	1963	0.25682	1.57505	1.31823
	1964	0.49644	1.83537	1.33893
	1965	-0.03807	1.32123	1.35930
	1966	-0.18124	1.19812	1.37936
	1967	-0.13966	1.25946	1.39912
	1968	-0.43521	0.98338	1.41859
	1969	-0.08543	1.35234	1.43777
	1970	-0.12731	1.32937	1.45668
	1971	-0.15898	1.31634	1.47532
	1972	-0.10397	1.38973	1.49369
	1973	0.14558	1.65740	1.51182
	1974	-0.11935	1.41035	1.52970
	1975	0.07885	1.62619	1.54733
	1976	0.14653	1.71126	1.56474
	1977	-0.12411	1.45780	1.58191
	1978	0.13005	1.72892	1.59887
	1979	0.07647	1.69208	1.61561
	1980	-0.08326	1.54887	1.63214
	1981	-0.24785	1.40061	1.64846
	1982	0.31629	1.98087	1.66458
	1983	0.10728	1.78779	1.68051

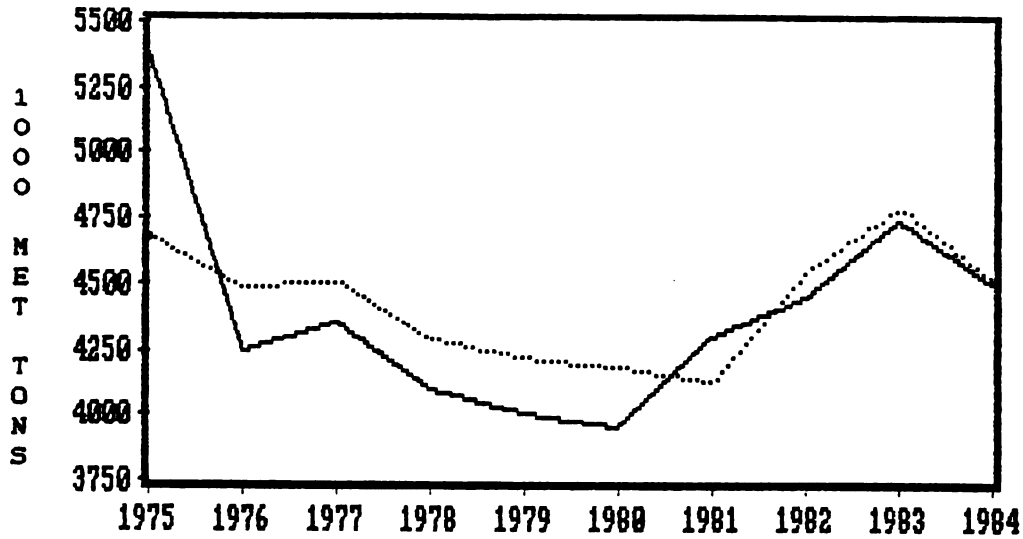
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

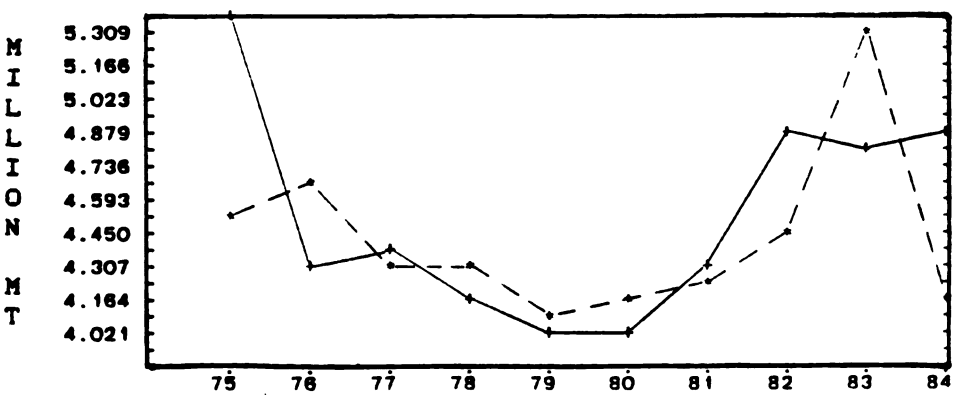
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYAR	1.4783268	0.2435738	1.9808740	0.9833819
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYAR,WYAR	0.0568562	1.0000000
WYAR,LOGT	0.0124799	0.5370500
LOGT,LOGT	0.0094976	1.0000000



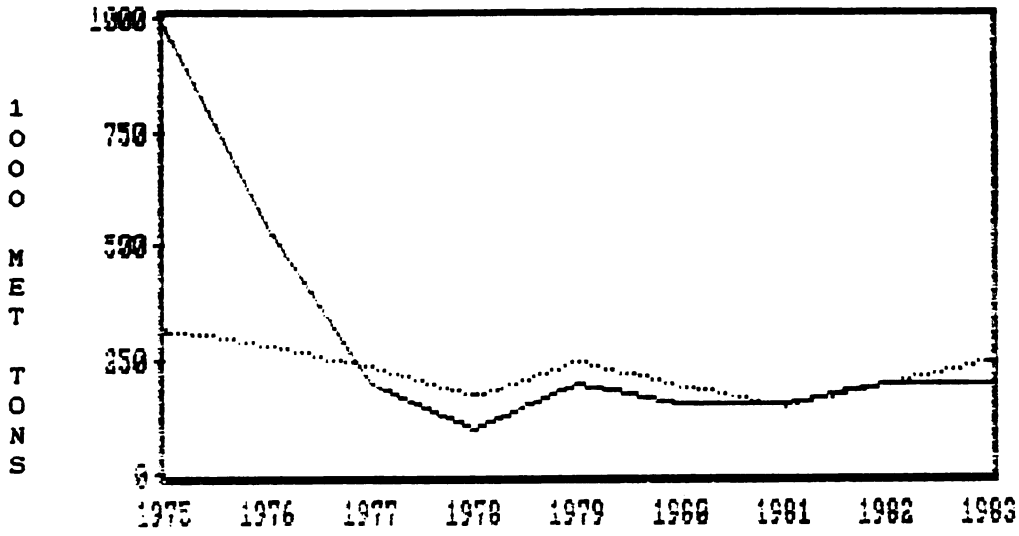
REGIONAL MODEL SIMULATION



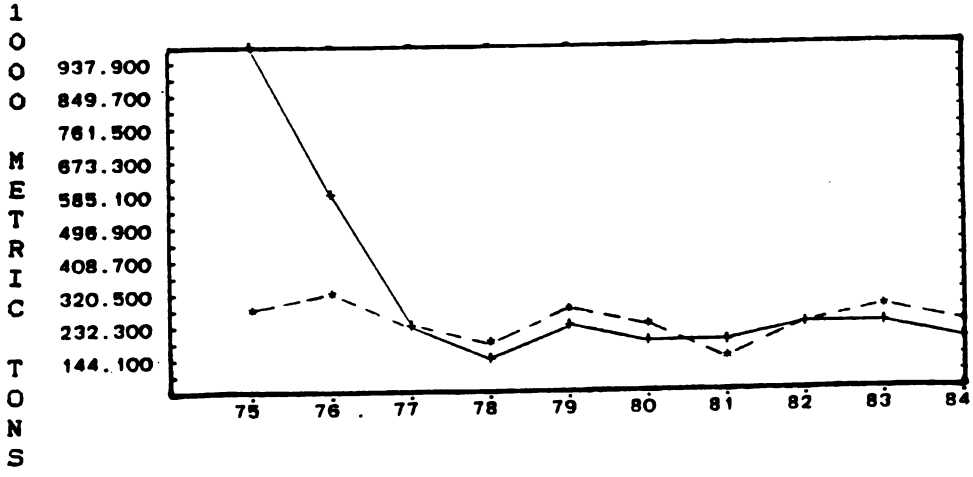
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.3.a & b. Total Wheat Consumption - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.4.a & b. Wheat Feed Consumption - Argentina

Argentina
Per Capita Wheat Feed Consumption (1000 MT)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is PCWFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0200462	0.0140406	-1.4277293	0.170
PCRGDP	2.3552615	1.2445260	1.8924968	0.074
WCGRAR	0.0062040	0.0057152	1.0855200	0.291

R-squared	0.172679	Mean of dependent var	0.007710
Adjusted R-squared	0.085593	S.D. of dependent var	0.007703
S.E. of regression	0.007366	Sum of squared resid	0.001031
Durbin-Watson stat	1.317015	F-statistic	1.982849
Log likelihood	78.43546	TPE = 6/21	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: *:	1961	0.00424	0.00662	0.00238
: *	1962	0.00738	0.00672	-0.00066
: *:	1963	-0.00157	0.00686	0.00843
* :	1964	-0.00654	0.00690	0.01344
:* :	1965	-0.00538	0.00627	0.01165
: *:	1966	-0.00181	0.00689	0.00870
: * :	1967	0.00021	0.00732	0.00712
: * :	1968	-0.00011	0.00623	0.00634
: * :	1969	0.00072	0.00773	0.00701
: * : :	1970	-0.00405	0.00131	0.00535
* : :	1971	-0.00706	0.00120	0.00826
:* : :	1972	-0.00516	0.00221	0.00737
* : :	1973	-0.00591	0.00201	0.00792
: * : :	1974	-0.00342	0.00749	0.01091
: : *	1975	0.02518	0.03770	0.01252
: : * :	1976	0.00970	0.02047	0.01077
: *: :	1977	-0.00112	0.00743	0.00856
: * : :	1978	-0.00277	0.00366	0.00643
: *: :	1979	-0.00171	0.00720	0.00891
: * :	1980	-0.00064	0.00531	0.00595
: * :	1981	0.00042	0.00523	0.00481
: * :	1982	-0.00059	0.00686	0.00745

INDEPENDENT VARIABLES

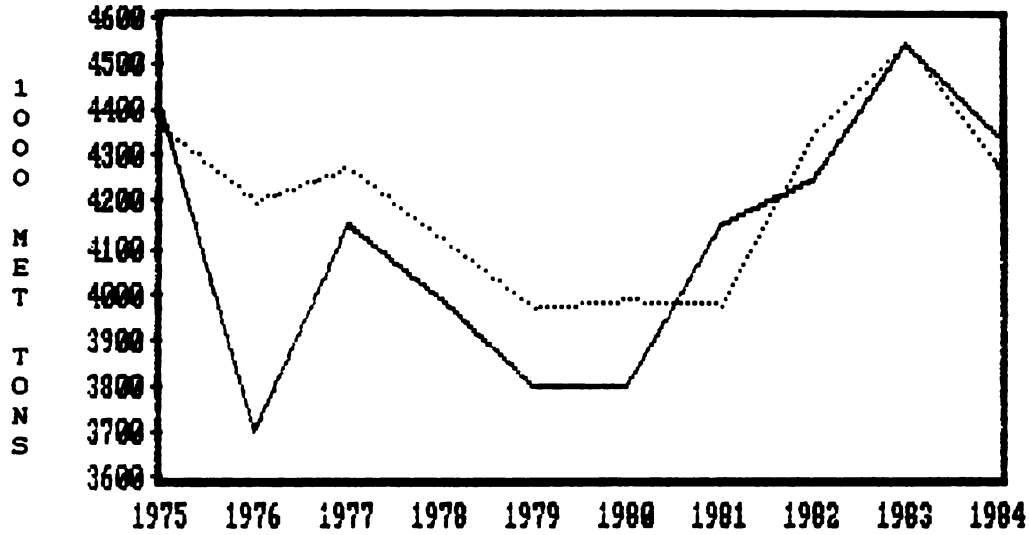
PCRGDP = Real Income Per Capita
GDPAR/CPIAR/POPAR

WCGRAR = Wheat/Coarse Grain Supply Ratio
(WPROAR+WESAR(-1))/(FPROAR+FESAR(-1))

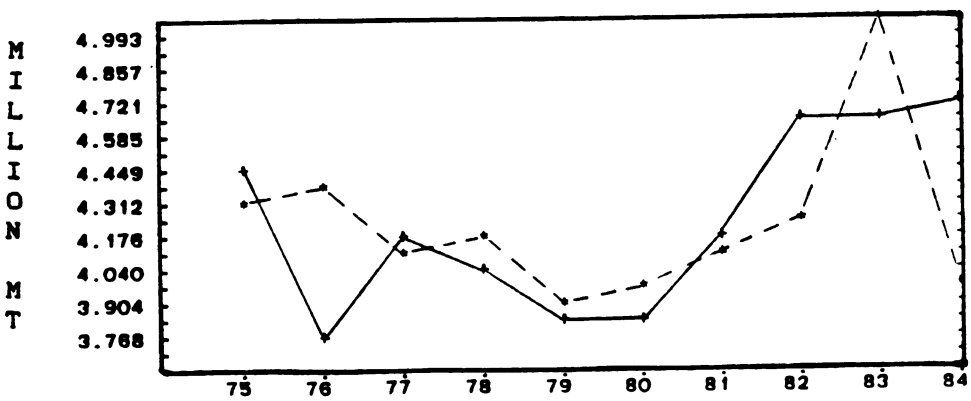
SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFED	0.0077098	0.0077030	0.0376967	0.0012048
PCRGDP	0.0100053	0.0013365	0.0119807	0.0058217
WCGRAR	0.6755172	0.2910277	1.6614870	0.3632193

	Covariance	Correlation
PCWFED,PCWFED	5.664D-05	1.0000000
PCWFED,PCRGDP	3.424D-06	0.3483819
PCWFED,WCGRAR	0.0002768	0.1293341
PCRGDP,PCRGDP	1.705D-06	1.0000000
PCRGDP,WCGRAR	-9.545D-05	-0.2570953
WCGRAR,WCGRAR	0.0808473	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.5.a & b. Wheat Food and Residual Consumption - Argentina

Argentina
Per Capita Wheat Food and Residual Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2348628	0.0300953	7.8039656	0.000
WPAR	-0.0346628	0.0300757	-1.1525164	0.263
FPAR	0.0747968	0.0405458	1.8447484	0.080
TIME	-0.0012727	0.0003537	-3.5980385	0.002

R-squared	0.601580	Mean of dependent var	0.162078
Adjusted R-squared	0.541817	S.D. of dependent var	0.016304
S.E. of regression	0.011036	Sum of squared resid	0.002436
Durbin-Watson stat	2.157322	F-statistic	10.06609
Log likelihood	76.29183	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00830	0.16774	0.17604
	1962	-0.00872	0.17064	0.17936
	1963	-0.00516	0.17400	0.17916
	1964	0.00276	0.17478	0.17202
	1965	-0.01594	0.15866	0.17459
	1966	0.00437	0.17443	0.17006
	1967	0.01832	0.18535	0.16703
	1968	-0.00866	0.15794	0.16660
	1969	0.02464	0.19577	0.17114
	1970	-0.00085	0.16947	0.17033
	1971	0.01889	0.17977	0.16088
	1972	-0.00077	0.17413	0.17490
	1973	0.00492	0.16805	0.16313
	1974	0.00767	0.17086	0.16319
	1975	0.00155	0.16883	0.16728
	1976	-0.01869	0.13973	0.15841
	1977	-0.00444	0.15418	0.15863
	1978	-0.00448	0.14600	0.15048
	1979	-0.00597	0.13674	0.14271
	1980	-0.00649	0.13456	0.14105
	1981	0.00614	0.14465	0.13851
	1982	-0.00335	0.14575	0.14910
	1983	-2.5D-06	0.15332	0.15333
	1984	0.00256	0.14452	0.14195

INDEPENDENT VARIABLES

WPAR = Real Argentine Wheat Price
WP*XRAR/CPIAR

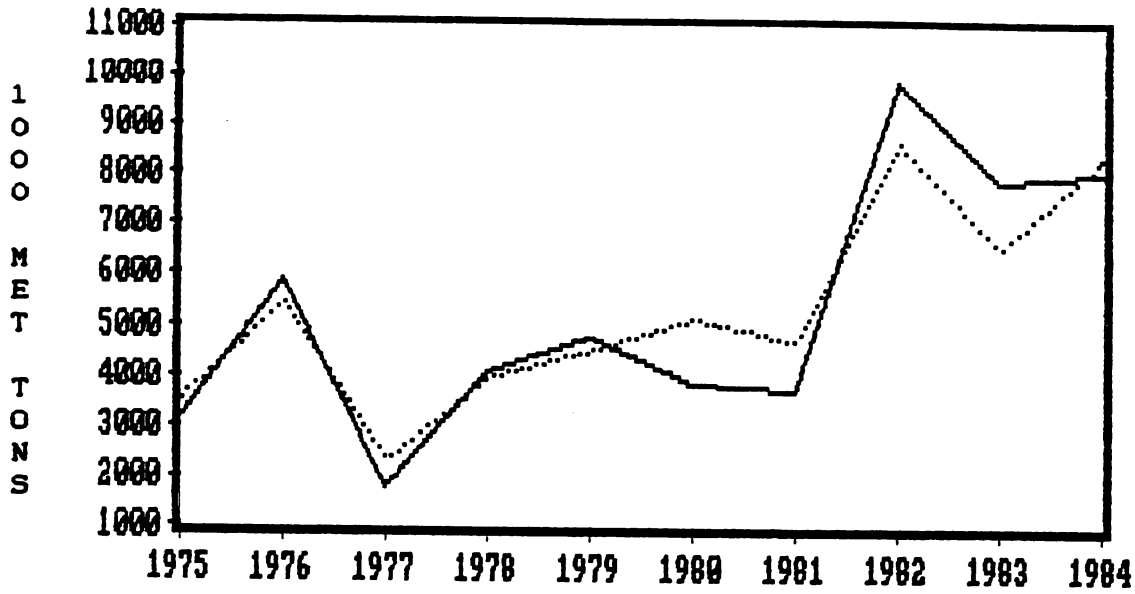
FPAR = Real Argentine Coarse Grain Price
FP*XRAR/CPIAR

TIME = 1960=60, 1961=61, ...

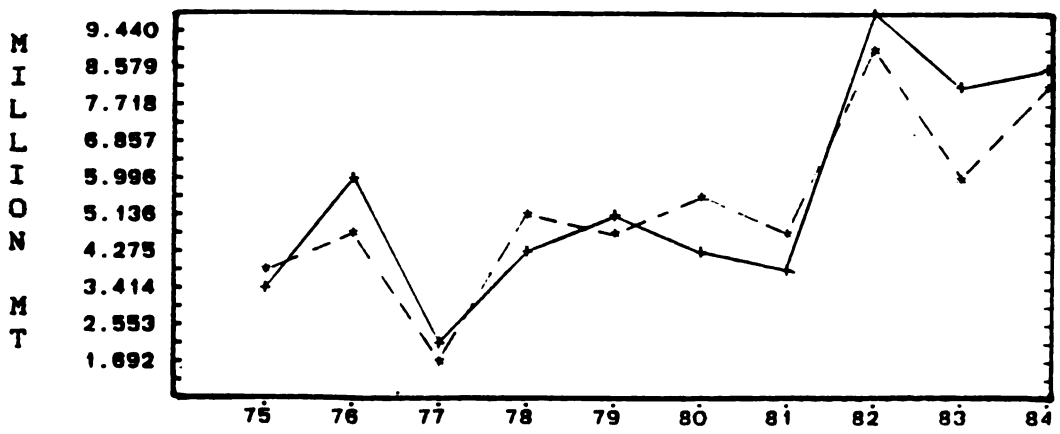
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFOD	0.1620778	0.0163037	0.1957746	0.1345609
WPAR	0.7011656	0.2210737	1.2418560	0.3341136
FPAR	0.5854164	0.1683937	0.9234641	0.2458400
TIME	72.500000	7.0710678	84.000000	61.000000

	Covariance	Correlation
PCWFOD,PCWFOD	0.0002547	1.0000000
PCWFOD,WPAR	0.0014408	0.4171243
PCWFOD,FPAR	0.0014073	0.5348918
PCWFOD,TIME	-0.0769435	-0.6964390
WPAR,WPAR	0.0468372	1.0000000
WPAR,FPAR	0.0334212	0.9367894
WPAR,TIME	-0.4435743	-0.2960927
FPAR,FPAR	0.0271749	1.0000000
FPAR,TIME	-0.4189660	-0.3671566
TIME,TIME	47.916667	1.0000000



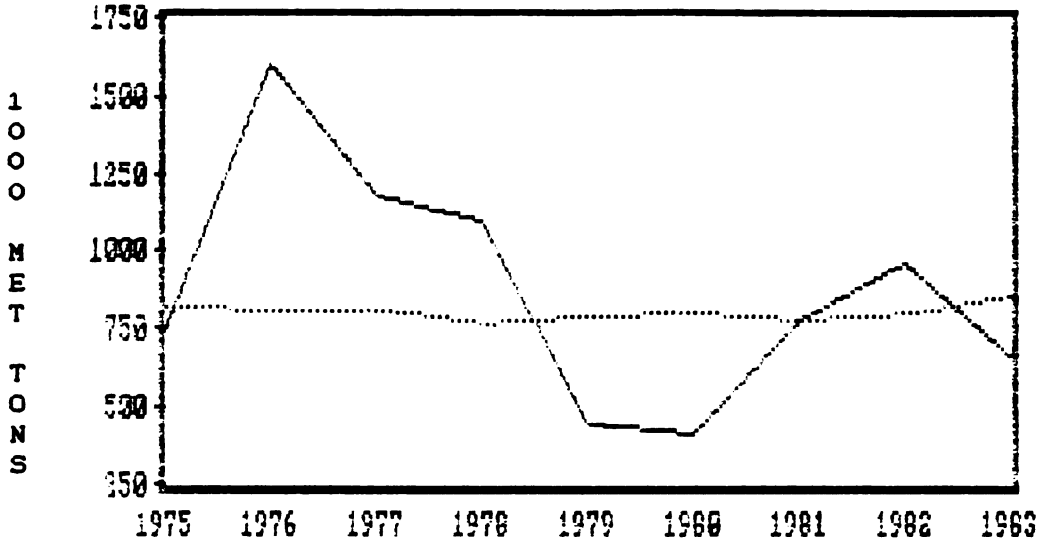
REGIONAL MODEL SIMULATION



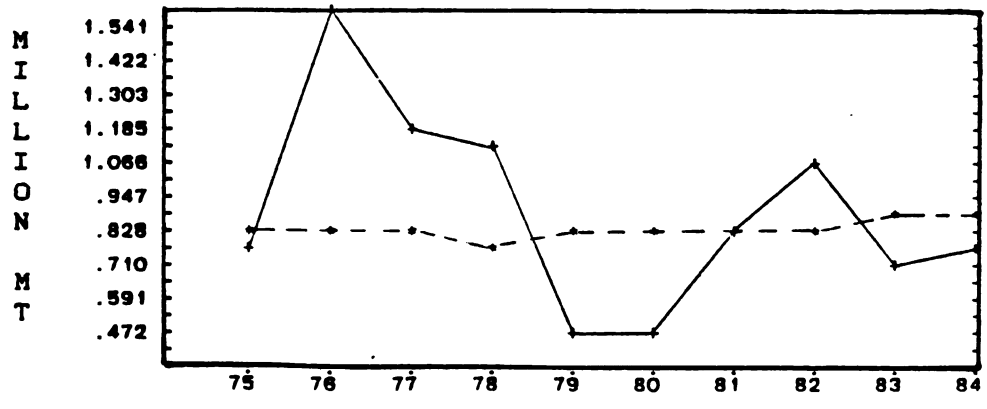
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.6.a & b. Wheat Net Exports - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.7.a & b. Wheat Ending Stocks - Argentina

Argentina
Per Capita Wheat Ending Stocks (1000 MT)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0107445	0.0254021	0.4229785	0.677
DV6364	0.1045393	0.0115640	9.0400460	0.000
PCRGDP	1.7343867	2.5171828	0.6890190	0.498

R-squared	0.795580	Mean of dependent var	0.036751
Adjusted R-squared	0.776111	S.D. of dependent var	0.032970
S.E. of regression	0.015600	Sum of squared resid	0.005111
Durbin-Watson stat	2.246327	F-statistic	40.86473
Log likelihood	67.39874	TPE = 9/23	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.01199	0.03835	0.02636
	1961	-0.01191	0.01201	0.02392
	1962	0.00370	0.02454	0.02084
	1963	-0.02542	0.10614	0.13156
	1964	0.02542	0.15777	0.13235
	1965	-0.02209	0.00789	0.02998
	1966	-0.01829	0.01089	0.02919
	1967	0.01682	0.04421	0.02740
	1968	0.00941	0.03678	0.02737
	1969	0.00509	0.03329	0.02821
	1970	0.00063	0.02842	0.02779
	1971	-0.01337	0.01537	0.02875
	1972	-0.01777	0.01103	0.02880
	1973	0.01173	0.04134	0.02961
	1974	-0.00292	0.02831	0.03123
	1975	-0.00304	0.02848	0.03152
	1976	0.03008	0.06042	0.03035
	1977	0.01368	0.04370	0.03002
	1978	0.01247	0.04033	0.02786
	1979	-0.01205	0.01612	0.02817
	1980	-0.01348	0.01462	0.02810
	1981	8.5D-05	0.02701	0.02693
	1982	0.00573	0.03282	0.02709
	1983	-0.00646	0.02217	0.02863

INDEPENDENT VARIABLES

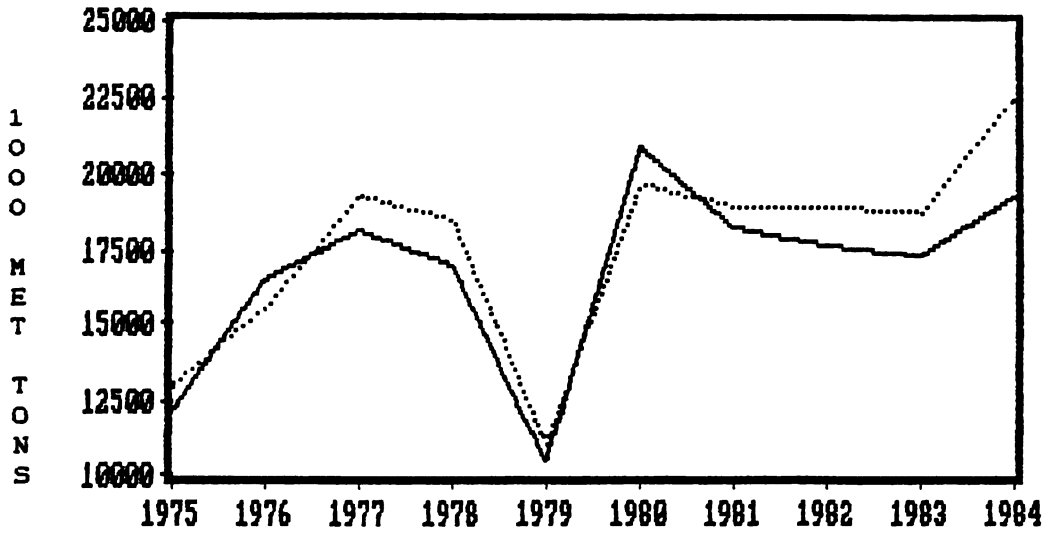
PCRGDP = Real Income Per Capita
GDP/CPIAR/POPAR

DV6364 = 1 If(TIME .EQ. 63 .OR. TIME .EQ. 63)
0 Otherwise

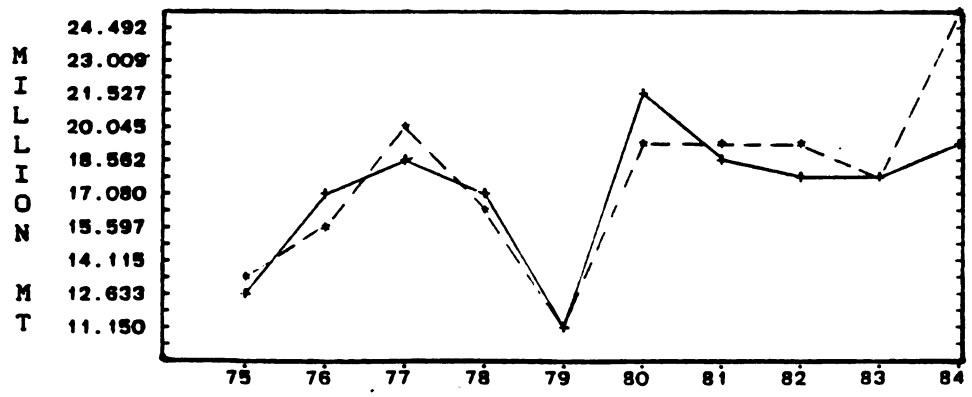
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0367513	0.0329702	0.1577704	0.0078900
DV6364	0.0833333	0.2823299	1.0000000	0.0000000
PCRGDP	0.0099719	0.0012970	0.0119807	0.0058217

	Covariance	Correlation
PCWES,PCWES	0.0010417	1.0000000
PCWES,DV6364	0.0079336	0.8893583
PCWES,PCRGDP	-3.389D-07	-0.0082699
DV6364,DV6364	0.0763889	1.0000000
DV6364,PCRGDP	-2.999D-05	-0.0854567
PCRGDP,PCRGDP	1.612D-06	1.0000000



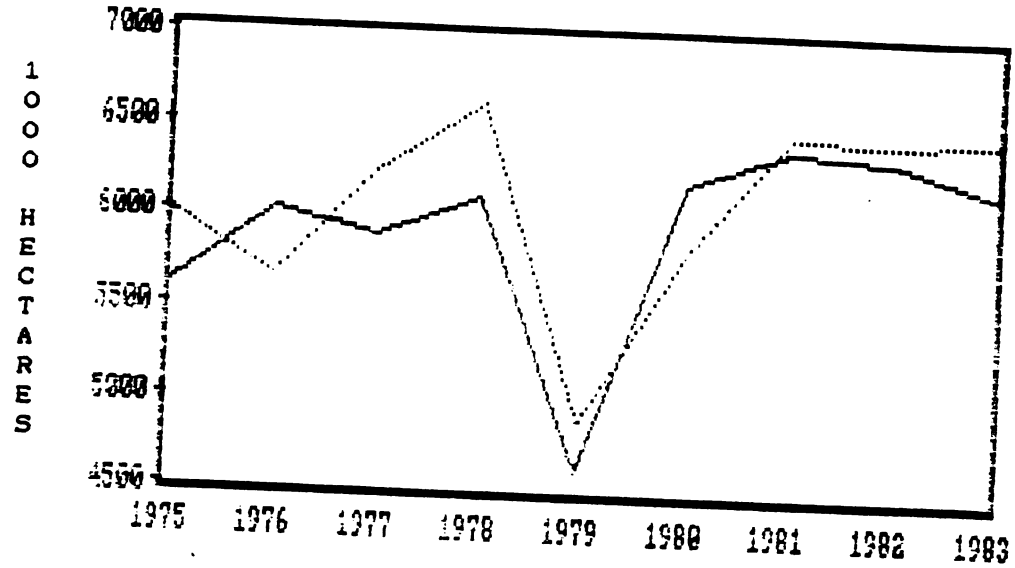
REGIONAL MODEL SIMULATION



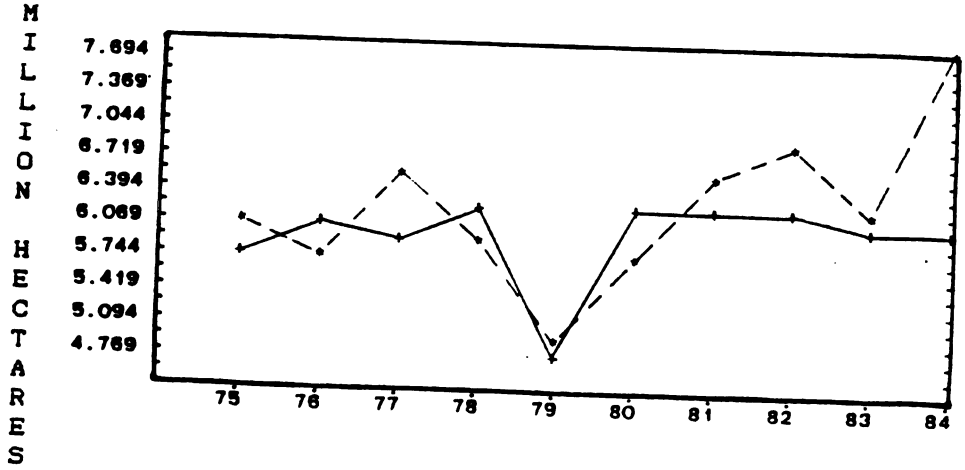
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.8.a & b. Coarse Grain Production - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure B.9.a & b. Coarse Grain Harvested Area - Argentina

Argentina
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is FHAAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	4428.9654	949.60993	4.6639838	0.000
DV7179	-1673.6062	320.42529	-5.2230776	0.000
FHAAR(-1)	0.3700898	0.1711834	2.1619495	0.047
WRAR(-1)	-2185.8006	668.20864	-3.2711349	0.005
FRAR(-1)	1393.0700	613.57822	2.2704032	0.038

R-squared	0.735970	Mean of dependent var	5966.050
Adjusted R-squared	0.665562	S.D. of dependent var	683.9973
S.E. of regression	395.5597	Sum of squared resid	2347012.
Durbin-Watson stat	1.753429	F-statistic	10.45294
Log likelihood	-145.1080	TPE = 6/19	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-487.639	4888.00	5375.64
	1965	-212.813	5086.00	5298.81
	1966	-384.633	5225.00	5609.63
	1967	43.5819	5683.00	5639.42
	1968	330.511	6037.00	5706.49
	1969	463.192	6805.00	6341.81
	1970	67.1463	7108.00	7040.85
	1971	88.7157	5518.00	5429.28
	1972	627.286	6894.00	6266.71
	1973	148.435	6865.00	6716.55
	1974	171.035	5853.00	5681.96
	1975	-381.192	5608.00	5989.19
	1976	507.658	6023.00	5515.34
	1977	-480.559	5898.00	6378.56
	1978	-371.313	6109.00	6480.31
	1979	-88.7157	4607.00	4695.72
	1980	488.743	6204.00	5715.26
	1981	-212.350	6387.00	6599.35
	1982	-60.5786	6350.00	6410.58
	1983	-256.530	6173.00	6429.53

INDEPENDENT VARIABLES

FHAAR = **Coarse Grain Harvested Area (1000 HA)**

FRAR = **Coarse Grain Revenue per Hectare ($/HA)**
(FYAR(-3)+FYAR(-2)+FYAR(-1)+FYAR)/4*FP*XRAR/CPIAR

WRAR = **Wheat Revenue per Hectare ($/HA)**
(WYAR(-3)+WYAR(-2)+WYAR(-1)+WYAR)/4*WP*XRAR/CPIAR

DV7179 = **1 If(TIME .GE. 71 .AND. TIME .LE.79)**
0 Otherwise

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
FHAAR	5966.0500	683.99734	7108.0000	4607.0000
DV7179	0.1000000	0.3077935	1.0000000	0.0000000
FHAAR(-1)	5919.9000	700.24424	7108.0000	4607.0000
WRAR(-1)	1.0157195	0.3424329	1.8079550	0.5368938
FRAR(-1)	1.2445253	0.3923744	2.1267720	0.6942303

	Covariance	Correlation
FHAAR,FHAAR	444459.75	1.0000000
FHAAR,DV7179	-90.355000	-0.4517672
FHAAR,FHAAR(-1)	160763.76	0.3533138
FHAAR,WRAR(-1)	-55.517814	-0.2495048
FHAAR,FRAR(-1)	-3.5586510	-0.0139575
DV7179,DV7179	0.0900000	1.0000000
DV7179,FHAAR(-1)	68.860000	0.3363058
DV7179,WRAR(-1)	-0.0175040	-0.1748152
DV7179,FRAR(-1)	-0.0024946	-0.0217427
FHAAR(-1),FHAAR(-1)	465824.89	1.0000000
FHAAR(-1),WRAR(-1)	8.5819966	0.0376738
FHAAR(-1),FRAR(-1)	87.841787	0.3365327
WRAR(-1),WRAR(-1)	0.1113972	1.0000000
WRAR(-1),FRAR(-1)	0.1116264	0.8745150
FRAR(-1),FRAR(-1)	0.1462598	1.0000000

Argentina
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-18.109949	2.3563803	-7.6854948	0.000
LOGT	4.7706553	0.5523520	8.6369836	0.000

R-squared	0.772251	Mean of dependent var	2.236758
Adjusted R-squared	0.761899	S.D. of dependent var	0.540440
S.E. of regression	0.263711	Sum of squared resid	1.529961
Durbin-Watson stat	2.172486	F-statistic	74.59749
Log likelihood	-1.020786	TPE = 7/23	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	-0.17784	1.60060	1.42276
	1961	0.19783	1.69945	1.50161
	1962	-0.05658	1.52260	1.57918
	1963	0.00772	1.66324	1.65552
	1964	-0.14697	1.58367	1.73065
	1965	0.20875	2.01337	1.80462
	1966	0.14781	2.02526	1.87745
	1967	-0.19589	1.75330	1.94919
	1968	-0.26635	1.75352	2.01987
	1969	0.01188	2.10140	2.08952
	1970	0.02248	2.18064	2.15816
	1971	-0.53083	1.69500	2.22583
	1972	-0.07715	2.21540	2.29255
	1973	0.16488	2.52323	2.35836
	1974	-0.11897	2.30429	2.42326
	1975	-0.31808	2.16922	2.48730
	1976	0.19399	2.74448	2.55048
	1977	0.46498	3.07782	2.61285
	1978	0.11492	2.78933	2.67441
	1979	-0.47579	2.25939	2.73518
	1980	0.57167	3.36686	2.79519
	1981	0.02562	2.88007	2.85445
	1982	-0.05299	2.86000	2.91299
	1983	-0.07076	2.90005	2.97081

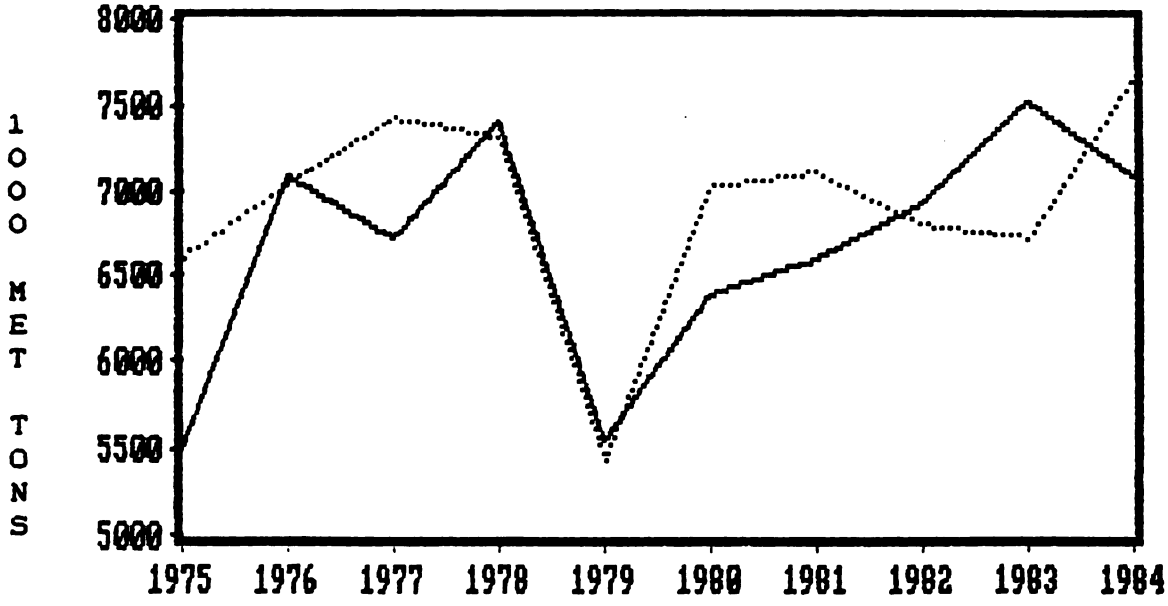
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

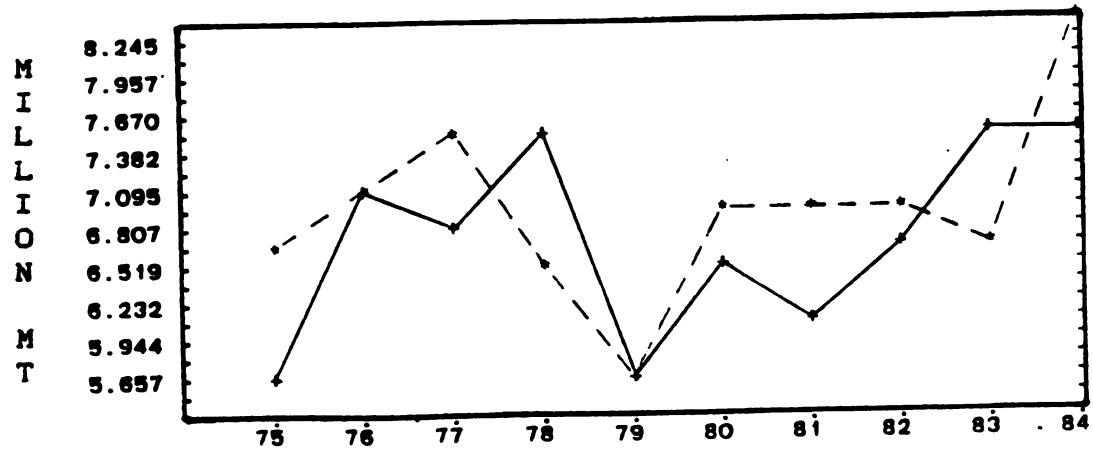
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYAR	2.2367581	0.5404404	3.3668600	1.5226010
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYAR,FYAR	0.2799060	1.0000000
FYAR,LOGT	0.0453098	0.8787780
LOGT,LOGT	0.0094976	1.0000000



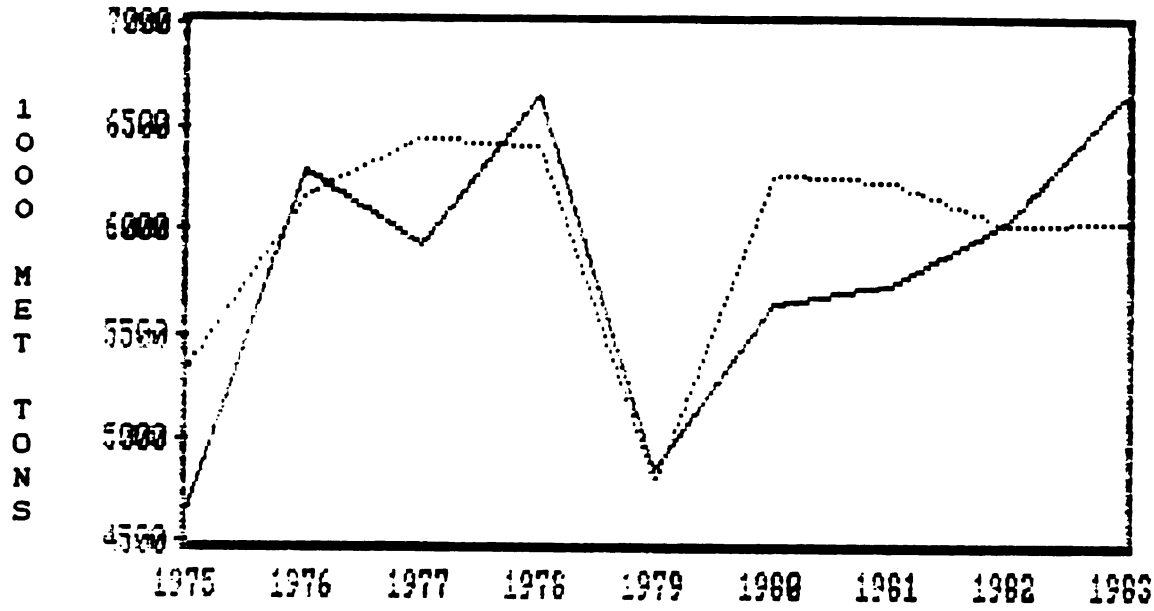
REGIONAL MODEL SIMULATION



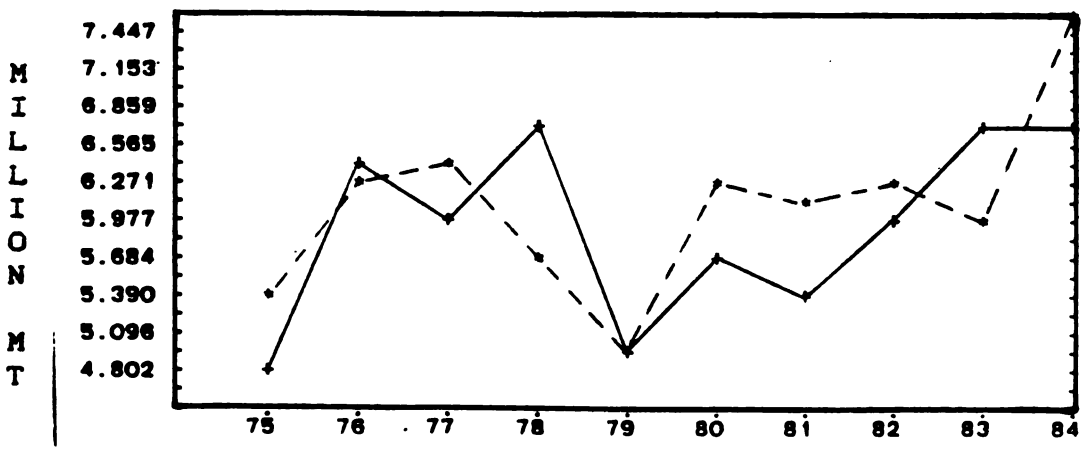
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.10 a & b. Total Coarse Grain Consumption - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure B.11.a & b. Coarse Grain Feed Consumption - Argentina

Argentina
Per Capita Coarse Grain Feed Consumption (1000 MT)

```
SMPL   1961  -  1983
23 Observations
LS // Dependent Variable is PCFFED
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0066462	0.0429547	0.1547230	0.879
PCRGDP(-1)	9.8268266	4.1519314	2.3668085	0.029
PCFDS	0.1674488	0.0446306	3.7519855	0.001
FPAR	-0.0386525	0.0414727	-0.9319970	0.364
SMPAR	0.0215501	0.0178720	1.2058031	0.244

R-squared	0.688994	Mean of dependent var	0.194496
Adjusted R-squared	0.619882	S.D. of dependent var	0.037280
S.E. of regression	0.022985	Sum of squared resid	0.009509
Durbin-Watson stat	2.375259	F-statistic	9.969176
Log likelihood	56.96060	TPE = 6/22	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.02506	0.18868	0.16362
	1962	-0.03686	0.09270	0.12955
	1963	-0.00164	0.13031	0.13195
	1964	-0.00338	0.15484	0.15822
	1965	0.00381	0.18377	0.17996
	1966	-0.00243	0.19000	0.19242
	1967	-0.00624	0.18009	0.18633
	1968	-0.01488	0.16335	0.17823
	1969	0.01090	0.21310	0.20220
	1970	-0.01692	0.19432	0.21123
	1971	0.05344	0.22858	0.17514
	1972	-0.00591	0.23079	0.23670
	1973	0.03161	0.25334	0.22173
	1974	-0.01208	0.18283	0.19491
	1975	-0.02120	0.17869	0.19989
	1976	-0.00086	0.23799	0.23885
	1977	-0.01245	0.22055	0.23300
	1978	0.01770	0.24314	0.22545
	1979	0.00642	0.17402	0.16760
	1980	-0.02990	0.19972	0.22962
	1981	-0.01410	0.20021	0.21431
	1982	0.00296	0.20734	0.20438
	1983	0.02695	0.22484	0.19789

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPAR/CPIAR/POPAR

PCFDS = Per Capita Domestic Coarse Grain Supply
(FESAR(-1)+FPROAR)/POPAR

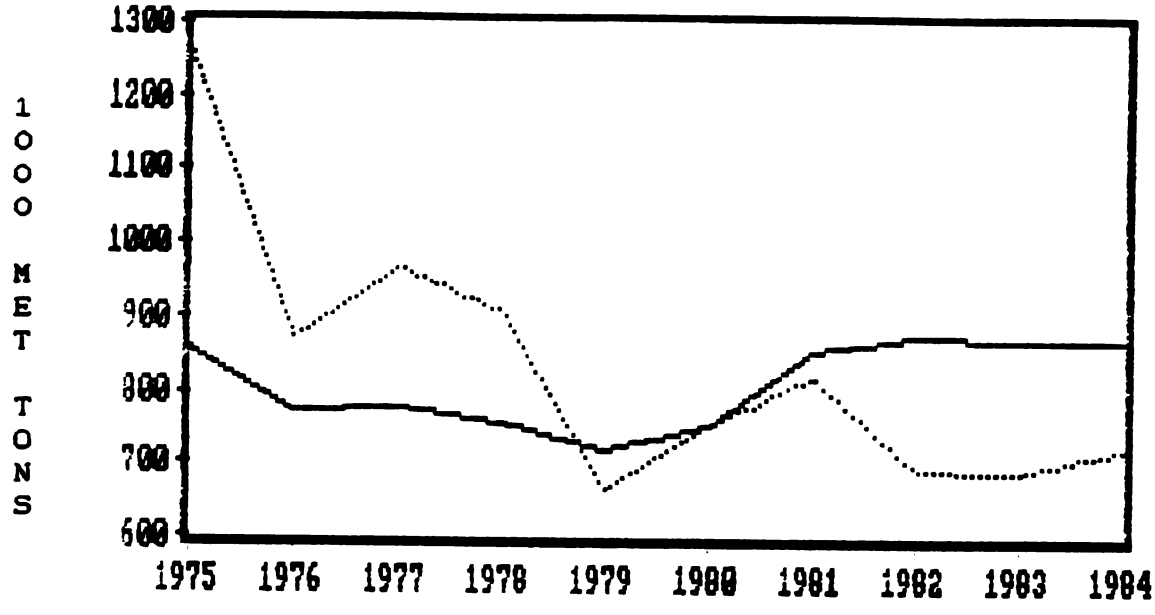
FPAR = Real Argentine Coarse Grain Price ($/MT)
WP*XRAR/CPIAR

SMPAR = Real Argentine Soymeal Price
SMP*XRAR/CPIAR

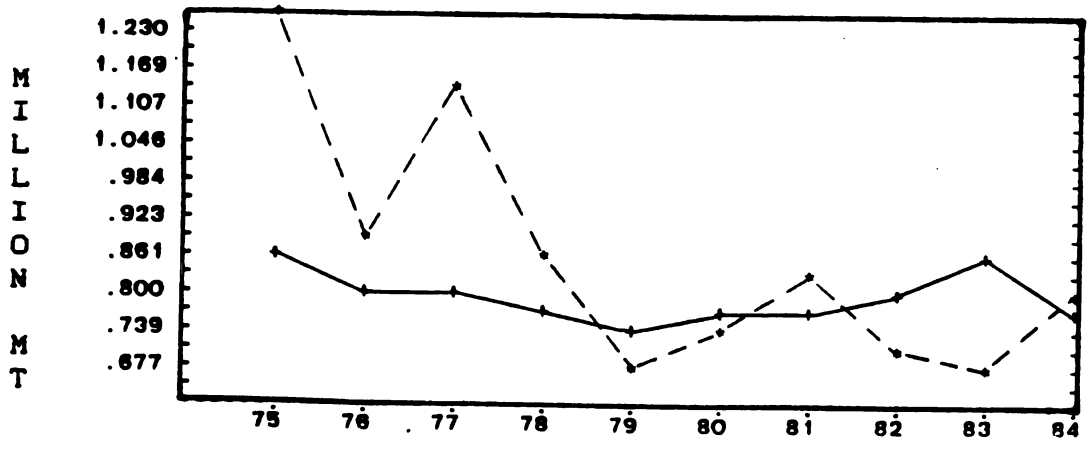
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFED	0.1944960	0.0372804	0.2533441	0.0926972
PCRGDP(-1)	0.0099571	0.0013241	0.0119807	0.0058217
PCFDS	0.5495227	0.1238178	0.7453966	0.3164070
FPAR	0.5915546	0.1697922	0.9234641	0.2458400
SMPAR	0.9675752	0.3957685	2.4937260	0.4349627

	Covariance	Correlation
PCFFED,PCFFED	0.0013294	1.0000000
PCFFED,PCRGDP(-1)	2.955D-05	0.6258848
PCFFED,PCFDS	0.0032880	0.7446795
PCFFED,FPAR	-0.0004112	-0.0679135
PCFFED,SMPAR	0.0027415	0.1942578
PCRGDP(-1),PCRGDP(-1)	1.677D-06	1.0000000
PCRGDP(-1),PCFDS	6.941D-05	0.4426321
PCRGDP(-1),FPAR	-9.051D-06	-0.0420869
PCRGDP(-1),SMPAR	5.102D-05	0.1017757
PCFDS,PCFDS	0.0146643	1.0000000
PCFDS,FPAR	-0.0013698	-0.0681191
PCFDS,SMPAR	0.0045190	0.0964107
FPAR,FPAR	0.0275759	1.0000000
FPAR,SMPAR	0.0451505	0.7024392
SMPAR,SMPAR	0.1498226	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure B.12.a & b. Coarse Grain Food and Residual Consumption - Argentina

Argentina
Per Capita Coarse Grain Food and Residual Consumption
(1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0196789	0.0085222	2.3091450	0.032
PCFFOD(-1)	0.4100899	0.1346744	3.0450465	0.006
CGWRAR	0.0088003	0.0038648	2.2770080	0.034
DV75ON	-0.0202278	0.0049006	-4.1276249	0.001

R-squared	0.750361	Mean of dependent var	0.044391
Adjusted R-squared	0.712915	S.D. of dependent var	0.018876
S.E. of regression	0.010114	Sum of squared resid	0.002046
Durbin-Watson stat	1.523532	F-statistic	20.03857
Log likelihood	78.38619	TPF	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-0.01191	0.03701	0.04892
*	1962	-0.00757	0.03690	0.04448
*	1963	-0.00036	0.04302	0.04338
*	1964	0.00259	0.04521	0.04262
*	1965	-0.00590	0.04211	0.04801
*	1966	0.00042	0.05211	0.05169
*	1967	0.00319	0.05623	0.05304
*	1968	0.00026	0.05733	0.05707
*	1969	0.00424	0.06376	0.05953
*	1970	-0.02252	0.04754	0.07006
*	1971	-0.00935	0.04396	0.05331
*	1972	0.01683	0.07339	0.05656
*	1973	0.01991	0.09291	0.07300
*	1974	0.01019	0.08537	0.07518
*	1975	-0.01409	0.03294	0.04703
*	1976	0.00319	0.02915	0.02597
*	1977	-0.00493	0.02895	0.03388
*	1978	-0.00069	0.02753	0.02822
*	1979	0.00473	0.02580	0.02107
*	1980	-0.00599	0.02656	0.03255
*	1981	0.00031	0.02959	0.02928
*	1982	0.00758	0.03001	0.02242
*	1983	0.00534	0.02926	0.02392
*	1984	0.00453	0.02874	0.02420

INDEPENDENT VARIABLES

PCFFOD = Coarse Grain For Human & Residual Consumption Per Capita (1000 MT)
FFODAR/POPAR

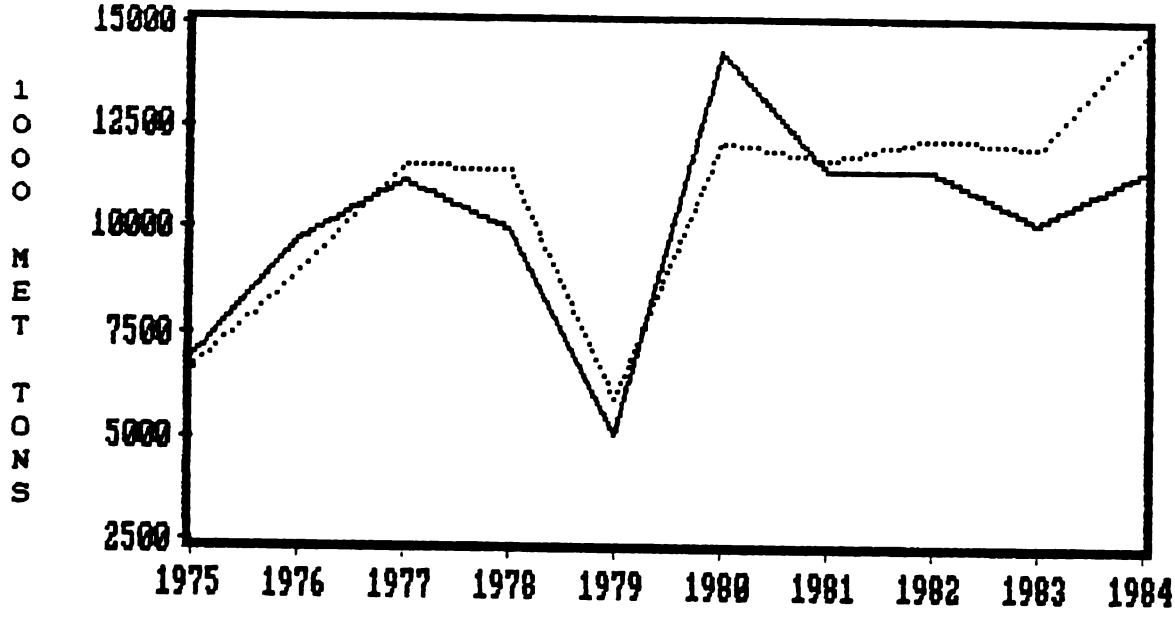
CGWRAR = Coarse Grain/Wheat Supply Ratio
(FESAR(-1)+FPROAR)/(WESAR(-1)+WPROAR)

DV75ON = 1 If(TIME .GE.75)
0 Otherwise

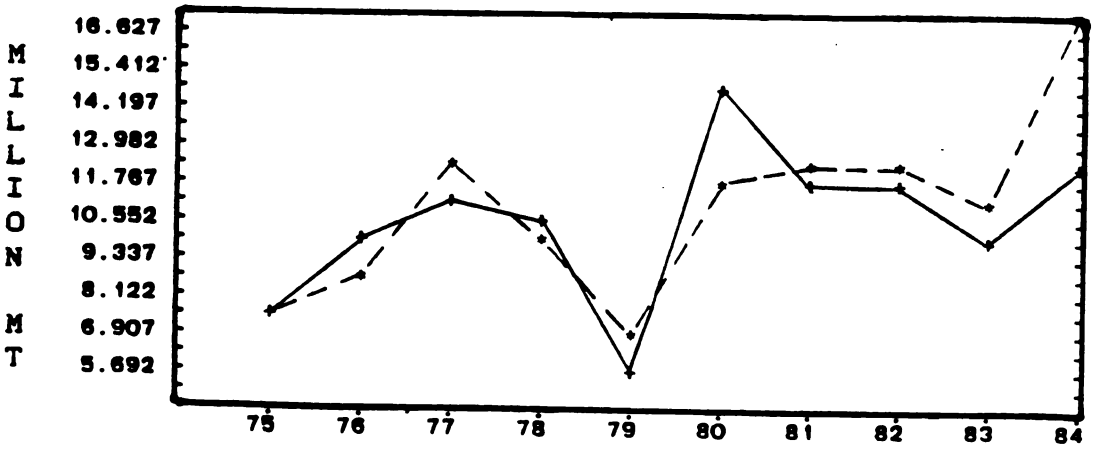
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFOD	0.0443906	0.0188757	0.0929089	0.0258007
PCFFOD(-1)	0.0449397	0.0185901	0.0929089	0.0258007
CGWRAR	1.6716044	0.5692673	2.7531580	0.6018704
DV75ON	0.4166667	0.5036102	1.0000000	0.0000000

	Covariance	Correlation
PCFFOD, PCFFOD	0.0003414	1.0000000
PCFFOD, PCFFOD(-1)	0.0002407	0.7158833
PCFFOD, CGWRAR	0.0030144	0.2927292
PCFFOD, DV75ON	-0.0064741	-0.7106650
PCFFOD(-1), PCFFOD(-1)	0.0003312	1.0000000
PCFFOD(-1), CGWRAR	0.0019390	0.1911904
PCFFOD(-1), DV75ON	-0.0043433	-0.4840902
CGWRAR, CGWRAR	0.3105625	1.0000000
CGWRAR, DV75ON	0.0254001	0.0924504
DV75ON, DV75ON	0.2430556	1.0000000



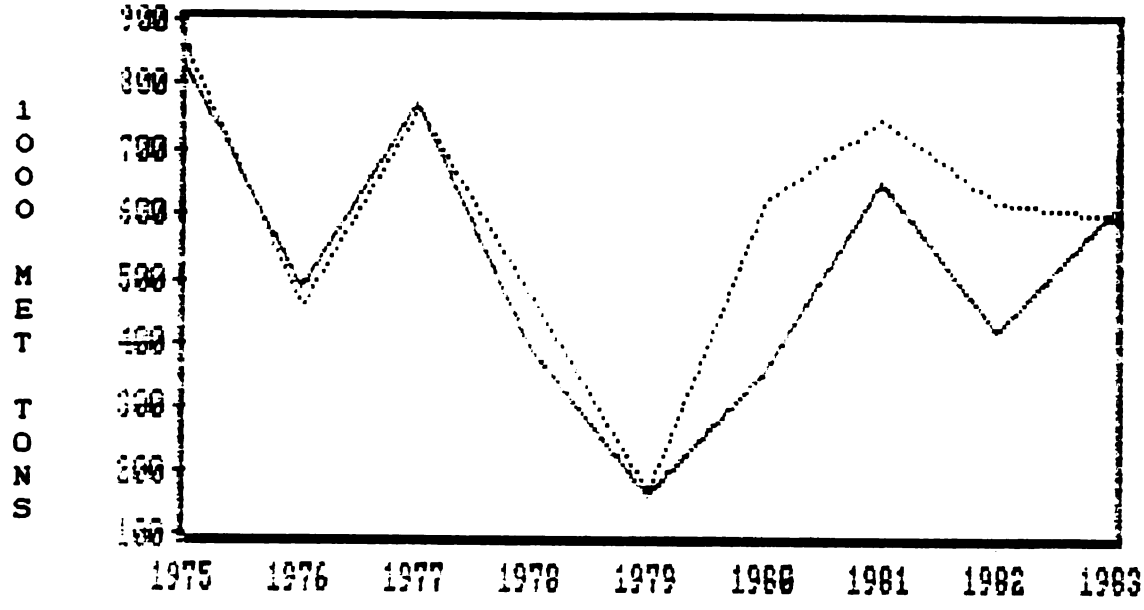
REGIONAL MODEL SIMULATION



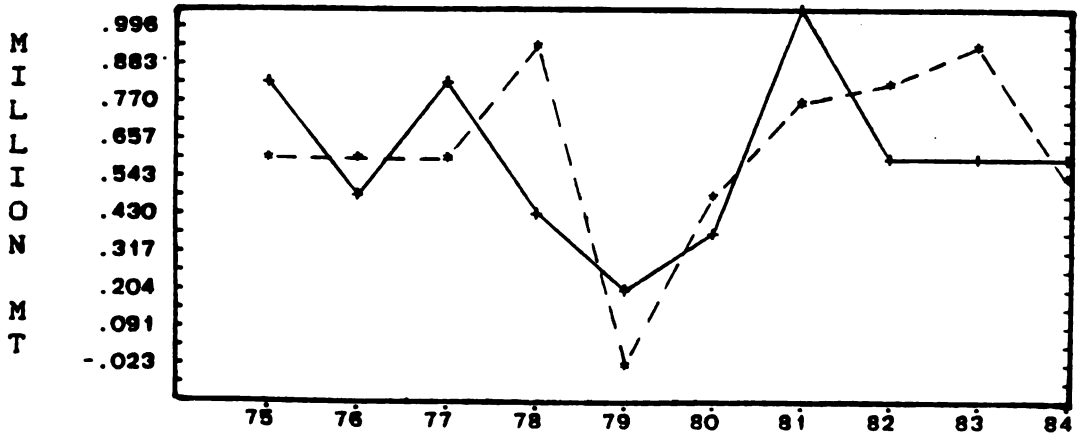
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.13.a & b. Coarse Grain Net Exports - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.14.a & b. Coarse Grain Ending Stocks - Argentina

Argentina
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1963 - 1983
21 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0206453	0.0020532	10.055156	0.000
PCFTAR	0.1757144	0.0290963	6.0390700	0.000
F1S1	0.0088015	0.0039141	2.2486647	0.038
DV79	-0.0296053	0.0066199	-4.4721924	0.000

R-squared	0.730856	Mean of dependent var	0.018812
Adjusted R-squared	0.683361	S.D. of dependent var	0.009777
S.E. of regression	0.005502	Sum of squared resid	0.000515
Durbin-Watson stat	1.437481	F-statistic	15.38777
Log likelihood	81.67742	TPE = 3/20	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1963	0.00341	0.01765	0.01424
	1964	-0.00304	0.01134	0.01437
	1965	0.00140	0.00794	0.00654
	1966	0.00390	0.01538	0.01148
	1967	0.00039	0.01785	0.01746
	1968	-0.00915	0.01337	0.02252
	1969	-0.00473	0.00824	0.01296
	1970	0.00573	0.03596	0.03022
	1971	0.00213	0.01263	0.01050
	1972	0.01119	0.02866	0.01747
	1973	0.00306	0.01398	0.01092
	1974	0.00676	0.04334	0.03658
	1975	-0.00102	0.03171	0.03273
	1976	0.00114	0.01832	0.01718
	1977	0.00048	0.02869	0.02820
	1978	-0.00263	0.01426	0.01689
	1979	-1.0D-18	0.00583	0.00583
	1980	-0.00934	0.01257	0.02191
	1981	-0.00337	0.02255	0.02592
	1982	-0.00667	0.01440	0.02107
	1983	0.00034	0.02038	0.02004

INDEPENDENT VARIABLES

PCFTAR = Target Consumption Level (1000 MT)
(An Estimate of expected consumption based upon a 3 year average of the growth of consumption.)
(((((FCONAR(-3) - FCONAR(-4))/FCONAR(-4)) +
((FCONAR(-2) - FCONAR(-3))/FCONAR(-3)) +
((FCONAR(-1) - FCONAR(-2))/FCONAR(-2)))/3 *
FCONAR(-1))/POPAR

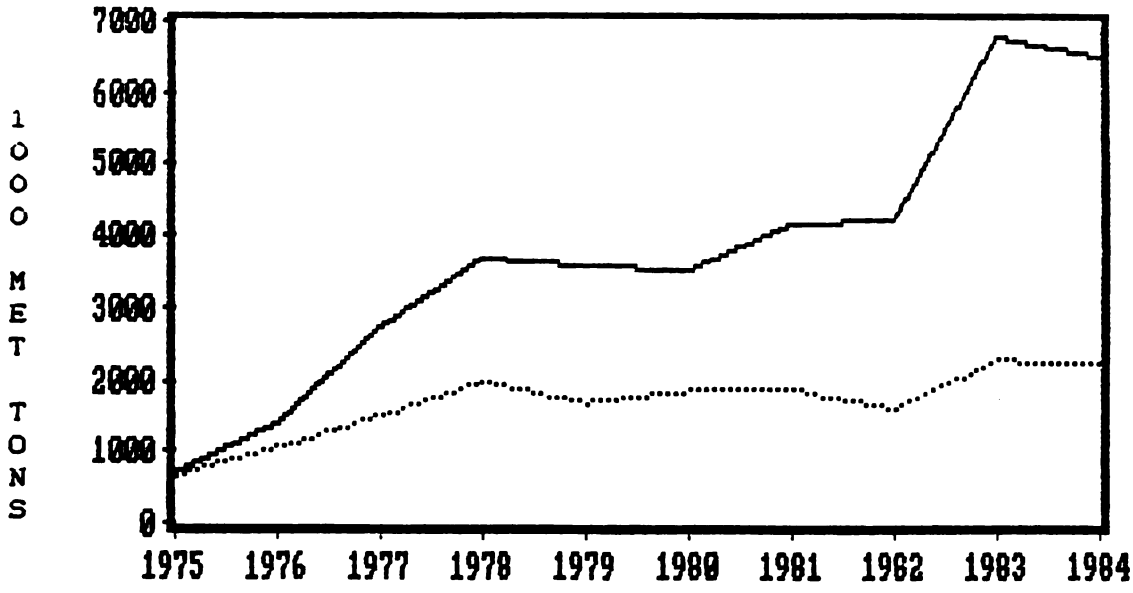
F1S1 = Spline for Large Crops (1000 MT)
PCPRO If(PCPRO .GT. .53)
0 Otherwise

DV79 = 1 If(TIME .EQ. 79)
0 Otherwise

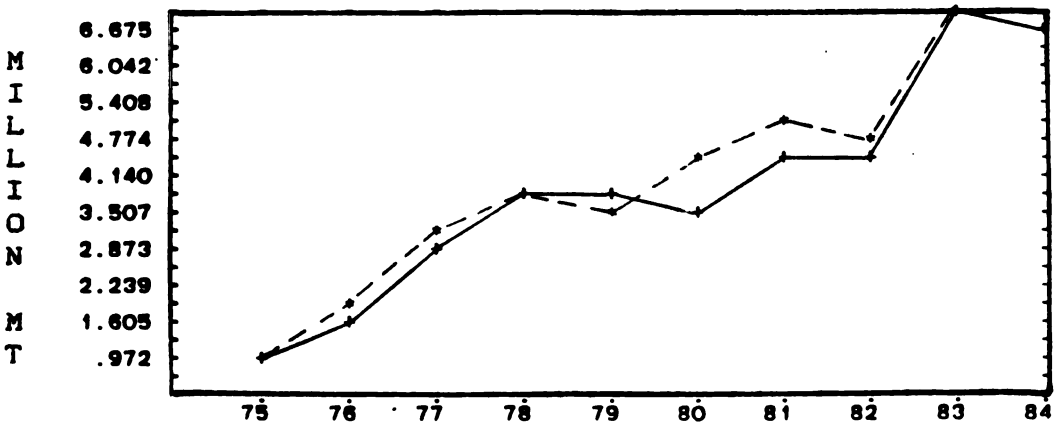
SMPL 1963 - 1983
21 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0188116	0.0097773	0.0433386	0.0058294
PCFTAR	-0.0206631	0.0486702	0.0841674	-0.0903228
F1S1	0.3643578	0.3255571	0.7396601	0.0000000
DV79	0.0476190	0.2182179	1.0000000	0.0000000

	Covariance	Correlation
PCFES,PCFES	9.104D-05	1.0000000
PCFES,PCFTAR	0.0002265	0.4996843
PCFES,F1S1	0.0009596	0.3165454
PCFES,DV79	-0.0006182	-0.3042329
PCFTAR,PCFTAR	0.0022560	1.0000000
PCFTAR,F1S1	-0.0025182	-0.1668724
PCFTAR,DV79	0.0049919	0.4935193
F1S1,F1S1	0.1009404	1.0000000
F1S1,DV79	-0.0173504	-0.2564369
DV79,DV79	0.0453515	1.0000000



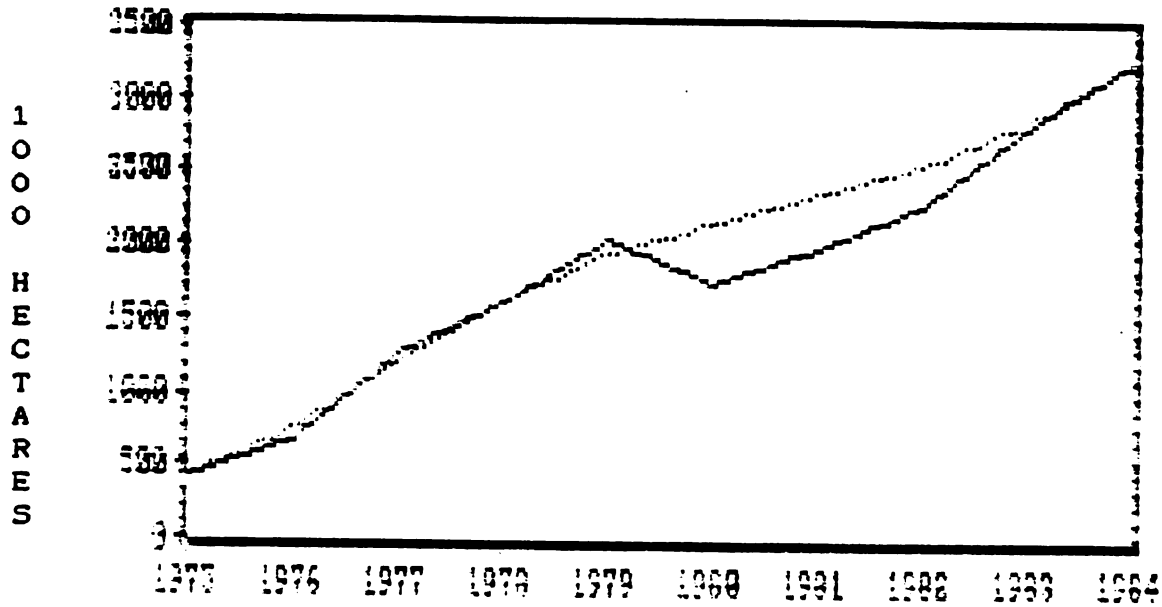
REGIONAL MODEL SIMULATION



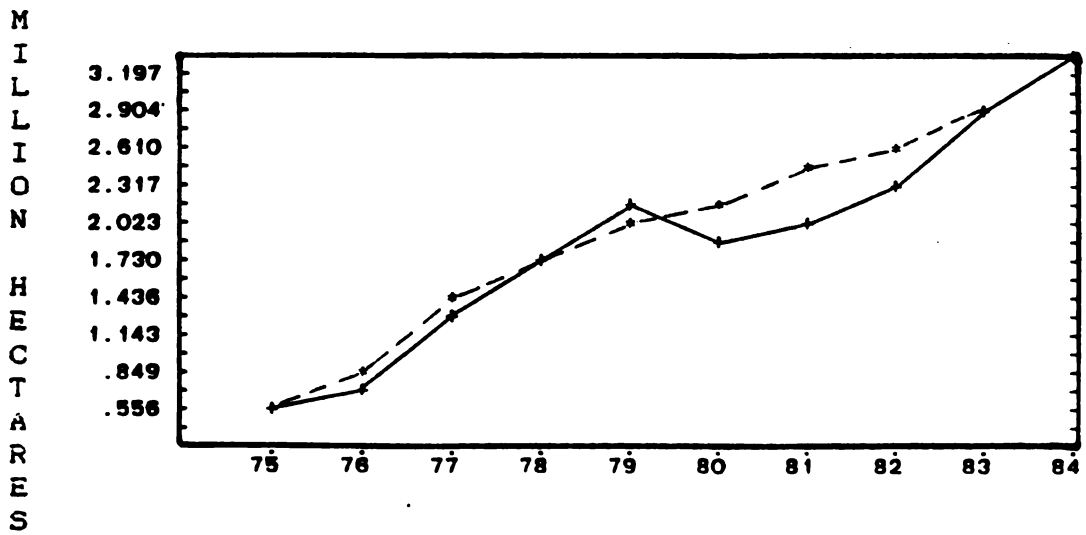
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.15.a & b. Soybean Production - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.16.a & b. Soybean Harvested Area - Argentina

Argentina
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is SHAAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-101.69139	122.42464	-0.8306448	0.419
SHAAR(-1)	0.9702668	0.0788883	12.299245	0.000
WRAR(-1)	-156.26107	147.02852	-1.0627943	0.305
SRARX(-1)	169.40640	66.569582	2.5448019	0.022
SPL76	3.3381535	1.8106595	1.8436119	0.085

R-squared	0.982485	Mean of dependent var	955.9000
Adjusted R-squared	0.977815	S.D. of dependent var	1065.527
S.E. of regression	158.7070	Sum of squared resid	377818.9
Durbin-Watson stat	2.188939	F-statistic	210.3568
Log likelihood	-126.8431	TPE	4/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	79.5184	16.0000	-63.5184
	1966	45.9389	17.0000	-28.9389
	1967	50.5415	20.0000	-30.5415
	1968	26.7639	28.0000	1.23611
	1969	-6.36547	26.0000	32.3655
	1970	-18.2765	36.0000	54.2765
	1971	-22.9752	68.0000	90.9752
	1972	19.1435	157.000	137.857
	1973	-135.273	344.000	479.273
	1974	-44.9385	356.000	400.939
	1975	19.4595	434.000	414.540
	1976	-94.7499	660.000	754.750
	1977	136.114	1250.00	1113.89
	1978	-49.0955	1600.00	1649.10
	1979	95.0334	2030.00	1934.97
	1980	-498.307	1740.00	2238.31
	1981	28.0151	1986.00	1957.98
	1982	95.4654	2281.00	2185.53
	1983	205.768	2800.00	2594.23
	1984	68.2189	3269.00	3200.78

INDEPENDENT VARIABLES

SHAAR = Soybean Harvested Area (HA)

SRAR = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPIAR

WRAR = Wheat Revenue per Hectare ($/HA)
(WYAR(-3)+WYAR(-2)+WYAR(-1)+WYAR)/4*FP/CPIAR

SPL76 = TIME If(TIME .GE. 76)
0 Otherwise

SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SHAAR	955.90000	1065.5274	3269.0000	16.000000
SHAAR(-1)	793.25000	934.02084	2800.0000	16.000000
WRAR(-1)	1.0126500	0.3409974	1.8079550	0.5368939
SRARX(-1)	1.9243162	0.7646384	3.6577190	1.0466200
SPL76	36.000000	40.872073	84.000000	0.0000000

	Covariance	Correlation
SHAAR,SHAAR	1078581.2	1.0000000
SHAAR,SHAAR(-1)	929959.22	0.9836013
SHAAR,WRAR(-1)	-17.632361	-0.0510824
SHAAR,SRARX(-1)	186.19539	0.2405607
SHAAR,SPL76	36871.800	0.8912088
SHAAR(-1),SHAAR(-1)	828775.19	1.0000000
SHAAR(-1),WRAR(-1)	-28.583568	-0.0944681
SHAAR(-1),SRARX(-1)	98.355106	0.1449642
SHAAR(-1),SPL76	31363.950	0.8648164
WRAR(-1),WRAR(-1)	0.1104653	1.0000000
WRAR(-1),SRARX(-1)	0.1634684	0.6599379
WRAR(-1),SPL76	-0.0988111	-0.0074628
SRARX(-1),SRARX(-1)	0.5554383	1.0000000
SRARX(-1),SPL76	6.6544721	0.2241337
SPL76,SPL76	1587.0000	1.0000000

Argentina
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is SYAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-18.241358	2.7245595	-6.6951586	0.000
LOGT	4.6217781	0.6334001	7.2967755	0.000

R-squared	0.736998	Mean of dependent var	1.635509
Adjusted R-squared	0.723156	S.D. of dependent var	0.453541
S.E. of regression	0.238635	Sum of squared resid	1.081986
Durbin-Watson stat	2.153856	F-statistic	53.24293
Log likelihood	1.342390	TPE	7/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1964	0.08242	1.06250	0.98008
: * :	1965	0.07326	1.12500	1.05174
: * :	1966	0.11300	1.23529	1.12230
: * :	1967	-0.09180	1.10000	1.19180
: * :	1968	-0.11742	1.14286	1.26027
* : :	1969	-0.28928	1.03846	1.32775
: : *	1970	0.24464	1.63889	1.39424
* : :	1971	-0.31274	1.14706	1.45980
: : * :	1972	0.20804	1.73248	1.52444
: * :	1973	-0.14634	1.44186	1.58820
* : :	1974	-0.28872	1.36236	1.65108
: * :	1975	-0.11173	1.60138	1.71311
: : *	1976	0.34688	2.12121	1.77433
: : *	1977	0.32526	2.16000	1.83474
: : *	1978	0.41812	2.31250	1.89438
: * :	1979	-0.17986	1.77340	1.95326
: * :	1980	9.4D-05	2.01149	2.01140
: * :	1981	0.02082	2.08963	2.06881
* : :	1982	-0.28422	1.84130	2.12552
: : *	1983	0.23810	2.41964	2.18154
* : :	1984	-0.24852	1.98838	2.23690

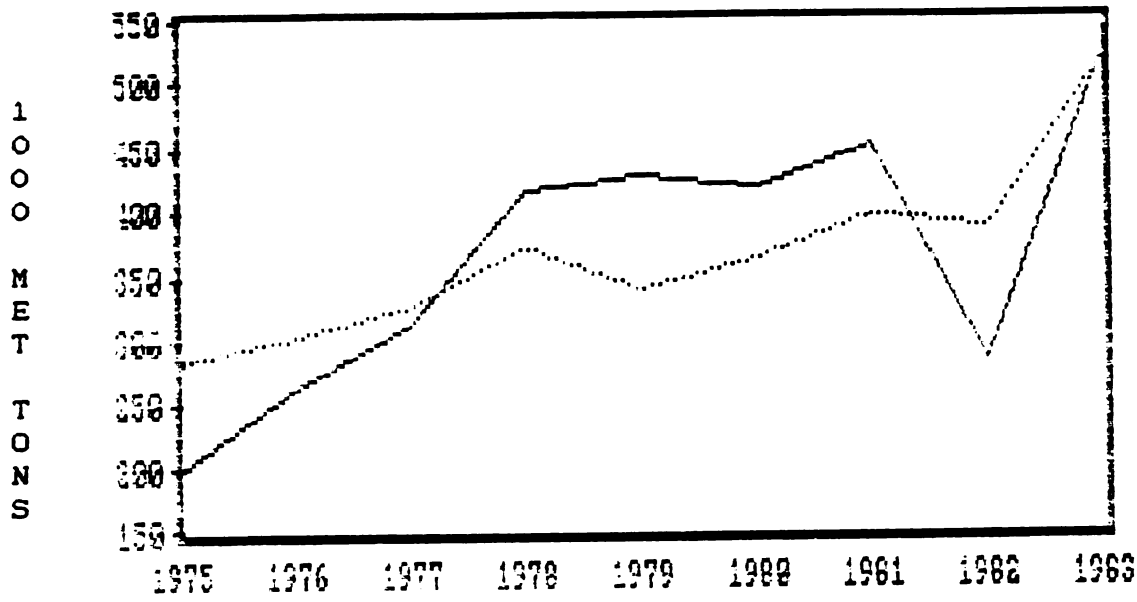
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

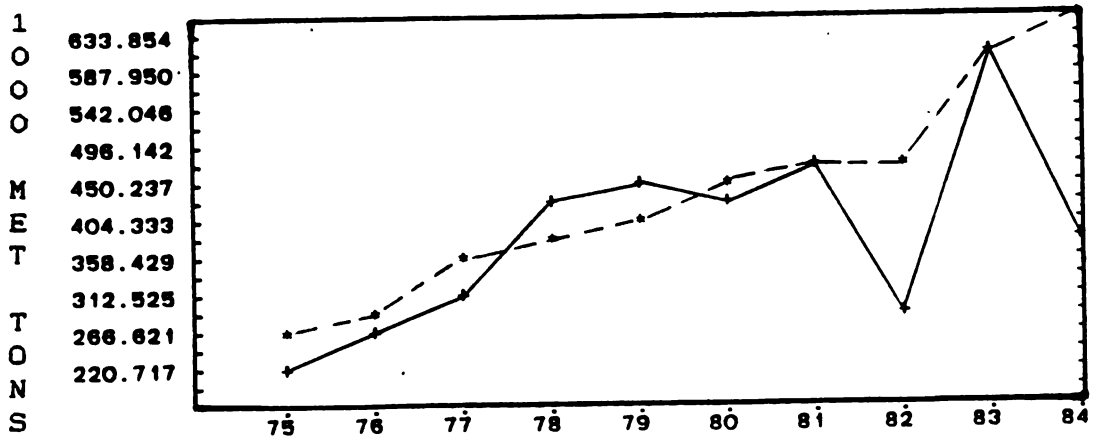
SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SYAR	1.6355094	0.4535413	2.4196430	1.0384620
LOGT	4.3006970	0.0842444	4.4308170	4.1588830

	Covariance	Correlation
SYAR,SYAR	0.1959045	1.0000000
SYAR,LOGT	0.0312393	0.8584862
LOGT,LOGT	0.0067592	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure B.17.a & b. Soymeal Equivalent Consumption - Argentina

Argentina
Per Capita Soymeal Equivalent Consumption* (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PCSMEC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0109897	0.0082880	-1.3259847	0.205
PCRGDP(-1)	1.2231466	0.7999745	1.5289819	0.147
PCSMDS	0.0598949	0.0172804	3.4660647	0.003
PCSMEC(-1)	0.4357947	0.1661773	2.6224690	0.019

R-squared	0.872979	Mean of dependent var	0.007981
Adjusted R-squared	0.847575	S.D. of dependent var	0.006276
S.E. of regression	0.002450	Sum of squared resid	9.01D-05
Durbin-Watson stat	1.711497	F-statistic	34.36354
Log likelihood	89.50596	TPE = 6/18	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-0.00097	0.00025	0.00122
	1966	-0.00257	0.00020	0.00277
	1967	-0.00186	0.00037	0.00223
	1968	-0.00033	0.00075	0.00108
	1969	-0.00039	0.00085	0.00124
	1970	-0.00058	0.00136	0.00193
	1971	0.00012	0.00205	0.00193
	1972	0.00361	0.00692	0.00331
	1973	0.00276	0.00873	0.00598
	1974	0.00481	0.01250	0.00769
	1975	-0.00302	0.00759	0.01061
	1976	-3.8D-05	0.00991	0.00995
	1977	-0.00084	0.01161	0.01245
	1978	0.00082	0.01521	0.01439
	1979	0.00116	0.01544	0.01429
	1980	0.00055	0.01487	0.01431
	1981	0.00070	0.01575	0.01505
	1982	-0.00464	0.00979	0.01443
	1983	0.00070	0.01748	0.01679

INDEPENDENT VARIABLES

PCSMECO = Soymeal Equivalent Consumption Per Capita (1000 MT)

PCRGDP = Real GDP Per Capita GDPAR/CPIAR/POPAR

PCSMDS = Soymeal Domestic Supply Per Capita (1000 MT) ((SESAR(-1) + SPROAR)*.795 + SMESAR(-1))/POPAR

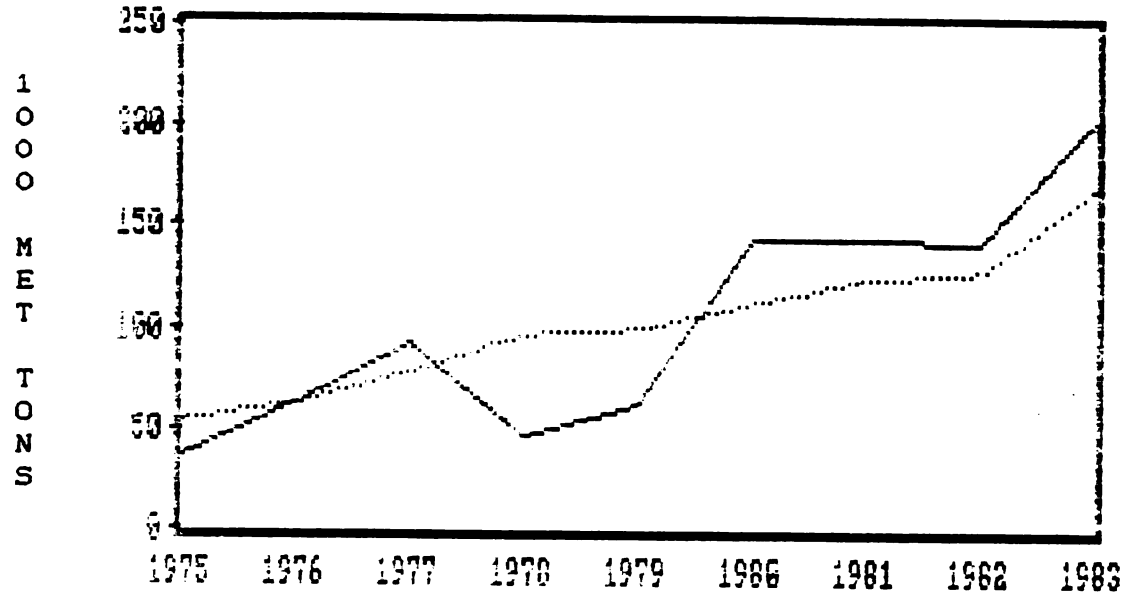
---

* Soymeal Equivalent Consumption = (SESAR(-1) + SPROAR - SNEAR - SESAR)*.795 + SMESAR(-1) - SMNEAR - SMESAR

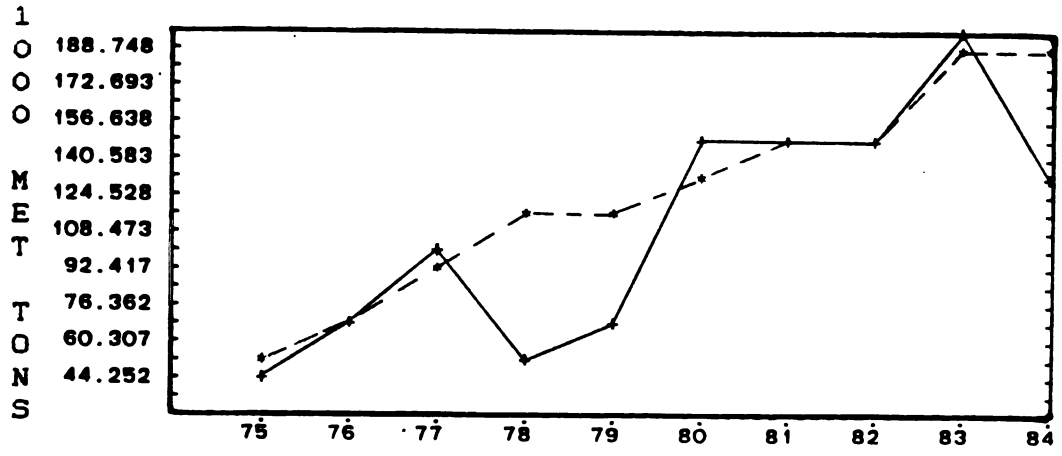
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSMEC	0.0079806	0.0062759	0.0174819	0.0002030
PCRGDP(-1)	0.0103793	0.0007914	0.0119807	0.0093308
PCSMDS	0.0532929	0.0592853	0.2000317	0.0010036
PCSMEC(-1)	0.0070743	0.0060674	0.0157534	0.0002030

	Covariance	Correlation
PCSMEC,PCSMEC	3.731D-05	1.0000000
PCSMEC,PCRGDP(-1)	3.613D-07	0.0767879
PCSMEC,PCSMDS	0.0003060	0.8680977
PCSMEC,PCSMEC(-1)	3.168D-05	0.8781126
PCRGDP(-1),PCRGDP(-1)	5.934D-07	1.0000000
PCRGDP(-1),PCSMDS	-8.496D-06	-0.1911453
PCRGDP(-1),PCSMEC(-1)	3.314D-07	0.0728555
PCSMDS,PCSMDS	0.0033298	1.0000000
PCSMDS,PCSMEC(-1)	0.0002684	0.7874807
PCSMEC(-1),PCSMEC(-1)	3.488D-05	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.18.a & b. Soyoil Equivalent Consumption - Argentina

Argentina
Soyoil Equivalent Consumption* (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SOECO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-232.81423	185.58331	-1.2544998	0.229
SDSAR	0.0142900	0.0073330	1.9487201	0.070
SOECO(-1)	0.1660377	0.2775653	0.5981933	0.559
TIME	3.4475606	2.6743067	1.2891418	0.217

R-squared	0.861963	Mean of dependent var	56.46974
Adjusted R-squared	0.834356	S.D. of dependent var	61.16167
S.E. of regression	24.89242	Sum of squared resid	9294.487
Durbin-Watson stat	1.872439	F-statistic	31.22228
Log likelihood	-85.79084	TPE = 6/18	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: | * :	1965	9.34427	1.22500	-8.11927
: |* :	1966	4.69665	0.22500	-4.47165
: |* :	1967	4.25078	3.27500	-0.97578
: * :	1968	-1.09970	2.15000	3.24970
: * :	1969	-1.26408	5.37500	6.63908
: *| :	1970	-3.58297	7.52500	11.1080
: *| :	1971	-5.56266	9.85000	15.4127
: *| :	1972	-5.99716	16.2500	22.2472
: * | :	1973	-7.03349	23.5250	30.5585
: | : *	1974	37.9210	75.4500	37.5290
: * | :	1975	-15.1021	36.2250	51.3271
: |* :	1976	5.29580	63.8750	58.5792
: | * :	1977	6.48726	92.4250	85.9377
* : | :	1978	-60.7151	45.7000	106.415
* : | :	1979	-40.8437	60.9750	101.819
: | : *	1980	37.7802	143.825	106.045
: | * :	1981	9.24492	142.225	132.980
: | * :	1982	6.42764	141.475	135.047
: | *:	1983	19.7524	201.350	181.598

INDEPENDENT VARIABLES

SDSAR = Soybean Supply (1000 MT)
SESAR(-1)+SPROAR

SOECO = Soyoil equivalent consumption (1000 MT)

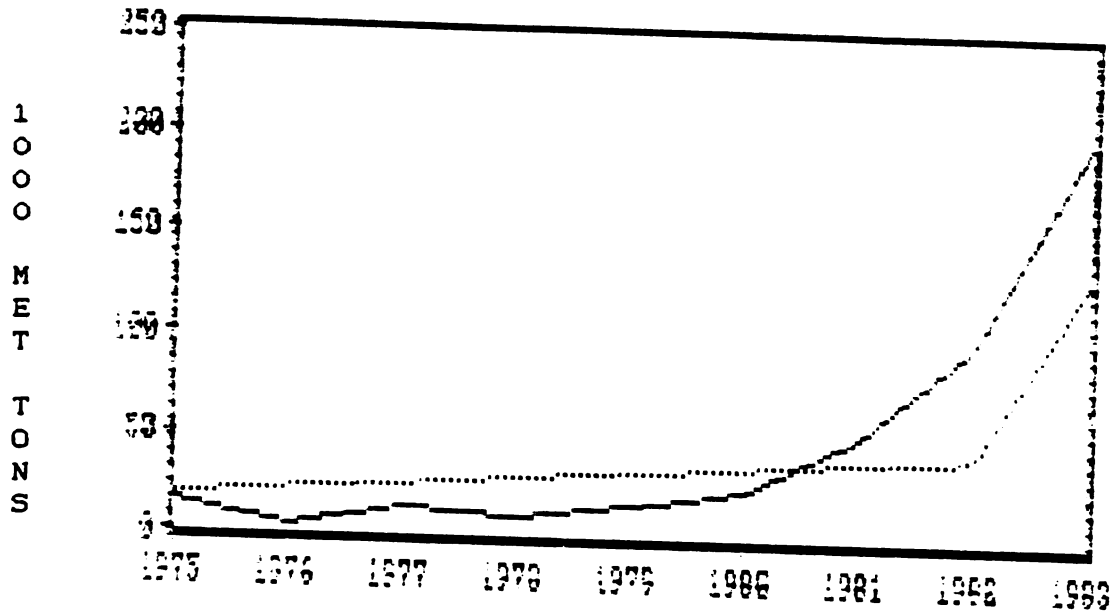
TIME = 1960=60, 1961=61, ...

*** Soyoil Equivalent Consumption = (SESAR(-1) + SPROAR - SNEAR - SESAR)*.175 + SOESAR(-1) - SONEAR - SOESAR**

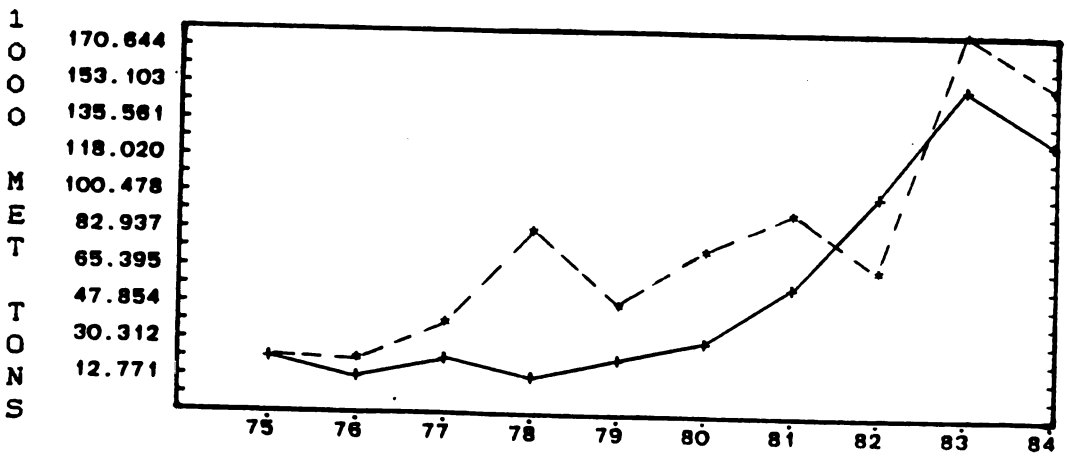
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SOECO	56.469737	61.161674	201.35000	0.2250000
SDSAR	1857.0526	2145.0163	7332.0000	28.000000
SOECO(-1)	45.936842	51.254973	143.82500	0.2250000
TIME	74.000000	5.6273143	83.000000	65.000000

	Covariance	Correlation
SOECO,SOECO	3543.8688	1.0000000
SOECO,SDSAR	113475.49	0.9130051
SOECO,SOECO(-1)	2576.8310	0.8676642
SOECO,TIME	291.58948	0.8942777
SDSAR,SDSAR	4358931.8	1.0000000
SDSAR,SOECO(-1)	93141.628	0.8942487
SDSAR,TIME	10361.368	0.9060798
SOECO(-1),SOECO(-1)	2488.8053	1.0000000
SOECO(-1),TIME	241.50527	0.8838336
TIME,TIME	30.000000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.19.a & b. Soymeal Ending Stocks - Argentina

Argentina
Soymeal Ending Stocks (1000 MT)

SMPL 1966 - 1983
18 Observations
LS // Dependent Variable is SMESAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-224.85095	90.270336	-2.4908620	0.025
S1	0.0758915	0.0149925	5.0619541	0.000
TIME	3.2363188	1.2216298	2.6491814	0.018

R-squared	0.789813	Mean of dependent var	26.72222
Adjusted R-squared	0.761788	S.D. of dependent var	49.11428
S.E. of regression	23.97118	Sum of squared resid	8619.263
Durbin-Watson stat	0.929322	F-statistic	28.18253
Log likelihood	-81.08334	TPE = 4/17	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1966	12.2539	1.00000	-11.2539
: * :	1967	11.0176	3.00000	-8.01758
:* :	1968	4.78126	0.00000	-4.78126
: * :	1969	1.54495	0.00000	-1.54495
: * :	1970	0.30863	2.00000	1.69137
: *: :	1971	-2.92769	2.00000	4.92769
: * : :	1972	-6.16401	2.00000	8.16401
: : *:	1973	18.5997	30.0000	11.4003
: * :	1974	-1.63665	13.0000	14.6366
: *: :	1975	-2.87297	15.0000	17.8730
: * : :	1976	-17.1093	4.00000	21.1093
: * : :	1977	-15.0230	14.0000	29.0230
* : : :	1978	-53.3148	9.00000	62.3148
*: : :	1979	-25.3746	16.0000	41.3746
: * : :	1980	-12.0546	22.0000	34.0546
: : * :	1981	14.6809	52.0000	37.3191
: : : *	1982	57.4728	98.0000	40.5272
: : * :	1983	15.8179	198.000	182.182

INDEPENDENT VARIABLES

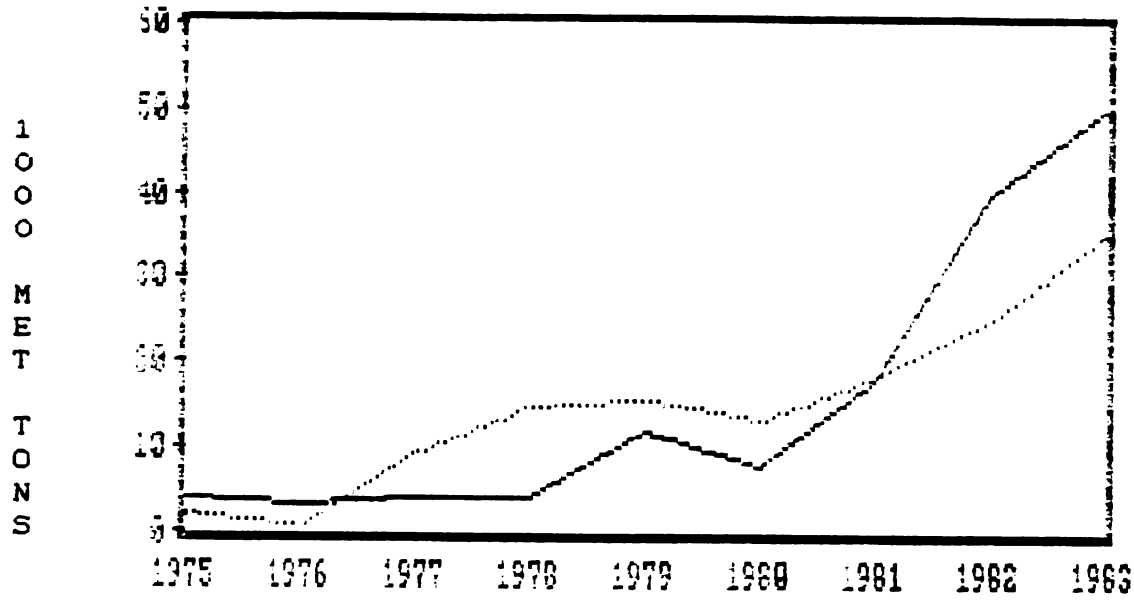
S1 = Soybean Domestic Supply If(Soybean Domestic Supply .GT. (-20603.389 + 297.66780*TIME)) 0 Otherwise

TIME = 1960=60, 1961=61, ...

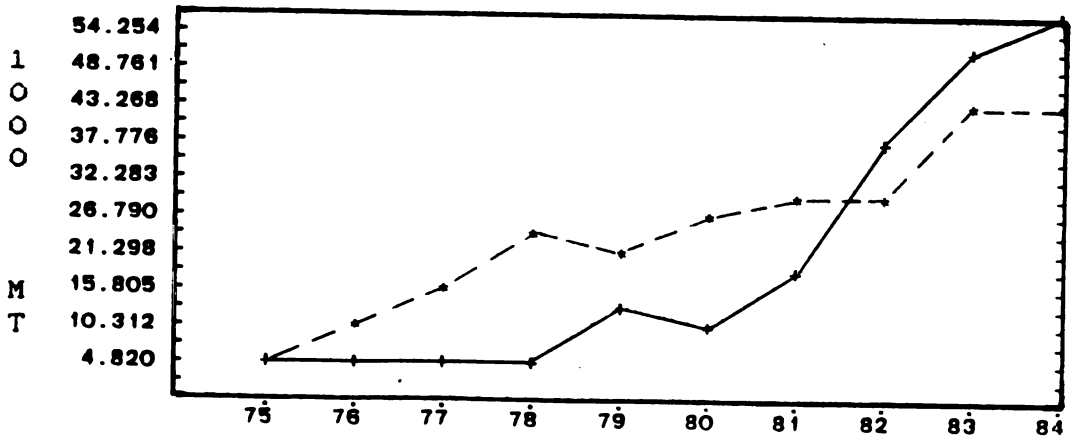
SMPL 1966 - 1983
18 Observations

Series	Mean	S.D.	Maximum	Minimum
SMESAR	26.722222	49.114279	198.00000	0.0000000
S1	137.92607	434.99793	1823.9010	0.0000000
TIME	74.500000	5.3385391	83.000000	66.000000

	Covariance	Correlation
SMESAR,SMESAR	2278.2006	1.0000000
SMESAR,S1	16778.707	0.8315476
SMESAR,TIME	162.52778	0.6563281
S1,S1	178710.80	1.0000000
S1,TIME	993.74603	0.4530951
TIME,TIME	26.916667	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.20.a & b. Soyoil Ending Stocks - Argentina

Argentina
Soyoil Ending Stocks (1000 MT)

SMPL 1969 - 1983
15 Observations
LS // Dependent Variable is SOESAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.5470052	3.2206582	-1.1013293	0.292
SODSAR	0.0349918	0.0060117	5.8205830	0.000
MARGIN	0.3640793	0.2088797	1.7430100	0.107

R-squared	0.738852	Mean of dependent var	10.53333
Adjusted R-squared	0.695327	S.D. of dependent var	14.89903
S.E. of regression	8.223847	Sum of squared resid	811.5798
Durbin-Watson stat	0.939543	F-statistic	16.97544
Log likelihood	-51.21607	TPE = 2/14	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1969	-1.08758	0.00000	1.08758
	1970	2.40815	0.00000	-2.40815
	1971	5.14500	1.00000	-4.14500
	1972	-3.47474	3.00000	6.47474
	1973	-2.51426	3.00000	5.51426
	1974	10.4252	8.00000	-2.42519
	1975	2.80142	4.00000	1.19858
	1976	2.52871	3.00000	0.47129
	1977	-8.90190	4.00000	12.9019
	1978	-14.0742	4.00000	18.0742
	1979	-8.32328	12.0000	20.3233
	1980	-5.43733	8.00000	13.4373
	1981	-1.91305	18.0000	19.9130
	1982	12.8967	40.0000	27.1033
	1983	9.52117	50.0000	40.4788

INDEPENDENT VARIABLES

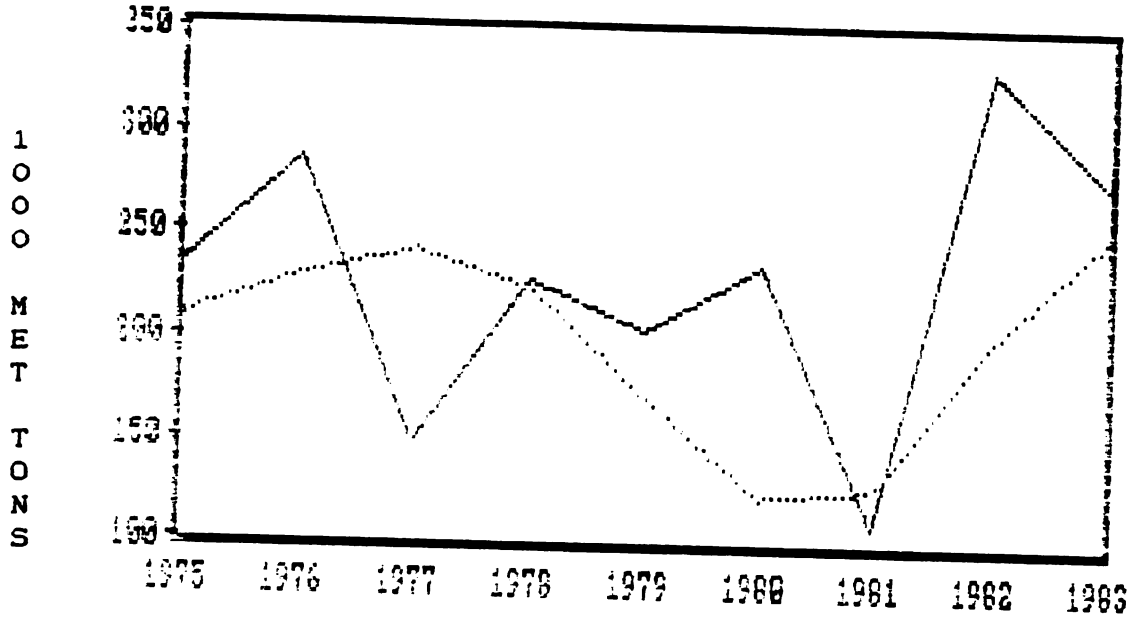
SODSAR = Soyoil Equivalent Domestic Supply (1000 MT)
((SESAR(-1) + SPROAR)*.175 + SOESAR(-1)

MARGIN = Soybean Crush Margin
(SMP*XRAR/CPIAR)*.795 + (SOP*XRAR/CPIAR)*.175 -
(SP*XRAR/CPIAR)

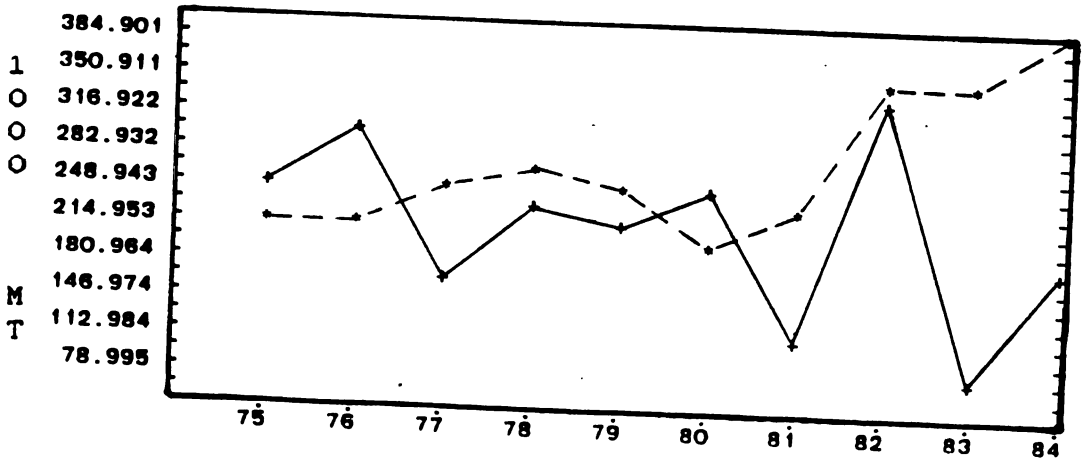
SMFL 1969 - 1983
15 Observations

Series	Mean	S.D.	Maximum	Minimum
SOESAR	10.533333	14.899025	50.000000	0.0000000
SODSAR	416.54499	389.16563	1323.1000	15.875000
MARGIN	-1.3605099	11.200529	21.307910	-16.847190

	Covariance	Correlation
SOESAR, SOESAR	207.18222	1.0000000
SOESAR, SODSAR	4438.6542	0.8202046
SOESAR, MARGIN	-6.1517877	-0.0394974
SODSAR, SODSAR	141353.23	1.0000000
SODSAR, MARGIN	-1394.0753	-0.3426703
MARGIN, MARGIN	117.08839	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.21.a & b. Soybean Ending Stocks - Argentina

Argentina
Soybean Ending Stocks (1000 MT)

SMPL 1966 - 1983
18 Observations
LS // Dependent Variable is SESAR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-72.172134	114.23638	-0.6317789	0.538
SPAR	412.33272	138.74380	2.9719002	0.011
SMPAR	-288.51642	108.31451	-2.6636914	0.019
SNEAR(-1)	0.0639183	0.0286085	2.2342390	0.044
SSURAR(-1)	-22.335465	15.705265	-1.4221642	0.179

R-squared	0.793123	Mean of dependent var	170.8889
Adjusted R-squared	0.729468	S.D. of dependent var	98.50941
S.E. of regression	51.23736	Sum of squared resid	34128.48
Durbin-Watson stat	2.501766	F-statistic	12.45981
Log likelihood	-93.46853	TPE = 7/17	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1966	-30.6359	35.0000	65.6359
	1967	12.8492	44.0000	31.1508
	1968	10.3800	58.0000	47.6200
	1969	33.2188	60.0000	26.7812
	1970	-27.2216	76.0000	103.222
	1971	-5.71091	92.0000	97.7109
	1972	-30.5465	134.000	164.546
	1973	36.5155	307.000	270.484
	1974	-5.87791	218.000	223.878
	1975	26.1048	235.000	208.895
	1976	64.0385	287.000	222.962
	1977	-94.2026	147.000	241.203
	1978	-47.1932	227.000	274.193
	1979	-17.4980	204.000	221.498
	1980	41.6563	235.000	193.344
	1981	-47.8510	107.000	154.851
	1982	91.8014	332.000	240.199
	1983	-9.82705	278.000	287.827

INDEPENDENT VARIABLES

SPAR = Real Argentine Soybean Price ($/MT)
SP*XRAR/CPIAR

SMPAR = Real Argentine Soymeal Price ($/MT)
SP*XRAR/CPIAR

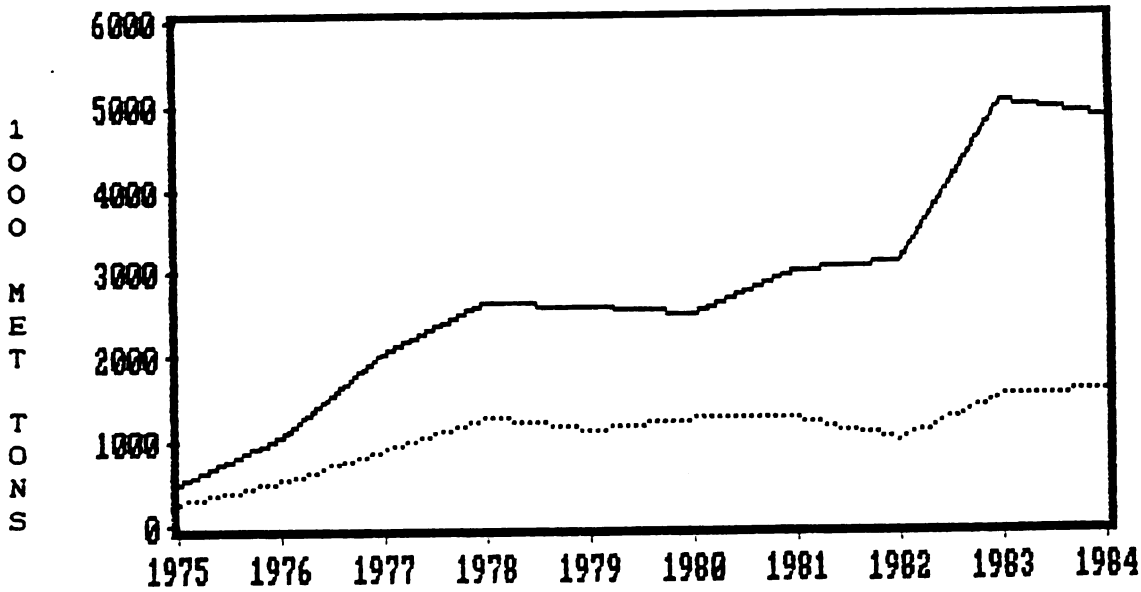
SNEAR = Soymeal Net Exports (1000 MT)

SSURAR = Soybean Stock/Consumption Ratio
SESAR/(SESAR(-1) + SPROAR - SNEAR - SESAR)

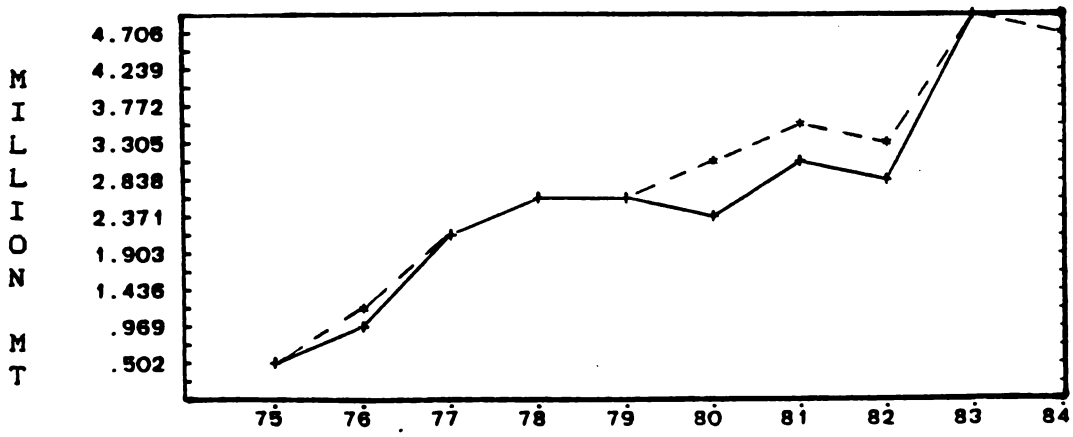
SMPL 1966 - 1983
18 Observations

Series	Mean	S.D.	Maximum	Minimum
SESAR	170.88889	98.509414	332.00000	35.000000
SPAR	1.2244740	0.4368048	2.3993790	0.5254005
SMPAR	0.9751381	0.4454319	2.4937260	0.4349627
SNEAR(-1)	771.33333	1082.4432	2776.0000	0.0000000
SSURAR(-1)	1.3336909	1.4718360	5.0000000	0.0503056

	Covariance	Correlation
SESAR, SESAR	9164.9877	1.0000000
SESAR, SPAR	6.3616687	0.1565415
SESAR, SMPAR	1.3098719	0.0316077
SESAR, SNEAR(-1)	40284.426	0.4000165
SESAR, SSURAR(-1)	-109.63936	-0.8006688
SPAR, SPAR	0.1801986	1.0000000
SPAR, SMPAR	0.1721461	0.9368111
SPAR, SNEAR(-1)	-279.21129	-0.6252648
SPAR, SSURAR(-1)	0.0190913	0.0314421
SMPAR, SMPAR	0.1873868	1.0000000
SMPAR, SNEAR(-1)	-225.35265	-0.4948799
SMPAR, SSURAR(-1)	0.0538731	0.0870071
SNEAR(-1), SNEAR(-1)	1106589.8	1.0000000
SNEAR(-1), SSURAR(-1)	-880.35515	-0.5850823
SSURAR(-1), SSURAR(-1)	2.0459512	1.0000000



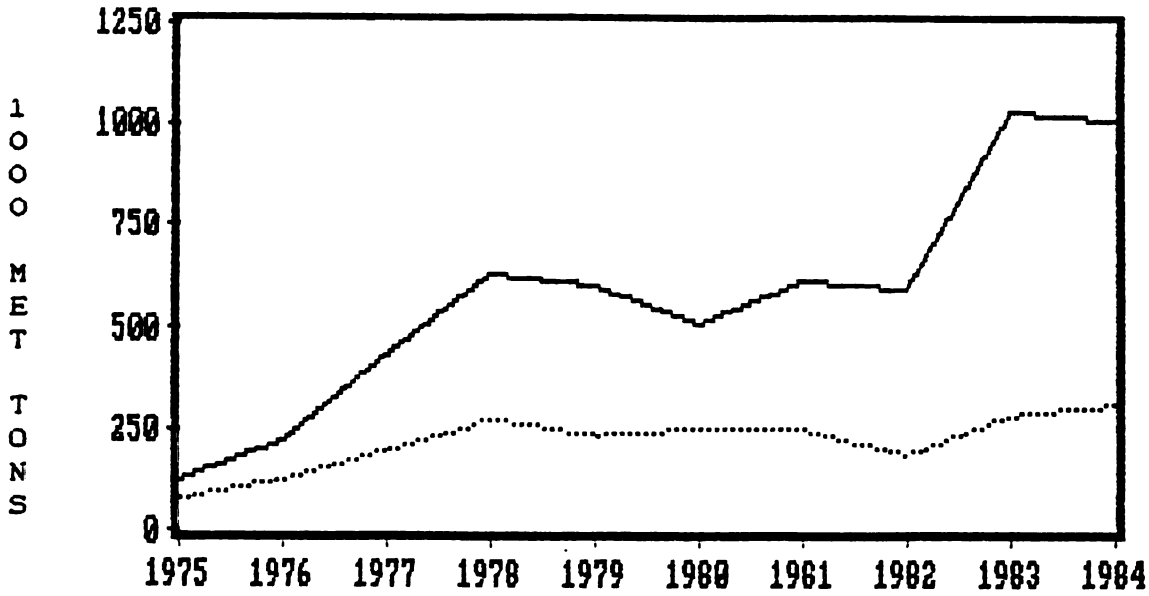
REGIONAL MODEL SIMULATION



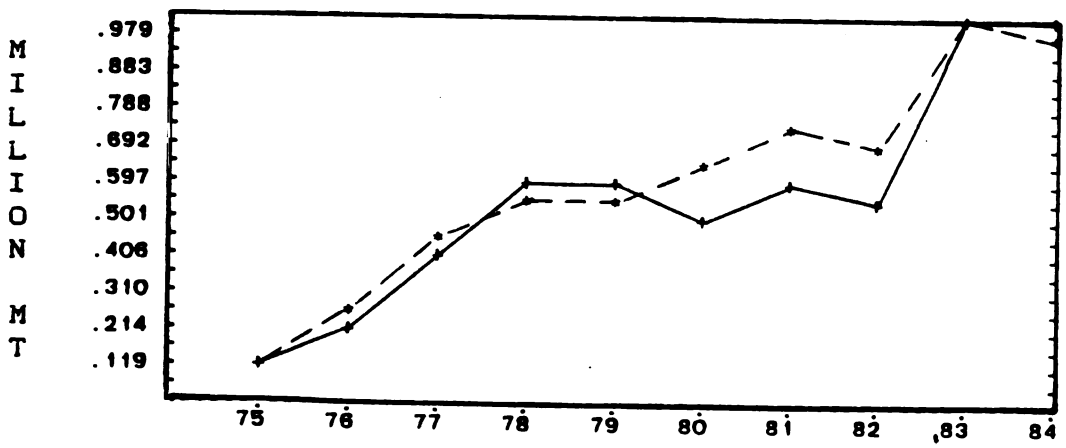
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.22.a & b. Soymeal Equivalent Net Exports - Argentina



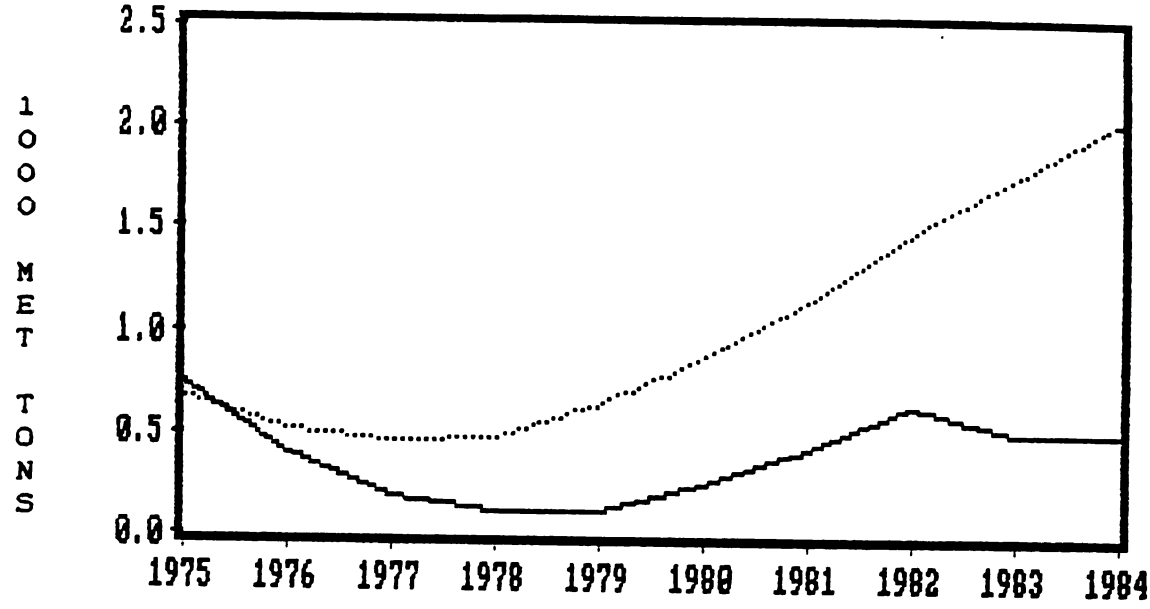
REGIONAL MODEL SIMULATION



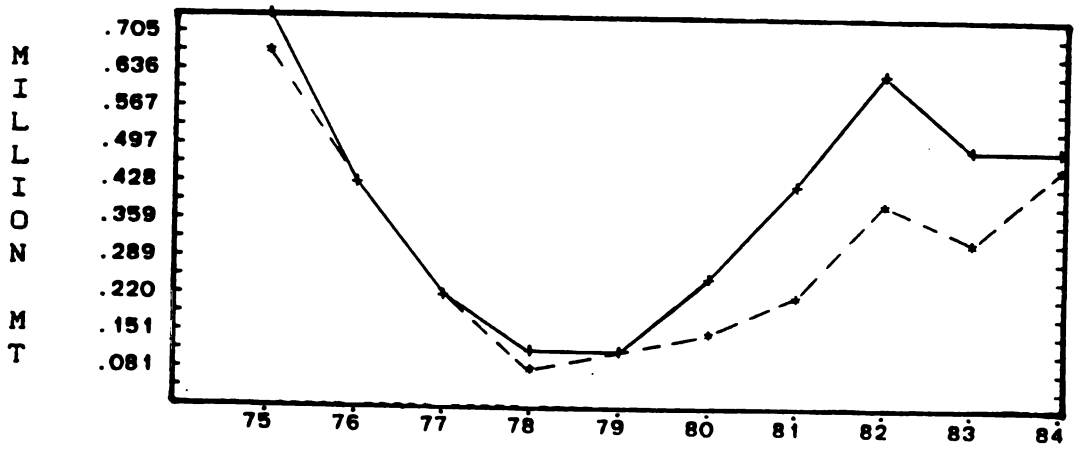
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure B.23.a & b. Soyoil Equivalent Net Exports - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.24.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Argentina

Argentina
Percentage Soymeal Equivalent Exported as Soymeal

SMPL 1975 - 1983
9 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-8.5515583	1.4951451	-5.7195509	0.002
PMEAL(-1)	0.7094612	0.0802566	8.8399065	0.000
SDSAR	-0.0001253	2.951D-05	-4.2467243	0.008
TIME	0.1149199	0.0200404	5.7344258	0.002

R-squared	0.950497	Mean of dependent var	0.370951
Adjusted R-squared	0.920795	S.D. of dependent var	0.224321
S.E. of regression	0.063131	Sum of squared resid	0.019928
Durbin-Watson stat	2.481577	F-statistic	32.00133
Log likelihood	14.73741		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1975	0.07741	0.73988	0.66247
*	1976	-0.10615	0.39620	0.50235
*	1977	-0.01282	0.19118	0.20400
*	1978	0.03972	0.10539	0.06568
*	1979	-0.00891	0.11333	0.12224
*	1980	-0.00478	0.25343	0.25821
*	1981	0.02701	0.41418	0.38717
*	1982	-0.00195	0.62396	0.62591
*	1983	-0.00953	0.50101	0.51053

INDEPENDENT VARIABLES

PMEAL = Percentage Soymeal Equivalent imported as Soymeal

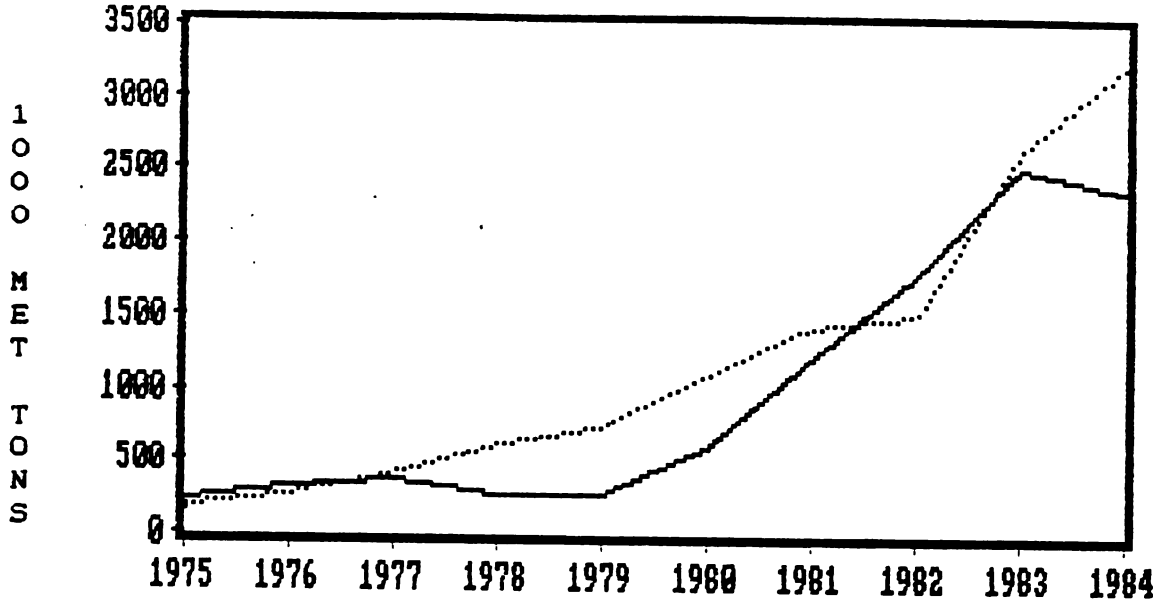
SDSAR = Soymeal Supply (1000 MT)
SESAR(-1) + SPROAR

TIME = 1960=60, 1961=61, ...

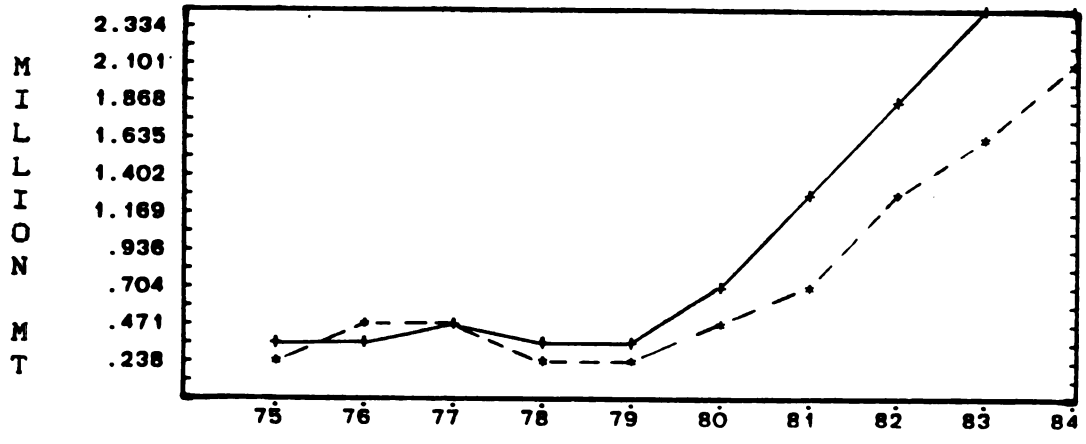
SMPL 1975 - 1983
9 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.3709507	0.2243212	0.7398783	0.1053946
PMEAL(-1)	0.4263942	0.3069369	1.0000000	0.1053946
SDSAR	3659.6667	1823.1900	7332.0000	913.00000
TIME	79.000000	2.7386128	83.000000	75.000000

	Covariance	Correlation
PMEAL,PMEAL	0.0447289	1.0000000
PMEAL,PMEAL(-1)	0.0468935	0.7662057
PMEAL,SDSAR	-40.982489	-0.1127324
PMEAL,TIME	0.0357567	0.0654801
PMEAL(-1),PMEAL(-1)	0.0837425	1.0000000
PMEAL(-1),SDSAR	-189.93301	-0.3818316
PMEAL(-1),TIME	-0.3160748	-0.4230217
SDSAR,SDSAR	2954686.0	1.0000000
SDSAR,TIME	4038.3333	0.9098968
TIME,TIME	6.6666667	1.0000000



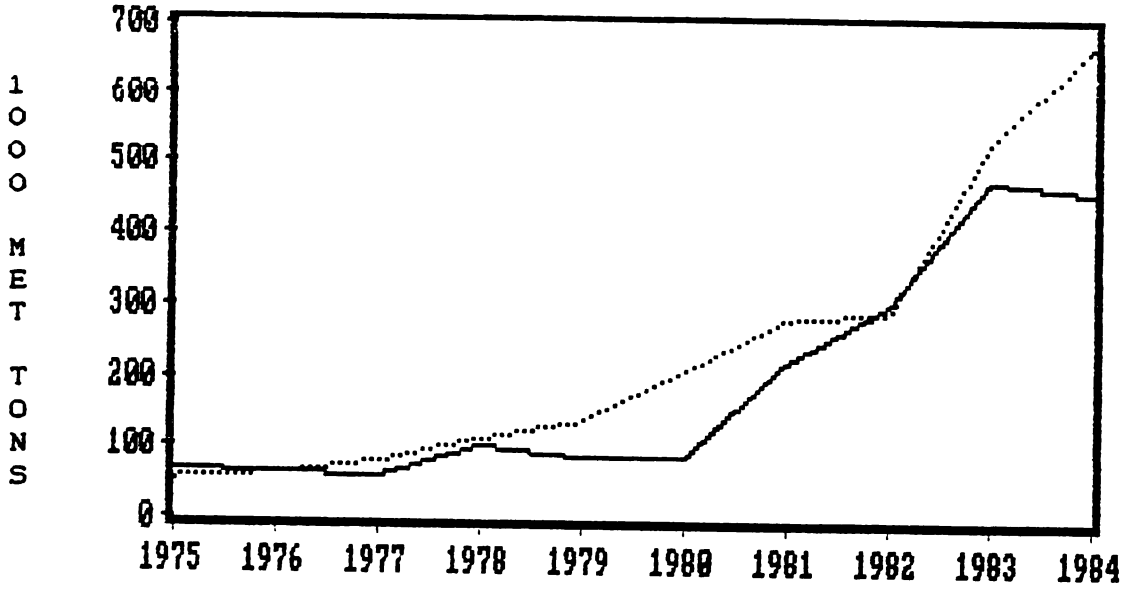
REGIONAL MODEL SIMULATION



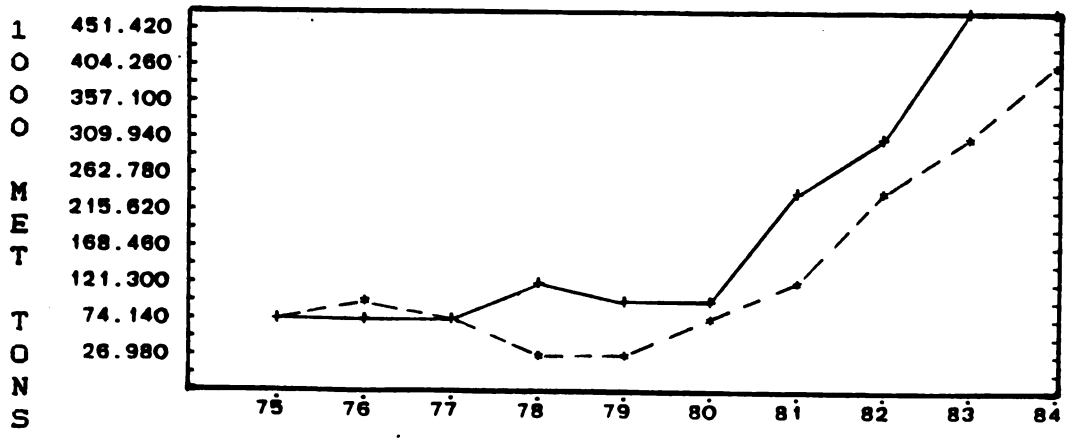
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.25.a & b. Soymeal Net Exports - Argentina



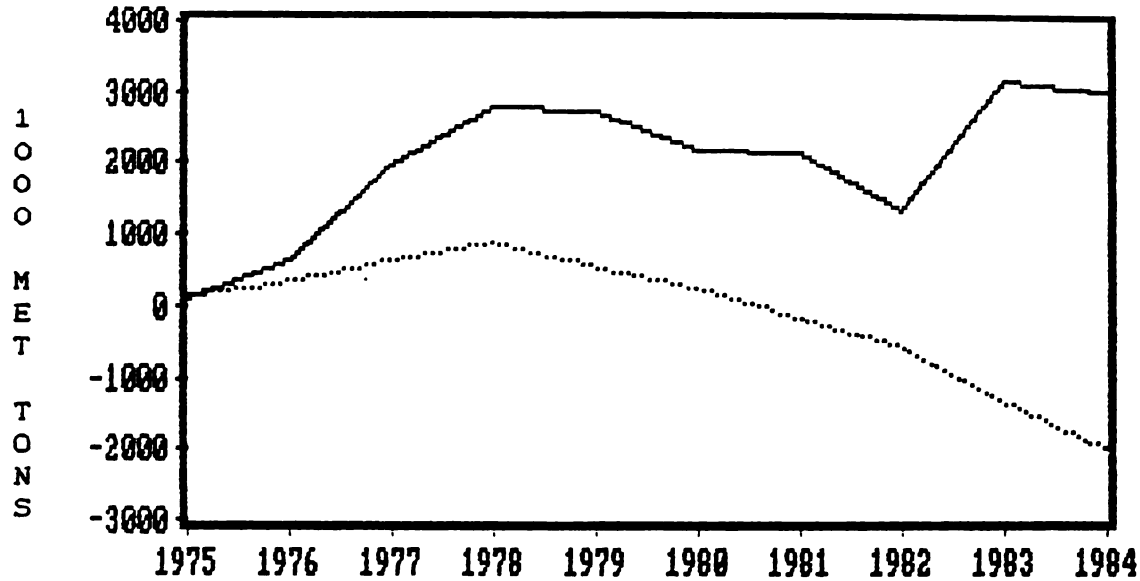
REGIONAL MODEL SIMULATION



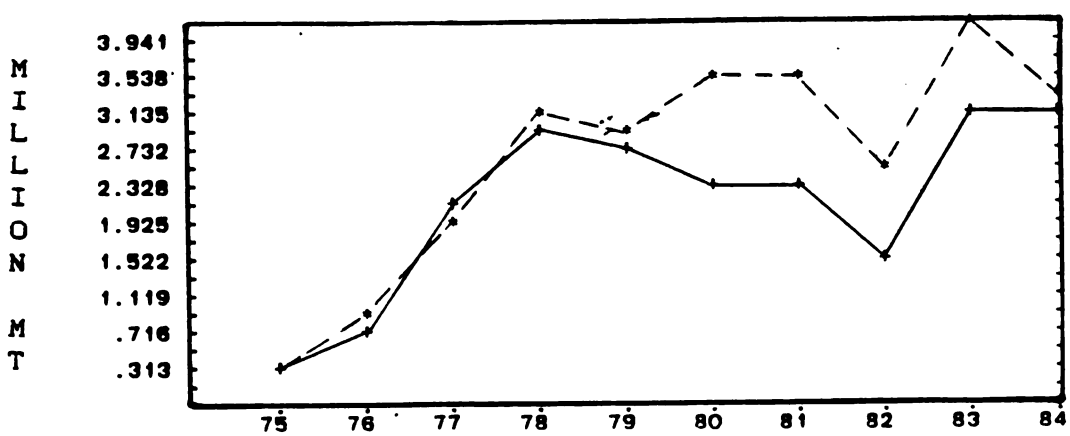
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.26.a & b. Soyoil Net Exports - Argentina



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure B.27.a & b. Soybean Net Exports - Argentina

APPENDIX C

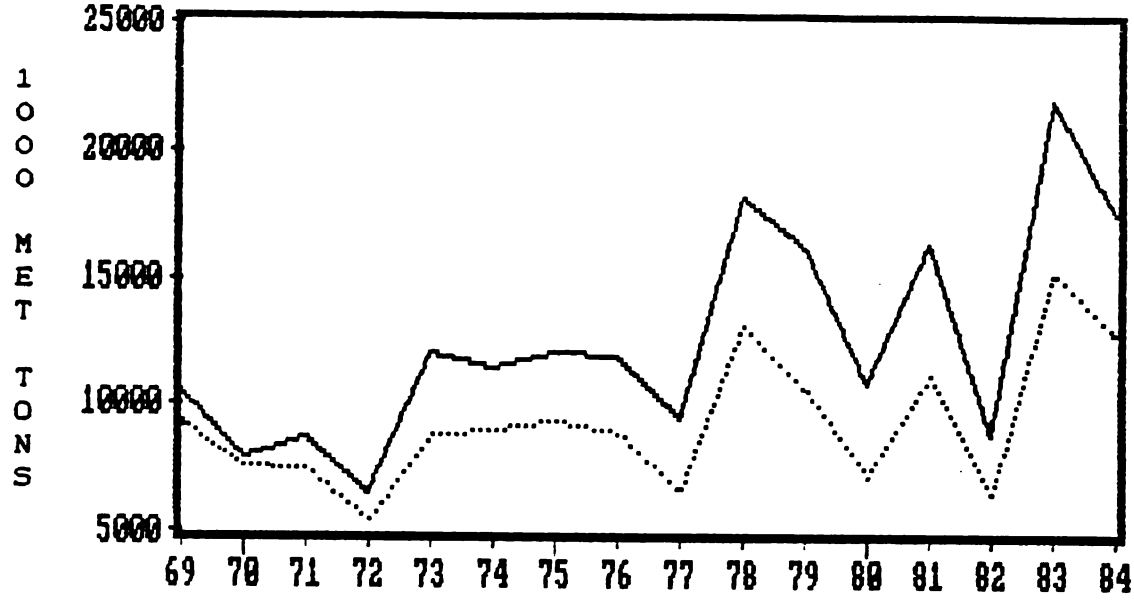
EQUATION STATISTICS - AUSTRALIA

Wheat

WPROAU.....Production
WHAAU.....Harvested Area
WYAU.....Yield
WCONAU.....Total Consumption
WFEDAU.....Feed Consumption
WFODAU.....Food & Residual Consumption
WNEAU.....Net Exports
WESAU.....Ending Stocks

Coarse Grain

FPROAU.....Production
FHAAU.....Harvested Area
FYAU.....Yield
FCONAU.....Total Consumption
FFEDAU.....Feed Consumption
FFODAU.....Food & Residual Consumption
FNEAU.....Net Exports
FESAU.....Ending Stocks



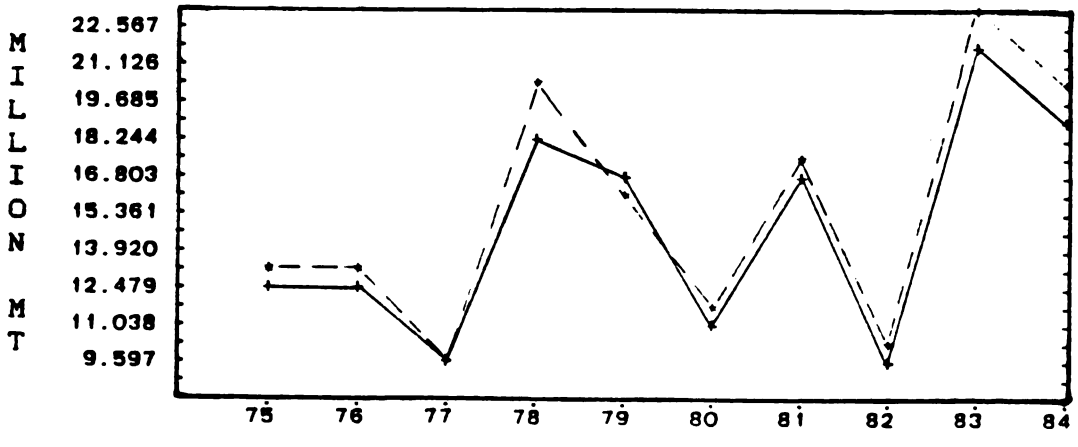
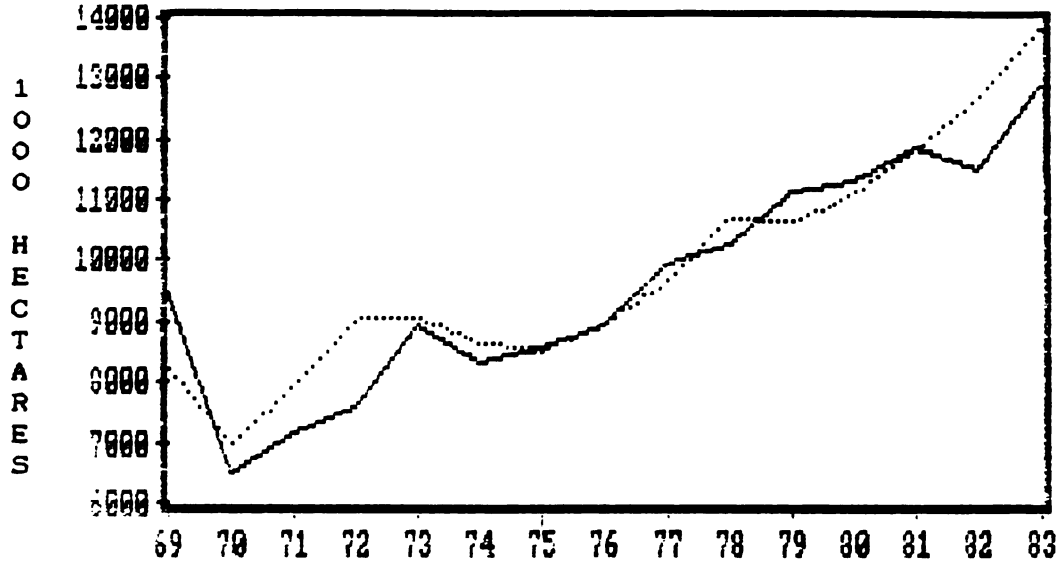
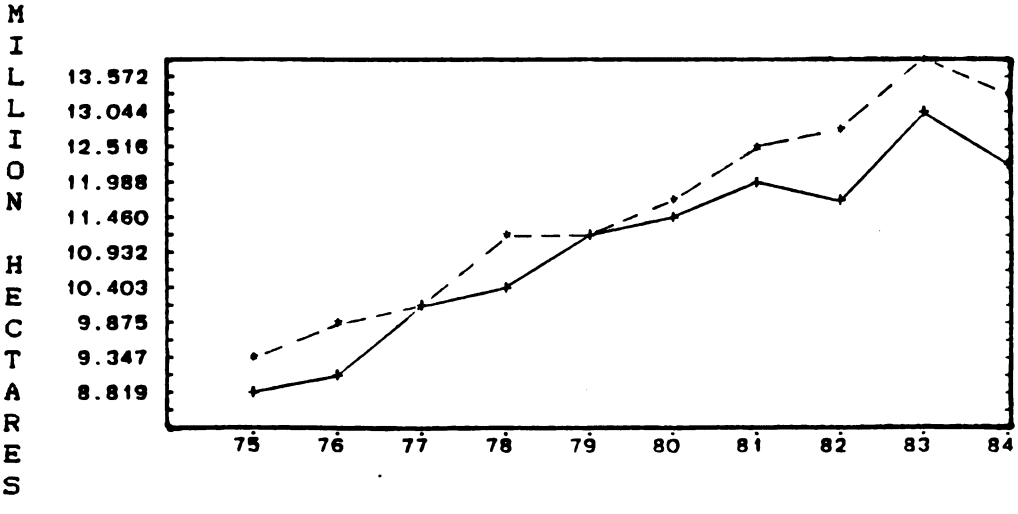


Figure C.1.a & b. Wheat Production - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.2.a & b. Wheat Harvested Area - Australia

Australia
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHAAU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-171.41769	2906.8789	-0.0589697	0.954
WHAAU(-1)	0.8047663	0.2425900	3.3173921	0.005
TIME	79.085496	60.858669	1.2994944	0.213
WRAU(-1)	443.10683	834.02920	0.5312846	0.603
FRAU(-1)	-2110.0476	1400.4332	-1.5067106	0.153
WESAU(-1)	-0.3671085	0.1075297	-3.4140202	0.004

R-squared	0.888017	Mean of dependent var	9491.524
Adjusted R-squared	0.850689	S.D. of dependent var	1878.499
S.E. of regression	725.8666	Sum of squared resid	7903234.
Durbin-Watson stat	2.592308	F-statistic	23.78972
Log likelihood	-164.5994	TPE	7/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-81.7127	7252.00	7333.71
	1965	-772.336	7088.00	7860.34
	1966	507.041	8427.00	7919.96
	1967	593.138	9082.00	8488.86
	1968	805.325	10846.0	10040.7
	1969	253.475	9486.00	9232.53
	1970	-1284.91	6479.00	7763.91
	1971	473.769	7138.00	6664.23
	1972	-782.348	7604.00	8386.35
	1973	711.706	8948.00	8236.29
	1974	-484.158	8308.00	8792.16
	1975	-3.51033	8555.00	8558.51
	1976	55.7076	8956.00	8900.29
	1977	192.337	9955.00	9762.66
	1978	-1009.59	10249.0	11258.6
	1979	912.136	11153.0	10240.9
	1980	25.0482	11283.0	11258.0
	1981	-166.076	11885.0	12051.1
	1982	-665.656	11520.0	12185.7
	1983	107.737	12908.0	12800.3
	1984	612.876	12200.0	11587.1

INDEPENDENT VARIABLES

WHAAU = Wheat Harvested Area (1000 HA)

WRAU = Wheat Revenue per Hectare ($/HA)
(WYAU(-3)+WYAU(-2)+WYAU(-1)+WYAU)/4*WP*XRAU/CPIAU

FRAU = Coarse Grain Revenue per Hectare ($/HA)
(FYAU(-3)+FYAU(-2)+FYAU(-1)+FYAU)/4*FP*XRAU/CPIAU

TIME = 1960=60, 1961=61, ...

WESAU = Wheat Ending Stocks (1000 MT)

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHAAU	9491.5238	1878.4987	12908.000	6479.0000
WHAAU(-1)	9228.0952	1867.5426	12908.000	6479.0000
TIME	74.000000	6.2048368	84.000000	64.000000
WRAU(-1)	2.0392244	0.4254949	3.1581400	1.4441920
FRAU(-1)	1.6214719	0.2627728	2.2566240	1.2418480
WESAU(-1)	2991.0952	2274.2776	7586.0000	565.00000

	Covariance	Correlation
WHAAU,WHAAU	3360721.3	1.0000000
WHAAU,WHAAU(-1)	2791960.0	0.8356359
WHAAU,TIME	8715.4286	0.7851213
WHAAU,WRAU(-1)	-248.35963	-0.3262609
WHAAU,FRAU(-1)	-211.04009	-0.4489138
WHAAU,WESAU(-1)	781832.33	0.1921536
WHAAU(-1),WHAAU(-1)	3321633.5	1.0000000
WHAAU(-1),TIME	8641.2381	0.7830048
WHAAU(-1),WRAU(-1)	-260.17499	-0.3437874
WHAAU(-1),FRAU(-1)	-210.89136	-0.4512292
WHAAU(-1),WESAU(-1)	2436011.8	0.6022194
TIME,TIME	36.666667	1.0000000
TIME,WRAU(-1)	-0.8578977	-0.3411929
TIME,FRAU(-1)	-0.3088007	-0.1988643
TIME,WESAU(-1)	3840.8095	0.2857842
WRAU(-1),WRAU(-1)	0.1724247	1.0000000
WRAU(-1),FRAU(-1)	0.0847599	0.7959847
WRAU(-1),WESAU(-1)	-357.69383	-0.3881172
FRAU(-1),FRAU(-1)	0.0657615	1.0000000
FRAU(-1),WESAU(-1)	-229.63773	-0.4034676
WESAU(-1),WESAU(-1)	4926036.8	1.0000000

Australia
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is WYAU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0279016	2.1877180	0.0127538	0.990
LOGT	0.2875052	0.5120109	0.5615217	0.580

R-squared	0.013524	Mean of dependent var	1.256010
Adjusted R-squared	-0.029367	S.D. of dependent var	0.254512
S.E. of regression	0.258222	Sum of squared resid	1.533605
Durbin-Watson stat	2.793269	F-statistic	0.315307
Log likelihood	-0.582784	TPE = 13/24	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.16469	1.36974	1.20505
	1961	-0.08073	1.12907	1.20980
	1962	0.03879	1.25326	1.21447
	1963	0.11941	1.33848	1.21907
	1964	0.16043	1.38403	1.22360
	1965	-0.23102	0.99704	1.22806
	1966	0.27449	1.50694	1.23245
	1967	-0.40579	0.83098	1.23677
	1968	0.12389	1.36493	1.24103
	1969	-0.13349	1.11174	1.24523
	1970	-0.03159	1.21778	1.24937
	1971	-0.04778	1.20566	1.25344
	1972	-0.39082	0.86665	1.25747
	1973	0.07820	1.33963	1.26143
	1974	0.10165	1.36700	1.26534
	1975	0.13138	1.40058	1.26920
	1976	0.04454	1.31755	1.27301
	1977	-0.33553	0.94124	1.27677
	1978	0.48457	1.76505	1.28048
	1979	0.16731	1.45145	1.28414
	1980	-0.32560	0.96216	1.28776
	1981	0.08621	1.37753	1.29133
	1982	-0.52437	0.77049	1.29486
	1983	0.39851	1.69685	1.29834
	1984	0.13264	1.43443	1.30178

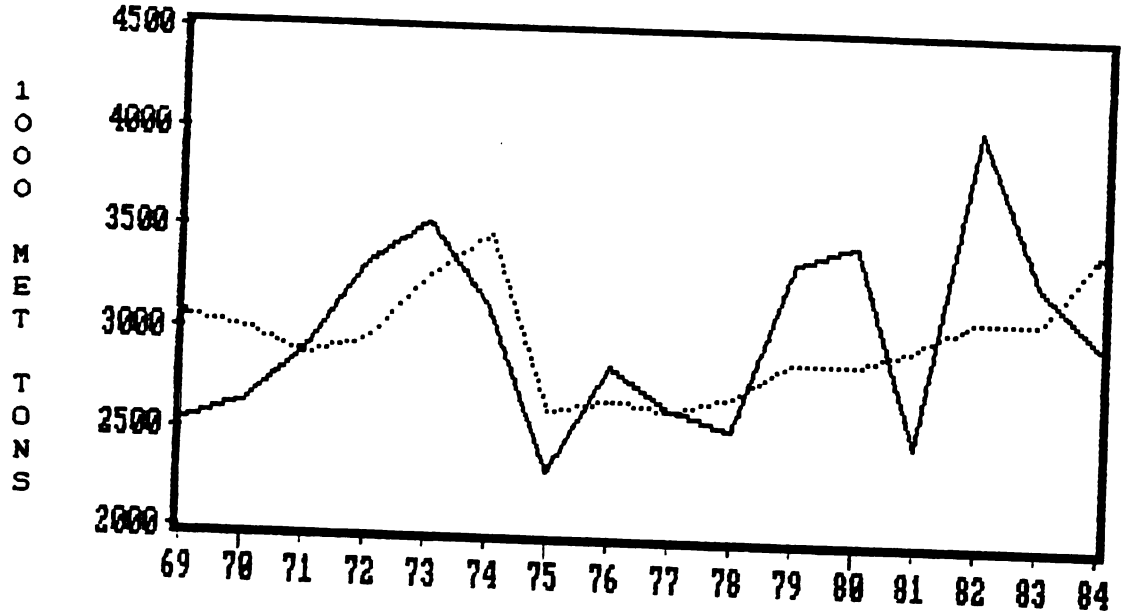
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

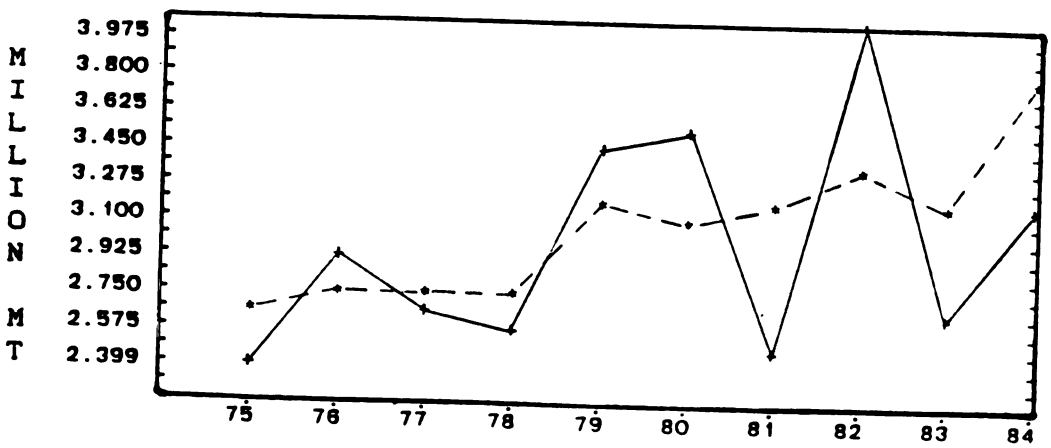
SMPL 1960 - 1984
25 Observations

Series	Mean	S.D.	Maximum	Minimum
WYAU	1.2560104	0.2545118	1.7650500	0.7704861
LOGT	4.2716050	0.1029457	4.4308170	4.0943450

	Covariance	Correlation
WYAU,WYAU	0.0621852	1.0000000
WYAU,LOGT	0.0029250	0.1162910
LOGT,LOGT	0.0101739	1.0000000



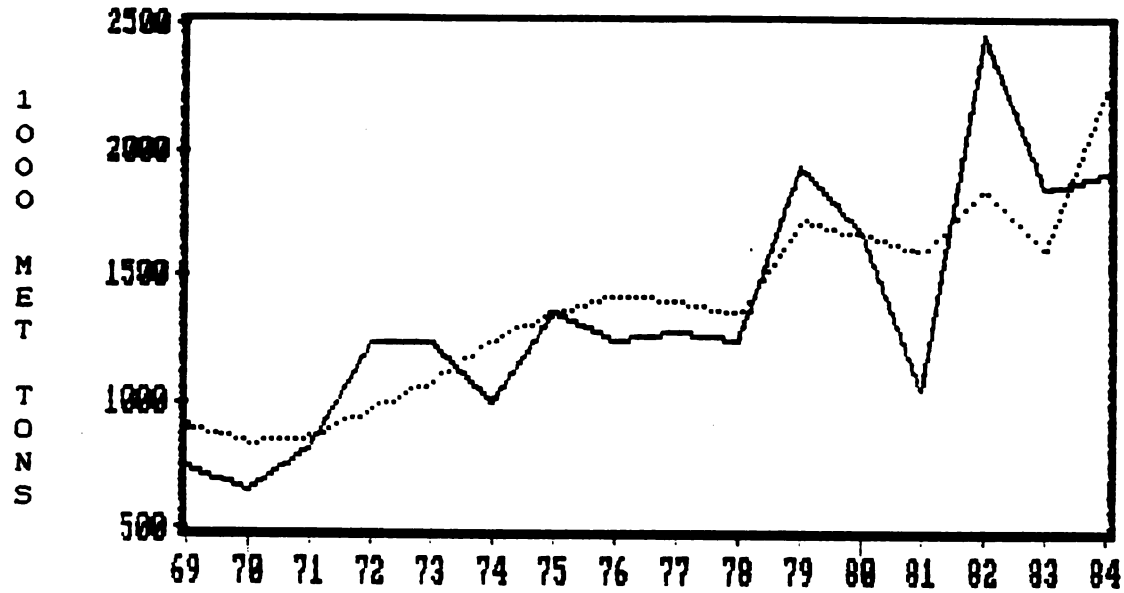
REGIONAL MODEL SIMULATION



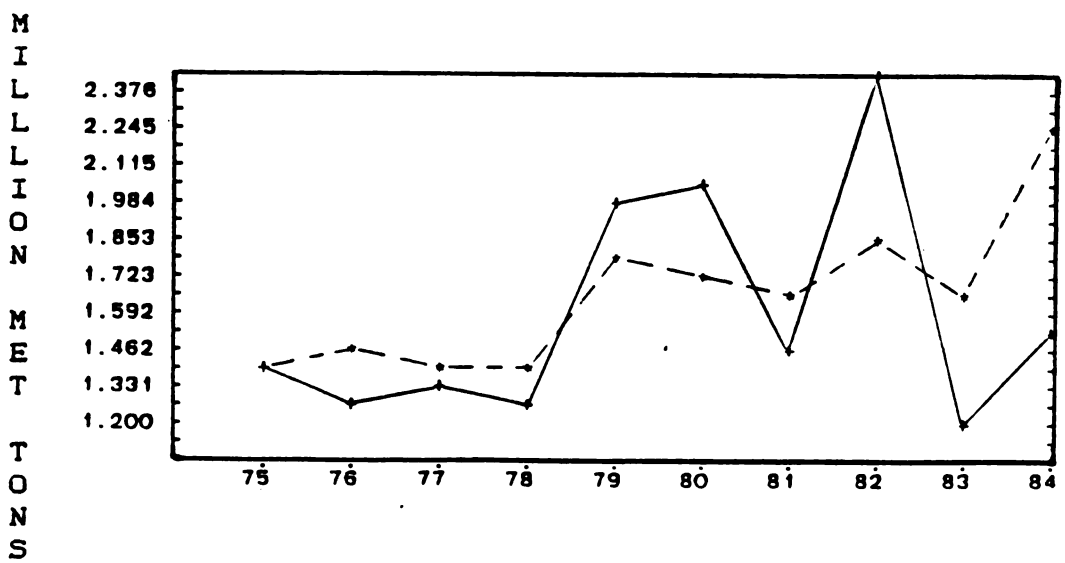
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.3.a & b. Total Wheat Consumption - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.4.a & b. Wheat Feed Consumption - Australia

Australia
Per Capita Wheat Feed Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0748560	0.0234526	-3.1918041	0.005
PCRGDP	1896.1194	330.29143	5.7407467	0.000
PCWPRO(-1)	0.0355123	0.0180034	1.9725302	0.063
PCFES(-1)	-0.2001651	0.1174156	-1.7047576	0.104

R-squared	0.696444	Mean of dependent var	0.080940
Adjusted R-squared	0.650911	S.D. of dependent var	0.032572
S.E. of regression	0.019245	Sum of squared resid	0.007407
Durbin-Watson stat	2.165840	F-statistic	15.29524
Log likelihood	62.94576	TPE	8/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00763	0.04493	0.03730
	1962	-0.00192	0.03771	0.03963
	1963	-0.01290	0.03826	0.05117
	1964	0.02677	0.08451	0.05774
	1965	0.00078	0.06330	0.06252
	1966	-0.00286	0.05181	0.05467
	1967	-0.00218	0.06458	0.06676
	1968	-0.02202	0.03739	0.05940
	1969	-0.01286	0.06036	0.07322
	1970	-0.01116	0.05220	0.06336
	1971	0.00872	0.06352	0.05480
	1972	0.02419	0.09401	0.06982
	1973	0.00940	0.09163	0.08223
	1974	-0.02290	0.07299	0.09589
	1975	-0.00093	0.09719	0.09812
	1976	-0.01176	0.08909	0.10085
	1977	-0.00393	0.09020	0.09414
	1978	-0.00352	0.08705	0.09057
	1979	0.02687	0.13287	0.10600
	1980	0.00048	0.11368	0.11320
	1981	-0.03590	0.07060	0.10650
	1982	0.04071	0.16212	0.12141
	1983	0.01645	0.12029	0.10384
	1984	-0.01716	0.12227	0.13942

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPAU/CPIAU/POPAU

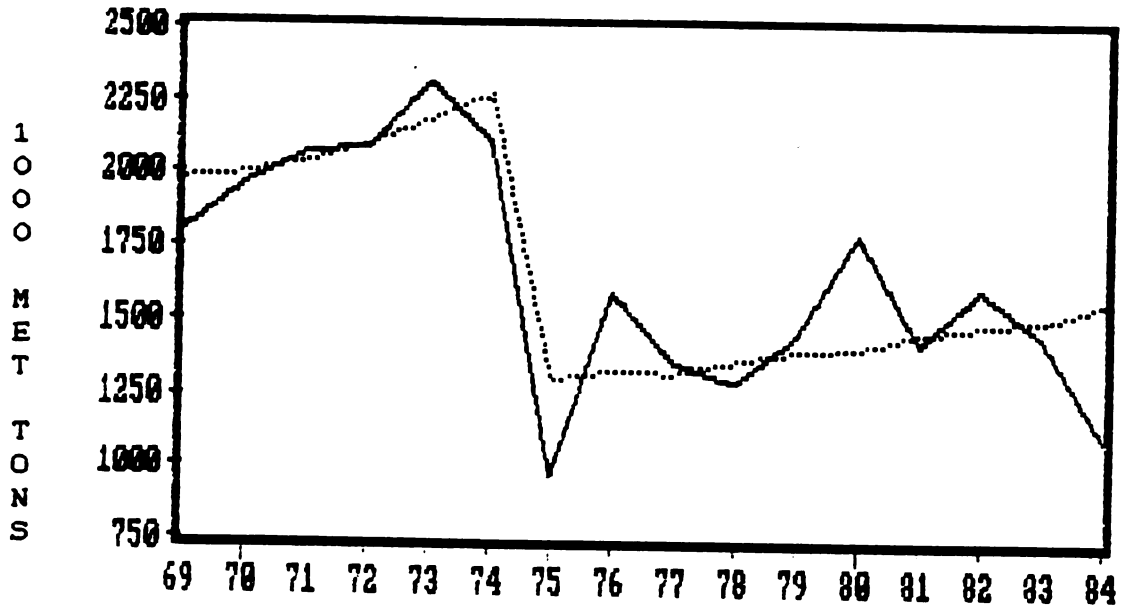
PCWPRO = Wheat Production Per Capita (1000 MT)
WPROAU/POPAU

PCFES = Coarse Grain Ending Stocks Per Capita (1000 MT)
FPROAU/POPAU

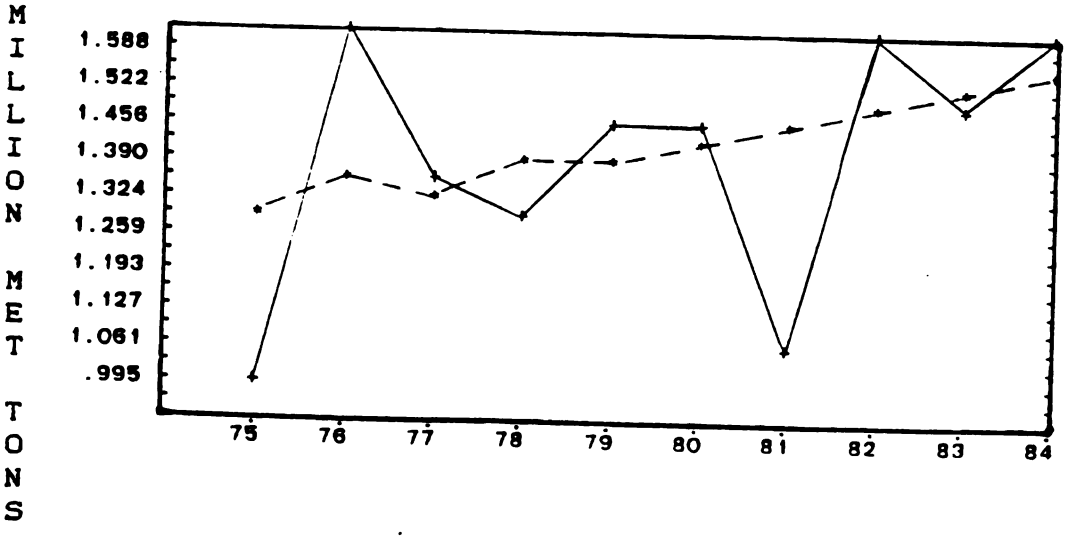
SMPL 1962 - 1984
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFED	0.0825058	0.0323674	0.1621212	0.0373855
PCRGDP	7.212D-05	1.267D-05	9.109D-05	4.884D-05
PCWPRO(-1)	0.8556996	0.2441749	1.4241220	0.5000000
PCFES(-1)	0.0471946	0.0374708	0.1289369	0.0017559

	Covariance	Correlation
PCWFED,PCWFED	0.0010021	1.0000000
PCWFED,PCRGDP	3.024D-07	0.7711358
PCWFED,PCWPRO(-1)	0.0032611	0.4313782
PCWFED,PCFES(-1)	0.0001084	0.0934588
PCRGDP,PCRGDP	1.535D-10	1.0000000
PCRGDP,PCWPRO(-1)	8.915D-07	0.3012971
PCRGDP,PCFES(-1)	1.447D-07	0.3186961
PCWPRO(-1),PCWPRO(-1)	0.0570291	1.0000000
PCWPRO(-1),PCFES(-1)	0.0024876	0.2842496
PCFES(-1),PCFES(-1)	0.0013430	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.5.a & b. Wheat Food and Residual Consumption - Australia

Australia
Per Capita Wheat Food and Residual Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1149412	0.0375585	3.0603206	0.006
PCRGDP	516.67237	413.11011	1.2506892	0.225
DV75ON	-0.0713717	0.0094826	-7.5265662	0.000
WCGRAU	0.0033883	0.0053744	0.6304531	0.536

R-squared	0.864046	Mean of dependent var	0.131600
Adjusted R-squared	0.843653	S.D. of dependent var	0.033811
S.E. of regression	0.013369	Sum of squared resid	0.003575
Durbin-Watson stat	1.958946	F-statistic	42.36951
Log likelihood	71.68878	TPE	11/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00857	0.14076	0.14933
	1962	0.00174	0.15345	0.15170
	1963	-0.00845	0.14603	0.15448
	1964	-0.00761	0.14888	0.15649
	1965	0.00909	0.16418	0.15509
	1966	0.00423	0.16026	0.15603
	1967	0.00319	0.16186	0.15868
	1968	0.01737	0.17777	0.16040
	1969	-0.01466	0.14682	0.16148
	1970	-0.00039	0.15763	0.15802
	1971	0.00370	0.16051	0.15681
	1972	0.00023	0.15850	0.15827
	1973	0.00972	0.17287	0.16315
	1974	-0.00959	0.15467	0.16426
	1975	-0.02302	0.06926	0.09228
	1976	0.01916	0.11354	0.09438
	1977	0.00279	0.09507	0.09228
	1978	-0.00411	0.08921	0.09331
	1979	0.00385	0.09931	0.09546
	1980	0.02662	0.12226	0.09564
	1981	-0.00173	0.09478	0.09650
	1982	0.00693	0.10573	0.09880
	1983	-0.00147	0.09428	0.09574
	1984	-0.02903	0.07079	0.09982

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPAU/CPIAU/POPAU

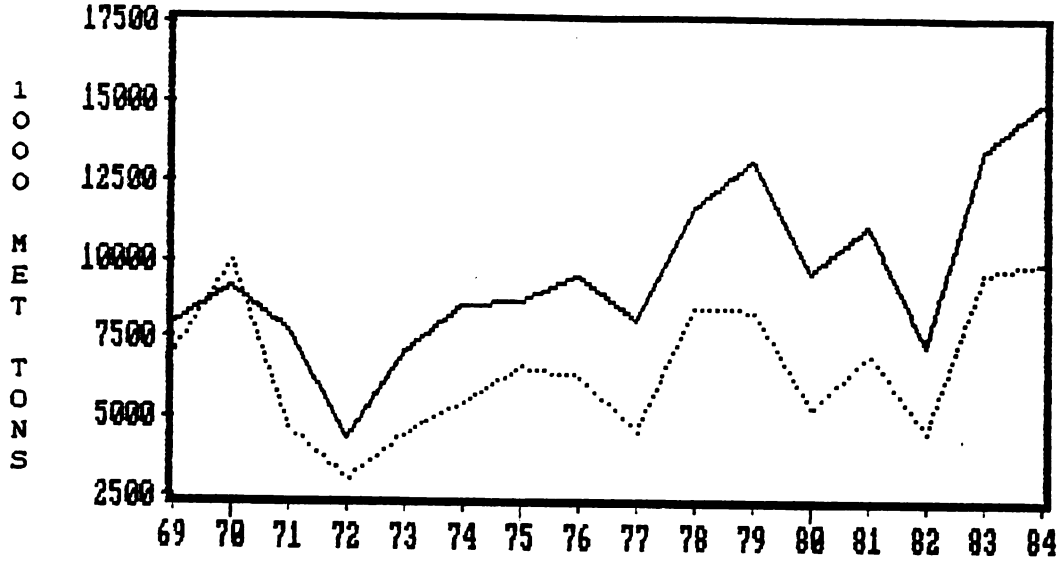
WCGRAU = Wheat/Coarse Grain Supply Ratio
(WESAU(-1) + WPROAU)/(FESAU(-1) + FPROAU)

DV75ON = 1 If(TIME .GE. 1975)
0 Otherwise

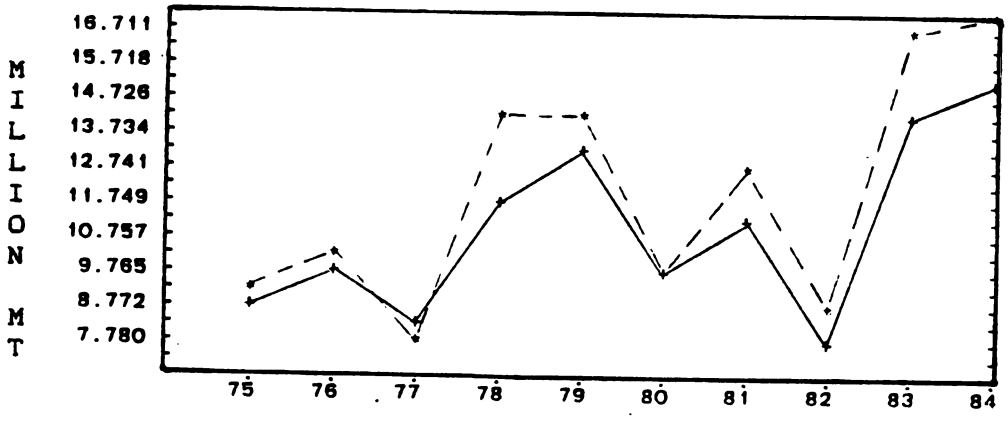
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFOD	0.1316000	0.0338109	0.1777685	0.0692585
PCRGDP	7.103D-05	1.349D-05	9.109D-05	4.594D-05
DV75ON	0.4166667	0.5036102	1.0000000	0.0000000
WCGRAU	2.8619480	0.6726203	3.9458490	1.6539960

	Covariance	Correlation
PCWFOD, PCWFOD	0.0010955	1.0000000
PCWFOD, PCRGDP	-3.000D-07	-0.6862324
PCWFOD, DV75ON	-0.0150744	-0.9237856
PCWFOD, WCGRAU	0.0075960	0.3485330
PCRGDP, PCRGDP	1.745D-10	1.0000000
PCRGDP, DV75ON	5.215D-06	0.8007184
PCRGDP, WCGRAU	-5.317D-06	-0.6113393
DV75ON, DV75ON	0.2430556	1.0000000
DV75ON, WCGRAU	-0.1243394	-0.3830254
WCGRAU, WCGRAU	0.4335673	1.0000000



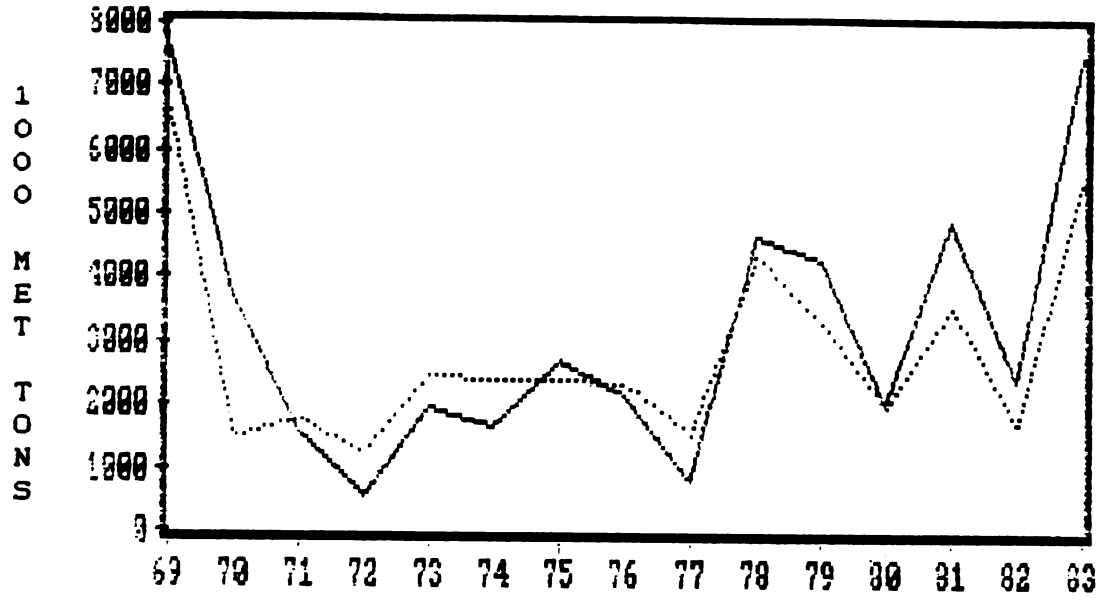
REGIONAL MODEL SIMULATION



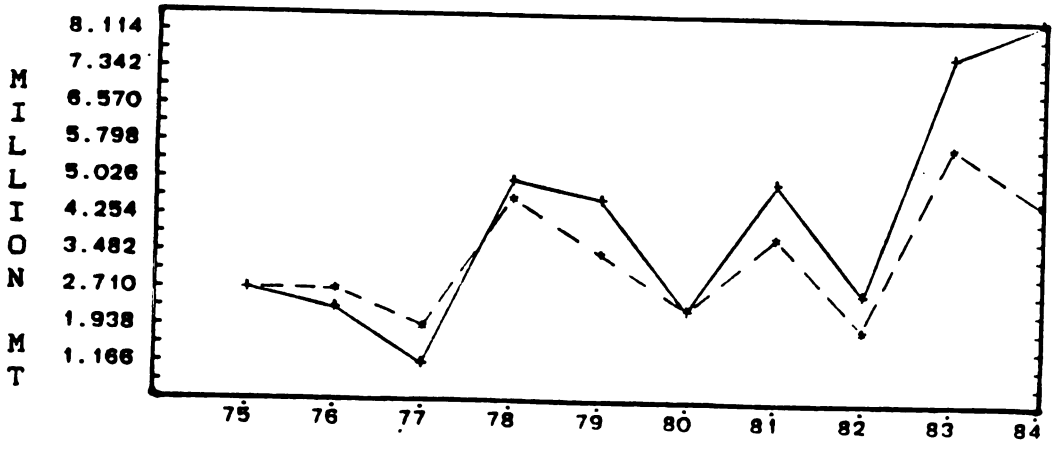
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.6.a & b. Wheat Net Exports - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.7.a & b. Wheat Ending Stocks - Australia

Australia
Per Capita Wheat Ending Stocks (1000 MT)

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0761929	0.0582544	-1.3079339	0.206
PCWPRO	0.2860822	0.0702031	4.0750650	0.001
DV6869	0.4003597	0.0515458	7.7670615	0.000

R-squared	0.845863	Mean of dependent var	0.194722
Adjusted R-squared	0.830449	S.D. of dependent var	0.159695
S.E. of regression	0.065757	Sum of squared resid	0.086480
Durbin-Watson stat	1.214554	F-statistic	54.87742
Log likelihood	31.57282	TPE =2/22	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1960	-0.03493	0.09621	0.13113
: * :	1961	-0.02973	0.07649	0.10622
* :	1962	-0.05701	0.08929	0.14631
*: :	1963	-0.07662	0.08037	0.15698
* : :	1964	-0.09233	0.08854	0.18087
: * :	1965	-0.03335	0.06795	0.10131
: * :	1966	-0.02010	0.21690	0.23699
: * :	1967	0.04042	0.14720	0.10678
:* :	1968	-0.04516	0.63164	0.67680
: *:	1969	0.04516	0.61542	0.57025
: : *	1970	0.18873	0.29297	0.10424
:* :	1971	0.00834	0.12241	0.11407
: * :	1972	-0.02398	0.04287	0.06685
: * :	1973	-0.03197	0.14813	0.18011
: * :	1974	-0.03994	0.12102	0.16096
: * :	1975	0.02127	0.19186	0.17059
: * :	1976	-0.01210	0.15232	0.16442
* :	1977	-0.05775	0.05497	0.11271
: * :	1978	0.03934	0.32354	0.28420
: *:	1979	0.05117	0.29414	0.24297
: * :	1980	0.00392	0.13914	0.13522
: : *	1981	0.08927	0.32679	0.23752
: *	1982	0.06735	0.15843	0.09108

INDEPENDENT VARIABLES

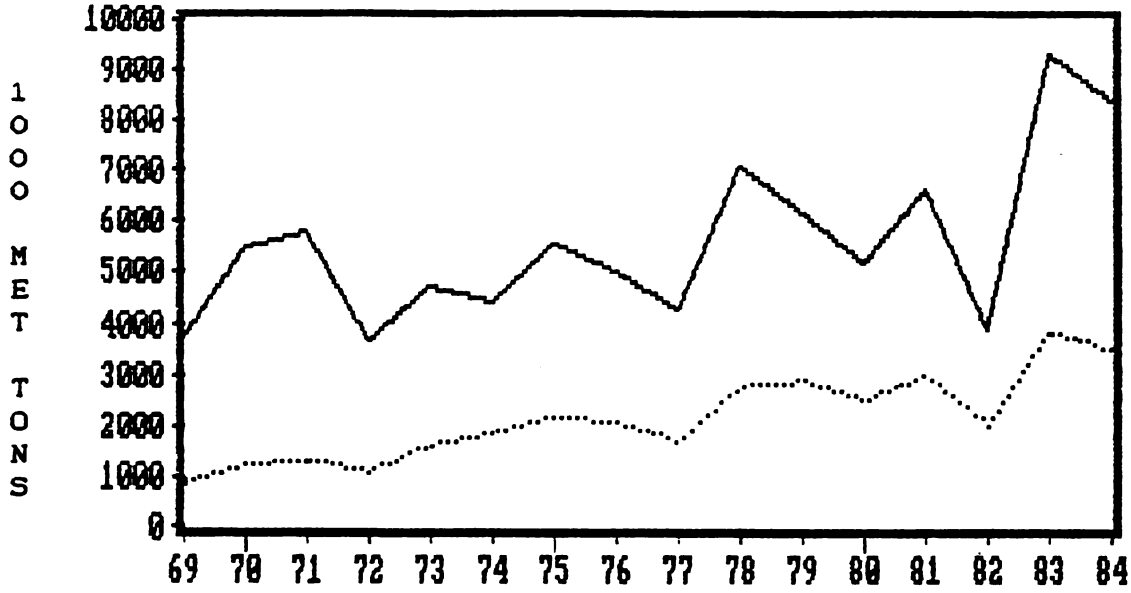
PCWPRO = Wheat Production Per Capita (1000 MT)
WPROAU/POPAU

DV6869 = 1 If(TIME .EQ. 68 .OR. TIME .EQ. 69)
0 Otherwise

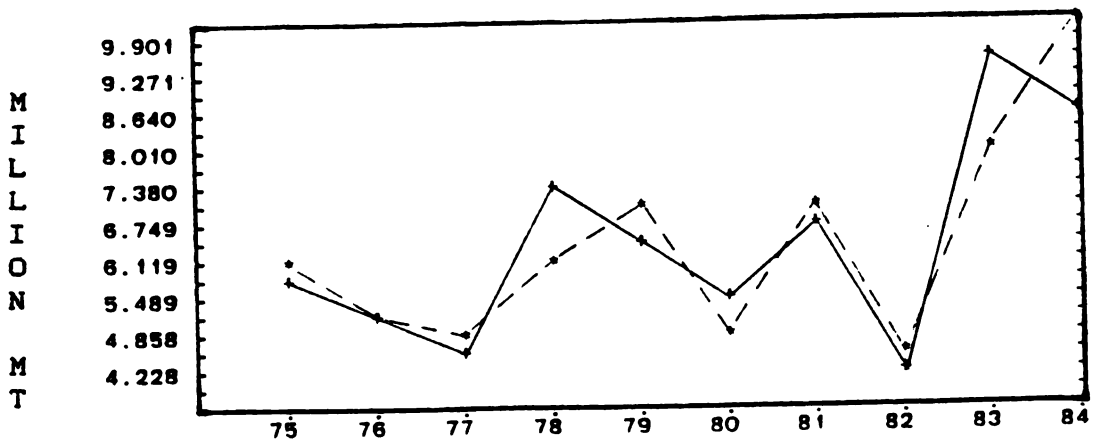
SMPL 1960 - 1982
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.1947218	0.1596955	0.6316403	0.0428680
PCWPRO	0.8252903	0.2115372	1.2597490	0.5000000
DV6869	0.0869565	0.2881041	1.0000000	0.0000000

	Covariance	Correlation
PCWES,PCWES	0.0243938	1.0000000
PCWES,PCWPRO	0.0199433	0.6171958
PCWES,DV6869	0.0372875	0.8472793
PCWPRO,PCWPRO	0.0428024	1.0000000
PCWPRO,DV6869	0.0192284	0.3298474
DV6869,DV6869	0.0793951	1.0000000



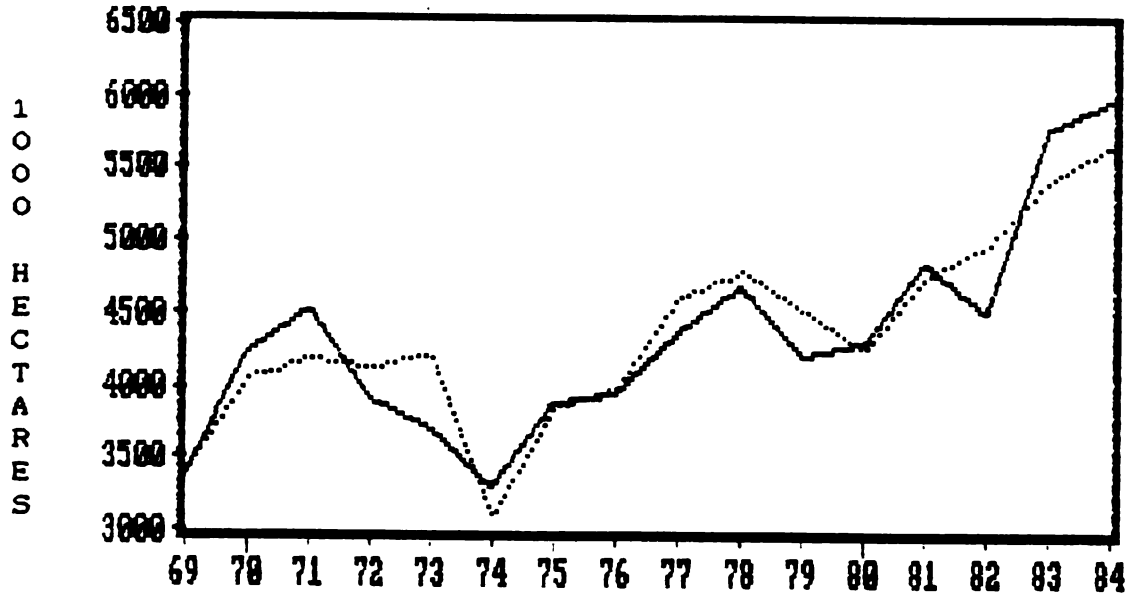
REGIONAL MODEL SIMULATION



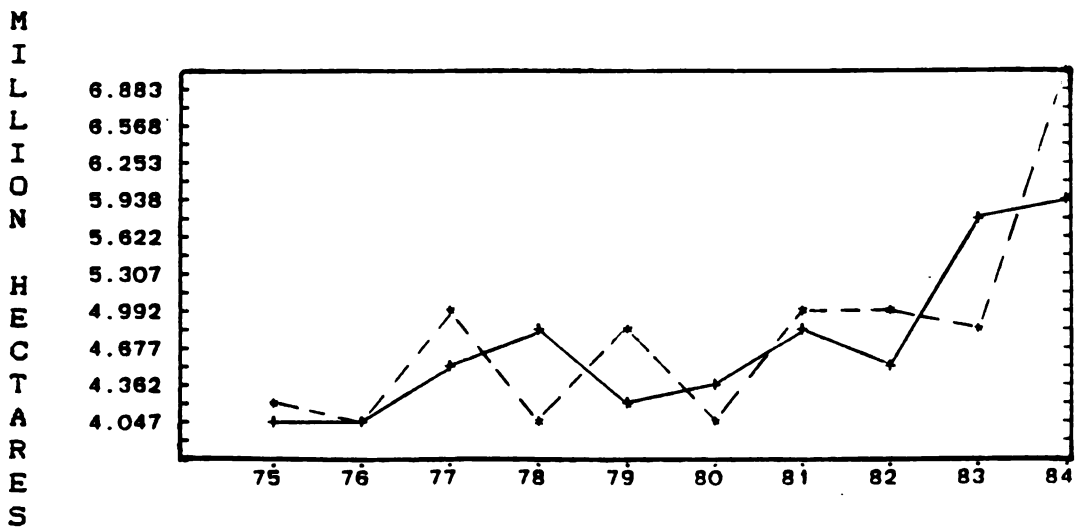
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.8.a & b. Coarse Grain Production - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

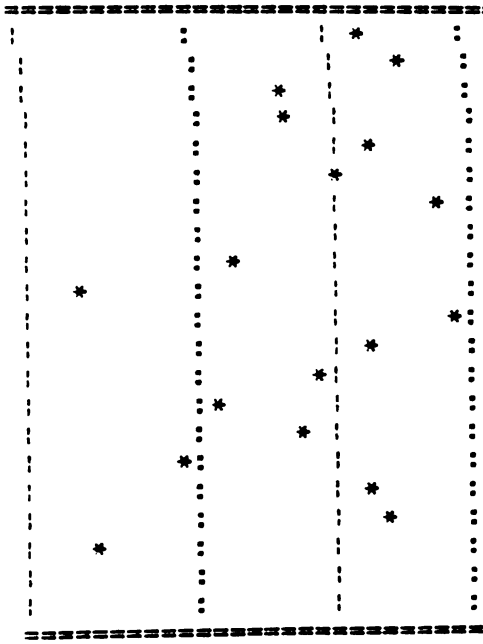
Figure C.9.a & b. Coarse Grain Harvested Area - Australia

Australia
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is FHAAU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2739.8403	905.79602	-3.0247873	0.008
TIME	107.70565	10.185803	10.574095	0.000
WRAU(-1)	-1303.5832	240.48422	-5.4206600	0.000
FRAU(-1)	872.11589	373.49714	2.3350002	0.032

R-squared	0.931011	Mean of dependent var	3986.190
Adjusted R-squared	0.918836	S.D. of dependent var	924.9273
S.E. of regression	263.5052	Sum of squared resid	1180395.
Durbin-Watson stat	1.998508	F-statistic	76.47159
Log likelihood	-144.6345	TPE	3/21



obs	RESIDUAL	ACTUAL	FITTED
1964	70.8897	2498.00	2427.11
1965	135.627	2735.00	2599.37
1966	-84.8196	3045.00	3129.82
1967	-114.550	2714.00	2828.55
1968	54.1210	3210.00	3155.88
1969	-14.7598	3380.00	3394.76
1970	213.832	4240.00	4026.17
1971	347.747	4516.00	4168.25
1972	-182.908	3918.00	4100.91
1973	-497.308	3702.00	4199.31
1974	225.483	3307.00	3081.52
1975	62.2126	3889.00	3826.79
1976	-42.0928	3923.00	3965.09
1977	-222.816	4368.00	4590.82
1978	-72.4231	4695.00	4767.42
1979	-306.230	4197.00	4503.23
1980	65.6258	4286.00	4220.37
1981	100.618	4833.00	4732.38
1982	-456.011	4494.00	4950.01
1983	380.861	5781.00	5400.14
1984	336.902	5979.00	5642.10

INDEPENDENT VARIABLES

FHAAU = Coarse Grain Harvested Area (1000 HA)

FRAU = Coarse Grain Revenue per Hectare ($/HA)
(FYAU(-3)+FYAU(-2)+FYAU(-1)+FYAU)/4*FP*XRAU/CPIAU

WRAU = Wheat Revenue per Hectare ($/HA)
(WYAU(-3)+WYAU(-2)+WYAU(-1)+WYAU)/4*WP*XRAU/CPIAU

TIME = 1960=60, 1961=61, ...

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
FHAAU	3986.1905	924.92727	5979.0000	2498.0000
TIME	74.000000	6.2048368	84.000000	64.000000
WRAU(-1)	2.0392244	0.4254949	3.1581400	1.4441920
FRAU(-1)	1.6214719	0.2627728	2.2566240	1.2418480

	Covariance	Correlation
FHAAU,FHAAU	814752.82	1.0000000
FHAAU,TIME	4798.2381	0.8778759
FHAAU,WRAU(-1)	-243.24996	-0.6489931
FHAAU,FRAU(-1)	-86.399475	-0.3732608
TIME,TIME	36.666667	1.0000000
TIME,WRAU(-1)	-0.8578977	-0.3411929
TIME,FRAU(-1)	-0.3088007	-0.1988643
WRAU(-1),WRAU(-1)	0.1724247	1.0000000
WRAU(-1),FRAU(-1)	0.0847599	0.7959847
FRAU(-1),FRAU(-1)	0.0657615	1.0000000

Australia
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is FYAU

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.2831276	1.6509588	-1.9886187	0.059
LOGT	1.0482650	0.3863884	2.7129824	0.012

R-squared	0.242431	Mean of dependent var	1.194646
Adjusted R-squared	0.209493	S.D. of dependent var	0.219172
S.E. of regression	0.194867	Sum of squared resid	0.873380
Durbin-Watson stat	2.739370	F-statistic	7.360273
Log likelihood	6.454785	TPE = 13/24	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.15091	1.15974	1.00883
	1961	-0.05233	0.97383	1.02616
	1962	0.04860	1.09181	1.04320
	1963	0.01513	1.07510	1.05998
	1964	0.03761	1.11409	1.07648
	1965	-0.21778	0.87495	1.09274
	1966	0.16581	1.27455	1.10874
	1967	-0.37174	0.75276	1.12450
	1968	0.05155	1.19159	1.14004
	1969	-0.05918	1.09615	1.15534
	1970	0.12722	1.29764	1.17042
	1971	0.10036	1.28565	1.18529
	1972	-0.26937	0.93058	1.19995
	1973	0.05706	1.27147	1.21441
	1974	0.11545	1.34412	1.22867
	1975	0.19670	1.43945	1.24274
	1976	0.02708	1.28371	1.25663
	1977	-0.29735	0.97299	1.27033
	1978	0.22818	1.51203	1.28386
	1979	0.18027	1.47748	1.29721
	1980	-0.09388	1.21652	1.31040
	1981	0.04654	1.36996	1.32342
	1982	-0.46623	0.87005	1.33628
	1983	0.26094	1.60993	1.34899
	1984	0.01845	1.38000	1.36154

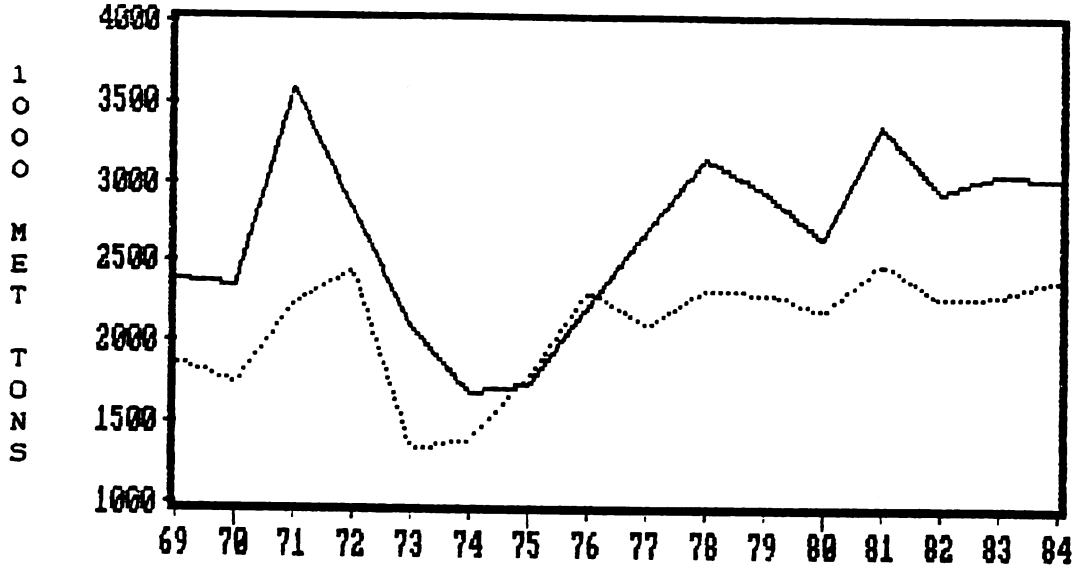
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

SMPL 1960 - 1984
25 Observations

Series	Mean	S.D.	Maximum	Minimum
FYAU	1.1946463	0.2191720	1.6099290	0.7527635
LOGT	4.2716050	0.1029457	4.4308170	4.0943450

	Covariance	Correlation
FYAU,FYAU	0.0461149	1.0000000
FYAU,LOGT	0.0106649	0.4923729
LOGT,LOGT	0.0101739	1.0000000



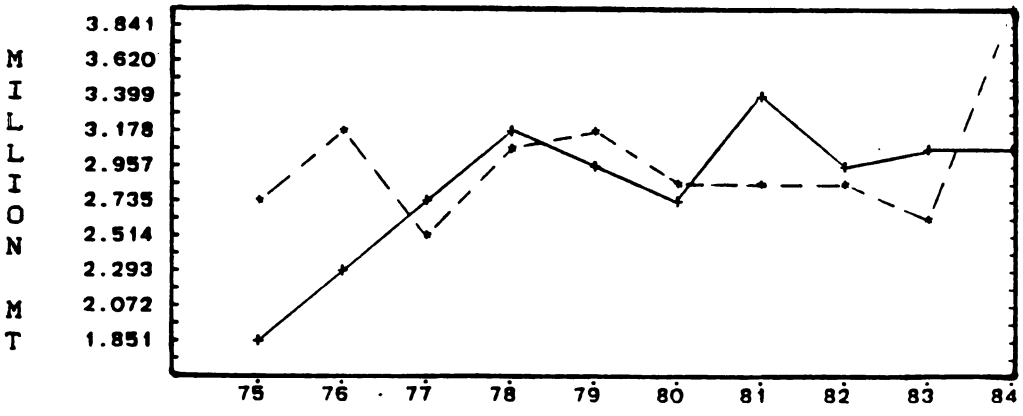
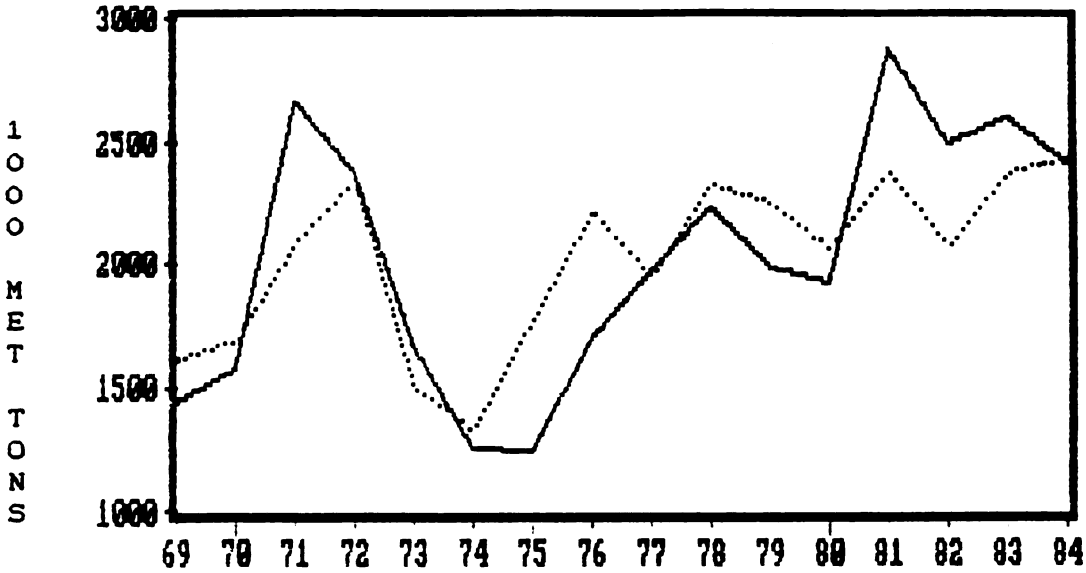
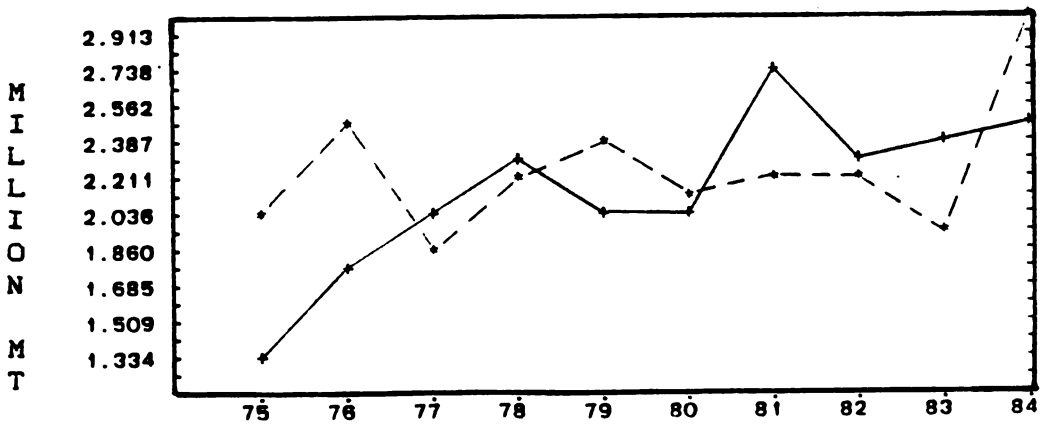


Figure C.10 a & b. Total Coarse Grain Consumption - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.11.a & b. Coarse Grain Feed Consumption - Australia

Australia
Per Capita Coarse Grain Feed Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1248453	0.0416856	2.9949273	0.007
FPAU	-0.0678895	0.0247514	-2.7428602	0.013
SMPAU	0.0238458	0.0085176	2.7995938	0.011
PCFDS	0.1224931	0.0446537	2.7431798	0.013

R-squared	0.559228	Mean of dependent var	0.132511
Adjusted R-squared	0.493113	S.D. of dependent var	0.033502
S.E. of regression	0.023852	Sum of squared resid	0.011379
Durbin-Watson stat	1.522587	F-statistic	8.458322
Log likelihood	57.79437	TPE	6/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00834	0.09592	0.10427
	1962	0.01705	0.12142	0.10437
	1963	0.01460	0.11416	0.09956
	1964	0.01797	0.11683	0.09886
	1965	-0.01470	0.08920	0.10390
	1966	0.03038	0.14733	0.11695
	1967	-0.02782	0.09051	0.11833
	1968	-0.02894	0.09950	0.12844
	1969	-0.01330	0.11803	0.13132
	1970	-0.01548	0.12622	0.14170
	1971	0.03837	0.20634	0.16796
	1972	0.00770	0.18065	0.17295
	1973	0.02144	0.12519	0.10374
	1974	-0.00625	0.09197	0.09822
	1975	-0.03747	0.08970	0.12718
	1976	-0.03512	0.12081	0.15593
	1977	0.00320	0.13961	0.13640
	1978	-0.00742	0.15613	0.16355
	1979	-0.01799	0.13687	0.15486
	1980	-0.00877	0.13193	0.14070
	1981	0.03207	0.19263	0.16056
	1982	0.03266	0.16416	0.13150
	1983	0.00885	0.16912	0.16026
	1984	-0.00271	0.15605	0.15876

INDEPENDENT VARIABLES

PCFDS = Per Capita Domestic Coarse Grain Supply
(FESAU(-1)+FPROAU)/POPAU

FPAU = Real Argentine Coarse Grain Price ($/MT)
WP*XRAU/CPIAU

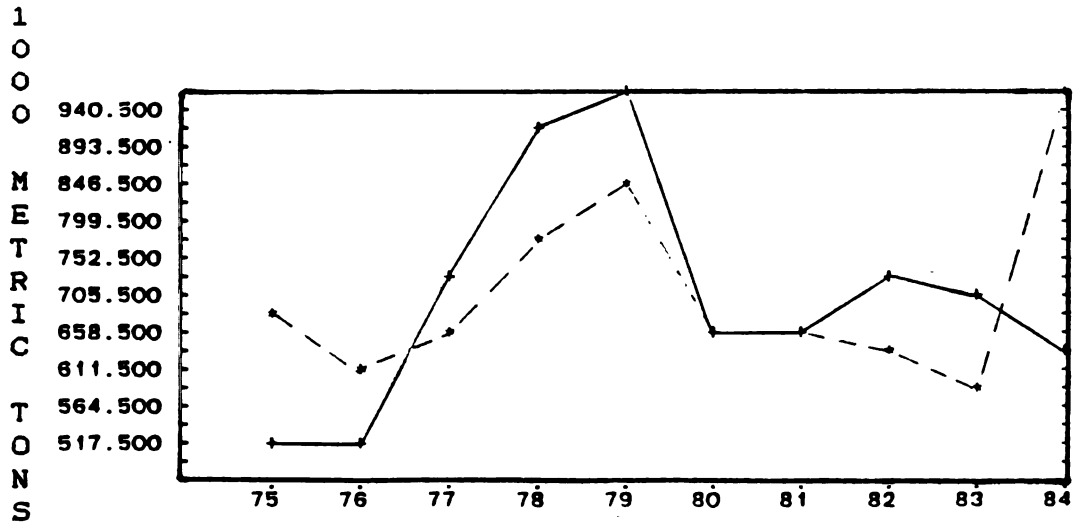
SMPAU = Real Argentine Soymeal Price
SMP*XRAU/CPIAU

SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFED	0.1325110	0.0335022	0.2063369	0.0892011
FPAU	1.3752713	0.2583690	1.8862790	0.9056585
SMPAU	2.2243076	0.6888300	5.0768500	1.1319940
PCFDS	0.3917920	0.1263718	0.6165150	0.2131694

	Covariance	Correlation
PCFFED, PCFFED	0.0010756	1.0000000
PCFFED, FPAU	-0.0039958	-0.4816960
PCFFED, SMPAU	0.0018925	0.0855743
PCFFED, PCFDS	0.0023277	0.5736921
FPAU, FPAU	0.0639731	1.0000000
FPAU, SMPAU	0.0903393	0.5296729
FPAU, PCFDS	-0.0147511	-0.4714310
SMPAU, SMPAU	0.4547165	1.0000000
SMPAU, PCFDS	-0.0230009	-0.2757181
PCFDS, PCFDS	0.0153044	1.0000000

REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure C.12.a & b. Coarse Grain Food and Residual Consumption - Australia

Australia
Per Capita Coarse Grain Food and Residual Consumption
(1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1653633	0.0228520	7.2362824	0.000
PCFDS	0.0537501	0.0227535	2.3622748	0.028
FPAU	-0.0246139	0.0095327	-2.5820410	0.018
PCRGDP	-1373.5174	225.34508	-6.0951735	0.000

R-squared	0.665625	Mean of dependent var	0.055009
Adjusted R-squared	0.615469	S.D. of dependent var	0.015722
S.E. of regression	0.009749	Sum of squared resid	0.001901
Durbin-Watson stat	1.633738	F-statistic	13.27105
Log likelihood	79.26686	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-0.01936	0.05953	0.07889
*	1962	-0.00470	0.06816	0.07286
*	1963	0.00488	0.07132	0.06645
*	1964	0.01036	0.07359	0.06323
*	1965	-0.00288	0.05830	0.06118
*	1966	0.01543	0.08250	0.06707
*	1967	-0.00482	0.05975	0.06457
*	1968	0.00212	0.06861	0.06649
*	1969	0.01551	0.07749	0.06198
*	1970	-0.00230	0.06203	0.06433
*	1971	1.2D-05	0.07071	0.07070
*	1972	-0.00881	0.03392	0.04273
*	1973	-0.00127	0.03214	0.03341
*	1974	-0.00340	0.03182	0.03522
*	1975	-0.00761	0.03557	0.04317
*	1976	-0.00923	0.03621	0.04543
*	1977	0.00467	0.05039	0.04572
*	1978	0.00798	0.06288	0.05490
*	1979	0.01582	0.06644	0.05062
*	1980	0.00298	0.04377	0.04079
*	1981	-0.00832	0.04280	0.05112
*	1982	0.00885	0.04664	0.03779
*	1983	-0.00804	0.04532	0.05336
*	1984	-0.00788	0.04035	0.04822

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPAU/CPIAU/POPAU

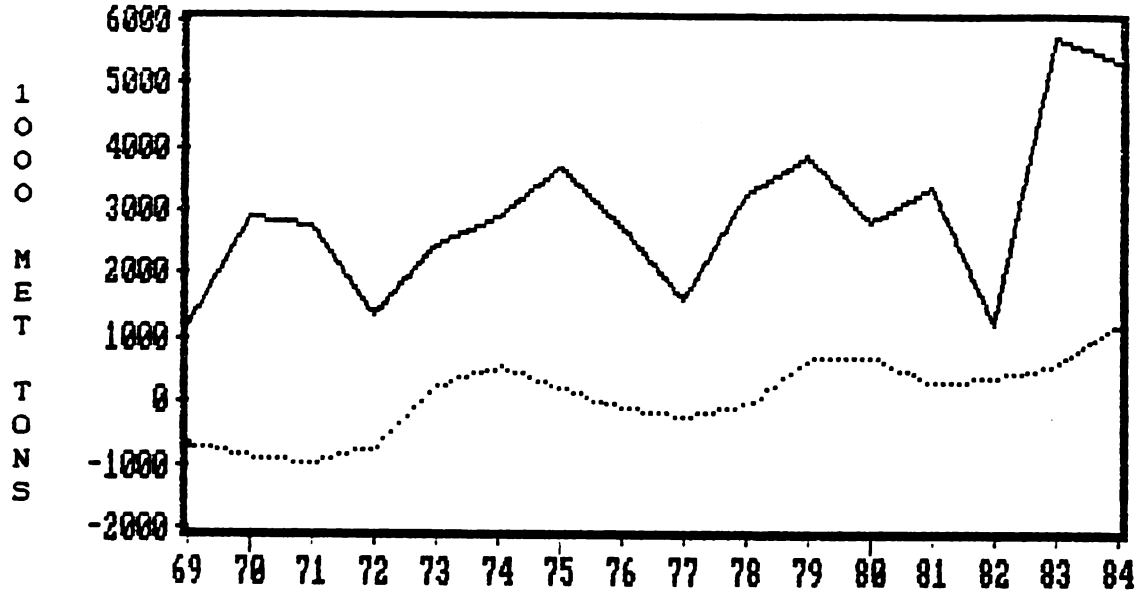
PCFDS = Coarse Grain Supply Per Capita
(FESAU(-1)+FPROAU)/POPAU

FPAU = Real Australian Coarse Grain Price
FP*XRAU/CPIAU

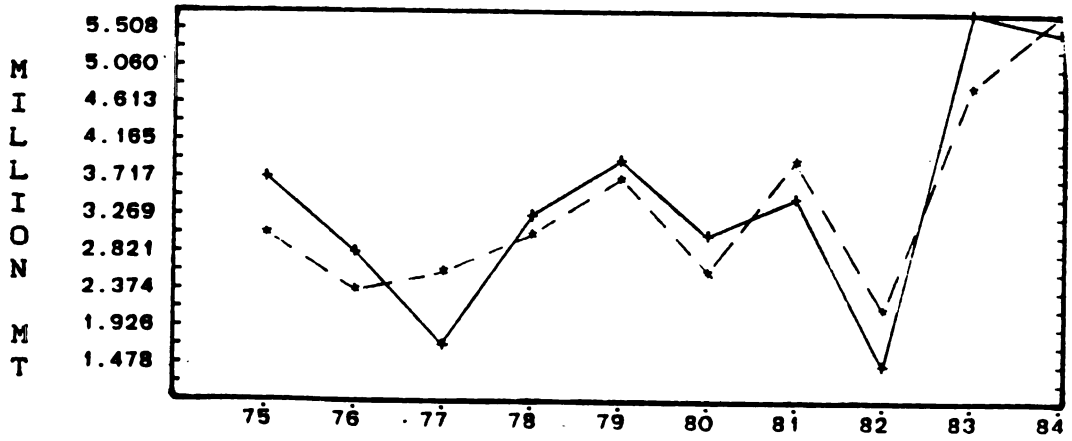
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFOD	0.0550089	0.0157219	0.0825000	0.0318248
PCFDS	0.3917920	0.1263718	0.6165150	0.2131694
FPAU	1.3752713	0.2583690	1.8862790	0.9056585
PCRGDP	7.103D-05	1.349D-05	9.109D-05	4.594D-05

	Covariance	Correlation
PCFFOD,PCFFOD	0.0002369	1.0000000
PCFFOD,PCFDS	-0.0003850	-0.2022253
PCFFOD,FPAU	0.0001648	0.0423448
PCFFOD,PCRGDP	-1.328D-07	-0.6532876
PCFDS,PCFDS	0.0153044	1.0000000
PCFDS,FPAU	-0.0147511	-0.4714310
PCFDS,PCRGDP	1.144D-06	0.6998026
FPAU,FPAU	0.0639731	1.0000000
FPAU,PCRGDP	-1.844D-06	-0.5518278
PCRGDP,PCRGDP	1.745D-10	1.0000000



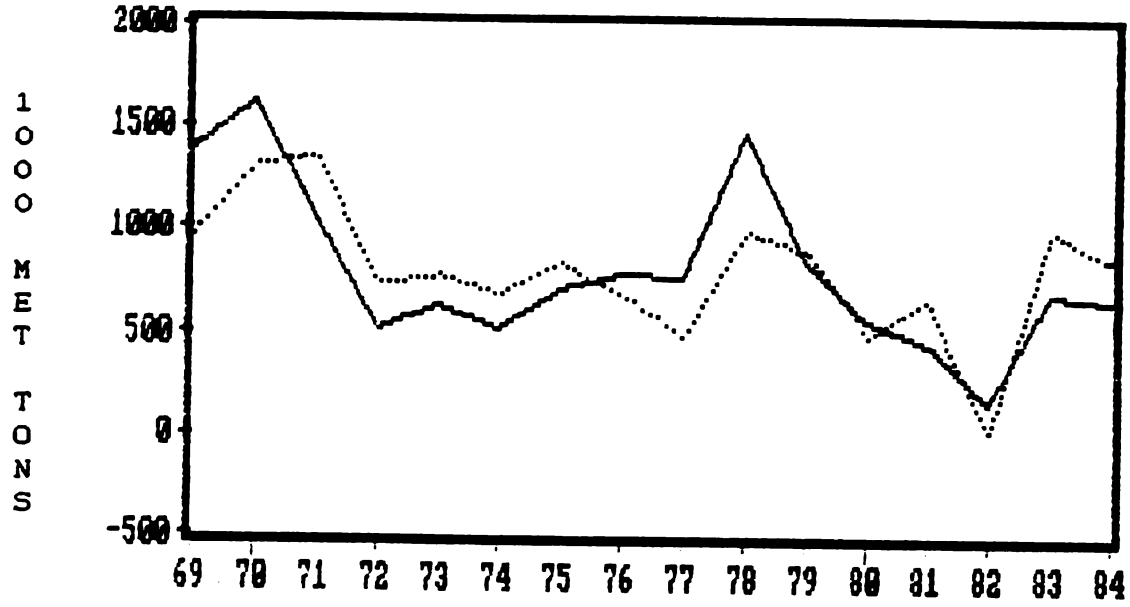
REGIONAL MODEL SIMULATION



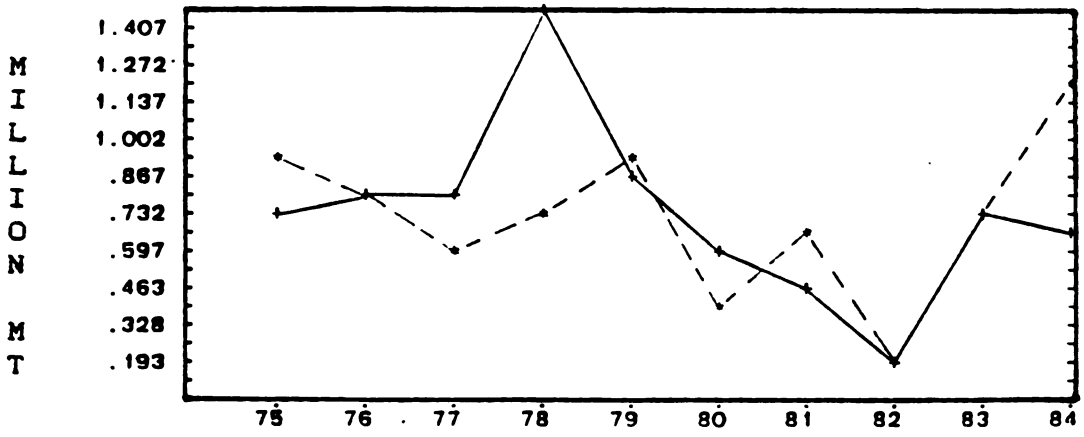
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.13.a & b. Coarse Grain Net Exports - Australia



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure C.14.a & b. Coarse Grain Ending Stocks - Australia

Australia
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1966 - 1984
19 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0314466	0.0076224	4.1255645	0.001
SUPDEV	-0.2051229	0.0435185	-4.7134612	0.000

R-squared	0.566511	Mean of dependent var	0.058473
Adjusted R-squared	0.541012	S.D. of dependent var	0.032313
S.E. of regression	0.021891	Sum of squared resid	0.008147
Durbin-Watson stat	1.150288	F-statistic	22.21672
Log likelihood	46.70847		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
* : | :	1966	-0.03443	0.04655	0.08098
* : | :	1967	-0.02004	0.03110	0.05114
: | : *	1968	0.03336	0.10566	0.07230
: | : *	1969	0.03395	0.11264	0.07870
: | : * :	1970	0.02562	0.12894	0.10331
* : | :	1971	-0.02234	0.08153	0.10387
: * | :	1972	-0.01672	0.03809	0.05481
: * | :	1973	-0.01009	0.04679	0.05688
: * | :	1974	-0.01183	0.03715	0.04898
: * | :	1975	-0.00891	0.04996	0.05887
: | * :	1976	0.00820	0.05617	0.04797
: | *	1977	0.02084	0.05356	0.03272
: | : *	1978	0.03465	0.10265	0.06800
: * | :	1979	-0.00225	0.05782	0.06007
: | * :	1980	0.00559	0.03778	0.03219
: * | :	1981	-0.01385	0.02914	0.04299
: | * :	1982	0.00969	0.00935	-0.00034
:* | :	1983	-0.01889	0.04499	0.06388
: * | :	1984	-0.01256	0.04112	0.05367

INDEPENDENT VARIABLES

SUPDEV = Deviation From Trend Domestic Supply (1000 MT)
(FPROAU + FESAU) If((FPROAU+FESAU(-1)) .GT. -22000 + 350*TIME)
0 Otherwise

SMPL 1966 - 1984
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0584734	0.0323125	0.1289369	0.0093544
SUPDEV	-0.1317587	0.1185663	0.1549407	-0.3530913

	Covariance	Correlation
PCFES,PCFES	0.0009891	1.0000000
PCFES,SUPDEV	-0.0027318	-0.7526695
SUPDEV,SUPDEV	0.0133181	1.0000000

APPENDIX D

EQUATION STATISTICS - BRAZIL

Wheat

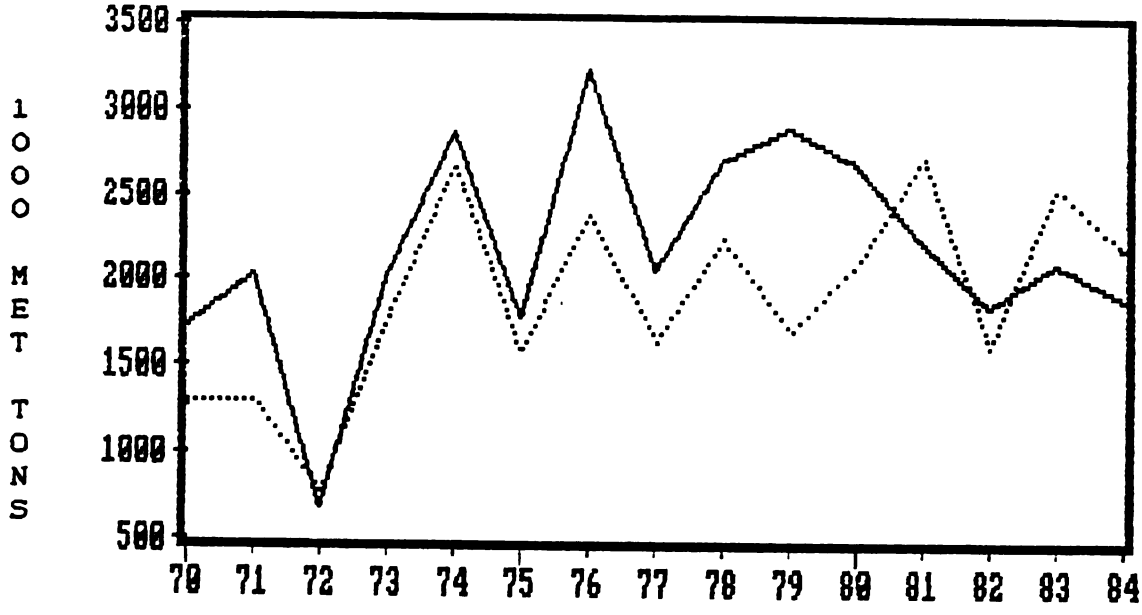
WPROBR.....Production
WHABR.....Harvested Area
WYBR.....Yield
WCONBR.....Total Consumption
WNIBR.....Net Imports
WESBR.....Ending Stocks

Coarse Grain

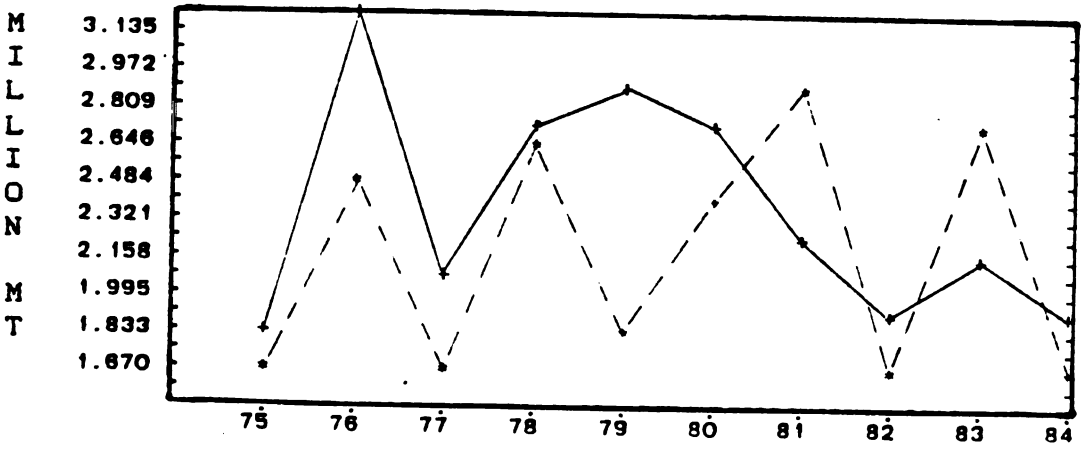
FPROBR.....Production
FHABR.....Harvested Area
FYBR.....Yield
FCONBR.....Total Consumption
FNIBR.....Net Imports
FESBR.....Ending Stocks

Soybean Complex

SPROBR.....Production
SHABR.....Harvested Area
SYBR.....Yield
SMCOBR.....Soymeal Equiv. Consumption
SOCOBR.....Soyoil Equiv. Consumption
SMESBR.....Soymeal Ending Stocks
SOESBR.....Soyoil Ending Stocks
SESBR.....Soybean Ending Stocks
SMEEBR.....Soymeal Equiv. Net Exports
SOEEBR.....Soyoil Equiv. Net Exports
PMELBR.....% SMEEBR Exported as SMNEBR
SMNEBR.....Soymeal Net Exports
SONEBR.....Soyoil Net Exports
SNEBR.....Soybean Net Exports



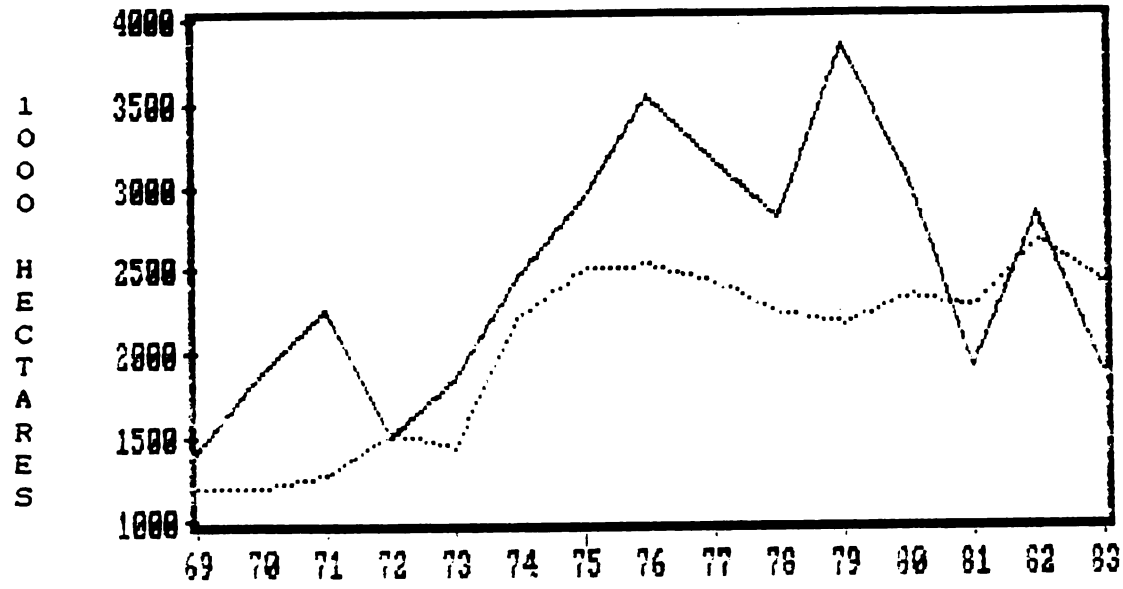
REGIONAL MODEL SIMULATION



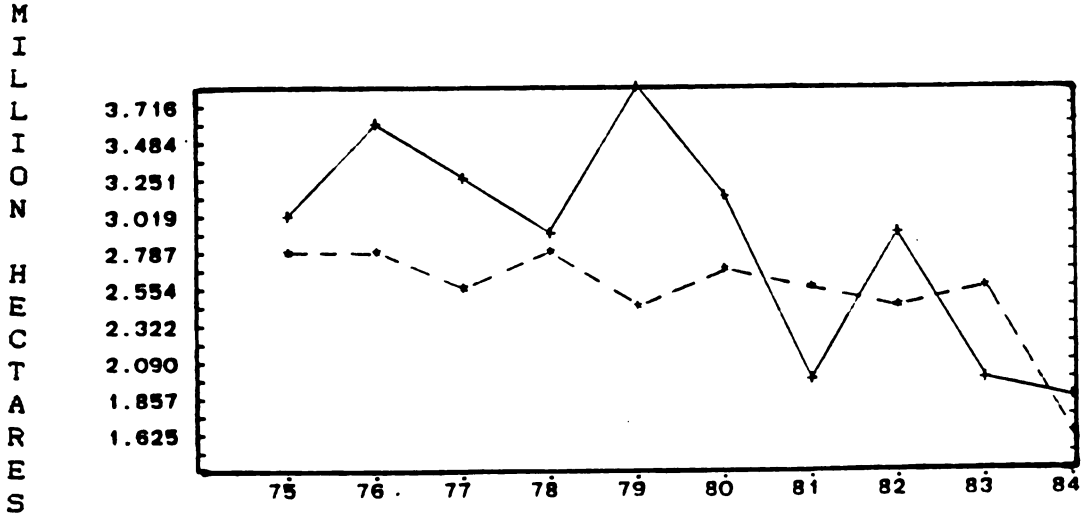
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.1.a & b. Wheat Production - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.2.a & b. Wheat Harvested Area - Brazil

Brazil
Wheat Harvested Area (1000 Hectares)

EMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHABR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	364.92906	576.11412	0.6334319	0.535
WHABR(-1)	0.7804525	0.1155273	6.7555705	0.000
WRBR(-1)	20.230879	15.079573	1.3416083	0.197
FRBR(-1)	-12.504105	12.517246	-0.9989501	0.332

R-squared	0.761416	Mean of dependent var	1967.762
Adjusted R-squared	0.719313	S.D. of dependent var	1091.061
S.E. of regression	579.0434	Sum of squared resid	5680281.
Durbin-Watson stat	2.451593	F-statistic	18.08455
Log likelihood	-161.1316	TPE	8/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-255.848	260.000	315.848
	1965	-331.861	290.000	621.861
	1966	-250.124	350.000	600.124
	1967	-248.876	480.000	728.876
	1968	-162.932	790.000	952.932
	1969	230.520	1407.00	1176.48
	1970	496.161	1895.00	1399.84
	1971	431.167	2261.00	1829.83
	1972	-779.621	1500.00	2279.62
	1973	359.814	1839.00	1479.19
	1974	-24.5472	2471.00	2495.55
	1975	229.235	2931.00	2701.76
	1976	664.886	3540.00	2875.11
	1977	-85.6445	3153.00	3238.64
	1978	-23.7426	2812.00	2835.74
	1979	1201.32	3832.00	2630.68
	1980	-562.740	3062.00	3624.74
	1981	-956.021	1922.00	2878.02
	1982	700.429	2828.00	2127.57
	1983	-679.215	1900.00	2579.21
	1984	47.6418	1800.00	1752.36

INDEPENDENT VARIABLES

WHABR = Wheat Harvested Area (1000 HA)

WRBR = Wheat Revenue per Hectare ($/HA)
(WYBR(-3)+WYBR(-2)+WYBR(-1)+WYBR)/4*WP*XRBR/CPIBR

FRBR = Coarse Grain Revenue per Hectare ($/HA)
(FYBR(-3)+FYBR(-2)+FYBR(-1)+FYBR)/4*FP*XRBR/CPIBR

SMPL 1964 - 1994
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHABR	1967.7619	1091.0610	3832.0000	260.00000
WHABR(-1)	1891.8095	1156.8562	3832.0000	205.00000
WRBR(-1)	65.121159	18.791107	119.21550	44.829350
FRBR(-1)	95.256160	22.497958	145.27360	64.292100

	Covariance	Correlation
WHABR, WHABR	1133727.7	1.0000000
WHABR, WHABR(-1)	1029893.3	0.8567481
WHABR, WRBR(-1)	6437.0019	0.3296640
WHABR, FRBR(-1)	5659.8149	0.2421026
WHABR(-1), WHABR(-1)	1274586.8	1.0000000
WHABR(-1), WRBR(-1)	5261.5510	0.2541390
WHABR(-1), FRBR(-1)	5702.6907	0.2300629
WRBR(-1), WRBR(-1)	336.29116	1.0000000
WRBR(-1), FRBR(-1)	357.71091	0.8884357
FRBR(-1), FRBR(-1)	482.05536	1.0000000

Brazil
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYBR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.5368231	0.6505301	-0.8252087	0.419
YEAR	0.0207591	0.0102782	2.0197224	0.056
WHABR	-7.315D-05	6.125D-05	-1.1943010	0.246

R-squared	0.190412	Mean of dependent var	0.822382
Adjusted R-squared	0.113308	S.D. of dependent var	0.200696
S.E. of regression	0.188984	Sum of squared resid	0.750017
Durbin-Watson stat	2.952075	F-statistic	2.469553
Log likelihood	7.534029		

10 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	-0.04792	0.61947	0.66739
	1961	-0.16318	0.53191	0.69510
	1962	0.21766	0.94815	0.73049
	1963	-0.26820	0.48780	0.75600
	1964	0.09649	0.86923	0.77274
	1965	-0.02578	0.76552	0.79130
	1966	0.04661	0.85429	0.80767
	1967	-0.05850	0.76042	0.81892
	1968	0.06148	0.87848	0.81700
	1969	0.02187	0.81450	0.79263
	1970	0.13788	0.91557	0.77769
	1971	0.12793	0.89960	0.77167
	1972	-0.38543	0.46267	0.84810
	1973	0.26034	1.10441	0.84406
	1974	0.33803	1.15662	0.81859
	1975	-0.19567	0.61003	0.80570
	1976	0.12657	0.90847	0.78191
	1977	-0.17573	0.65525	0.83098
	1978	0.08029	0.95697	0.87668
	1979	-0.07152	0.75130	0.82283
	1980	-0.02597	0.87394	0.89991
	1981	0.14942	1.15349	1.00406
	1982	-0.30473	0.65382	0.95855
	1983	0.05807	1.10526	1.04719

INDEPENDENT VARIABLES

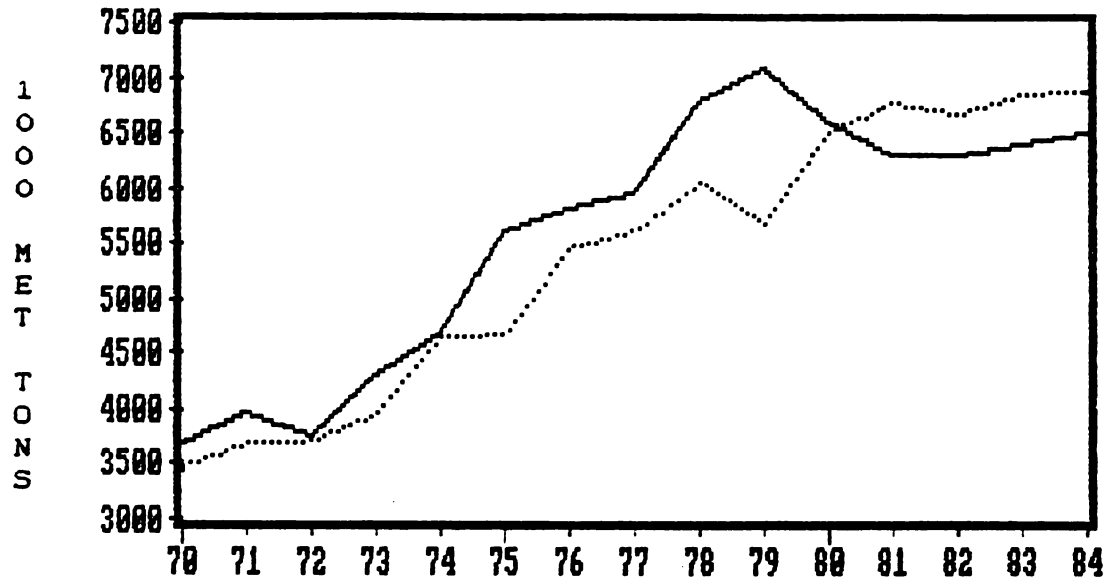
YEAR = 1960=60, 1961=61, ...

WHABR = Wheat Harvested Area (1000 HA)

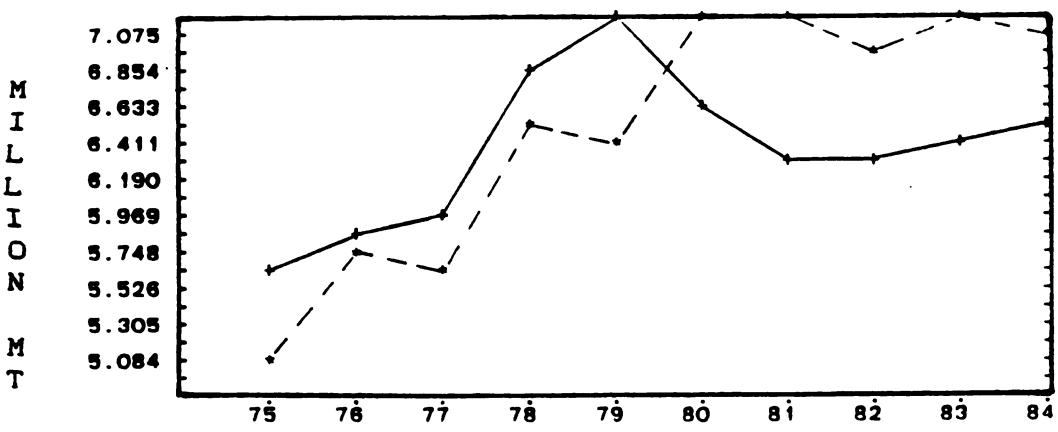
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYBR	0.8223817	0.2006964	1.1566170	0.4626667
YEAR	71.500000	7.0710678	83.000000	60.000000
WHABR	1709.7083	1186.5678	3832.0000	205.00000

	Covariance	Correlation
WYBR,WYBR	0.0386008	1.0000000
WYBR,YEAR	0.5004807	0.3679986
WYBR,WHABR	41.550537	0.1820656
YEAR,YEAR	47.916667	1.0000000
YEAR,WHABR	6756.1875	0.8402481
WHABR,WHABR	1349279.0	1.0000000



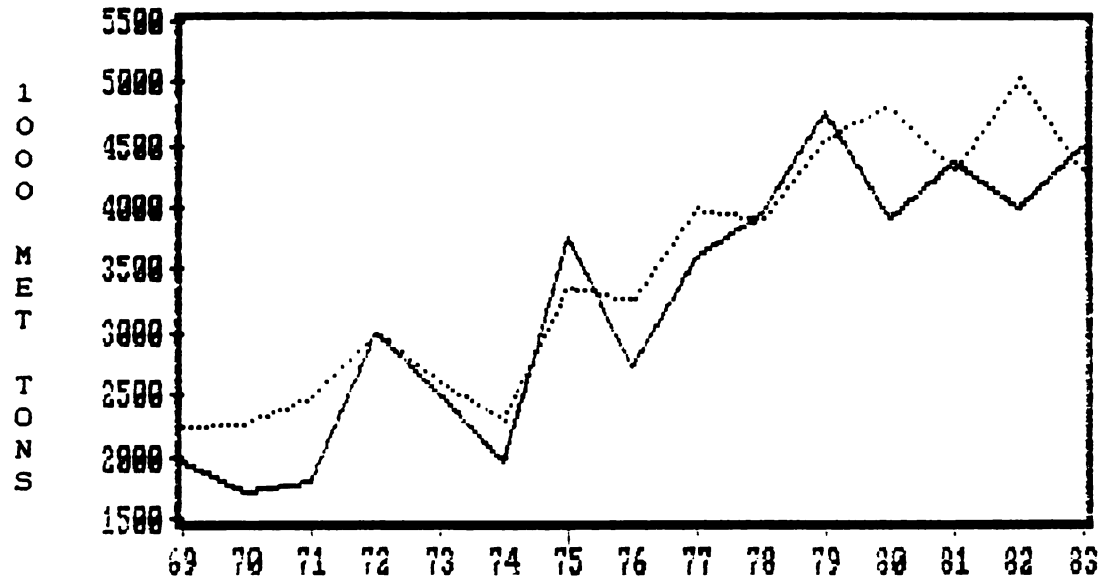
REGIONAL MODEL SIMULATION



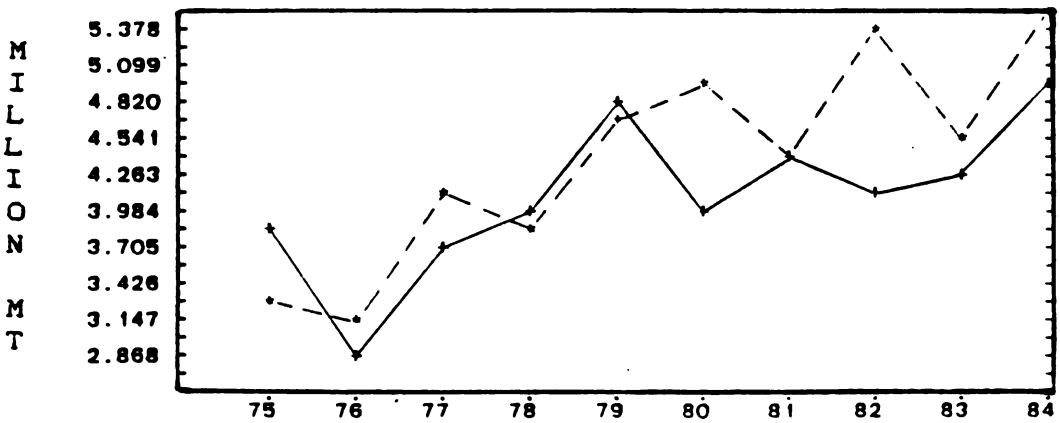
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.3.a & b. Total Wheat Consumption - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.4.a & b. Wheat Net Imports - Brazil

Brazil
Per Capita Wheat Net Imports (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0265225	0.0031640	8.3825673	0.000
PCRGDP	28.226979	3.8416067	7.3477015	0.000
PCWDS	-0.7168301	0.1146453	-6.2525923	0.000
WPBR	-2.617D-05	3.592D-05	-0.7285894	0.475

R-squared	0.747934	Mean of dependent var	0.029206
Adjusted R-squared	0.708134	S.D. of dependent var	0.006008
S.E. of regression	0.003246	Sum of squared resid	0.000200
Durbin-Watson stat	1.810249	F-statistic	18.79234
Log likelihood	101.3604	TPE	7/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00280	0.03047	0.02767
	1962	0.00053	0.02934	0.02881
	1963	0.00206	0.03409	0.03204
	1964	-0.00583	0.02383	0.02966
	1965	-0.00099	0.02939	0.03039
	1966	0.00048	0.02929	0.02881
	1967	0.00268	0.03067	0.02799
	1968	0.00093	0.02674	0.02581
	1969	-0.00159	0.02174	0.02326
	1970	-0.00094	0.01848	0.01942
	1971	-0.00159	0.01888	0.02047
	1972	-0.00189	0.03077	0.03266
	1973	-6.1D-06	0.02512	0.02511
	1974	-0.00211	0.01900	0.02112
	1975	0.00565	0.03575	0.03010
	1976	0.00094	0.02538	0.02444
	1977	8.4D-05	0.03286	0.03277
	1978	0.00250	0.03481	0.03230
	1979	0.00718	0.04130	0.03412
	1980	-0.00283	0.03224	0.03507
	1981	-0.00102	0.03533	0.03635
	1982	-0.00528	0.03154	0.03683
	1983	-0.00182	0.03471	0.03653

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPBR/CPIBR/CPIBR

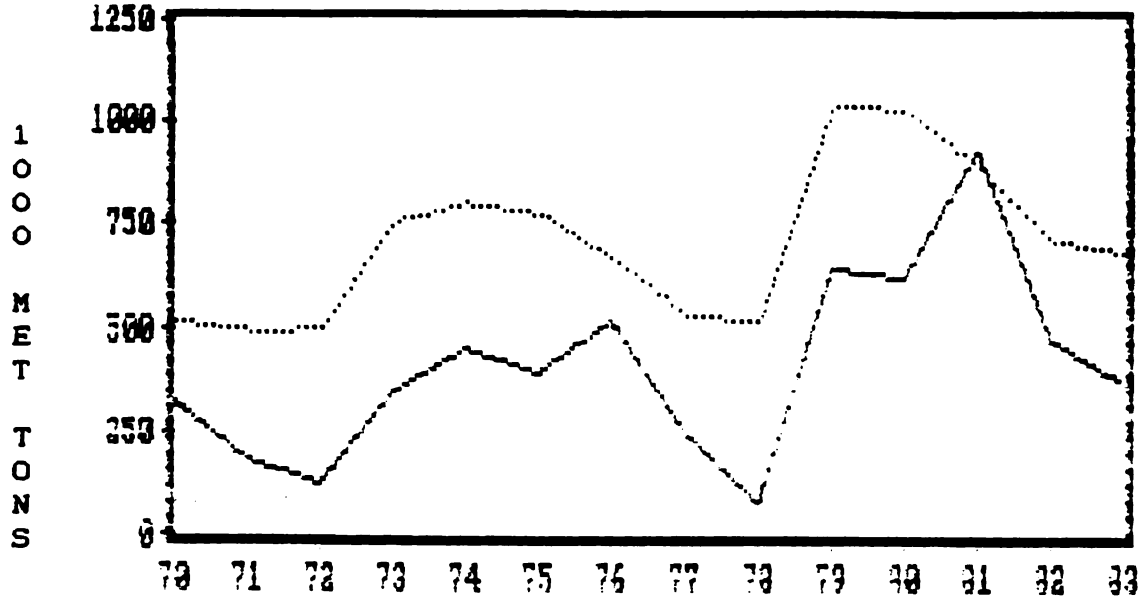
PCWDS = Per Capita Domestic Wheat Supply (1000 MT)
(WESBR(-1) + WPROBR)/POPBR

WPBR = Real Brazilian Wheat Price
WP*XRBR/CPIBR

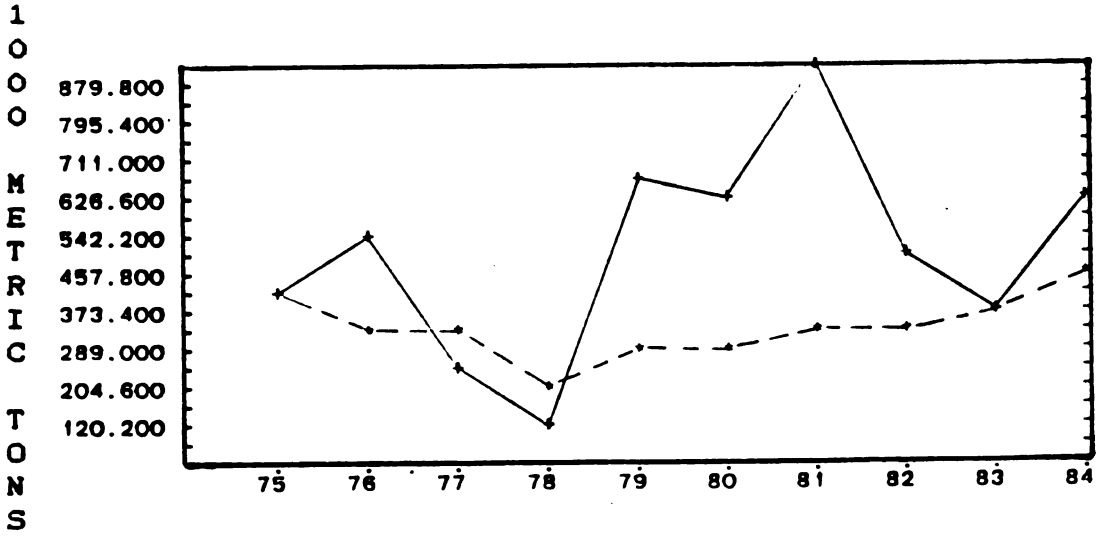
SMPL 1961 - 1983
83 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0292054	0.0060081	0.0412995	0.0184825
PCRGDP	0.0006321	0.0002705	0.0010853	0.0002780
PCWDS	0.0182302	0.0089181	0.0335410	0.0039200
WPBR	79.873577	19.792553	140.99000	54.212400

	Covariance	Correlation
PCWNI, PCWNI	3.453D-05	1.0000000
PCWNI, PCRGDP	7.440D-07	0.4785369
PCWNI, PCWDS	-7.161D-06	-0.1397393
PCWNI, WPBR	0.0118846	0.1044851
PCRGDP, PCRGDP	7.001D-08	1.0000000
PCRGDP, PCWDS	1.685D-06	0.7299300
PCRGDP, WPBR	0.0009429	0.1840939
PCWDS, PCWDS	7.607D-05	1.0000000
PCWDS, WPBR	0.0068692	0.0406857
WPBR, WPBR	374.71274	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure D.5.a & b. Wheat Ending Stocks - Brazil

Brazil
Per Capita Wheat Ending Stocks (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0028593	0.0024229	-1.1801236	0.253
PCWES(-1)	0.9742152	0.2426640	4.0146673	0.001
WPBR	3.351D-05	2.054D-05	1.6317828	0.120
WCONUR(-1)	6.613D-05	2.682D-05	2.4655078	0.024
DV72ON	-0.0012835	0.0007508	-1.7096206	0.105

R-squared	0.517343	Mean of dependent var	0.004303
Adjusted R-squared	0.410086	S.D. of dependent var	0.002021
S.E. of regression	0.001552	Sum of squared resid	4.34D-05
Durbin-Watson stat	2.173044	F-statistic	4.823387
Log likelihood	118.9518		

TPE = 11/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00074	0.00278	0.00352
	1962	-0.00076	0.00270	0.00346
	1963	0.00144	0.00457	0.00313
	1964	-0.00077	0.00436	0.00512
	1965	0.00134	0.00580	0.00447
	1966	0.00065	0.00629	0.00564
	1967	0.00230	0.00799	0.00569
	1968	0.00034	0.00777	0.00743
	1969	-0.00054	0.00628	0.00682
	1970	-0.00205	0.00348	0.00553
	1971	-0.00122	0.00189	0.00311
	1972	-0.00061	0.00124	0.00184
	1973	-0.00044	0.00340	0.00384
	1974	0.00062	0.00438	0.00377
	1975	-0.00033	0.00373	0.00406
	1976	0.00211	0.00477	0.00266
	1977	-0.00116	0.00222	0.00339
	1978	-0.00133	0.00069	0.00202
	1979	0.00037	0.00550	0.00514
	1980	-3.2D-05	0.00514	0.00517
	1981	0.00350	0.00743	0.00393
	1982	-0.00215	0.00371	0.00587
	1983	-0.00054	0.00283	0.00337

INDEPENDENT VARIABLES

PCWES = Per Capita Wheat Ending Stocks (1000 MT)
WESBR/POPBR

WPBR = Real Brazilian Wheat Price
WP*XRBR/CPIBR

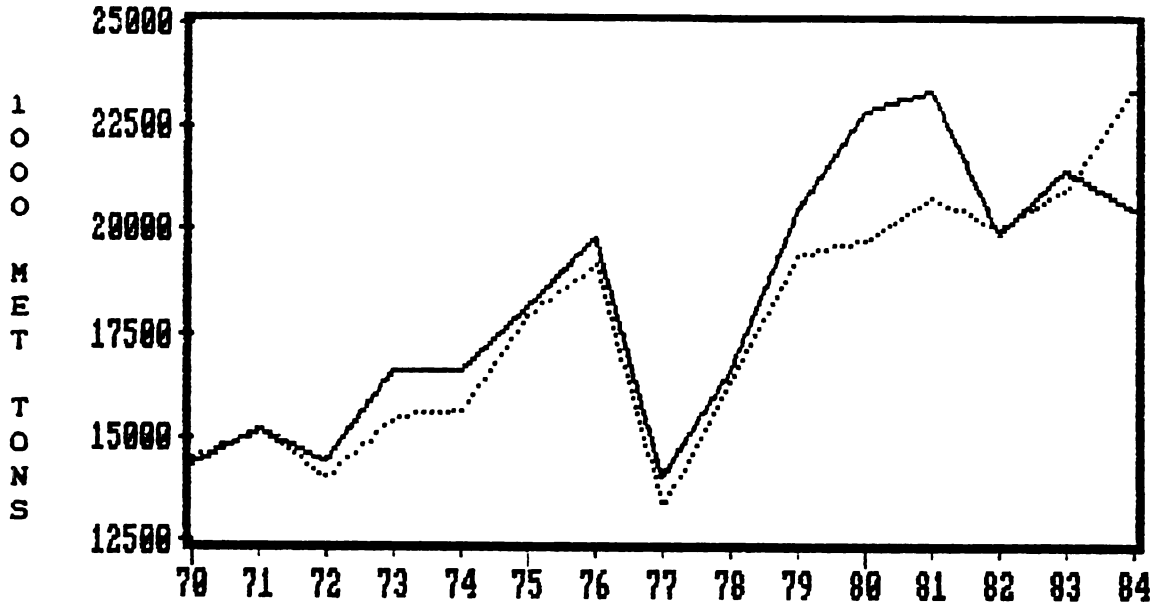
WCONUR = Wheat Consumption/Stock Ratio
(WCONBR/WESBR)

DV72ON = 1 If(TIME .GE. 72)
0 Otherwise

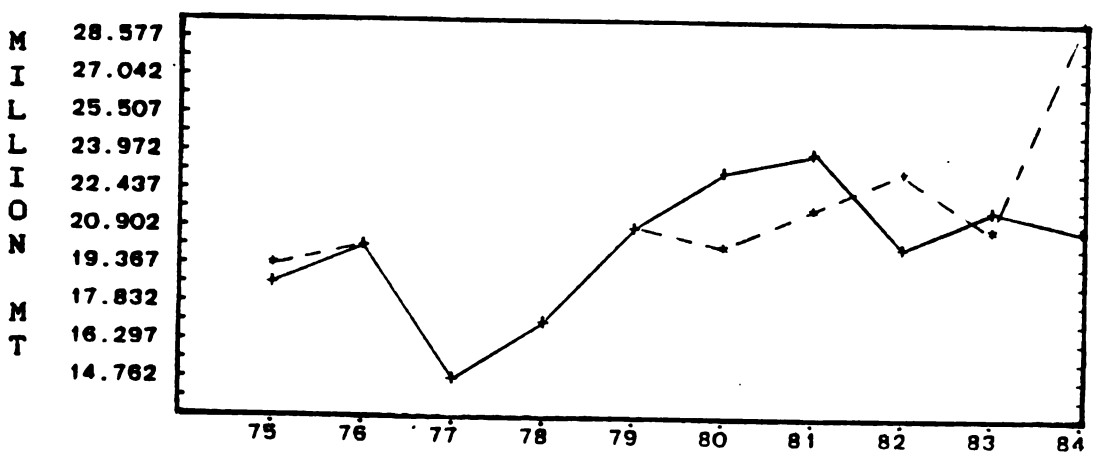
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0043032	0.0020207	0.0079892	0.0006906
PCWES(-1)	0.0043048	0.0020195	0.0079892	0.0006906
WPBR	79.361604	19.885221	140.99000	54.212400
WCONUR(-1)	14.802317	17.077918	87.038460	4.1409690
DV72ON	0.5217391	0.5107539	1.0000000	0.0000000

	Covariance	Correlation
PCWES,PCWES	3.906D-06	1.0000000
PCWES,PCWES(-1)	2.141D-06	0.5484219
PCWES,WPBR	-0.0055513	-0.1444334
PCWES,WCONUR(-1)	-0.0037248	-0.1128419
PCWES,DV72ON	-0.0002863	-0.2900122
PCWES(-1),PCWES(-1)	3.901D-06	1.0000000
PCWES(-1),WPBR	-0.0197736	-0.5147835
PCWES(-1),WCONUR(-1)	-0.0214434	-0.6500213
PCWES(-1),DV72ON	-0.0003280	-0.3324543
WPBR,WPBR	378.22976	1.0000000
WPBR,WCONUR(-1)	91.085408	0.2804069
WPBR,DV72ON	3.8843576	0.3998363
WCONUR(-1),WCONUR(-1)	278.97461	1.0000000
WCONUR(-1),DV72ON	3.3774548	0.4048071
DV72ON,DV72ON	0.2495274	1.0000000



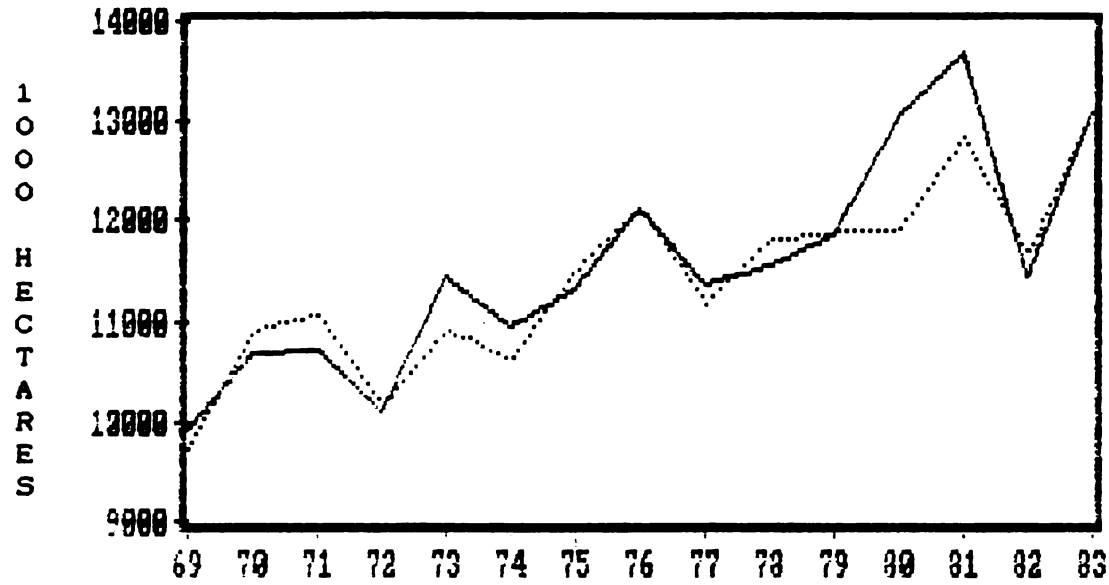
REGIONAL MODEL SIMULATION



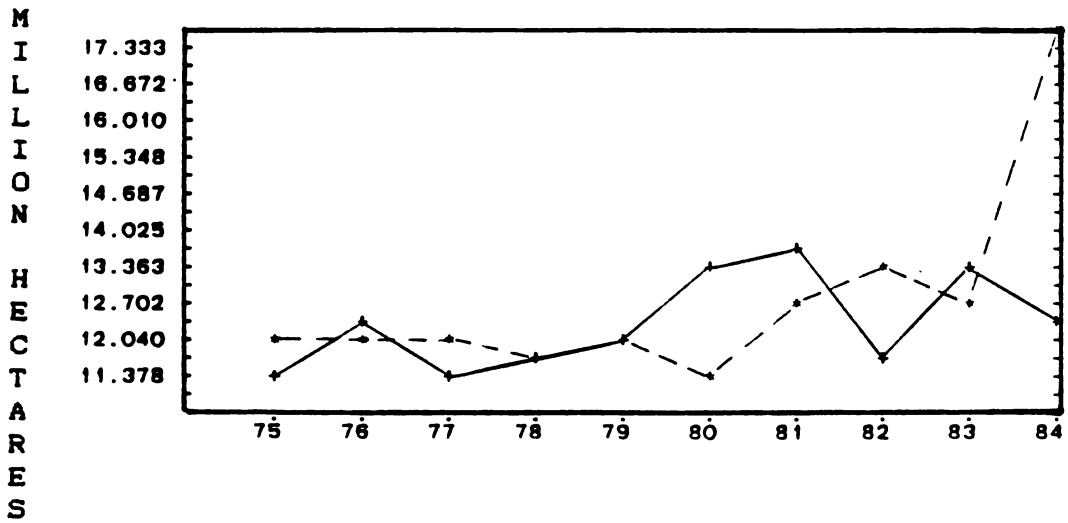
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure D.6.a & b. Coarse Grain Production - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.7.a & b. Coarse Grain Harvested Area - Brazil

Brazil
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1968 - 1983
16 Observations
LS // Dependent Variable is FHABR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	6246.1184	585.34055	10.670914	0.000
CLBBR(-1)	0.2145058	0.0280933	7.6354729	0.000
FRBR(-1)	70.183922	14.599770	4.8071938	0.001
WRBR(-1)	-53.665455	12.720485	-4.2188214	0.001
SRBR(-1)	-9.6529254	3.3582039	-2.8744310	0.015

R-squared	0.899729	Mean of dependent var	11435.31
Adjusted R-squared	0.863266	S.D. of dependent var	1134.094
S.E. of regression	419.3599	Sum of squared resid	1934490.
Durbin-Watson stat	1.442320	F-statistic	24.67555
Log likelihood	-116.3251	TPE = 2	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1968	425.764	9718.00	9292.24
	1969	202.383	9918.00	9715.62
	1970	-232.931	10686.0	10918.9
	1971	-349.057	10717.0	11066.1
	1972	-229.228	10103.0	10332.2
	1973	463.792	11428.0	10964.2
	1974	-25.8763	10950.0	10975.9
	1975	-428.733	11324.0	11752.7
	1976	-144.625	12113.0	12257.6
	1977	-139.703	11375.0	11514.7
	1978	-529.270	11546.0	12075.3
	1979	-164.501	11846.0	12010.5
	1980	694.139	13053.0	12358.9
	1981	447.566	13676.0	13228.4
	1982	-159.496	11446.0	11605.5
	1983	169.775	13066.0	12896.2

INDEPENDENT VARIABLES

CLBBR = Cropland Base (1000 HA)

FRBR = Coarse Grain Revenue per Hectare ($/HA)
(FYBR(-3)+FYBR(-2)+FYBR(-1)+FYBR)/4*FP*XRBR/CPIBR

WRBR = Wheat Revenue per Hectare ($/HA)
(WYBR(-3)+WYBR(-2)+WYBR(-1)+WYBR)/4*WP*XRBR/CPIBR

WRBR = Wheat Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP*XRBR/CPIBR

SMPL 1968 - 1983
16 Observations

Series	Mean	S.D.	Maximum	Minimum
FHABR	11435.313	1134.0939	13676.000	9718.0000
CLBBR(-1)	18842.375	4811.2372	24600.000	10856.000
FRBR(-1)	93.424062	21.850967	137.27240	64.292090
WRBR(-1)	66.407730	20.649713	119.21550	44.829350
SRBR(-1)	191.20320	57.980530	284.09080	112.33950

	Covariance	Correlation
FHABR,FHABR	1205783.3	1.0000000
FHABR,CLBBR(-1)	4243346.3	0.8295287
FHABR,FRBR(-1)	11015.117	0.4741308
FHABR,WRBR(-1)	5913.2470	0.2693343
FHABR,SRBR(-1)	29119.836	0.4723745
CLBBR(-1),CLBBR(-1)	21701254.	1.0000000
CLBBR(-1),FRBR(-1)	40927.537	0.4152569
CLBBR(-1),WRBR(-1)	33358.891	0.3581538
CLBBR(-1),SRBR(-1)	154764.79	0.5917823
FRBR(-1),FRBR(-1)	447.62321	1.0000000
FRBR(-1),WRBR(-1)	382.09623	0.9032684
FRBR(-1),SRBR(-1)	898.65608	0.7566053
WRBR(-1),WRBR(-1)	399.75999	1.0000000
WRBR(-1),SRBR(-1)	684.36644	0.6097071
SRBR(-1),SRBR(-1)	3151.6330	1.0000000

Brazil
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYBR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-4.5304496	0.9634542	-4.7022988	0.000
LOGT	1.4029197	0.2258404	6.2119964	0.000

R-squared	0.636897	Mean of dependent var	1.452963
Adjusted R-squared	0.620393	S.D. of dependent var	0.175004
S.E. of regression	0.107824	Sum of squared resid	0.255771
Durbin-Watson stat	1.698292	F-statistic	38.58890
Log likelihood	20.44378	TPE = 8	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: : *:	1960	0.09327	1.30686	1.21359
: : * :	1961	0.06291	1.29969	1.23678
: : * :	1962	0.05419	1.31378	1.25959
*: : :	1963	-0.12515	1.15689	1.28204
: : * :	1964	0.07331	1.37743	1.30413
: *: :	1965	-0.02316	1.30273	1.32588
: :* :	1966	0.03090	1.37820	1.34730
: * : :	1967	-0.03568	1.33271	1.36840
: * : :	1968	-0.07739	1.31179	1.38918
: :* :	1969	0.02944	1.43910	1.40966
:* : :	1970	-0.08660	1.34325	1.42985
: * : :	1971	-0.03517	1.41457	1.44975
: * : :	1972	-0.04425	1.42512	1.46937
: * : :	1973	-0.03807	1.45065	1.48872
: * :	1974	0.01073	1.51854	1.50781
: : * :	1975	0.07368	1.60032	1.52664
: : *:	1976	0.09145	1.63667	1.54522
* : : :	1977	-0.33323	1.23033	1.56356
*: : :	1978	-0.14324	1.43842	1.58166
: : :*	1979	0.13497	1.73451	1.59954
: : :*	1980	0.13935	1.75653	1.61718
: : *:	1981	0.07839	1.71300	1.63461
: : *:	1982	0.08817	1.74000	1.65182
: *: :	1983	-0.01882	1.65001	1.66883

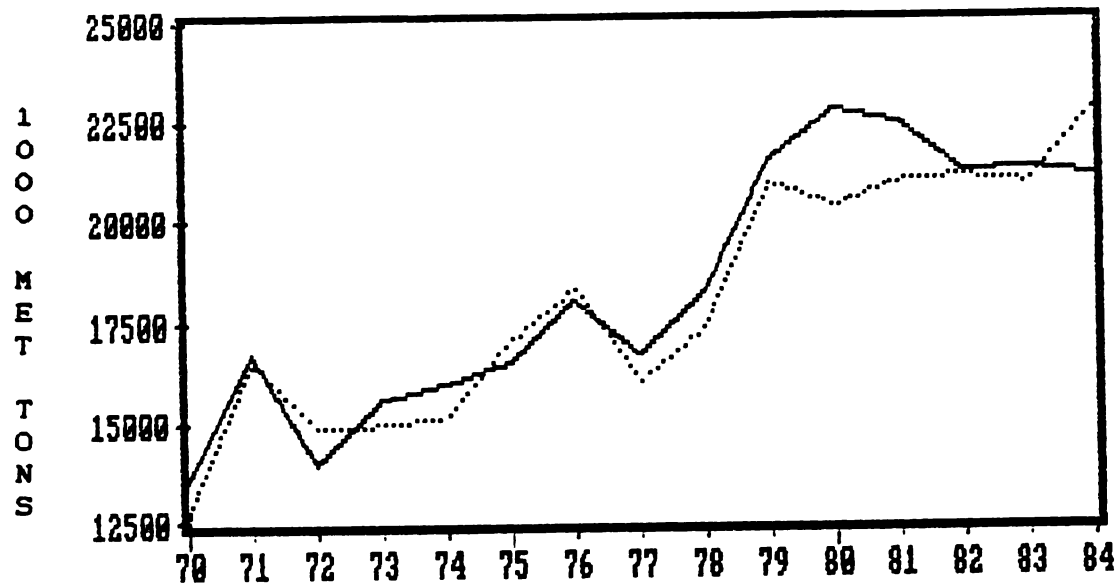
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

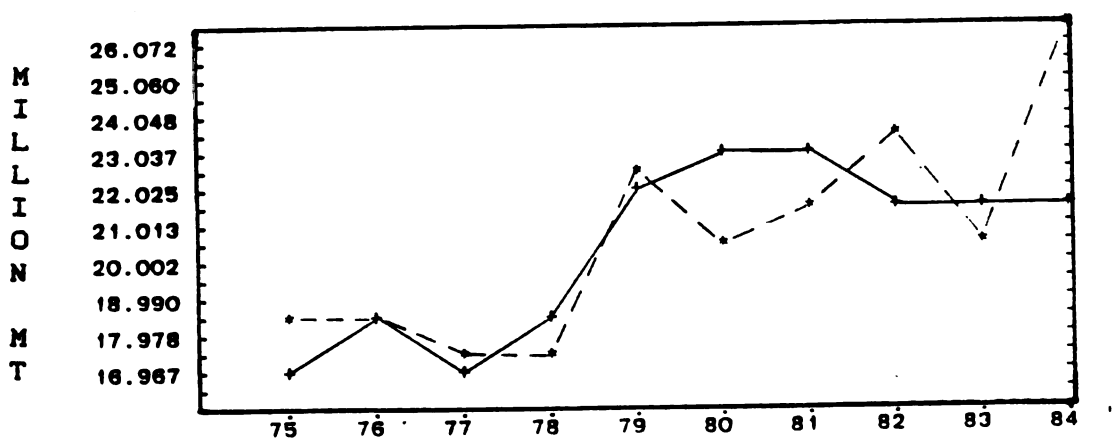
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYBR	1.4529626	0.1750037	1.7565310	1.1568890
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYBR,FYBR	0.0293502	1.0000000
FYBR,LOGT	0.0133244	0.7980584
LOGT,LOGT	0.0094976	1.0000000



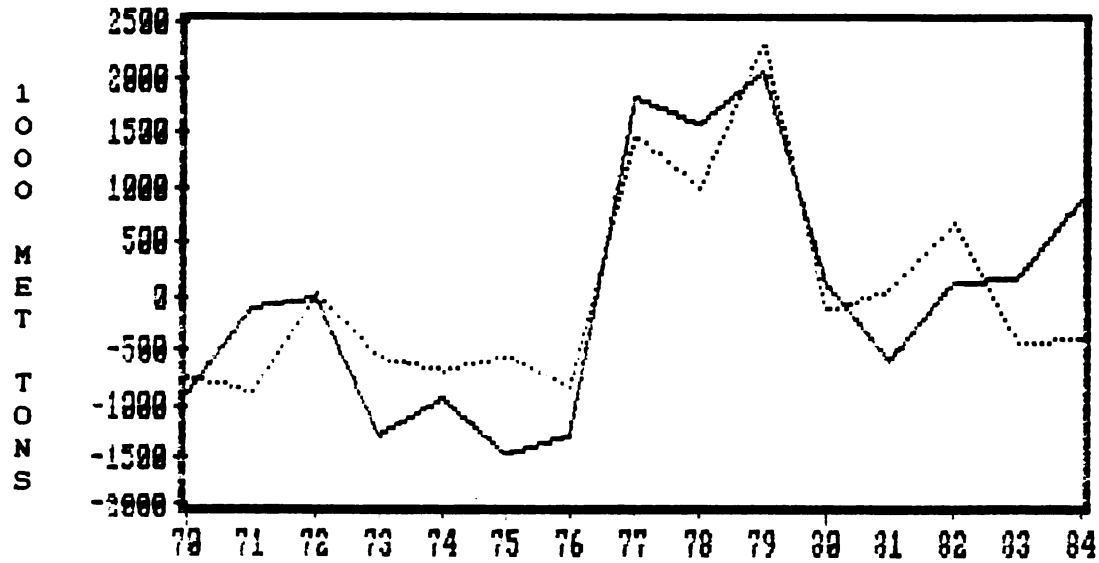
REGIONAL MODEL SIMULATION



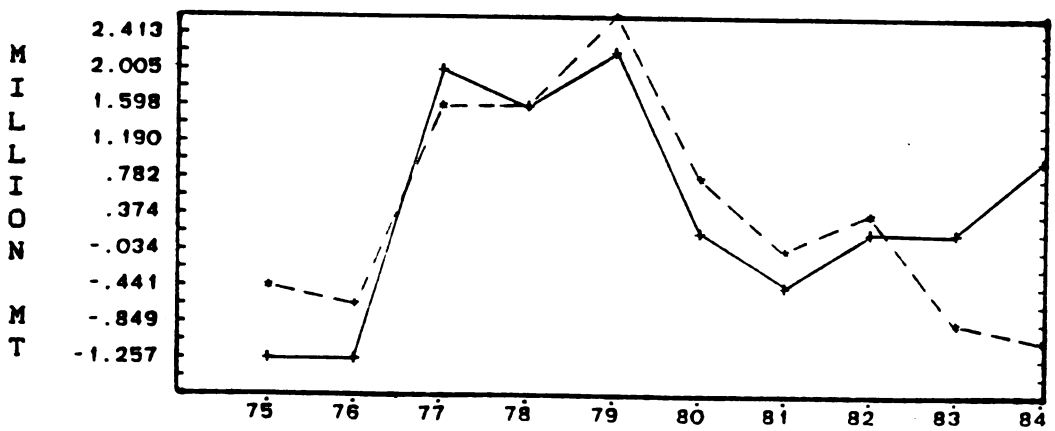
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.8 a & b. Total Coarse Grain Consumption - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.9.a & b. Coarse Grain Net Imports - Brazil

Brazil
Per Capita Coarse Grain Net Imports (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0549432	0.0136133	4.0359917	0.001
PCRGDP	20.745402	5.7107591	3.6326873	0.002
PCFDS	-0.3035104	0.0656265	-4.6248127	0.000
PCWDS	-0.3433298	0.1758935	-1.9519188	0.067
FPBR	-0.0001950	8.271D-05	-2.3579560	0.030
DV79	0.0168577	0.0054806	3.0758650	0.007

R-squared	0.774239	Mean of dependent var	-0.002940
Adjusted R-squared	0.711527	S.D. of dependent var	0.009524
S.E. of regression	0.005115	Sum of squared resid	0.000471
Durbin-Watson stat	2.156287	F-statistic	12.34606
Log likelihood	96.00924	TPE	5/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00455	0.00076	-0.00379
	1962	-0.00304	-0.00872	-0.00568
	1963	-0.00376	-0.00018	0.00357
	1964	0.00312	-0.00630	-0.00942
	1965	0.00341	-0.00701	-0.01042
	1966	0.00411	-0.00519	-0.00929
	1967	-0.00289	-0.01316	-0.01027
	1968	0.00434	-0.00625	-0.01060
	1969	-0.00930	-0.01900	-0.00970
	1970	-7.7D-06	-0.00966	-0.00966
	1971	0.00654	-0.00130	-0.00784
	1972	-0.00243	8.2D-05	0.00251
	1973	-0.00174	-0.01296	-0.01122
	1974	0.00049	-0.00908	-0.00957
	1975	-0.00934	-0.01392	-0.00458
	1976	-0.00361	-0.01178	-0.00817
	1977	0.00377	0.01646	0.01269
	1978	0.00452	0.01379	0.00927
	1979	-1.9D-19	0.01784	0.01784
	1980	0.00768	0.00098	-0.00670
	1981	-0.00230	-0.00488	-0.00258
	1982	-0.00472	0.00110	0.00583
	1983	0.00119	0.00127	8.2D-05
	1984	-0.00057	0.00656	0.00713

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPBR/CPIBR/CPIBR

PCFDS = Per Capita Domestic Coarse Grain Supply (1000 MT)
(FESBR(-1) + FPROBR)/POPBR

PCWDS = Per Capita Domestic Wheat Supply (1000 MT)
(WESBR(-1) + WPROBR)/POPBR

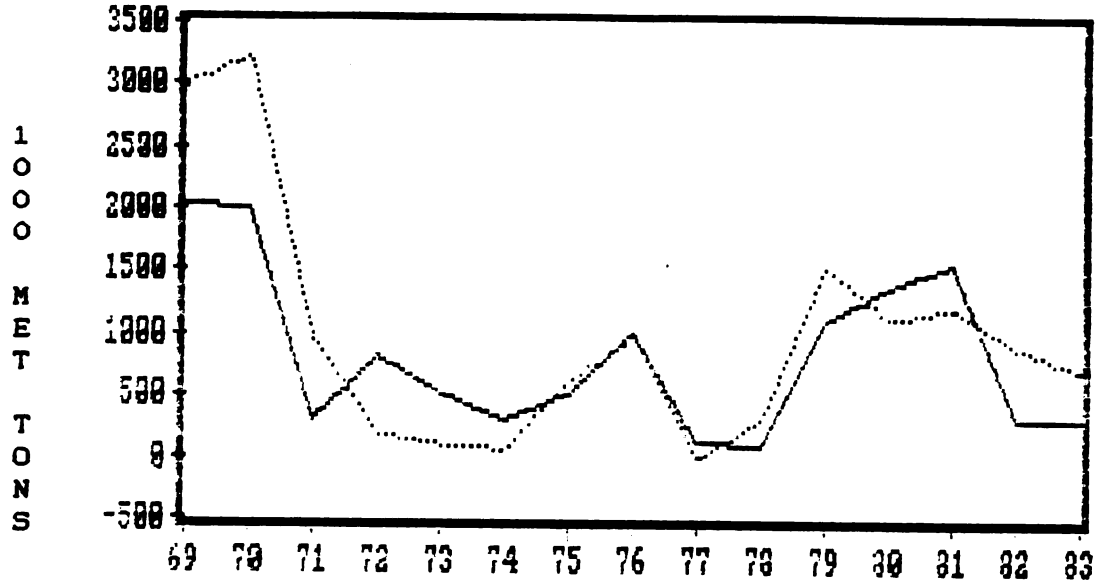
FPBR = Real Brazilian Coarse Grain Price
FP*XRBR/CPIBR

DV79 = 1 If(TIME .EQ. 79)
0 Otherwise

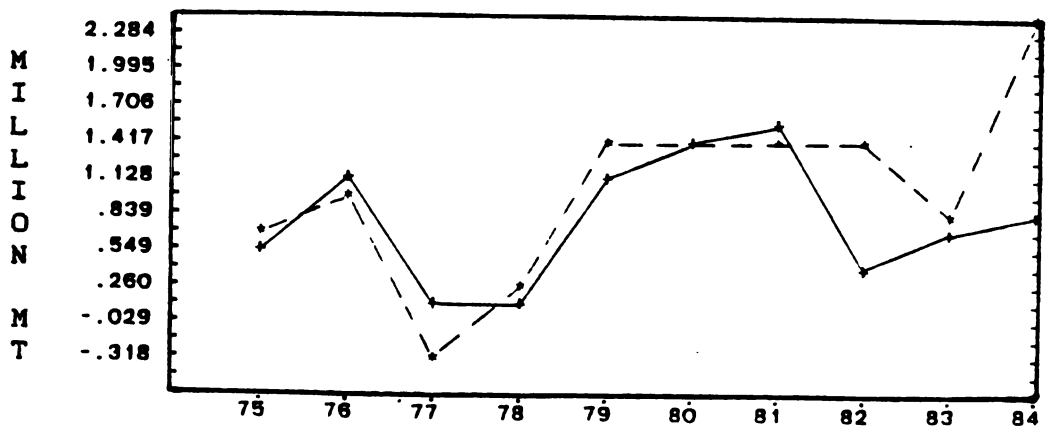
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	-0.0029397	0.0095243	0.0178417	-0.0189963
PCRGDP	0.0006473	0.0002750	0.0010853	0.0002780
PCFDS	0.1741013	0.0169842	0.1990889	0.1360584
PCWDS	0.0181830	0.0087251	0.0335410	0.0039200
FPBR	66.301254	13.258359	97.467000	47.296190
DV79	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
PCFNI,PCFNI	8.693D-05	1.0000000
PCFNI,PCRGDP	1.253D-06	0.4990804
PCFNI,PCFDS	-8.619D-05	-0.5559795
PCFNI,PCWDS	9.136D-06	0.1147182
PCFNI,FPBR	-0.0189776	-0.1568191
PCFNI,DV79	0.0008659	0.4647487
PCRGDP,PCRGDP	7.246D-08	1.0000000
PCRGDP,PCFDS	-3.247D-07	-0.0725464
PCRGDP,PCWDS	1.598D-06	0.6949268
PCRGDP,FPBR	0.0002370	0.0678358
PCRGDP,DV79	1.457D-05	0.2708439
PCFDS,PCFDS	0.0002764	1.0000000
PCFDS,PCWDS	1.692D-05	0.1191120
PCFDS,FPBR	-0.0375805	-0.1741450
PCFDS,DV79	0.0001737	0.0522835
PCWDS,PCWDS	7.296D-05	1.0000000
PCWDS,FPBR	-0.0051111	-0.0461037
PCWDS,DV79	0.0003069	0.1798110
FPBR,FPBR	168.45976	1.0000000
FPBR,DV79	-0.2492305	-0.0960949
DV79,DV79	0.0399306	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.10.a & b. Coarse Grain Ending Stocks - Brazil

Brazil
Per Capita Coarse Grain Ending Stocks (1000 MT)

```
SMPL   1961 -  1984
24 Observations
LS // Dependent Variable is PCFES
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0116959	0.0166156	-0.7039092	0.489
PCTFS	0.2594669	0.0963164	2.6939007	0.014
DV71ON	-0.0269571	0.0027000	-9.9841125	0.000

R-squared	0.835929	Mean of dependent var	0.016990
Adjusted R-squared	0.820303	S.D. of dependent var	0.015383
S.E. of regression	0.006521	Sum of squared resid	0.000893
Durbin-Watson stat	1.564702	F-statistic	53.49655
Log likelihood	88.33292	TPE	9/24

Residual Plot

obs	RESIDUAL	ACTUAL	FITTED
1961	-0.00163	0.02919	0.03082
1962	-0.00378	0.02643	0.03021
1963	-0.00072	0.02621	0.02693
1964	0.01184	0.04519	0.03336
1965	-0.00224	0.03222	0.03446
1966	0.01292	0.04835	0.03543
1967	0.01257	0.04883	0.03626
1968	-0.01028	0.02648	0.03676
1969	-0.00843	0.02275	0.03118
1970	-0.01026	0.02154	0.03180
1971	-0.00462	0.00315	0.00777
1972	0.00783	0.00818	0.00034
1973	0.00189	0.00500	0.00311
1974	0.00054	0.00293	0.00239
1975	0.00148	0.00476	0.00328
1976	0.00197	0.00930	0.00733
1977	-1.3D-05	0.00091	0.00092
1978	-0.00255	0.00076	0.00331
1979	-0.00273	0.00950	0.01223
1980	-0.00189	0.01111	0.01300
1981	0.00072	0.01246	0.01174
1982	-0.00314	0.00237	0.00551
1983	-0.00094	0.00440	0.00534
1984	0.00145	0.00573	0.00428

INDEPENDENT VARIABLES

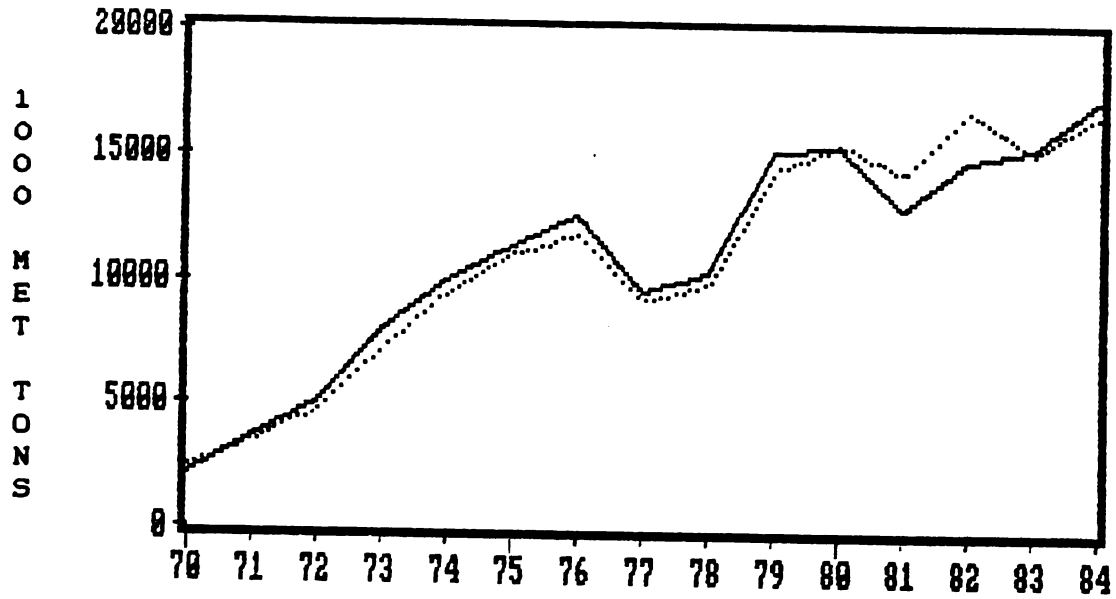
PCTFS = Per Capita Total Coarse Grain Supply (1000 MT)
(FESBR(-1) + FPROBR + FNIBR)/POPBR

DV71ON = 1 If(TIME .GE. 71)
0 Otherwise

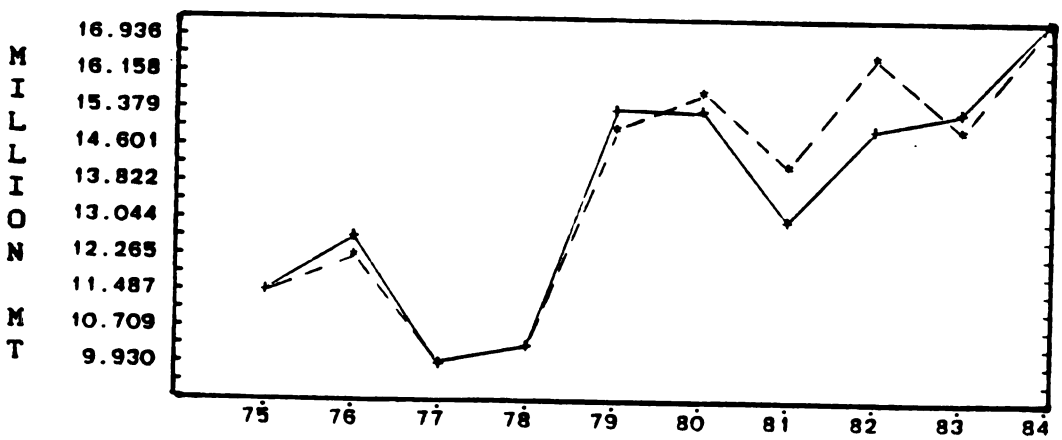
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0169897	0.0153833	0.0488268	0.0007615
PCTFS	0.1711606	0.0141175	0.1990848	0.1488567
DV710N	0.5833333	0.5036102	1.0000000	0.0000000

	Covariance	Correlation
PCFES,PCFES	0.0002268	1.0000000
PCFES,PCTFS	4.974D-05	0.2389917
PCFES,DV710N	-0.0065538	-0.8827398
PCTFS,PCTFS	0.0001910	1.0000000
PCTFS,DV710N	-6.761D-06	-0.0009924
DV710N,DV710N	0.2430556	1.0000000



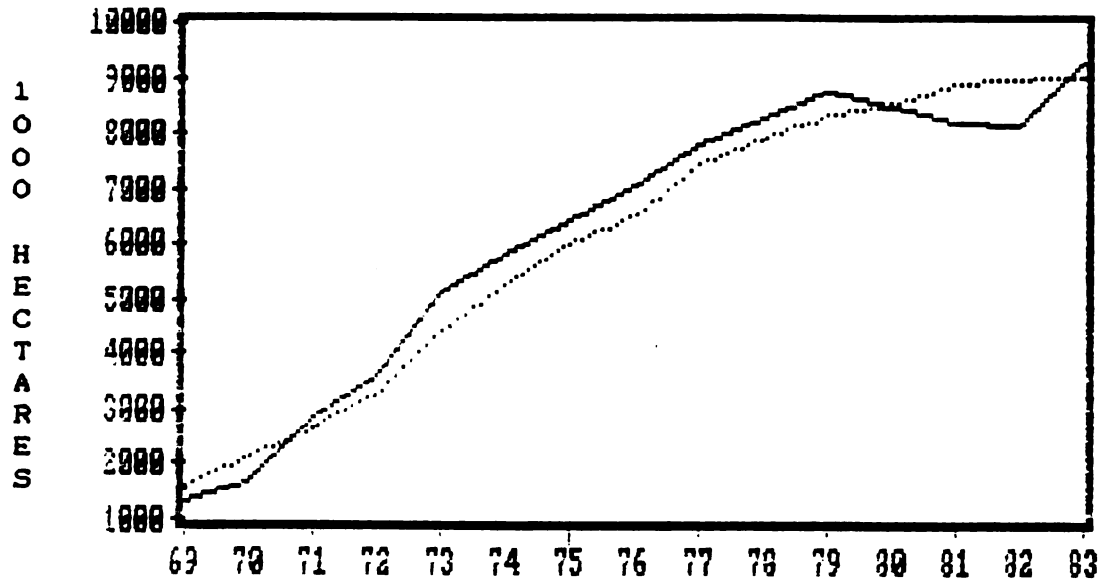
REGIONAL MODEL SIMULATION



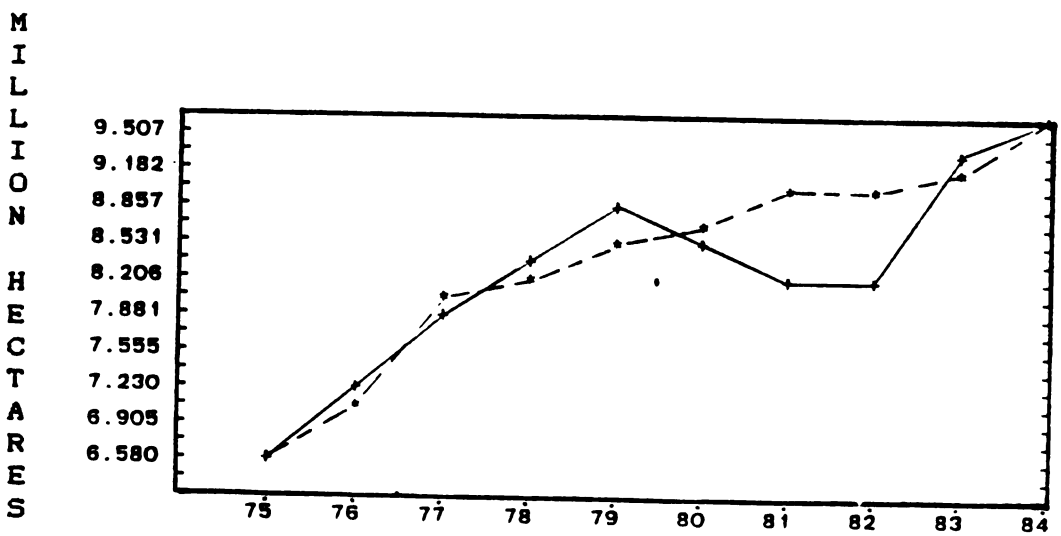
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure D.11.a & b. Soybean Production - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.12.a & b. Soybean Harvested Area - Brazil

Brazil
Soybean Harvested Area (1000 Hectares)

SMPL 1968 - 1983
16 Observations
LS // Dependent Variable is SHABR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	331.67078	536.31062	0.6184304	0.548
SHABR(-1)	0.8946809	0.0511250	17.499879	0.000
SRBR(-1)	5.6278452	3.6578419	1.5385698	0.150
FRBR(-1)	-3.3127154	8.5639584	-0.3868206	0.706

R-squared	0.978700	Mean of dependent var	5862.813
Adjusted R-squared	0.973375	S.D. of dependent var	2901.025
S.E. of regression	473.3661	Sum of squared resid	2688906.
Durbin-Watson stat	1.290044	F-statistic	183.7927
Log likelihood	-118.9595	TPE = 2	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1968	-497.804	906.000	1403.80
	1969	-248.882	1319.00	1567.88
	1970	-170.704	1716.00	1886.70
	1971	547.742	2840.00	2292.26
	1972	188.747	3615.00	3426.25
	1973	424.534	5143.00	4718.47
	1974	-86.0817	5824.00	5910.08
	1975	-92.4614	6417.00	6509.46
	1976	205.006	7070.00	6864.99
	1977	-166.830	7782.00	7948.83
	1978	34.5858	8256.00	8221.41
	1979	154.940	8774.00	8619.06
	1980	-438.397	8485.00	8923.40
	1981	-649.092	8202.00	8851.09
	1982	-232.667	8136.00	8368.67
	1983	1027.36	9320.00	8292.64

INDEPENDENT VARIABLES

SHABR = Soybean Harvested Area (HA)

SRBR = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPIBR

FRBR = Coarse Grain Revenue per Hectare ($/HA)
(FYBR(-3)+FYBR(-2)+FYBR(-1)+FYBR)/4*FP/CPIBR

SMPL 1968 - 1983
16 Observations

Series	Mean	S.D.	Maximum	Minimum
SHABR	5862.8125	2901.0254	9320.0000	906.00000
SHABR(-1)	5325.4375	3012.1386	8774.0000	722.00000
SRBR(-1)	191.20320	57.980530	284.09080	112.33950
FRBR(-1)	93.424062	21.850967	137.27240	64.292090

	Covariance	Correlation
SHABR,SHABR	7889951.7	1.0000000
SHABR,SHABR(-1)	8080683.0	0.9863937
SHABR,SRBR(-1)	103703.12	0.6576379
SHABR,FRBR(-1)	27579.355	0.4640776
SHABR(-1),SHABR(-1)	8505917.7	1.0000000
SHABR(-1),SRBR(-1)	99413.333	0.6071783
SHABR(-1),FRBR(-1)	26830.468	0.4348219
SRBR(-1),SRBR(-1)	3151.6330	1.0000000
SRBR(-1),FRBR(-1)	899.65608	0.7566053
FRBR(-1),FRBR(-1)	447.62321	1.0000000

Brazil
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SYBR

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-9.5720254	2.3080058	-4.1473143	0.001
LOGT	2.5602057	0.5373812	4.7642267	0.000

R-squared	0.557716	Mean of dependent var	1.421987
Adjusted R-squared	0.533145	S.D. of dependent var	0.277134
S.E. of regression	0.189357	Sum of squared resid	0.645409
Durbin-Watson stat	1.378237	F-statistic	22.69786
Log likelihood	5.957264	TPE = 5	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.13508	1.21065	1.07557
	1965	0.09655	1.21181	1.11527
	1966	0.01558	1.16993	1.15435
	1967	-0.28704	0.90582	1.19285
	1968	-0.06412	1.16667	1.23078
	1969	-0.12411	1.14405	1.26816
	1970	-0.09462	1.21037	1.30500
	1971	-0.05047	1.29085	1.34131
	1972	0.00933	1.38645	1.37712
	1973	0.11897	1.53140	1.41244
	1974	0.25122	1.69849	1.44727
	1975	0.26794	1.74957	1.48163
	1976	0.25433	1.76987	1.51554
	1977	-0.32297	1.22603	1.54901
	1978	-0.34174	1.24031	1.58205
	1979	0.11272	1.72738	1.61466
	1980	0.14453	1.79140	1.64687
	1981	-0.11381	1.56486	1.67867
	1982	0.10285	1.81293	1.71008
	1983	-0.11021	1.63090	1.74111

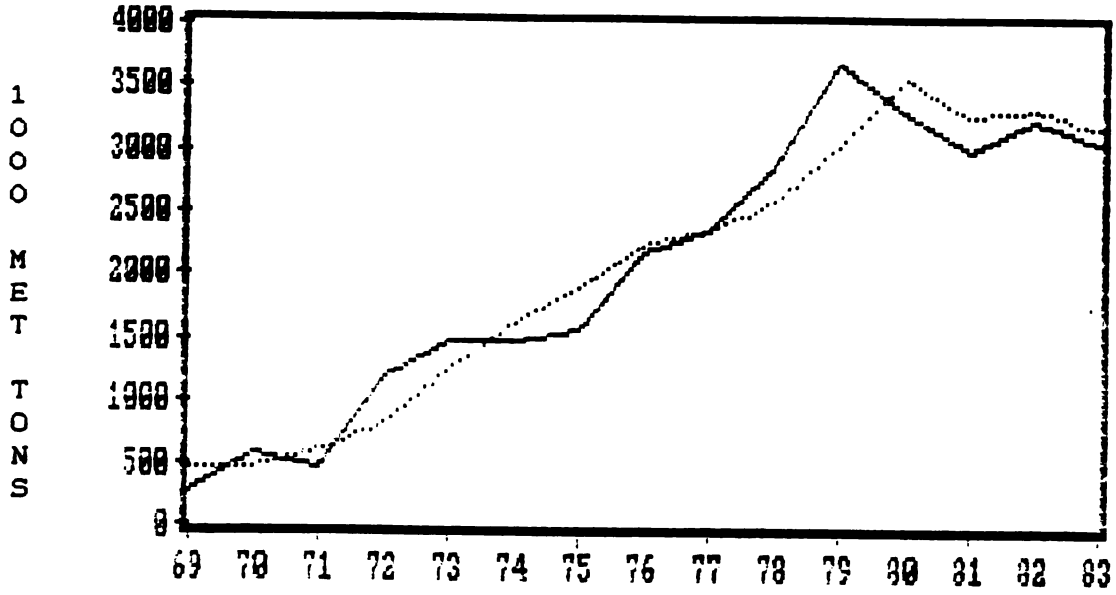
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

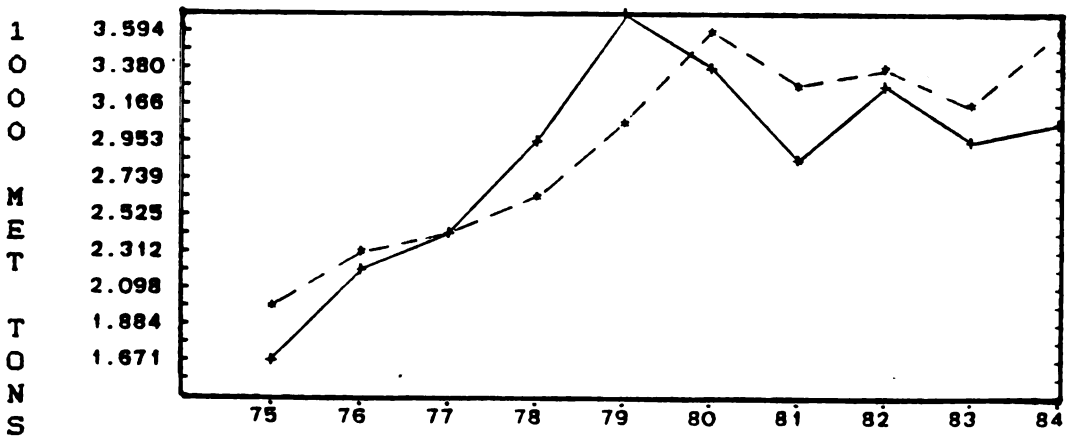
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SYBR	1.4219869	0.2771342	1.8129300	0.9058172
LOGT	4.2941910	0.0808392	4.4188400	4.1588830

	Covariance	Correlation
SYBR,SYBR	0.0729632	1.0000000
SYBR,LOGT	0.0158943	0.7468040
LOGT,LOGT	0.0062082	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.13.a & b. Soymeal Equivalent Consumption - Brazil

Brazil
Per Capita Soymeal Equivalent Consumption* (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PCSMEC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0097371	0.0025503	-3.8180257	0.002
PCRGDP	31.145411	7.3355310	4.2458291	0.001
PCSMDS	0.0469747	0.0466901	1.0060950	0.329

R-squared	0.953837	Mean of dependent var	0.014773
Adjusted R-squared	0.948066	S.D. of dependent var	0.010016
S.E. of regression	0.002283	Sum of squared resid	8.34D-05
Durbin-Watson stat	1.758903	F-statistic	165.2981
Log likelihood	90.23872	TPE =6	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-0.00054	0.00217	0.00270
	1966	0.00053	0.00323	0.00269
	1967	0.00022	0.00245	0.00224
	1968	-0.00114	0.00318	0.00433
	1969	-0.00174	0.00321	0.00496
	1970	0.00150	0.00618	0.00468
	1971	-0.00132	0.00493	0.00624
	1972	0.00365	0.01209	0.00845
	1973	0.00190	0.01479	0.01288
	1974	-0.00182	0.01420	0.01602
	1975	-0.00320	0.01490	0.01811
	1976	-0.00100	0.02027	0.02127
	1977	-0.00012	0.02129	0.02141
	1978	0.00238	0.02543	0.02306
	1979	0.00540	0.03197	0.02658
	1980	-0.00221	0.02711	0.02932
	1981	-0.00172	0.02422	0.02593
	1982	-0.00025	0.02541	0.02566
	1983	-0.00052	0.02365	0.02417

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPBR/CPIBR/POPBR

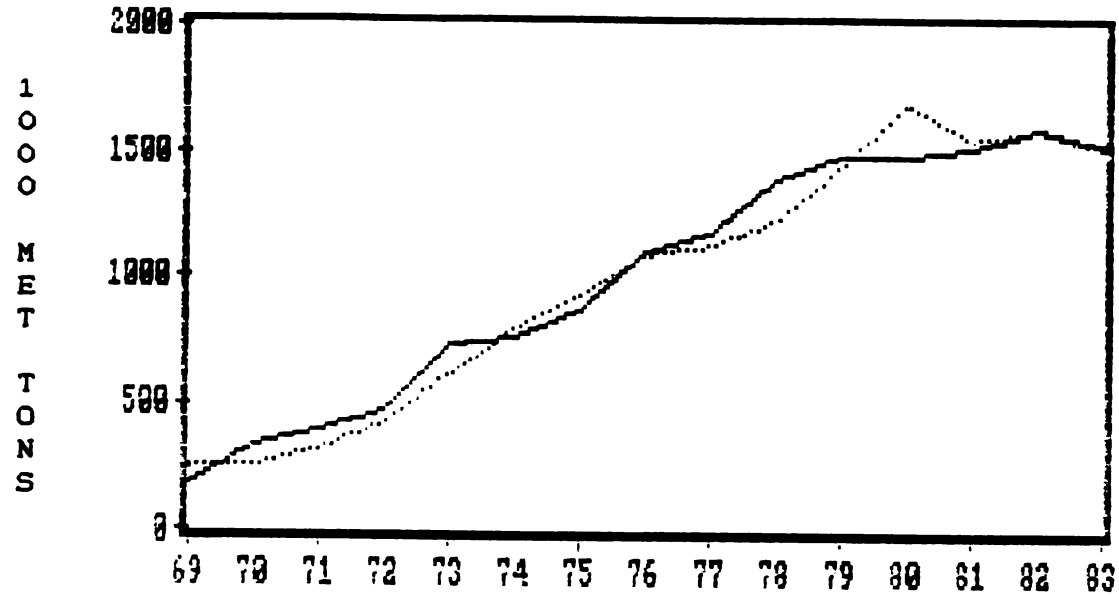
PCSMDS = Soymeal Domestic Supply Per Capita (1000 MT)
((SESBR(-1) + SPROBR)*.795 + SMESBR(-1))/POPBR

*** Soymeal Equivalent Consumption = (SESBR(-1) + SPROBR - SNEBR - SESBR)*.795 + SMESBR(-1) - SMNEBR - SMESBR**

SMPL 1963 - 1987
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSMEC	0.0147734	0.0100165	0.0319730	0.0021666
PCRGDP	0.0006946	0.0002556	0.0010853	0.0003737
PCSMDS	0.0612207	0.0401564	0.1120166	0.0071679

	Covariance	Correlation
PCSMEC,PCSMEC	9.305D-05	1.0000000
PCSMEC,PCRGDP	2.365D-06	0.9751494
PCSMEC,PCSMDS	0.0003619	0.9496447
PCRGDP,PCRGDP	6.189D-08	1.0000000
PCRGDP,PCSMDS	9.315D-06	0.9579424
PCSMDS,PCSMDS	0.0015277	1.0000000



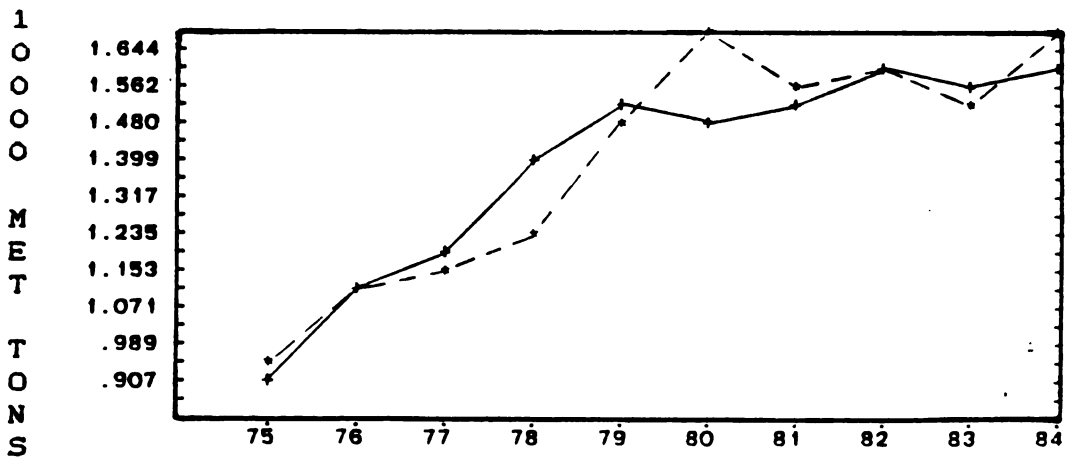


Figure D.14.a & b. Soyoil Equivalent Consumption - Brazil

Brazil
Soyoil Equivalent Consumption* (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PCSOEC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0037622	0.0008721	-4.3139240	0.001
PCRGDP	13.388412	2.4764312	5.4063331	0.000
PCSODS	0.1221245	0.0691363	1.7664294	0.096

R-squared	0.972179	Mean of dependent var	0.007240
Adjusted R-squared	0.968701	S.D. of dependent var	0.004565
S.E. of regression	0.000808	Sum of squared resid	1.04D-05
Durbin-Watson stat	1.460426	F-statistic	279.5496
Log likelihood	109.9805	TPE = 5/18	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1965	-0.00053	0.00111	0.00164
: * :	1966	-0.00042	0.00123	0.00165
: * :	1967	-0.00020	0.00124	0.00144
* :	1968	-0.00087	0.00149	0.00236
: * :	1969	-0.00057	0.00209	0.00266
: : *	1970	0.00099	0.00358	0.00258
: * :	1971	0.00078	0.00412	0.00335
: * :	1972	0.00043	0.00481	0.00438
: :*	1973	0.00093	0.00737	0.00644
: * :	1974	-0.00055	0.00746	0.00801
:* :	1975	-0.00071	0.00826	0.00896
: * :	1976	-0.00012	0.01023	0.01035
: * :	1977	0.00047	0.01072	0.01026
: : *	1978	0.00138	0.01233	0.01094
:* :	1979	0.00017	0.01285	0.01268
* : :	1980	-0.00174	0.01216	0.01390
: * :	1981	-8.8D-05	0.01215	0.01224
: * :	1982	0.00035	0.01255	0.01220
: * :	1983	0.00029	0.01180	0.01151

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPBR/CPIBR/POPBR

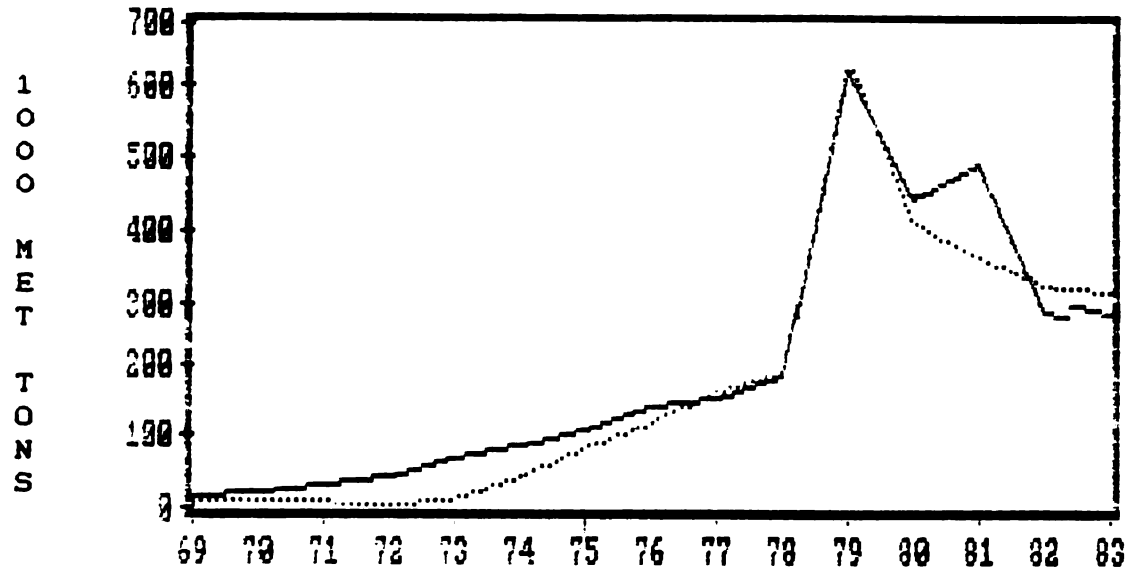
PCSODS = Soyoil Domestic Supply Per Capita (1000 MT)
((SESBR(-1) + SPROBR)*.175 + SOESBR(-1))/POPBR

*** Soyoil Equivalent Consumption = (SESBR(-1) + SPROBR - SNEBR - SESBR)*.175 + SOESBR(-1) - SONEBR - SOESBR**

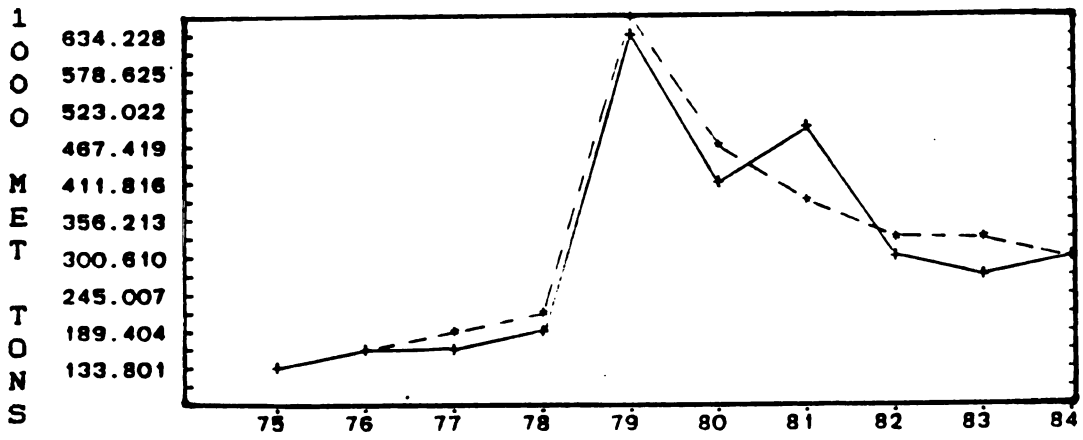
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSOEC	0.0072395	0.0045648	0.0128527	0.0011085
PCRGDP	0.0006946	0.0002556	0.0010853	0.0003737
PCSODS	0.0139343	0.0091552	0.0256651	0.0016210

	Covariance	Correlation
PCSOEC,PCSOEC	1.974D-05	1.0000000
PCSOEC,PCRGDP	1.087D-06	0.9832360
PCSOEC,PCSODS	3.800D-05	0.9598726
PCRGDP,PCRGDP	6.189D-08	1.0000000
PCRGDP,PCSODS	2.114D-06	0.9537091
PCSODS,PCSODS	7.941D-05	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.15.a & b. Soymeal Ending Stocks - Brazil

Brazil
Soymeal Ending Stocks Per Capita (1000 MT)

SMPL 1969 - 1983
15 Observations
LS // Dependent Variable is PCSMES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0011565	0.0003895	-2.9693307	0.013
PCRGDP(-1)	2.3584753	0.7619477	3.0953243	0.010
DV79	0.0037141	0.0004442	8.3605863	0.000
SMSUR	0.0120977	0.0034306	3.5263856	0.005

R-squared	0.954658	Mean of dependent var	0.001687
Adjusted R-squared	0.942292	S.D. of dependent var	0.001544
S.E. of regression	0.000371	Sum of squared resid	1.51D-06
Durbin-Watson stat	2.347693	F-statistic	77.20034
Log likelihood	99.53560	TPE = 2	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1969	-4.9D-05	0.00016	0.00020
	1970	5.9D-05	0.00026	0.00020
	1971	-0.00015	0.00034	0.00048
	1972	0.00015	0.00042	0.00027
	1973	0.00027	0.00067	0.00040
	1974	-4.2D-05	0.00084	0.00088
	1975	-0.00016	0.00101	0.00117
	1976	6.4D-05	0.00128	0.00122
	1977	-0.00016	0.00137	0.00153
	1978	6.9D-05	0.00161	0.00154
	1979	2.0D-19	0.00535	0.00535
	1980	0.00019	0.00366	0.00347
	1981	0.00079	0.00398	0.00319
	1982	-0.00077	0.00229	0.00307
	1983	-0.00025	0.00206	0.00231

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPBR/CPIBR/POPBR

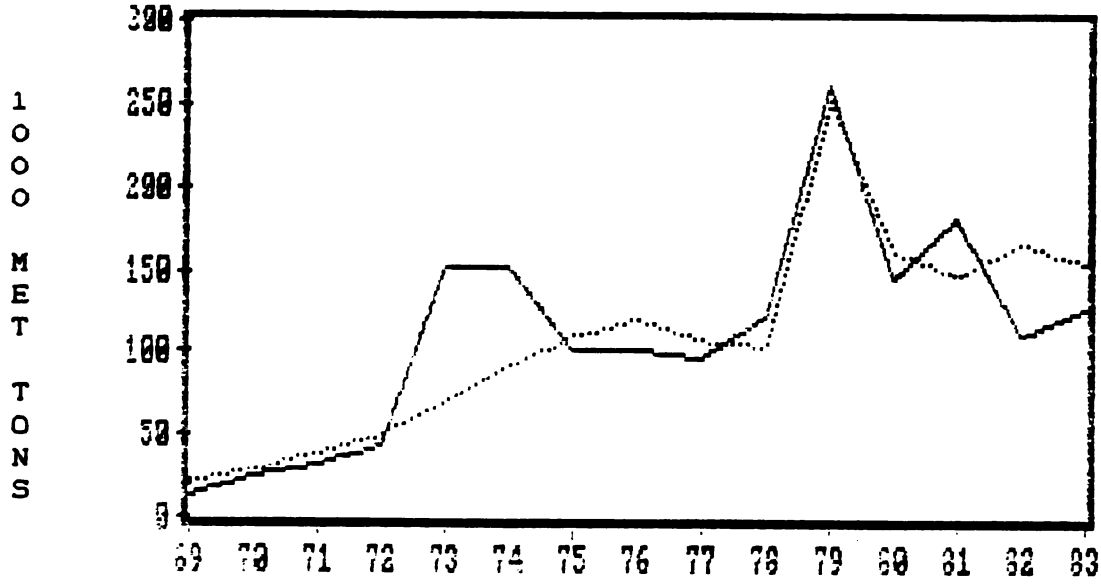
DV79 = 1 If(TIME .EQ. 79)
0 Otherwise

SMSUR = Lagged Soymeal Stock/Consumption Ratio
SMESBR(-1)/SMCOBR(-1)

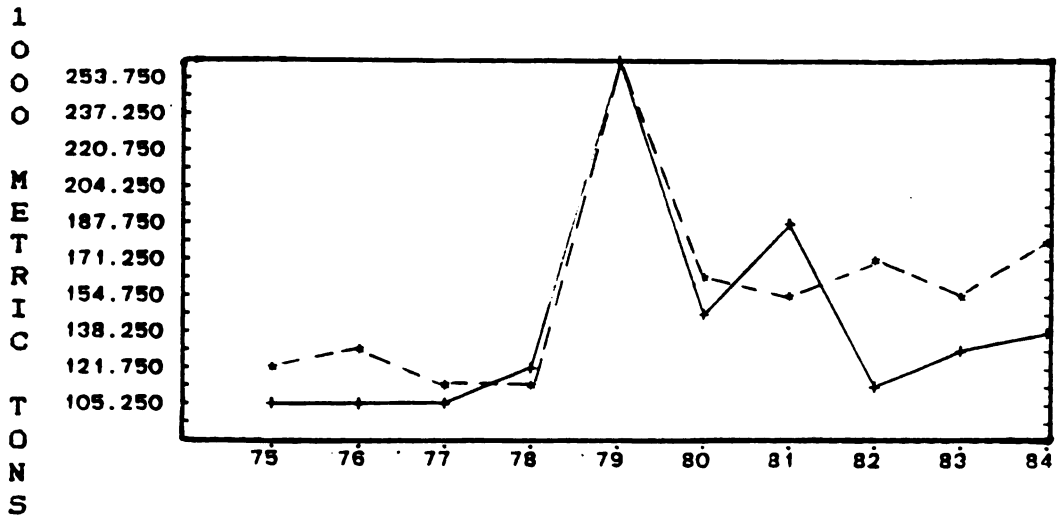
SMPL 1969 - 1983
15 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSMES	0.0016868	0.0015440	0.0053482	0.0001554
PCRGDP(-1)	0.0007406	0.0002377	0.0010853	0.0004323
DV79	0.0666667	0.2581989	1.0000000	0.0000000
SMSUR	0.0701761	0.0517990	0.1882392	0.0244877

	Covariance	Correlation
PCSMES,PCSMES	2.225D-06	1.0000000
PCSMES,PCRGDP(-1)	2.795D-07	0.8160295
PCSMES,DV79	0.0002441	0.6560315
PCSMES,SMSUR	4.615D-05	0.6183198
PCRGDP(-1),PCRGDP(-1)	5.272D-08	1.0000000
PCRGDP(-1),DV79	1.269D-05	0.2215728
PCRGDP(-1),SMSUR	8.928D-06	0.7770619
DV79,DV79	0.0622222	1.0000000
DV79,SMSUR	-0.0013996	-0.1121237
SMSUR,SMSUR	0.0025043	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.16.a & b. Soyoil Ending Stocks - Brazil

Brazil
Soyoil Ending Stocks Per Capita (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PCSOES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	3.745D-05	0.0001169	0.3203956	0.753
PCSODS	0.0506096	0.0073483	6.8872817	0.000
DV79	0.0009429	0.0002932	3.2155157	0.005

R-squared	0.830338	Mean of dependent var	0.000792
Adjusted R-squared	0.809130	S.D. of dependent var	0.000623
S.E. of regression	0.000272	Sum of squared resid	1.18D-06
Durbin-Watson stat	1.678731	F-statistic	39.15251
Log likelihood	130.6513	TPE = 7	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-6.2D-05	6.2D-05	0.00012
	1966	-7.7D-05	6.0D-05	0.00014
	1967	-4.9D-05	7.0D-05	0.00012
	1968	-7.0D-05	9.1D-05	0.00016
	1969	-4.9D-05	0.00016	0.00020
	1970	1.6D-06	0.00027	0.00027
	1971	-6.8D-05	0.00034	0.00040
	1972	-8.4D-05	0.00045	0.00053
	1973	0.00072	0.00150	0.00078
	1974	0.00046	0.00146	0.00100
	1975	-0.00015	0.00095	0.00111
	1976	-0.00030	0.00093	0.00123
	1977	-0.00012	0.00088	0.00100
	1978	0.00010	0.00107	0.00097
	1979	2.3D-19	0.00226	0.00226
	1980	-0.00014	0.00120	0.00134
	1981	0.00037	0.00146	0.00109
	1982	-0.00032	0.00087	0.00119
	1983	-0.00017	0.00097	0.00114

INDEPENDENT VARIABLES

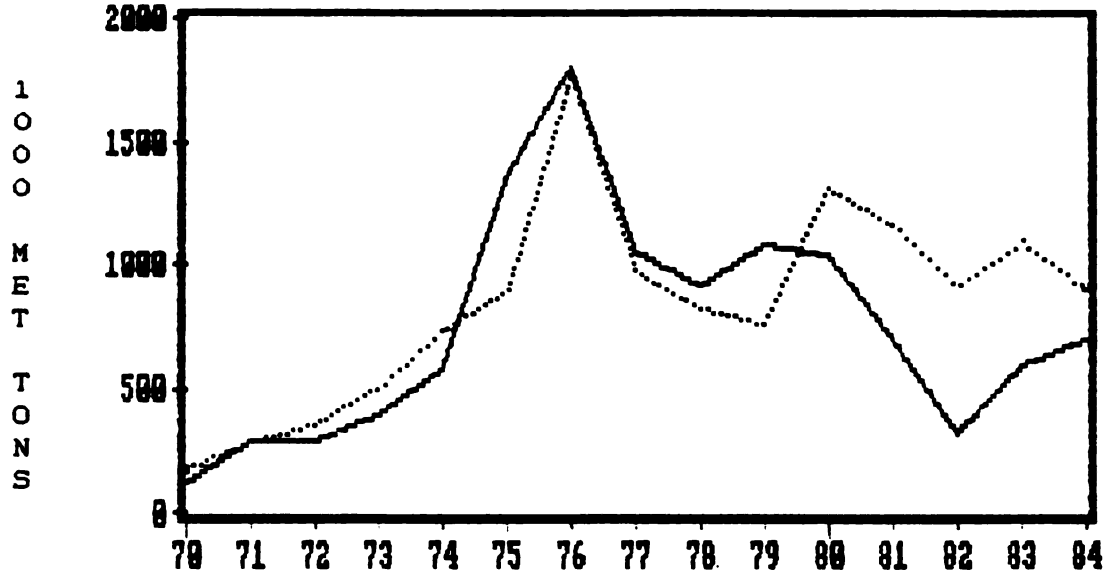
SODSBR = Soyoil Equivalent Domestic Supply (1000 MT)
(SESBR(-1) + SPROBR)*.175 + SOESBR(-1)

DV79 = 1 If(TIME .EQ. 79)
0 Otherwise

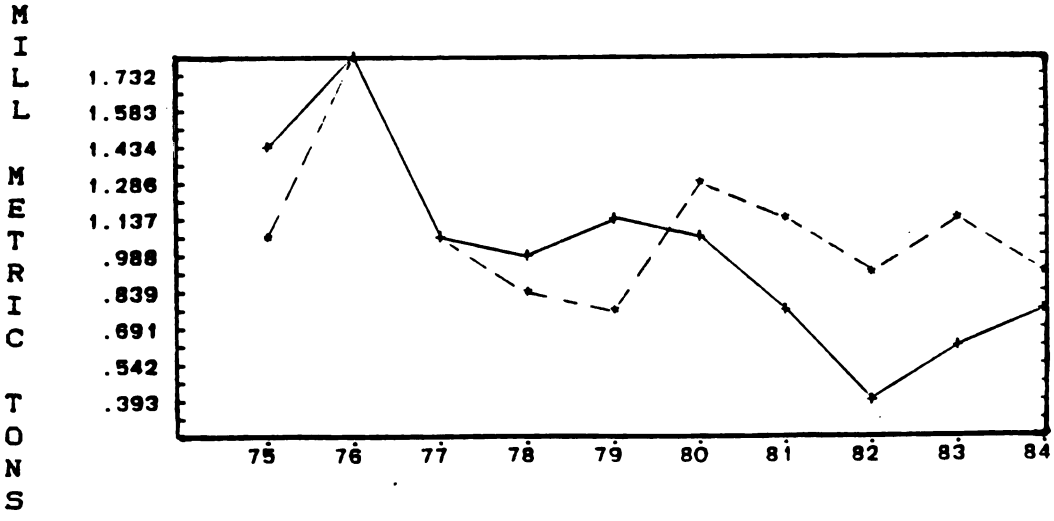
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSOES	0.0007923	0.0006228	0.0022637	6.029D-05
PCSODS	0.0139343	0.0091552	0.0256651	0.0016210
DV79	0.0526316	0.2294157	1.0000000	0.0000000

	Covariance	Correlation
PCSOES,PCSOES	3.674D-07	1.0000000
PCSOES,PCSODS	4.586D-06	0.8489396
PCSOES,DV79	7.744D-05	0.5721415
PCSODS,PCSODS	7.941D-05	1.0000000
PCSODS,DV79	0.0006012	0.3021398
DV79,DV79	0.0498615	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.17.a & b. Soybean Ending Stocks - Brazil

Brazil
Per Capita Soybean Ending Stocks (1000 MT)

SMPL 1965 - 1984
20 Observations
LS // Dependent Variable is PCSES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0027181	0.0033319	-0.8157784	0.428
PCRGDP	10.912502	9.4558318	1.1540499	0.268
MARGIN	2.264D-06	7.532D-05	0.0300548	0.976
DV76	0.0071095	0.0024772	2.8700134	0.012
PCSDS	-0.0245563	0.0526528	-0.4663823	0.648
SNEBR(-1)	1.933D-06	6.878D-07	2.8101097	0.014

R-squared	0.828252	Mean of dependent var	0.005511
Adjusted R-squared	0.766913	S.D. of dependent var	0.004224
S.E. of regression	0.002039	Sum of squared resid	5.82D-05
Durbin-Watson stat	1.295373	F-statistic	13.50293
Log likelihood	99.09118	TPE	5/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	0.00091	0.00236	0.00144
	1966	-0.00016	0.00129	0.00145
	1967	-0.00014	0.00158	0.00172
	1968	-0.00022	0.00160	0.00182
	1969	0.00050	0.00286	0.00236
	1970	-0.00055	0.00139	0.00194
	1971	0.00116	0.00297	0.00181
	1972	-0.00071	0.00291	0.00362
	1973	-0.00159	0.00400	0.00560
	1974	-0.00232	0.00569	0.00802
	1975	0.00338	0.01296	0.00958
	1976	-1.9D-19	0.01679	0.01679
	1977	0.00031	0.00959	0.00928
	1978	0.00209	0.00817	0.00608
	1979	0.00393	0.00943	0.00550
	1980	0.00070	0.00855	0.00785
	1981	-0.00081	0.00568	0.00648
	1982	-0.00165	0.00252	0.00416
	1983	-0.00253	0.00454	0.00708
	1984	-0.00230	0.00533	0.00763

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPBR/CPIBR/POPBR

MARGIN = Soybean Crush Margin
(SMP*XRBR/CPIBR)*.795 + (SOP*XRBR/CPIBR)*.175 -
(SP*XRBR/CPIBR)

SNEBR = Soymeal Net Exports (1000 MT)

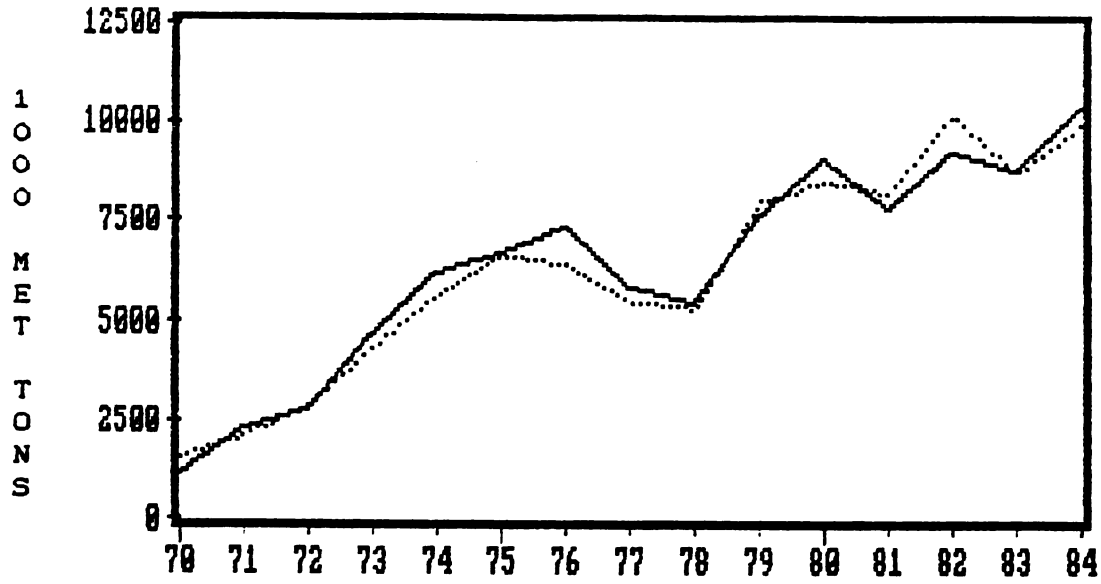
PCSDS = Per Capita Soybean Supply (1000 MT)
(SESBR(-1) + SPROBR)/POPBR

DV76 = 1 If(TIME .EQ. 76)
0 Otherwise

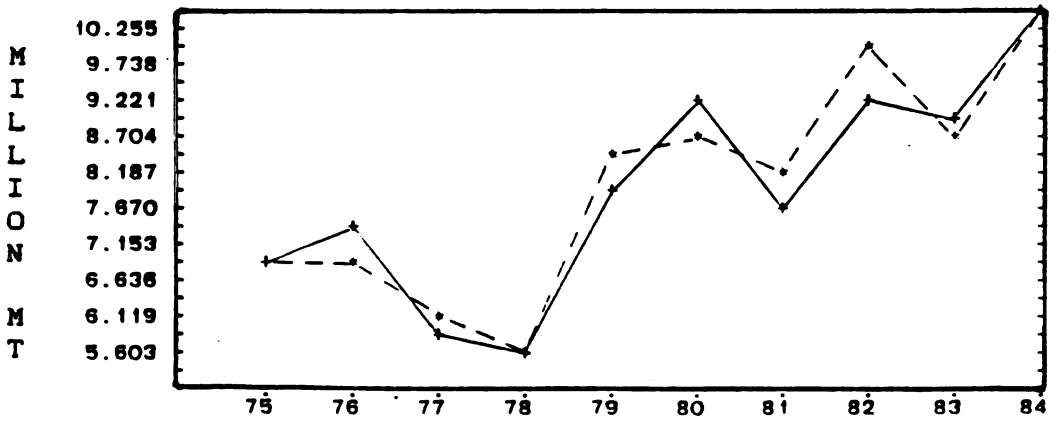
SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSES	0.0055112	0.0042239	0.0167937	0.0012902
PCRGDP	0.0007098	0.0002579	0.0010853	0.0003737
MARGIN	-0.3335628	7.4776746	18.581780	-9.9866480
DV76	0.0500000	0.2236068	1.0000000	0.0000000
PCSDS	0.0784010	0.0496024	0.1389235	0.0089277
SNEBR(-1)	1062.6000	1169.0712	3516.0000	-455.00000

	Covariance	Correlation
PCSES,PCSES	1.695D-05	1.0000000
PCSES,PCRGDP	6.072D-07	0.5867566
PCSES,MARGIN	-0.0128428	-0.4280083
PCSES,DV76	0.0005641	0.6287120
PCSES,PCSDS	0.0001391	0.6986366
PCSES,SNEBR(-1)	3.5418835	0.7550094
PCRGDP,PCRGDP	6.319D-08	1.0000000
PCRGDP,MARGIN	-0.0007362	-0.4018626
PCRGDP,DV76	6.482D-06	0.1183199
PCRGDP,PCSDS	1.161D-05	0.9554152
PCRGDP,SNEBR(-1)	0.0819618	0.2861506
MARGIN,MARGIN	53.119836	1.0000000
MARGIN,DV76	-0.4826542	-0.3038512
MARGIN,PCSDS	-0.1345255	-0.3817784
MARGIN,SNEBR(-1)	-2484.0519	-0.2991090
DV76,DV76	0.0475000	1.0000000
DV76,PCSDS	0.0025301	0.2401197
DV76,SNEBR(-1)	113.27000	0.4561055
PCSDS,PCSDS	0.0023374	1.0000000
PCSDS,SNEBR(-1)	26.940262	0.4890285
SNEBR(-1),SNEBR(-1)	1298391.1	1.0000000



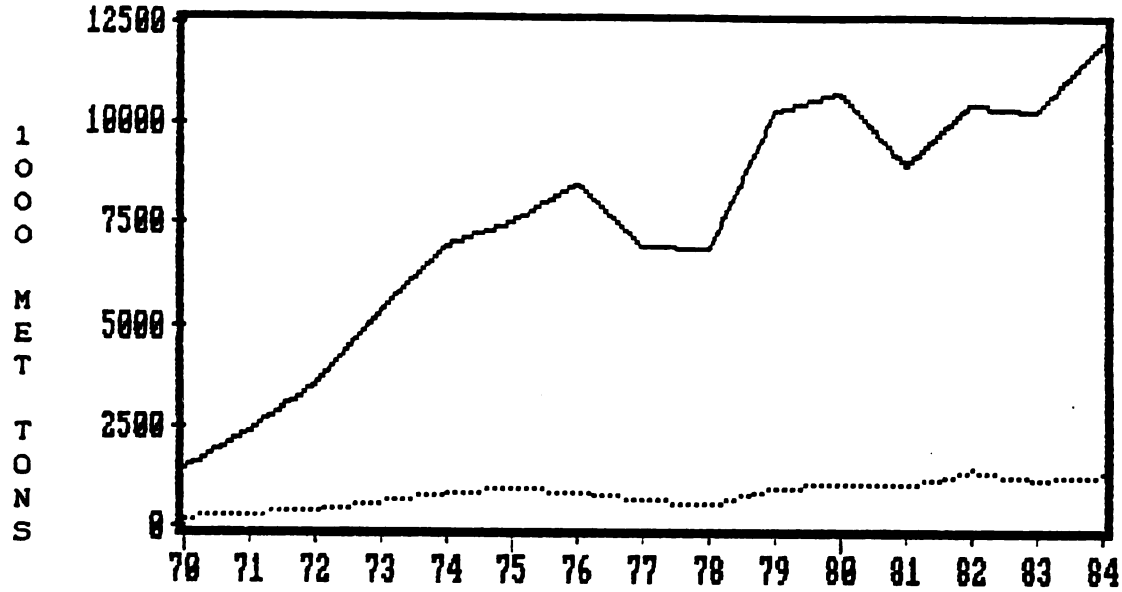
REGIONAL MODEL SIMULATION



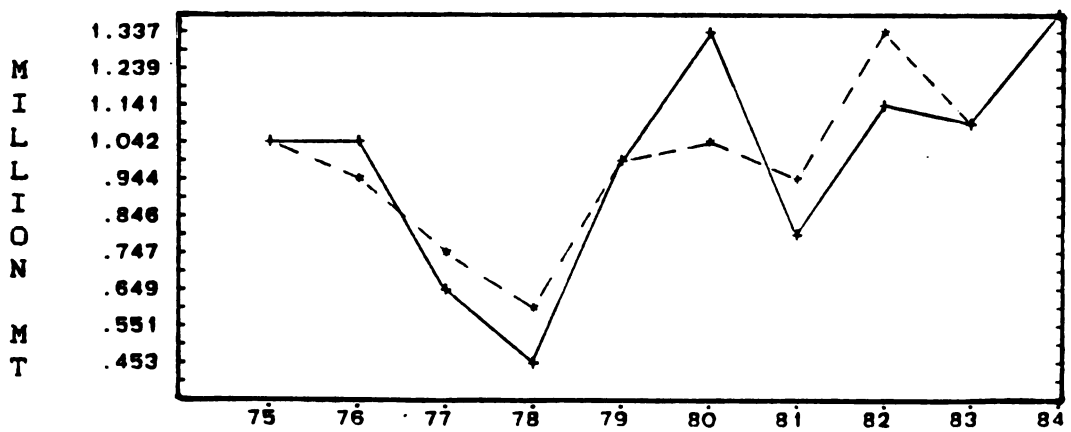
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.18.a & b. Soymeal Equivalent Net Exports - Brazil



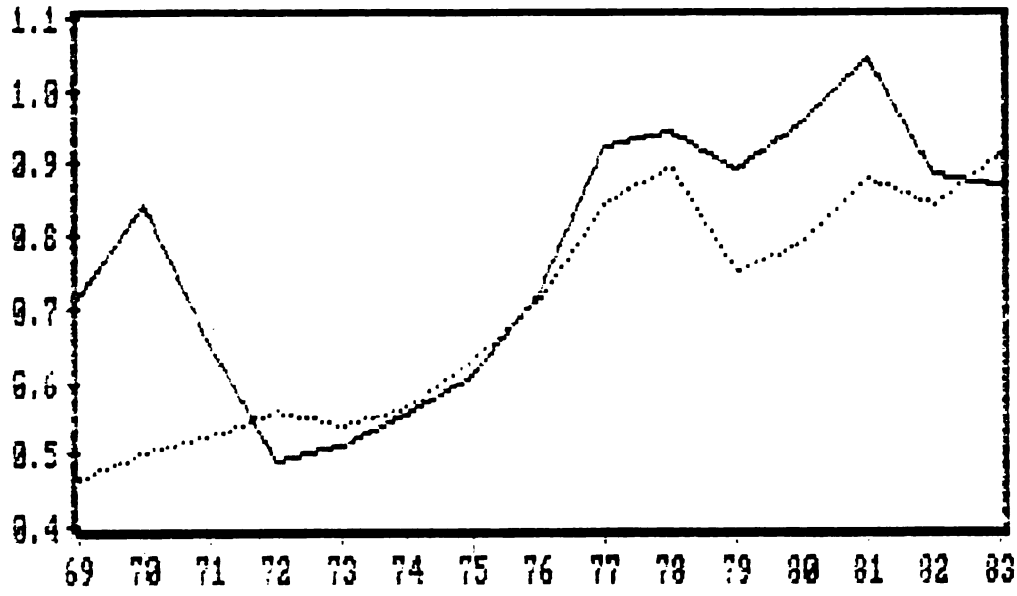
REGIONAL MODEL SIMULATION



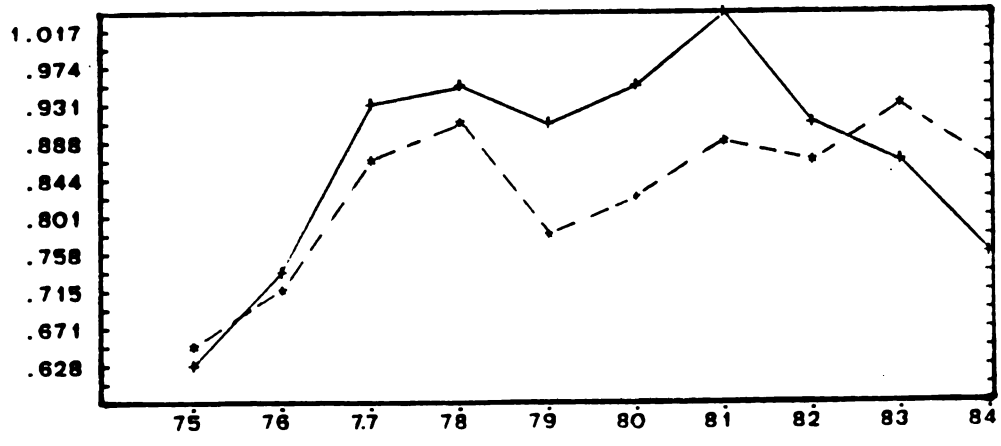
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.19.a & b. Soyoil Equivalent Net Exports - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.20.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Brazil

Brazil
Percentage Soymeal Equivalent Exported as Soymeal

IMPL 1971 - 1984
14 Observations
LS // Dependent variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.7379210	0.1617905	4.5609664	0.001
CSUPBR	-0.3814419	0.0884994	-4.3101053	0.001
PMEAL(-1)	0.6204997	0.1176976	5.2719844	0.000

R-squared	0.864065	Mean of dependent var	0.771866
Adjusted R-squared	0.839349	S.D. of dependent var	0.183199
S.E. of regression	0.073428	Sum of squared resid	0.059309
Durbin-Watson stat	1.664398	F-statistic	34.96050
Log likelihood	18.38326	TPE =1	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1971	0.00891	0.65131	0.64240
	1972	-0.11688	0.49297	0.60985
	1973	0.05848	0.51439	0.45591
	1974	-0.02270	0.55336	0.57606
	1975	-0.03617	0.60741	0.64358
	1976	0.05601	0.72276	0.66674
	1977	0.04802	0.92243	0.87440
	1978	0.01241	0.94293	0.93052
	1979	0.11202	0.89212	0.78010
	1980	0.04985	0.95486	0.90501
	1981	0.04402	1.04830	1.00428
	1982	-0.07788	0.88730	0.96518
	1983	-0.03319	0.87226	0.90544
	1984	-0.10291	0.74373	0.84664

INDEPENDENT VARIABLES

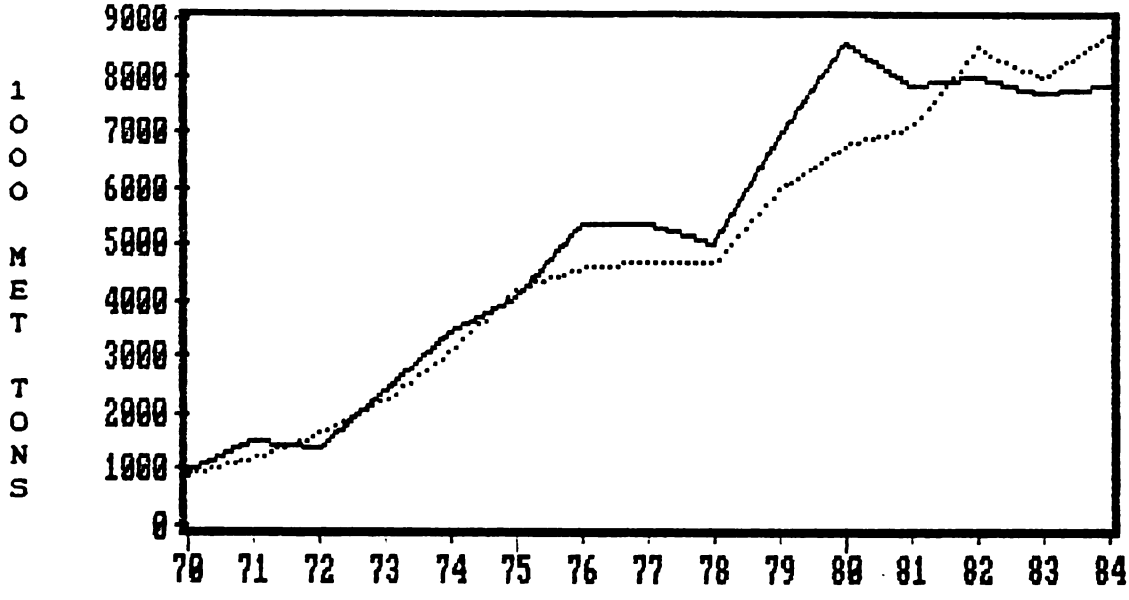
PMEAL = Percentage Soymeal Equivalent Imported as Soymeal

CSUPBR = Change in Soybean Supply
(SESBR(-1) + SPROBR)/(SESBR(-2)+SPROBR(-1))

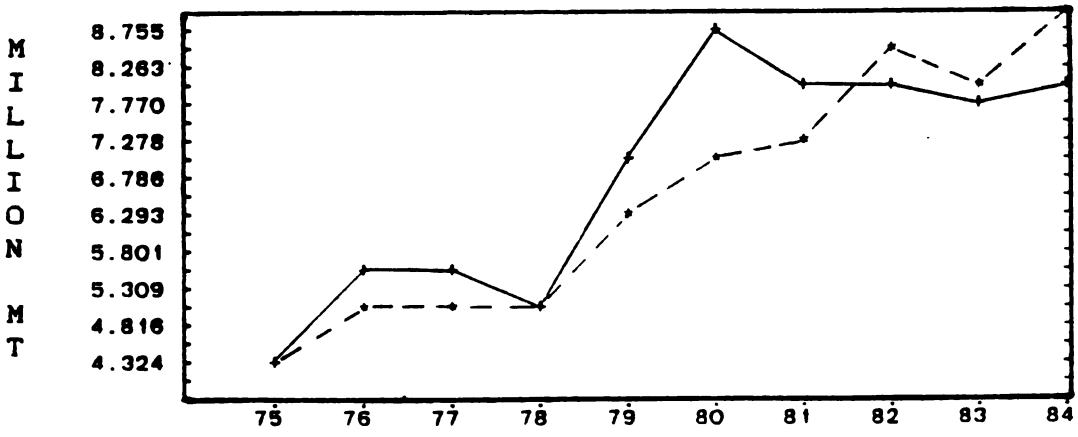
EMPL 1971 - 1984
14 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.7718659	0.1831984	1.0482950	0.4929741
CSUPBR	1.1784060	0.2447116	1.6252690	0.9179197
PMEAL(-1)	0.7791112	0.1840041	1.0482950	0.4929741

	Covariance	Correlation
PMEAL.PMEAL	0.0311644	1.0000000
PMEAL.CSUPBR	-0.0300360	-0.7215236
PMEAL.PMEAL(-1)	0.0249332	0.7965521
CSUPBR.CSUPBR	0.0556064	1.0000000
CSUPBR.PMEAL(-1)	-0.0142231	-0.3401698
PMEAL(-1).PMEAL(-1)	0.0314391	1.0000000



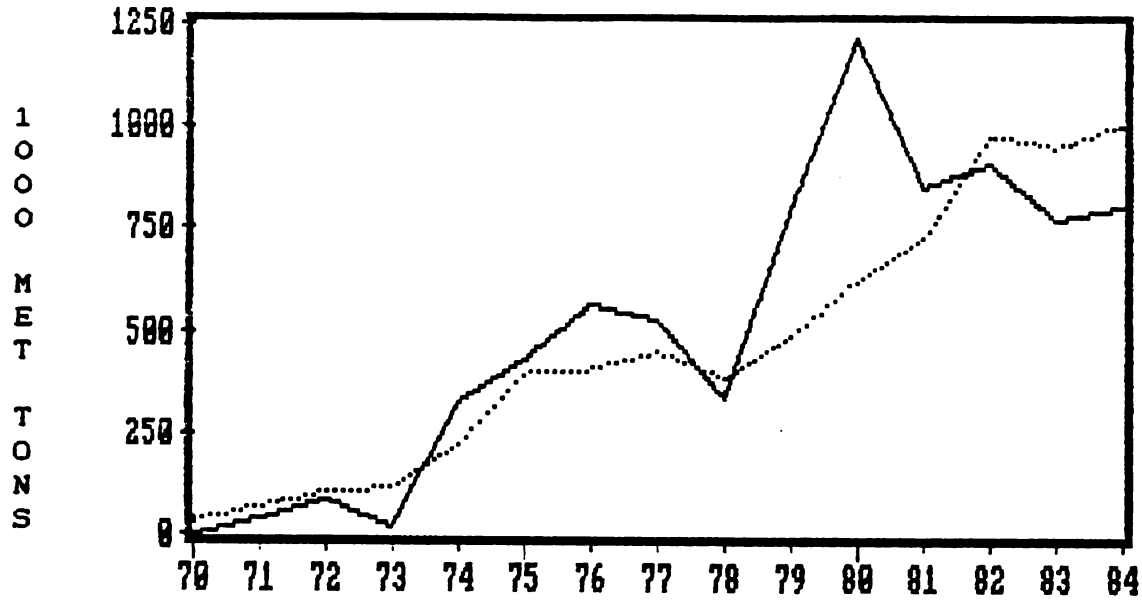
REGIONAL MODEL SIMULATION



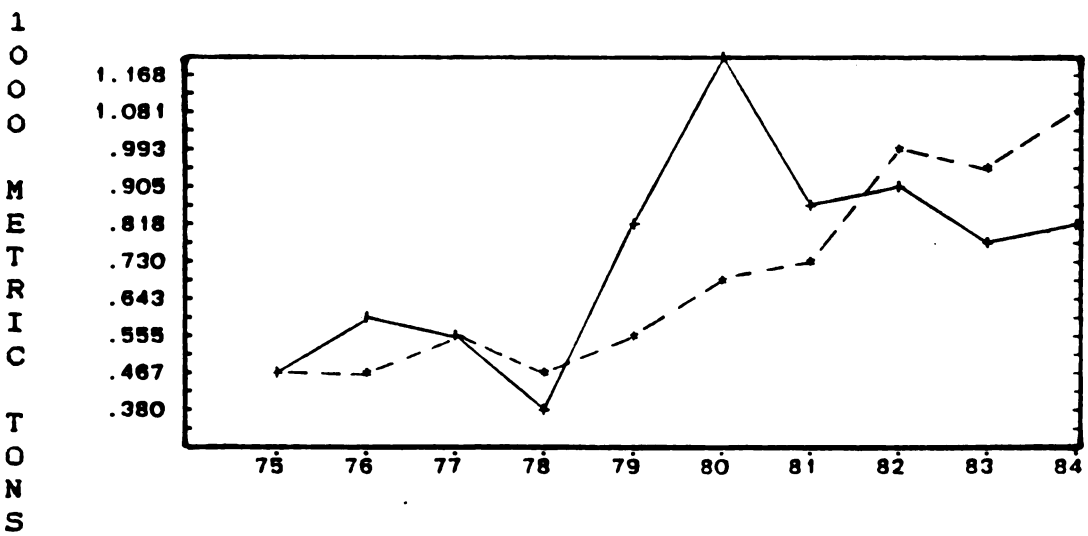
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.21.a & b. Soymeal Net Exports - Brazil



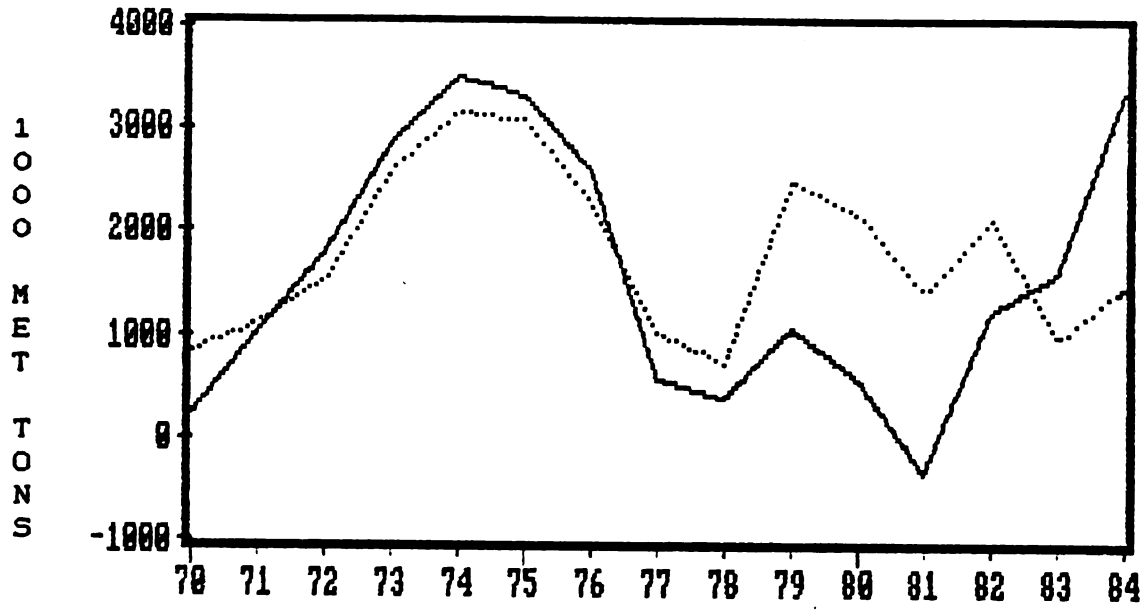
REGIONAL MODEL SIMULATION



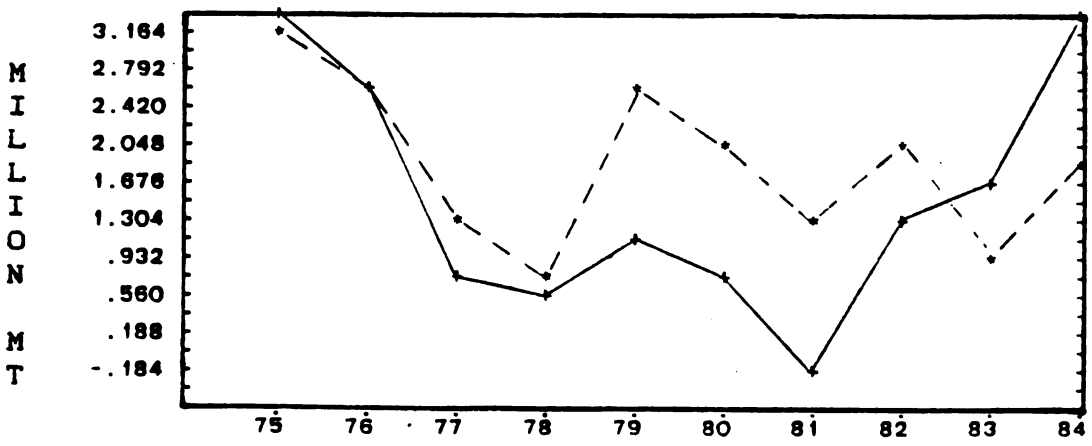
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure D.22.a & b. Soyoil Net Exports - Brazil



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure D.23.a & b. Soybean Net Exports - Brazil

APPENDIX E

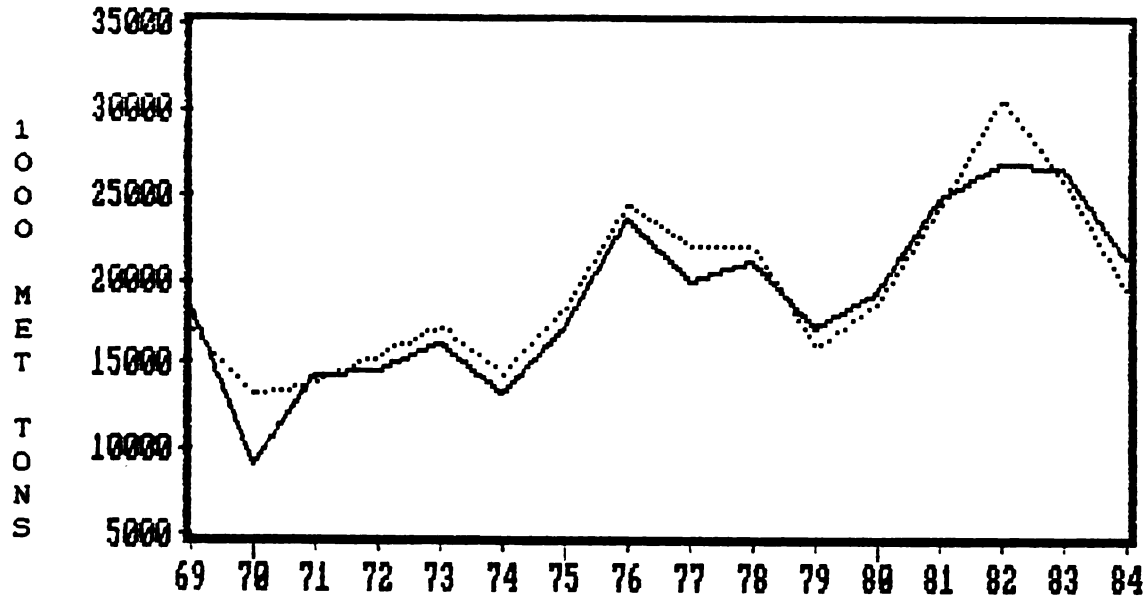
EQUATION STATISTICS - CANADA

Wheat

WPROCA.....Production
WHACA.....Harvested Area
WYCA.....Yield
WCONCA.....Total Consumption
WFEDCA.....Feed Consumption
WFODCA.....Food & Residual Consumption
WNECA.....Net Exports
WESCA.....Ending Stocks

Coarse Grain

FPROCA.....Production
FHACA.....Harvested Area
FYCA.....Yield
FCONCA.....Total Consumption
FFEDCA.....Feed Consumption
FFODCA.....Food & Residual Consumption
FNECA.....Net Exports
FESCA.....Ending Stocks



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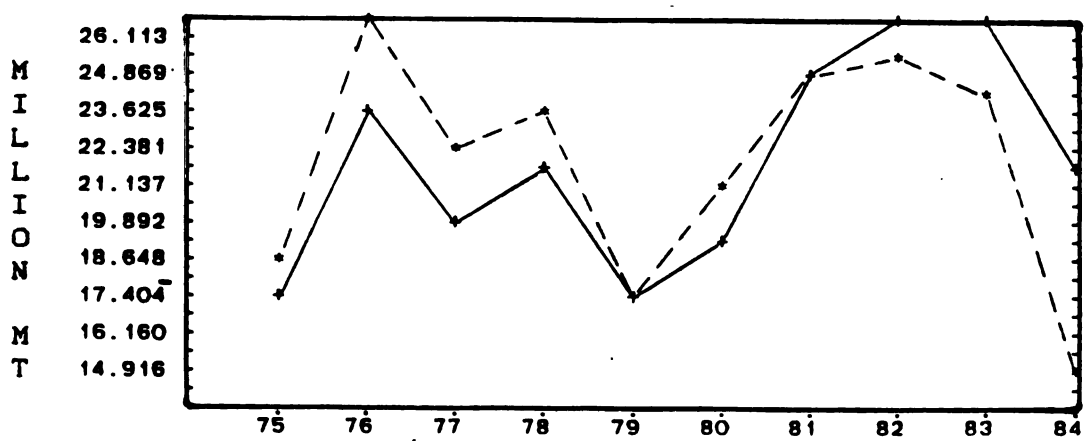
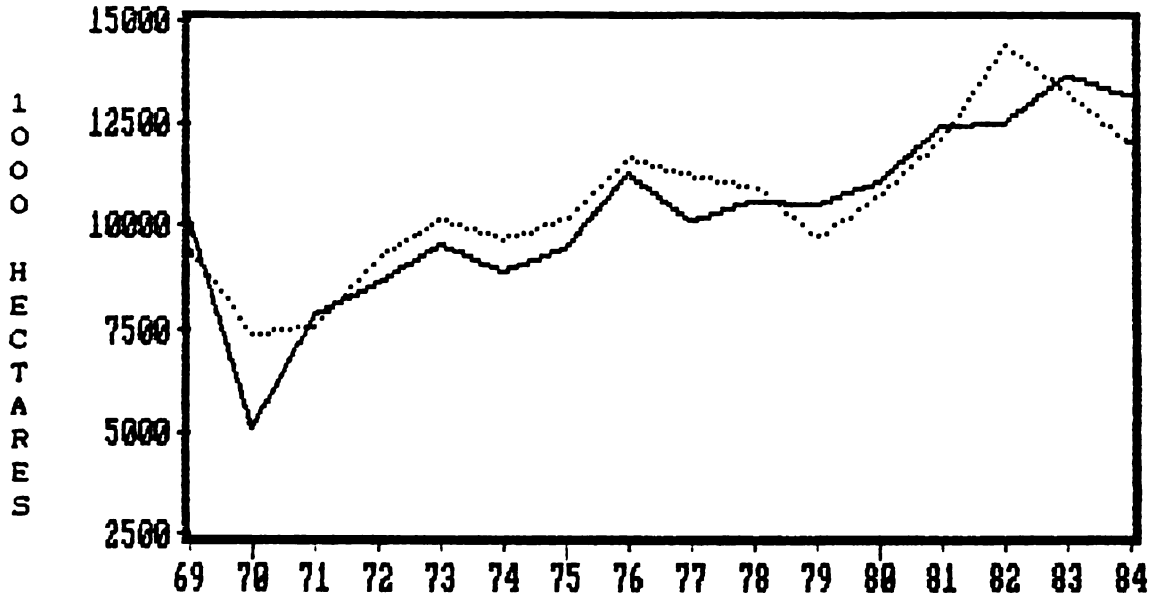


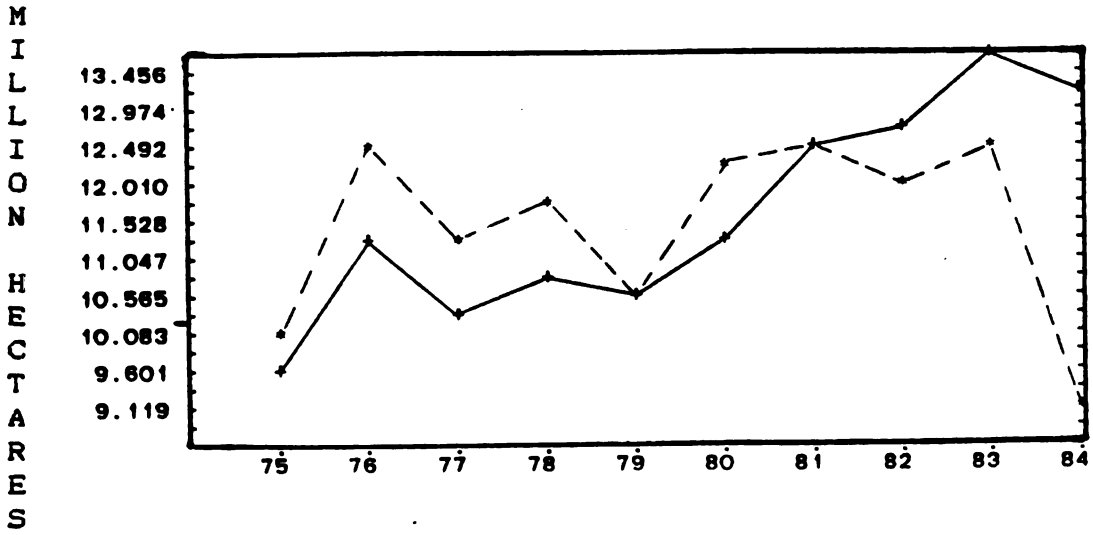
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.1.a & b. Wheat Production - Canada



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.2.a & b. Wheat Harvested Area - Canada

Canada
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHACA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	13288.549	2721.5528	4.8827085	0.000
WHACA(-1)	0.5257741	0.1168302	4.5003253	0.000
WESCA(-1)	-0.3128951	0.0571479	-5.4751832	0.000
WRCA(-1)	333.19026	646.19186	0.5156213	0.613
FRCA(-1)	-1426.2842	829.95699	-1.7185037	0.105

R-squared	0.922771	Mean of dependent var	10695.19
Adjusted R-squared	0.778464	S.D. of dependent var	2006.126
S.E. of regression	944.2358	Sum of squared resid	14265300
Durbin-Watson stat	2.504876	F-statistic	18.56968
Log likelihood	-170.8003	TPE	6/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-171.535	12018.0	12189.5
	1965	-570.093	11453.0	12023.1
	1966	-138.175	12016.0	12154.2
	1967	933.680	12190.0	11256.3
	1968	706.324	11908.0	11201.7
	1969	783.751	10102.0	9318.25
	1970	-1623.66	5052.00	6675.66
	1971	1687.80	7854.00	6166.20
	1972	-903.323	8640.00	9543.32
	1973	-595.989	9575.00	10171.0
	1974	-530.881	8935.00	9465.88
	1975	-578.096	9479.00	10057.1
	1976	26.1011	11252.0	11225.9
	1977	-1256.25	10118.0	11374.2
	1978	-307.692	10584.0	10891.7
	1979	691.007	10489.0	9797.99
	1980	178.922	11098.0	10919.1
	1981	1130.13	12427.0	11296.9
	1982	-454.949	12554.0	13008.9
	1983	983.578	13697.0	12713.4
	1984	9.34272	13158.0	13148.7

INDEPENDENT VARIABLES

WHACA = Wheat Harvested Area (1000 HA)

WRCA = Wheat Revenue per Hectare ($/HA)
(WYCA(-3)+WYCA(-2)+WYCA(-1)+WYCA)/4*WP*XRCA/CPICA

FRCA = Coarse Grain Revenue per Hectare ($/HA)
(FYCA(-3)+FYCA(-2)+FYCA(-1)+FYCA)/4*FP*XRCA/CPICA

WESCA = Wheat Ending Stocks (1000 MT)

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHACA	10695.190	2006.1257	13697.000	5052.0000
WHACA(-1)	10599.905	1929.3520	13697.000	5052.0000
WESCA(-1)	13474.238	5164.0192	27452.000	8038.0000
WRCA(-1)	3.1441207	0.9143173	5.7842160	2.0912100
FRCA(-1)	3.5042670	0.7799334	5.3477420	2.5303920

	Covariance	Correlation
WHACA,WHACA	3832895.7	1.0000000
WHACA,WHACA(-1)	2533889.4	0.6873966
WHACA,WESCA(-1)	-6051527.6	-0.6133499
WHACA,WRCA(-1)	101.37247	0.0580302
WHACA,FRCA(-1)	74.268233	0.0498398
WHACA(-1),WHACA(-1)	3545141.9	1.0000000
WHACA(-1),WESCA(-1)	-1508710.5	-0.1589996
WHACA(-1),WRCA(-1)	-145.01540	-0.0863167
WHACA(-1),FRCA(-1)	-172.61299	-0.1204464
WESCA(-1),WESCA(-1)	25397233.	1.0000000
WESCA(-1),WRCA(-1)	-2606.6449	-0.5796774
WESCA(-1),FRCA(-1)	-2493.8175	-0.6501426
WRCA(-1),WRCA(-1)	0.7961677	1.0000000
WRCA(-1),FRCA(-1)	0.6332988	0.9324885
FRCA(-1),FRCA(-1)	0.5793296	1.0000000

Canada
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYCA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-7.5284777	1.9901798	-3.7828129	0.001
LOGT	2.1610333	0.4665120	4.6323205	0.000

R-squared	0.493769	Mean of dependent var	1.688267
Adjusted R-squared	0.470758	S.D. of dependent var	0.306160
S.E. of regression	0.222728	Sum of squared resid	1.091376
Durbin-Watson stat	2.081892	F-statistic	21.45839
Log likelihood	3.032855		

9 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.10121	1.42075	1.31954
*	1961	-0.60240	0.75286	1.35526
	1962	0.02796	1.41836	1.39040
	1963	0.33984	1.76481	1.42498
*	1964	-0.09863	1.36038	1.45901
	1965	0.05066	1.54318	1.49251
	1966	0.34833	1.87383	1.52551
*	1967	-0.23421	1.32379	1.55800
*	1968	-0.10455	1.48547	1.59002
	1969	0.18669	1.80826	1.62157
	1970	0.13356	1.78622	1.65266
	1971	0.15167	1.83499	1.68332
*	1972	-0.03368	1.67986	1.71354
*	1973	-0.05573	1.68762	1.74335
*	1974	-0.28478	1.48797	1.77275
*	1975	-9.1D-05	1.80167	1.80176
	1976	0.26587	2.09625	1.83038
*	1977	0.10441	1.96304	1.85863
*	1978	0.11131	1.99783	1.88652
*	1979	-0.27566	1.63838	1.91405
*	1980	-0.21497	1.72626	1.94123
	1981	0.02782	1.99590	1.96807
*	1982	0.13501	2.12960	1.99459
*	1983	-0.07963	1.94115	2.02078

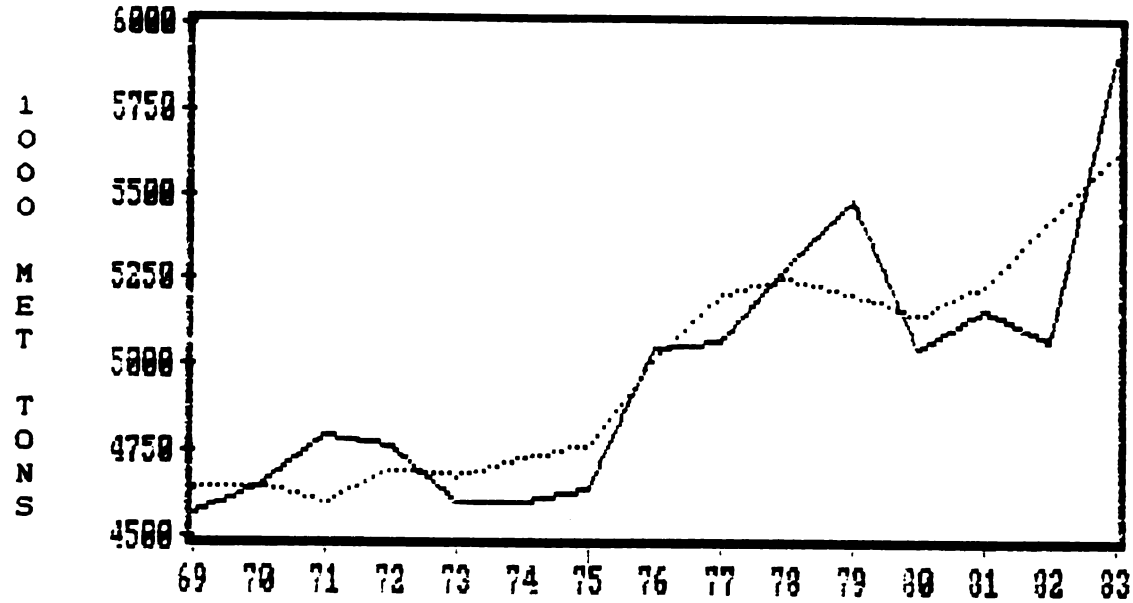
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

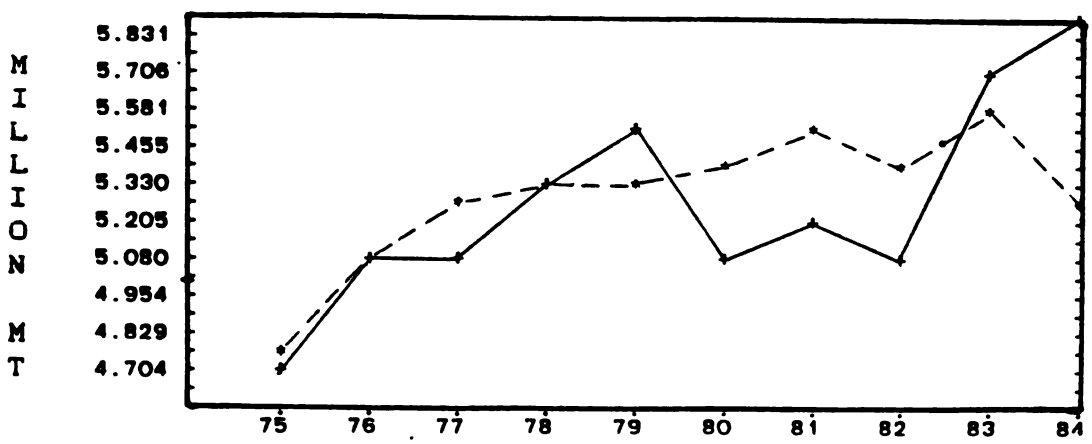
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYCA	1.6882670	0.3061602	2.1296000	0.7528551
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYCA,WYCA	0.0898285	1.0000000
WYCA,LOGT	0.0205247	0.7026868
LOGT,LOGT	0.0094976	1.0000000



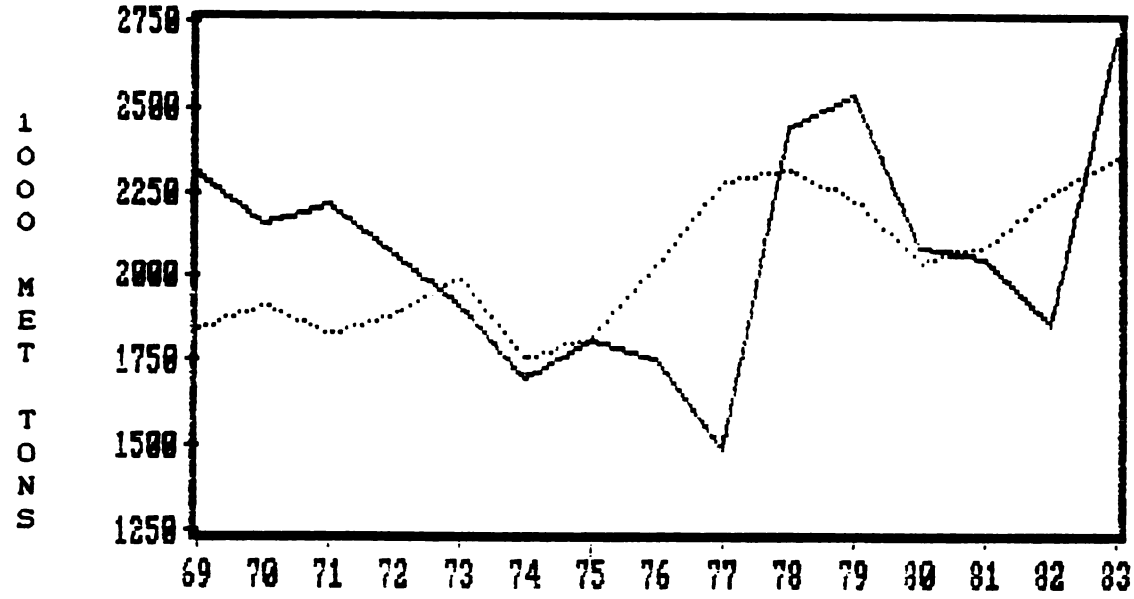
REGIONAL MODEL SIMULATION



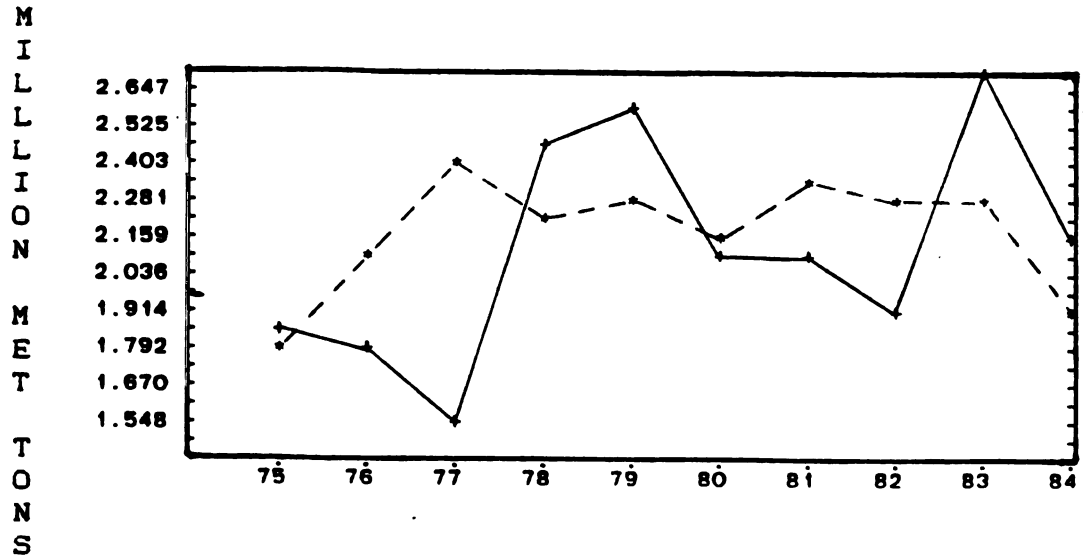
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.3.a & b. Total Wheat Consumption - Canada



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.4.a & b. Wheat Feed Consumption - Canada

Canada
Per Capita Wheat Feed Consumption (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0499045	0.0494108	-1.0099929	0.325
PCRGDP	464.03168	137.74415	3.3687942	0.003
PCWDS	0.0507404	0.0199475	2.5436930	0.020
WPCA	0.0074293	0.0084659	0.8775503	0.391

R-squared	0.408263	Mean of dependent var	0.084072
Adjusted R-squared	0.314831	S.D. of dependent var	0.015165
S.E. of regression	0.012553	Sum of squared resid	0.002994
Durbin-Watson stat	1.298927	F-statistic	4.369619
Log likelihood	70.25156		

7 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00621	0.06579	0.05958
	1962	-0.00090	0.06464	0.06555
	1963	-0.00686	0.07716	0.08403
	1964	-0.00685	0.06601	0.07286
	1965	-0.00946	0.06936	0.07882
	1966	-0.00850	0.07796	0.08646
	1967	-0.00703	0.07158	0.07862
	1968	-0.00445	0.08427	0.08872
	1969	0.01006	0.10975	0.09969
	1970	0.01294	0.10113	0.08819
	1971	0.01837	0.10232	0.08395
	1972	0.01439	0.09441	0.08002
	1973	0.00293	0.08691	0.08398
	1974	0.00062	0.07585	0.07523
	1975	0.00411	0.07985	0.07574
	1976	-0.01143	0.07599	0.08742
	1977	-0.02671	0.06387	0.09059
	1978	0.01092	0.10383	0.09291
	1979	0.01301	0.10705	0.09403
	1980	-0.00114	0.08723	0.08837
	1981	-0.00916	0.08439	0.09354
	1982	-0.01743	0.07560	0.09303
	1983	0.01639	0.10871	0.09232

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPCA/CPICA/POPCA

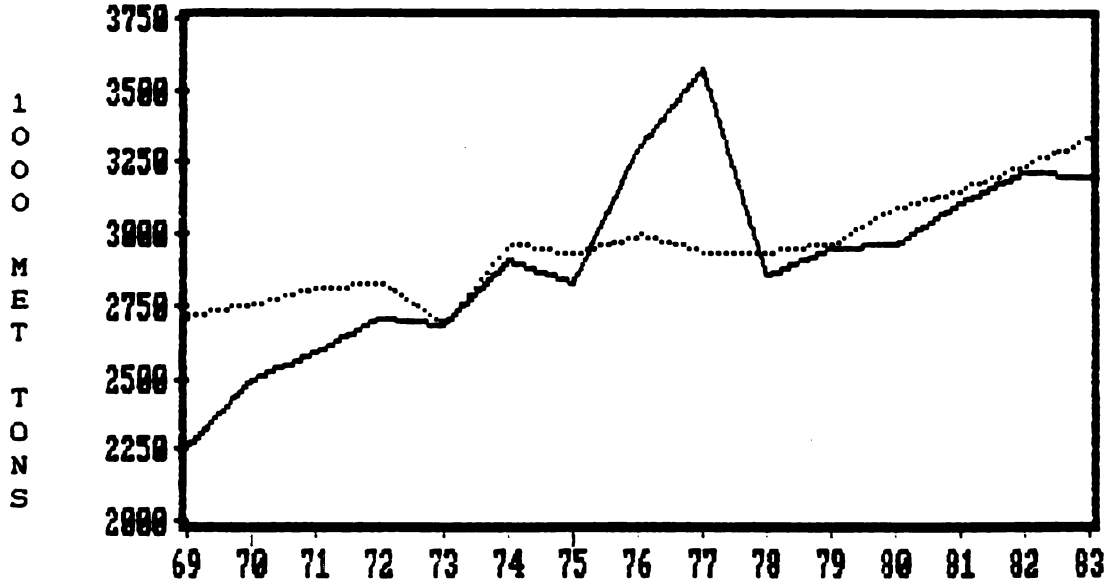
PCWDS = Wheat Supply Per Capita (1000 MT)
(WESCA(-1) + WPROCA)/POPCA

WPCA = Real Canadian Wheat Price
WP*XRCA/CPICA

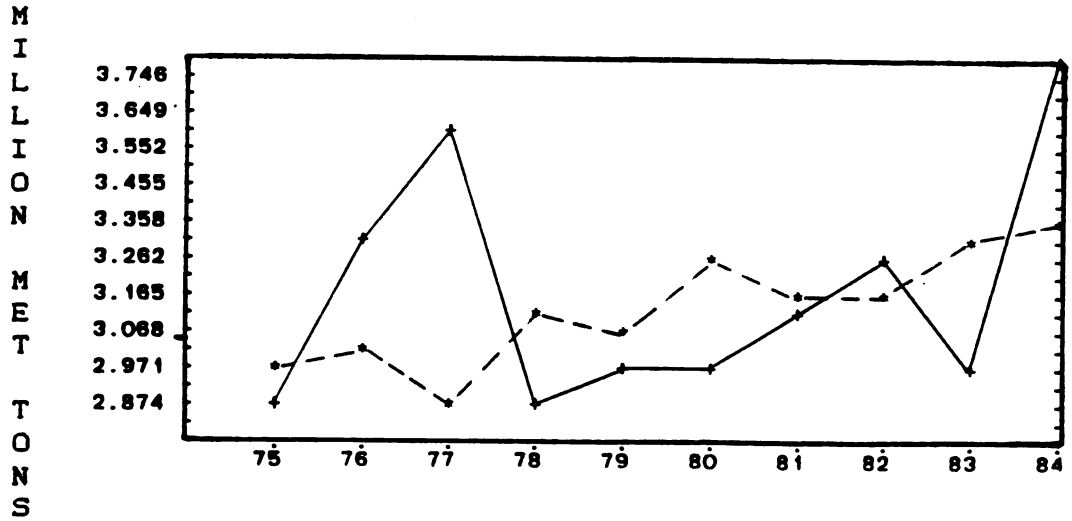
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFED	0.0840718	0.0151647	0.1097480	0.0638746
PCRGDP	9.876D-05	2.284D-05	0.0001285	6.207D-05
PCWDS	1.4649660	0.2191526	1.9709940	1.0439290
WPCA	1.8595330	0.4609950	3.3106120	1.2886130

	Covariance	Correlation
PCWFED,PCWFED	0.0002200	1.0000000
PCWFED,PCRGDP	1.287D-07	0.3885082
PCWFED,PCWDS	0.0007417	0.2333142
PCWFED,WPCA	-0.0010156	-0.1518726
PCRGDP,PCRGDP	4.988D-10	1.0000000
PCRGDP,PCWDS	-2.327D-06	-0.4860601
PCRGDP,WPCA	2.058D-06	0.2043349
PCWDS,PCWDS	0.0459397	1.0000000
PCWDS,WPCA	-0.0685952	-0.7098326
WPCA,WPCA	0.2032766	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.5.a & b. Wheat Food and Residual Consumption - Canada

Canada
Per Capita Wheat Food and Residual Consumption (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1602762	0.0305542	5.2456351	0.000
WCGRCA	0.0290191	0.0088022	3.1831945	0.005
PCWDS	-0.0375904	0.0165800	-2.2672105	0.035
WPCA	-0.0067676	0.0066513	-1.0174991	0.322

R-squared	0.360055	Mean of dependent var	0.131628
Adjusted R-squared	0.259011	S.D. of dependent var	0.011717
S.E. of regression	0.010086	Sum of squared resid	0.001933
Durbin-Watson stat	1.437442	F-statistic	3.563350
Log likelihood	75.28407		

11 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00866	0.14669	0.15535
	1962	-0.00250	0.13718	0.13968
	1963	0.01591	0.14784	0.13192
	1964	0.00356	0.14175	0.13819
	1965	0.01098	0.14832	0.13735
	1966	0.00779	0.13975	0.13196
	1967	-0.00254	0.13665	0.13919
	1968	-0.00128	0.13213	0.13341
	1969	-0.01897	0.10747	0.12644
	1970	-0.00926	0.11698	0.12623
	1971	-0.00516	0.11978	0.12494
	1972	-0.00401	0.12382	0.12783
	1973	-0.00021	0.12157	0.12178
	1974	-0.00151	0.12982	0.13133
	1975	-0.00675	0.12433	0.13108
	1976	0.01028	0.14307	0.13279
	1977	0.02439	0.15382	0.12943
	1978	-0.00632	0.12137	0.12769
	1979	-0.00450	0.12460	0.12910
	1980	-0.00783	0.12341	0.13124
	1981	0.00223	0.12794	0.12571
	1982	0.00561	0.13053	0.12492
	1983	-0.00126	0.12862	0.12988

INDEPENDENT VARIABLES

PCWDS = Wheat Supply Per Capita (1000 MT)
(WESCA(-1) + WPROCA)/POPCA

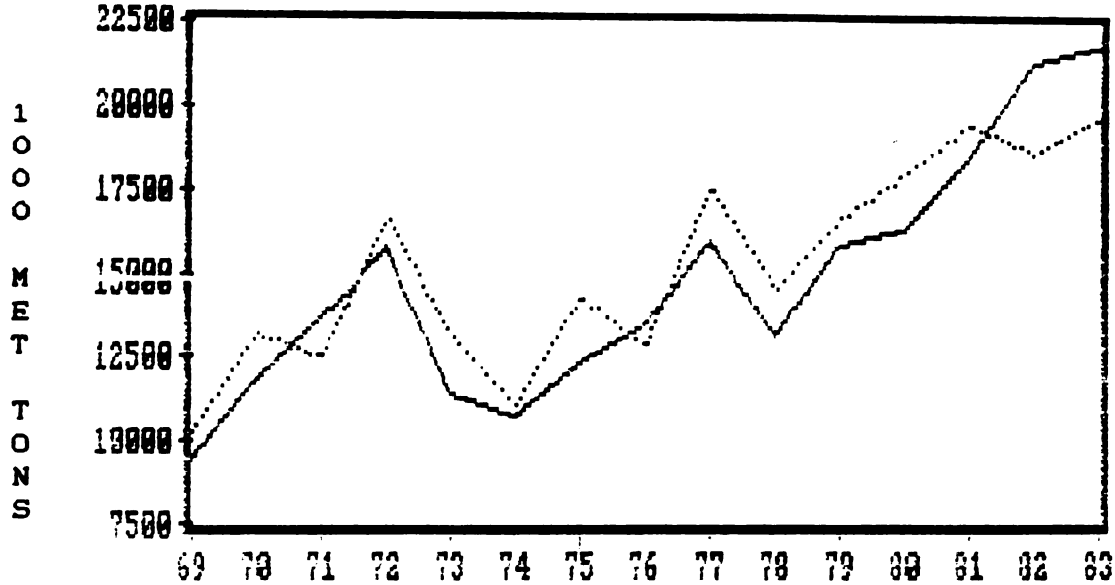
WCGRCA = Wheat/Coarse Grain Supply Ratio
(WESCA(-1) + WPROCA)/(FESCA(-1) + FPROCA)

WPCA = Real Canadian Wheat Price
WP*XRCA/CPICA

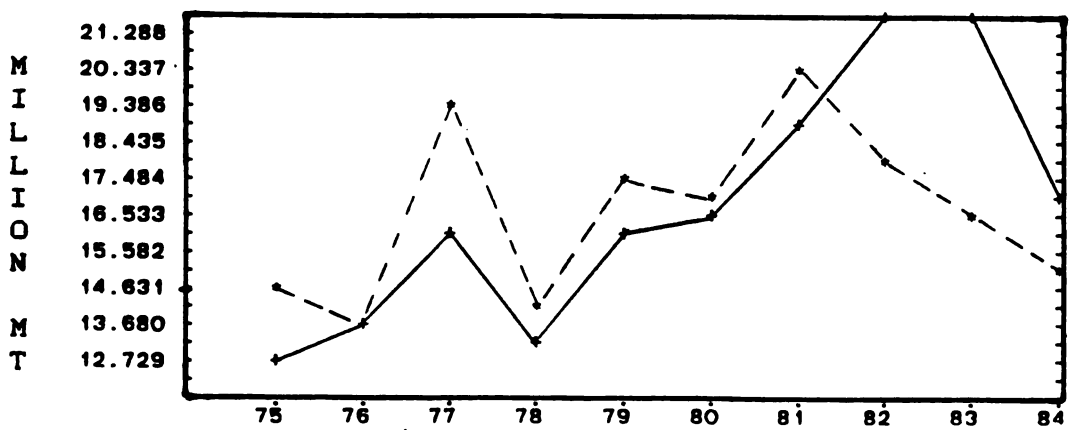
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFOD	0.1316280	0.0117166	0.1538230	0.1074655
WCGRCA	1.3920947	0.3170377	2.0380420	1.0051630
PCWDS	1.4649660	0.2191526	1.9709940	1.0439290
WPCA	1.8595330	0.4609950	3.3106120	1.2886130

	Covariance	Correlation
PCWFOD,PCWFOD	0.0001313	1.0000000
PCWFOD,WCGRCA	0.0014889	0.4190346
PCWFOD,PCWDS	-8.344D-05	-0.0339711
PCWFOD,WPCA	-0.0003584	-0.0693775
WCGRCA,WCGRCA	0.0961428	1.0000000
WCGRCA,PCWDS	0.0420867	0.6332749
WCGRCA,WPCA	-0.0557212	-0.3985826
PCWDS,PCWDS	0.0459397	1.0000000
PCWDS,WPCA	-0.0685952	-0.7098326
WPCA,WPCA	0.2032766	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.6.a & b. Wheat Net Exports - Canada

Canada
Wheat Net Exports (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is WNECA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-4568.1818	2773.9345	-1.6468240	0.115
WNIRES	0.2663655	0.0301809	8.8256402	0.000
WDSCA	0.2451678	0.0796452	3.0782476	0.006

R-squared	0.817258	Mean of dependent var	13675.65
Adjusted R-squared	0.798984	S.D. of dependent var	3763.112
S.E. of regression	1687.184	Sum of squared resid	56931797
Durbin-Watson stat	1.043418	F-statistic	44.72202
Log likelihood	-201.9371		

3 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	709.792	9744.00	9034.21
	1962	663.967	9018.00	8354.03
	1963	2455.81	16181.0	13725.2
	1964	1625.78	10875.0	9249.22
	1965	2384.95	15918.0	13533.0
	1966	970.716	14024.0	13053.3
	1967	-1999.30	9145.00	11144.3
	1968	-1862.99	8323.00	10186.0
	1969	-2006.22	9430.00	11436.2
	1970	-1161.20	11846.0	13007.2
	1971	1373.82	13710.0	12336.2
	1972	-186.205	15692.0	15878.2
	1973	-1065.64	11414.0	12479.6
	1974	63.5994	10739.0	10675.4
	1975	-1542.92	12253.0	13795.9
	1976	805.747	13446.0	12640.3
	1977	-686.919	15997.0	16683.9
	1978	-819.058	13061.0	13880.1
	1979	-724.852	15883.0	16607.9
	1980	-2051.46	16262.0	18313.5
	1981	-1896.15	18447.0	20343.2
	1982	2602.88	21368.0	18765.1
	1983	2345.85	21764.0	19418.2

INDEPENDENT VARIABLES

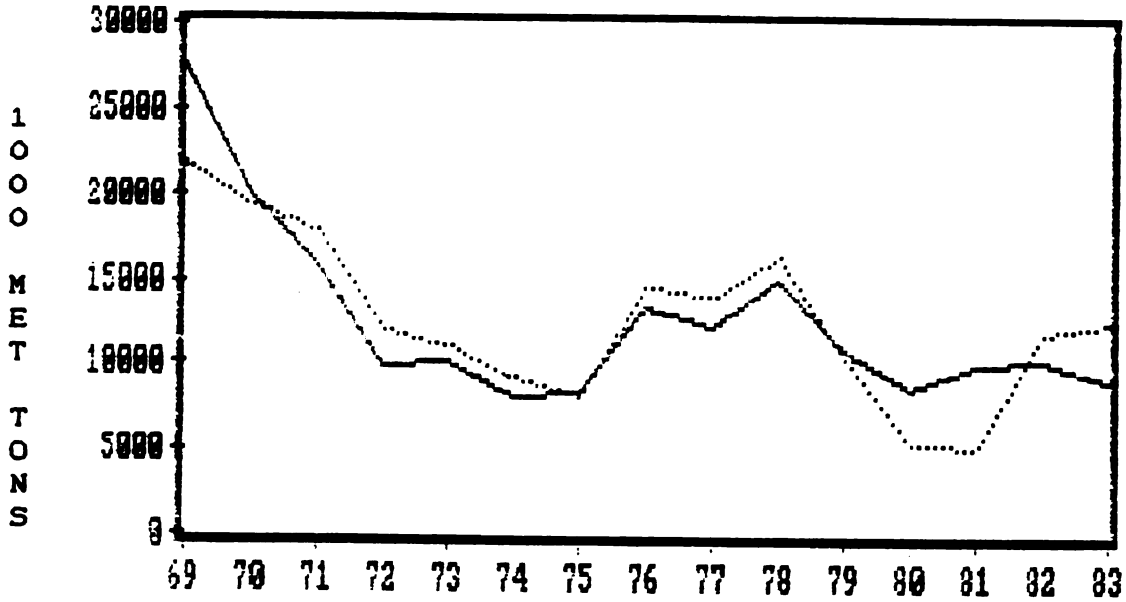
WNIRES = Residual Pool of Import Demand After Surplus Exporters have Exported (1000 MT)
WNIBR + WNIDM + WNILD + WNISB + WNIOP + WNILO + WNINI + WNICH - WNEAR - WNEAU

WDSCA = Wheat Supply (1000 MT)
WESCA(-1) + WPROCA

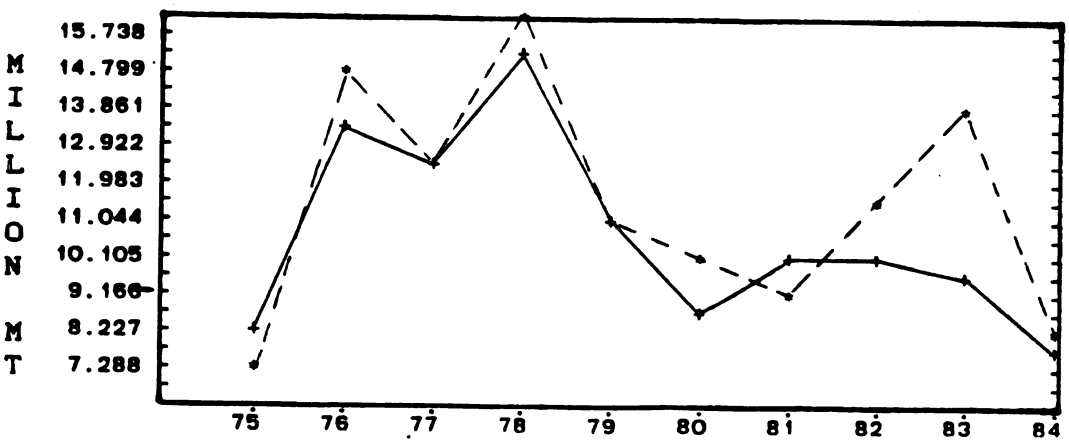
SMPL 1961 - 1993
33 Observations

Series	Mean	S.D.	Maximum	Minimum
WNECA	13673.652	3763.1121	21754.000	8323.0000
WNIRES	39301.217	11926.202	62806.000	21933.000
WDSCA	31714.391	4519.3302	41450.000	23384.000

	Covariance	Correlation
WNECA,WNECA	13545316.	1.0000000
WNECA,WNIRES	36695042.	0.8547975
WNECA,WDSCA	5285069.0	0.3248887
WNIRES,WNIRES	136050193	1.0000000
WNIRES,WDSCA	1859815.2	0.0360744
WDSCA,WDSCA	19536330.	1.0000000



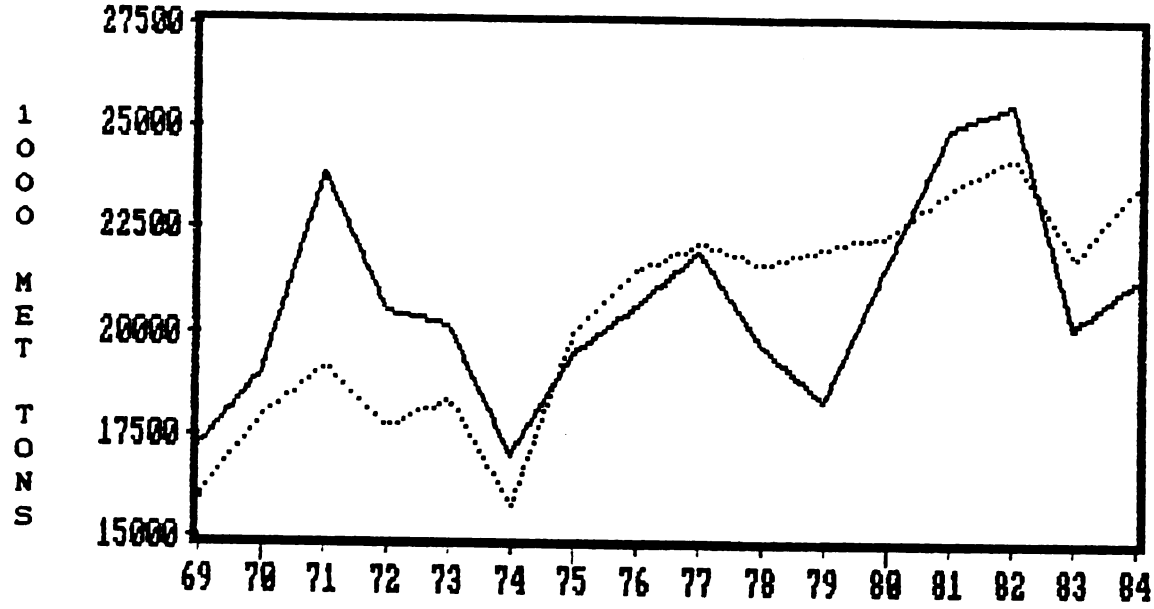
REGIONAL MODEL SIMULATION



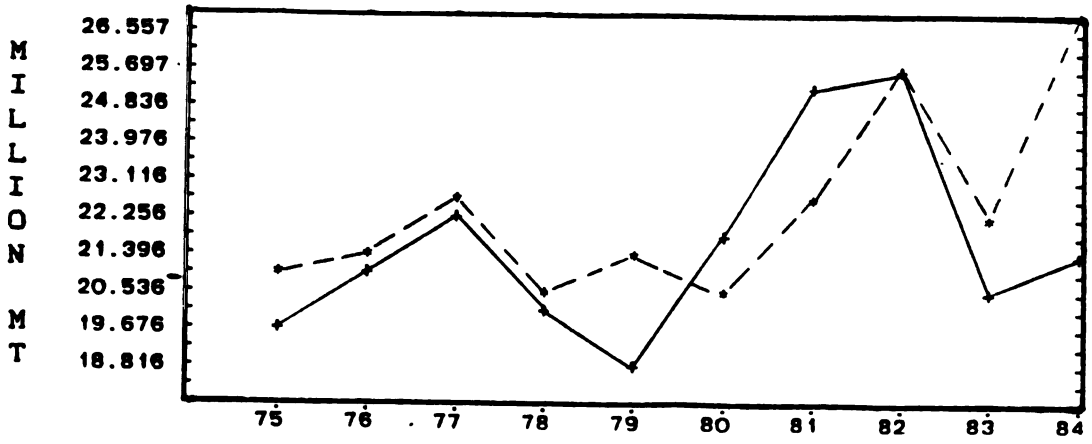
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure E.7.a & b. Wheat Ending Stocks - Canada



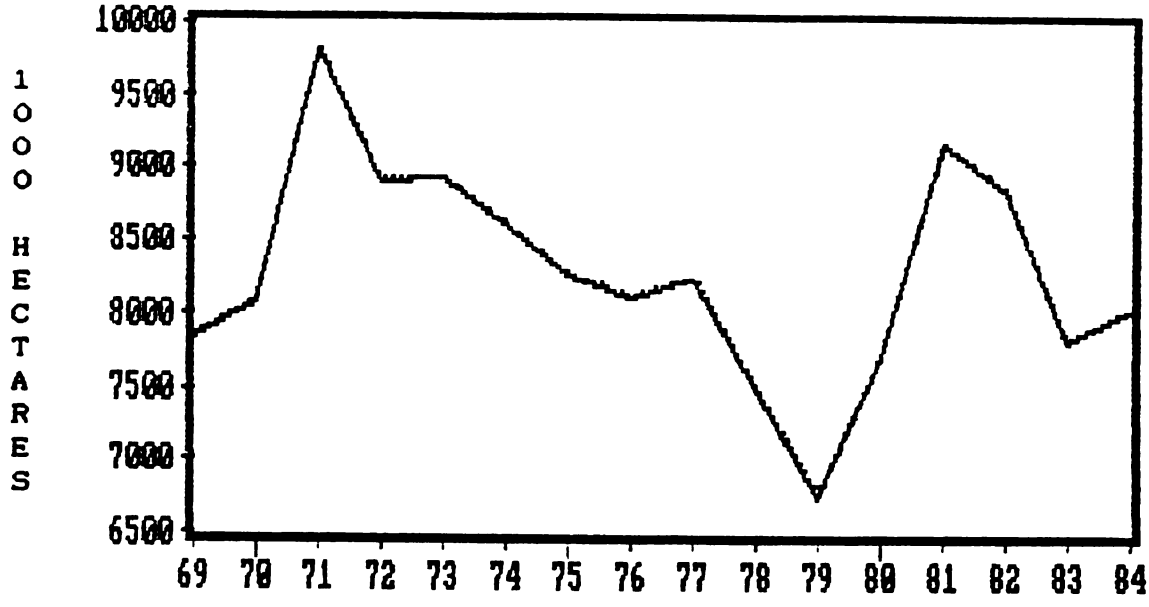
REGIONAL MODEL SIMULATION



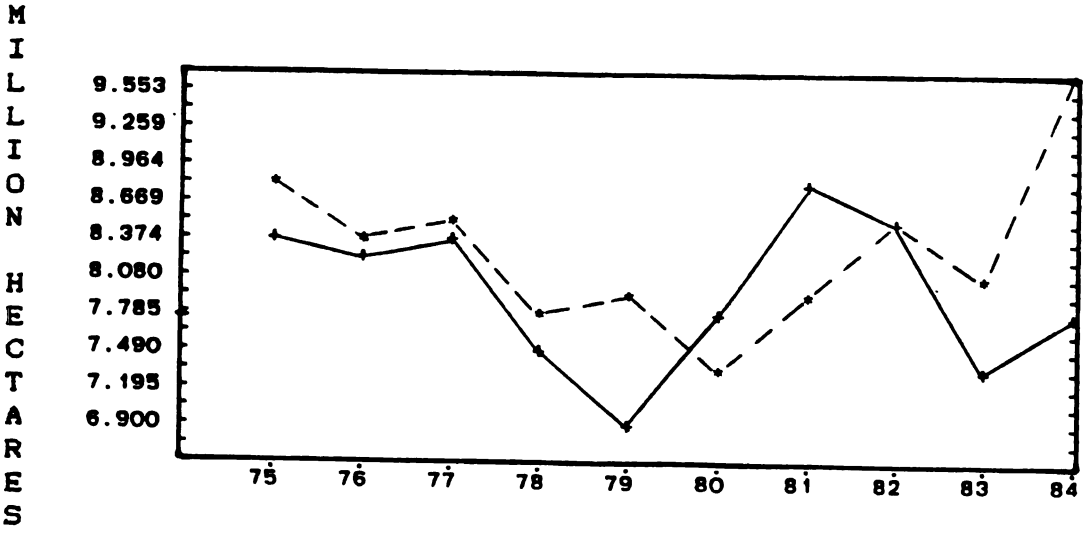
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.8.a & b. Coarse Grain Production - Canada



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.9.a & b. Coarse Grain Harvested Area - Canada

Canada
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is FHACA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2684.1912	1278.7882	2.0990116	0.052
FHACA(-1)	0.7422678	0.1812191	4.0959687	0.001
FRCA(-1)	924.07632	494.90856	1.6651082	0.115
WRCA(-1)	-661.34088	415.67224	-1.5910153	0.131
FESCA(-1)	-0.2503882	0.1239551	-2.0199907	0.060

R-squared	0.604391	Mean of dependent var	7995.571
Adjusted R-squared	0.505489	S.D. of dependent var	861.9758
S.E. of regression	606.1541	Sum of squared resid	5878764.
Durbin-Watson stat	1.294606	F-statistic	6.111001
Log likelihood	-161.4922	TPE	9/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1964	-791.964	6340.00	7131.96
*	1965	-218.249	6827.00	7045.25
*	1966	-303.810	7268.00	7571.81
*	1967	-196.298	7307.00	7503.30
*	1968	137.565	7625.00	7487.44
*	1969	567.407	7848.00	7280.59
*	1970	341.378	8081.00	7739.62
*	1971	1417.17	9825.00	8407.83
*	1972	-249.498	8905.00	9154.50
*	1973	-70.3652	8918.00	8988.37
*	1974	239.263	8604.00	8364.74
*	1975	-468.622	8260.00	8728.62
*	1976	-264.463	8114.00	8378.46
*	1977	117.282	8233.00	8115.72
*	1978	-203.758	7476.00	7679.76
*	1979	-373.389	6753.00	7126.39
*	1980	456.160	7686.00	7229.84
*	1981	939.842	9165.00	8225.16
*	1982	180.599	9851.00	8670.40
*	1983	-421.295	7799.00	8220.30
*	1984	-834.950	9022.00	8856.95

INDEPENDENT VARIABLES

FHACA = Coarse Grain Harvested Area (1000 HA)

FRCA = Coarse Grain Revenue per Hectare ($/HA)
(FYCA(-3)+FYCA(-2)+FYCA(-1)+FYCA)/4*FP*XRCA/CPICA

WRCA = Wheat Revenue per Hectare ($/HA)
(WYCA(-3)+WYCA(-2)+WYCA(-1)+WYCA)/4*WP*XRCA/CPICA

FESCA = Coarse Grain Ending Stocks (1000 MT)

EMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
FHACA	7993.3714	861.97584	9825.0000	6340.0000
FHACA(-1)	7951.4286	884.00953	9825.0000	6340.0000
FRCA(-1)	3.3042670	0.7799334	5.3477420	2.5303920
WRCA(-1)	3.1441207	0.9143173	5.7842160	2.0912100
FESCA(-1)	3587.9524	1244.8991	7996.0000	3706.0000

	Covariance	Correlation
FHACA,FHACA	707621.29	1.0000000
FHACA,FHACA(-1)	470781.80	0.6487195
FHACA,FRCA(-1)	160.71316	0.2510083
FHACA,WRCA(-1)	79.294560	0.1056430
FHACA,FESCA(-1)	7049.9320	0.0068983
FHACA(-1),FHACA(-1)	744259.86	1.0000000
FHACA(-1),FRCA(-1)	152.18143	0.2317589
FHACA(-1),WRCA(-1)	126.14014	0.1638660
FHACA(-1),FESCA(-1)	493816.54	0.4711550
FRCA(-1),FRCA(-1)	0.5793296	1.0000000
FRCA(-1),WRCA(-1)	0.6332988	0.9324885
FRCA(-1),FESCA(-1)	43.259510	0.0467820
WRCA(-1),WRCA(-1)	0.7961677	1.0000000
WRCA(-1),FESCA(-1)	38.673870	0.0356760
FESCA(-1),FESCA(-1)	1475975.1	1.0000000

Canada
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYCA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-14.111653	1.5227434	-9.2672563	0.000
LOGT	3.3430188	0.3569417	10.766517	0.000

R-squared	0.840485	Mean of dependent var	2.278711
Adjusted R-squared	0.833234	S.D. of dependent var	0.417308
S.E. of regression	0.170416	Sum of squared resid	0.638915
Durbin-Watson stat	1.748971	F-statistic	115.9179
Log likelihood	9.457929		

8 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.02756	1.65055	1.62299
	1961	-0.39353	1.29298	1.68651
	1962	0.12718	1.87618	1.74900
	1963	0.17048	1.98097	1.81049
	1964	-0.00761	1.86341	1.87101
	1965	0.13209	2.06269	1.93060
	1966	0.16868	2.15795	1.98927
	1967	-0.18419	1.86287	2.04706
	1968	0.04197	2.14597	2.10400
	1969	0.03575	2.19585	2.16010
	1970	0.13506	2.35045	2.21539
	1971	0.15625	2.42616	2.26991
	1972	-0.01349	2.31016	2.32366
	1973	-0.11685	2.25981	2.37667
	1974	-0.44766	1.98129	2.42895
	1975	-0.12242	2.35811	2.48054
	1976	0.01626	2.54769	2.53143
	1977	0.08552	2.66719	2.58167
	1978	0.00116	2.63242	2.63126
	1979	0.04242	2.72264	2.68022
	1980	0.09332	2.82188	2.72856
	1981	0.05742	2.83371	2.77630
	1982	0.17316	2.99661	2.82345
	1983	-0.17853	2.69150	2.87003

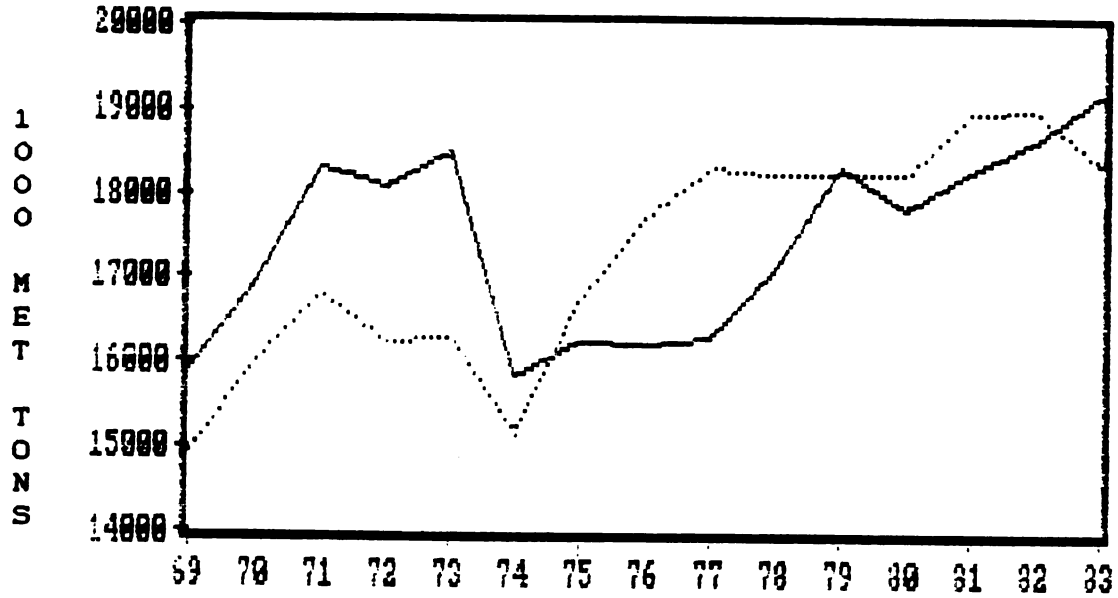
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

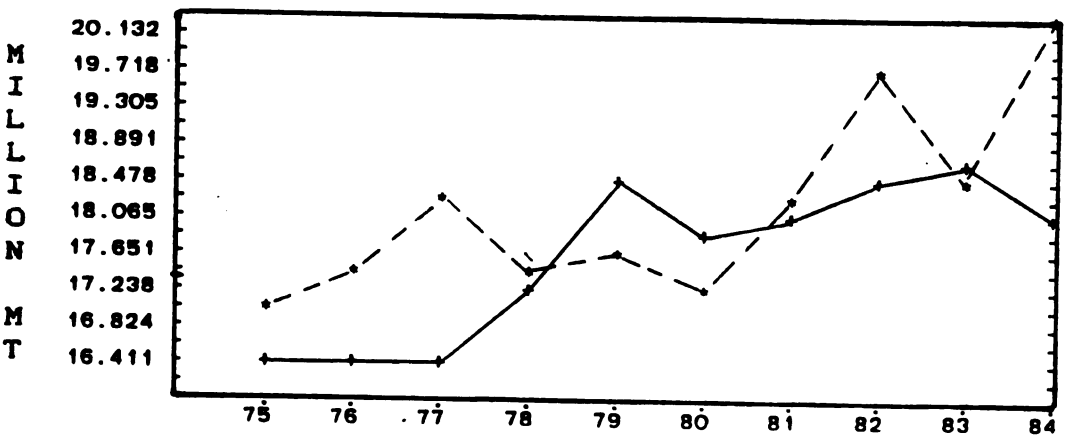
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYCA	2.2787112	0.4173079	2.9966110	1.2929830
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYCA,FYCA	0.1668898	1.0000000
FYCA,LOGT	0.0364995	0.9167796
LOGT,LOGT	0.0094976	1.0000000



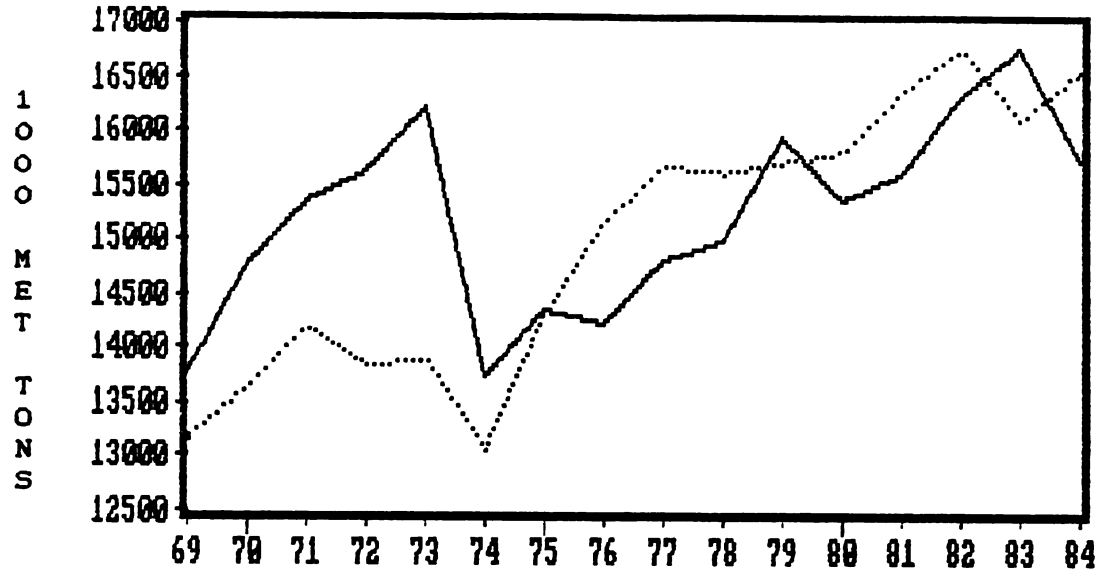
REGIONAL MODEL SIMULATION



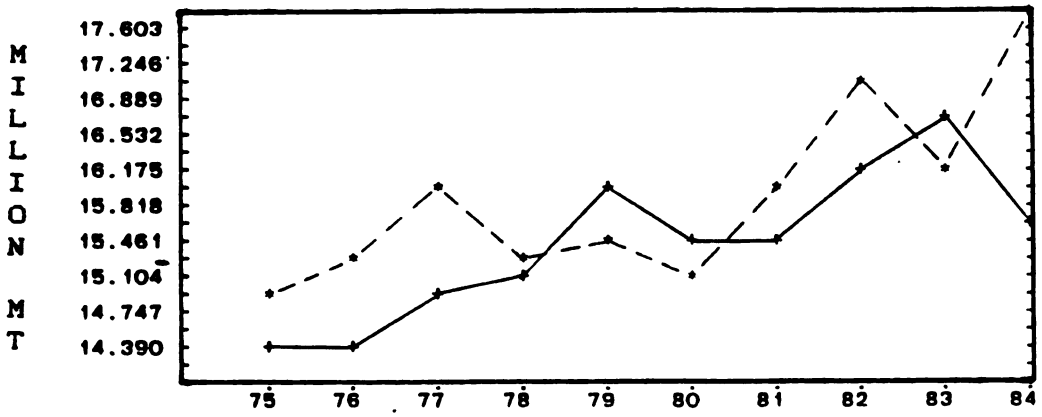
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.10 a & b. Total Coarse Grain Consumption - Canada



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.11.a & b. Coarse Grain Feed Consumption - Canada

Canada
Per Capita Coarse Grain Feed Consumption (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2564458	0.0496900	5.1609160	0.000
PCFDS	0.3459729	0.0455044	7.6030665	0.000

R-squared	0.733525	Mean of dependent var	0.630054
Adjusted R-squared	0.720836	S.D. of dependent var	0.066968
S.E. of regression	0.035383	Sum of squared resid	0.026291
Durbin-Watson stat	1.117743	F-statistic	57.80662
Log likelihood	45.26561		

7 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.06465	0.41730	0.48194
	1962	-0.00382	0.55449	0.55830
	1963	-0.02519	0.56735	0.59255
	1964	0.00470	0.56999	0.56530
	1965	0.02802	0.60407	0.57605
	1966	0.03720	0.63736	0.60016
	1967	0.03033	0.59735	0.56702
	1968	-0.00098	0.59778	0.59876
	1969	0.00825	0.65483	0.64657
	1970	0.01618	0.69207	0.67590
	1971	0.00447	0.72510	0.72063
	1972	0.04101	0.71562	0.67461
	1973	0.07448	0.73507	0.66059
	1974	-0.00104	0.61250	0.61354
	1975	-0.00562	0.63115	0.63677
	1976	-0.02177	0.61706	0.63883
	1977	-0.03089	0.63570	0.66659
	1978	-0.02521	0.63814	0.66335
	1979	0.03952	0.67291	0.63340
	1980	0.00893	0.64040	0.63147
	1981	-0.05976	0.64026	0.70003
	1982	-0.05867	0.66212	0.72079
	1983	0.00454	0.67262	0.66809

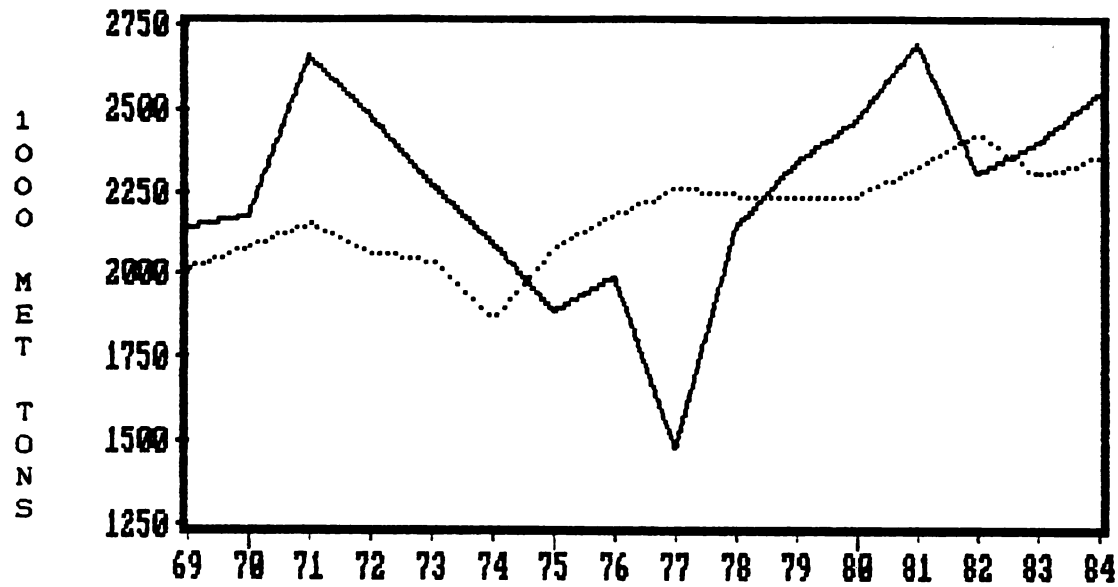
INDEPENDENT VARIABLES

PCFDS = Per Capita Domestic Coarse Grain Supply (1000 MT)
(FESCA(-1)+FPROCA)/POPCA

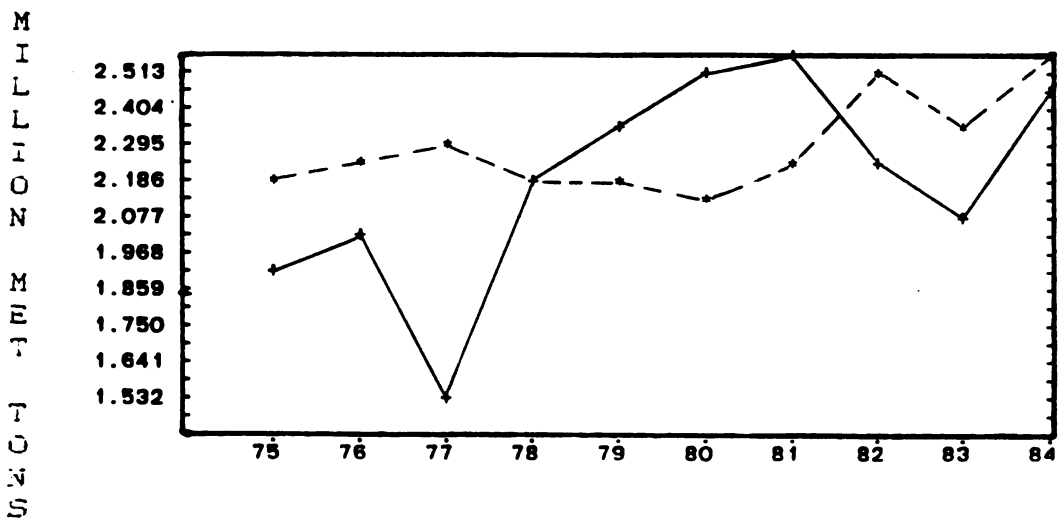
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFED	0.6300544	0.0669677	0.7350702	0.4172961
PCFDS	1.0798781	0.1657794	1.3421440	0.6517789

	Covariance	Correlation
PCFFED,PCFFED	0.0042897	1.0000000
PCFFED,PCFDS	0.0090949	0.8564607
PCFDS,PCFDS	0.0262879	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure E.12.a & b. Coarse Grain Food and Residual Consumption - Canada

Canada
Per Capita Coarse Grain Food and Residual Consumption
(1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0498798	0.0150226	3.3203228	0.003
PCRGDP	-195.72190	139.45347	-1.4034925	0.176
PCFDS	0.0587342	0.0192098	3.0575073	0.006

R-squared	0.342075	Mean of dependent var	0.093976
Adjusted R-squared	0.276283	S.D. of dependent var	0.012560
S.E. of regression	0.010685	Sum of squared resid	0.002283
Durbin-Watson stat	1.374241	F-statistic	5.199311
Log likelihood	73.36713		

10 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00549	0.08150	0.07601
	1962	0.00063	0.08898	0.08836
	1963	-0.00997	0.08376	0.09373
	1964	-0.00476	0.08365	0.08842
	1965	-0.00623	0.08323	0.08946
	1966	0.00076	0.09347	0.09271
	1967	0.00265	0.08947	0.08681
	1968	0.00250	0.09416	0.09167
	1969	0.00248	0.10171	0.09923
	1970	-0.00150	0.10225	0.10375
	1971	0.01304	0.12339	0.11036
	1972	0.01163	0.11324	0.10160
	1973	0.00519	0.10290	0.09771
	1974	0.00502	0.09344	0.08842
	1975	-0.00941	0.08302	0.09243
	1976	-0.00479	0.08654	0.09133
	1977	-0.03238	0.06345	0.09582
	1978	-0.00390	0.09119	0.09509
	1979	0.00973	0.09886	0.08913
	1980	0.01409	0.10267	0.08858
	1981	0.01060	0.11064	0.10004
	1982	-0.01145	0.09359	0.10503
	1983	0.00058	0.09635	0.09576

INDEPENDENT VARIABLES

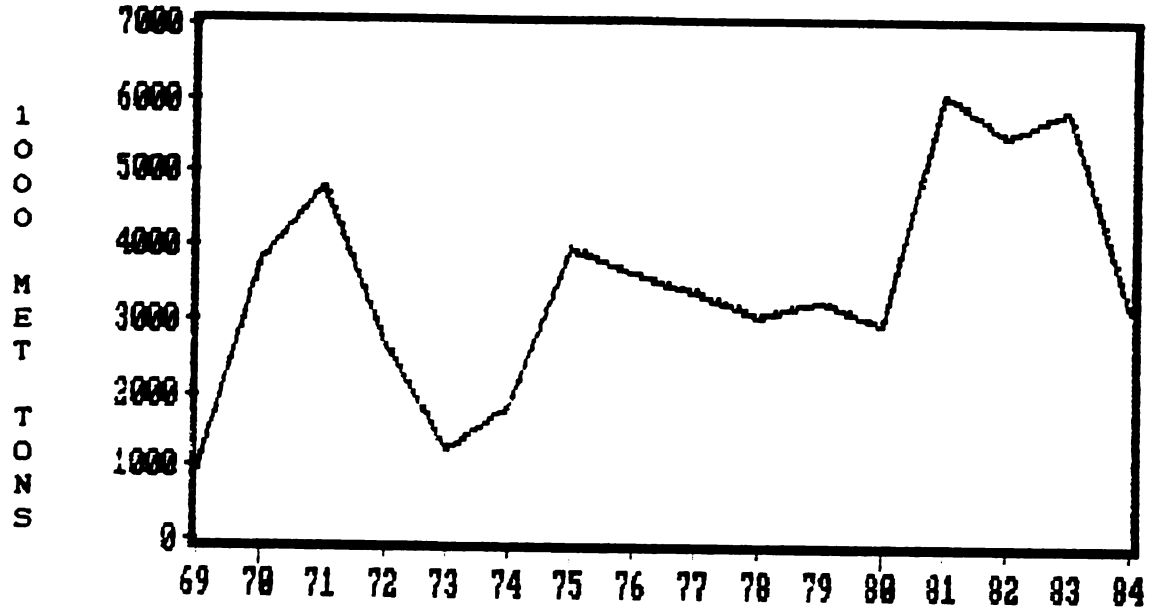
PCRGDP = Real Income Per Capita
GDPCA/CPICA/POPCA

PCFDS = Coarse Grain Supply Per Capita
(FESCA(-1)+FPROCA)/POPCA

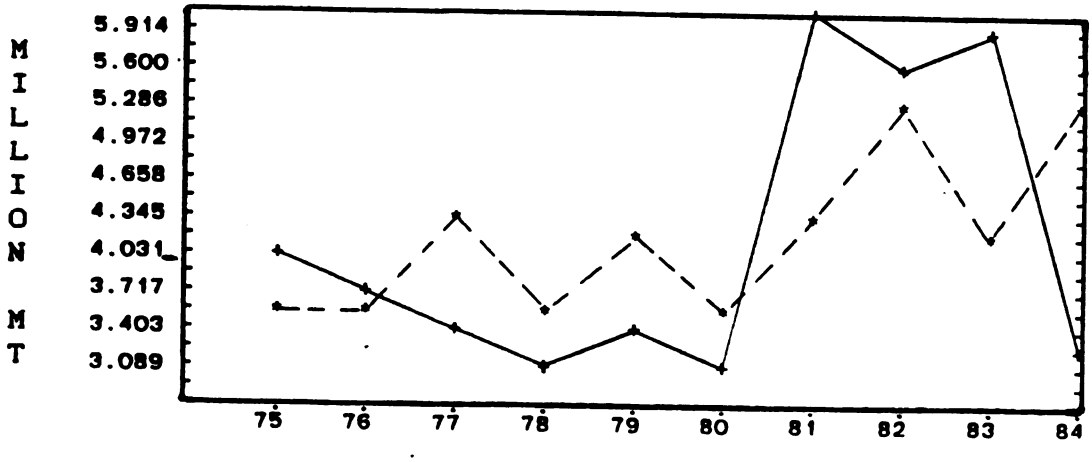
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFOD	0.0939758	0.0125598	0.1233905	0.0634450
PCRGDP	9.876D-05	2.284D-05	0.0001285	6.207D-05
PCFDS	1.0798781	0.1657794	1.3421440	0.6517789

	Covariance	Correlation
PCFFOD,PCFFOD	0.0001509	1.0000000
PCFFOD,PCRGDP	5.099D-08	0.1858762
PCFFOD,PCFDS	0.0010487	0.5265707
PCRGDP,PCRGDP	4.988D-10	1.0000000
PCRGDP,PCFDS	2.530D-06	0.6987958
PCFDS,PCFDS	0.0262879	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.13.a & b. Coarse Grain Net Exports - Canada

Canada
Coarse Grain Net Exports (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is FNECA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-5128.1387	1122.9772	-4.5665566	0.000
FDSCA	0.2874396	0.0613605	4.6844429	0.000
FNIRES	0.0194993	0.0140582	1.3870403	0.180

R-squared	0.784057	Mean of dependent var	2416.583
Adjusted R-squared	0.763491	S.D. of dependent var	1995.135
S.E. of regression	970.2788	Sum of squared resid	19770258
Durbin-Watson stat	1.400187	F-statistic	38.12385
Log likelihood	-197.5141	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	1575.24	104.000	-1471.24
	1962	74.0582	-102.000	-176.058
	1963	149.764	632.000	482.236
	1964	354.231	523.000	168.769
	1965	-68.9868	419.000	487.987
	1966	-427.067	556.000	983.067
	1967	-369.547	156.000	525.547
	1968	-1397.05	-314.000	1083.05
	1969	-1032.60	950.000	1982.60
	1970	1129.34	3783.00	2653.66
	1971	1112.13	4835.00	3722.87
	1972	-542.509	2663.00	3205.51
	1973	-1791.55	1214.00	3005.55
	1974	-449.890	1798.00	2247.89
	1975	937.479	3972.00	3034.52
	1976	405.196	3611.00	3205.80
	1977	-537.668	3375.00	3912.67
	1978	-988.594	3059.00	4047.59
	1979	-591.195	3248.00	3839.19
	1980	-657.060	2932.00	3589.06
	1981	1141.20	6071.00	4929.80
	1982	229.369	5483.00	5253.63
	1983	1768.88	5860.00	4091.12
	1984	-23.1674	3170.00	3193.17

INDEPENDENT VARIABLES

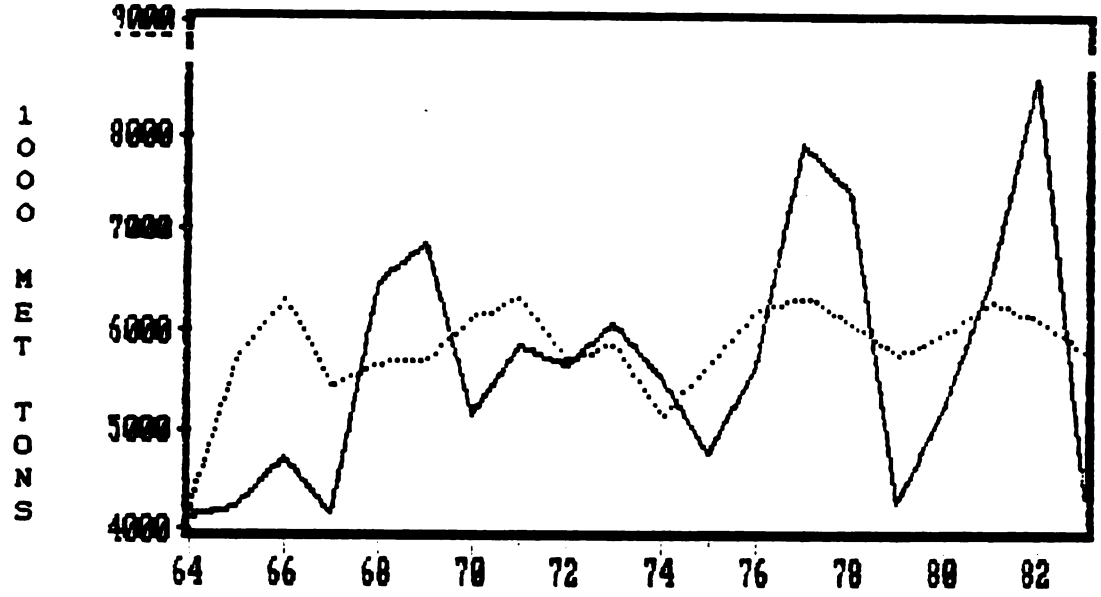
FNIRES = Residual Pool of Import Demand After Surplus Exporters have Exported (1000 MT)
FNIBR + FNIDM + FNILD + FNISB + FNIOP + FNILO + FNINI + FNICH - FNEAR - FNEAU

FDSCA = Coarse Grain Supply (1000 MT)
FESCA(-1) + FPROCA

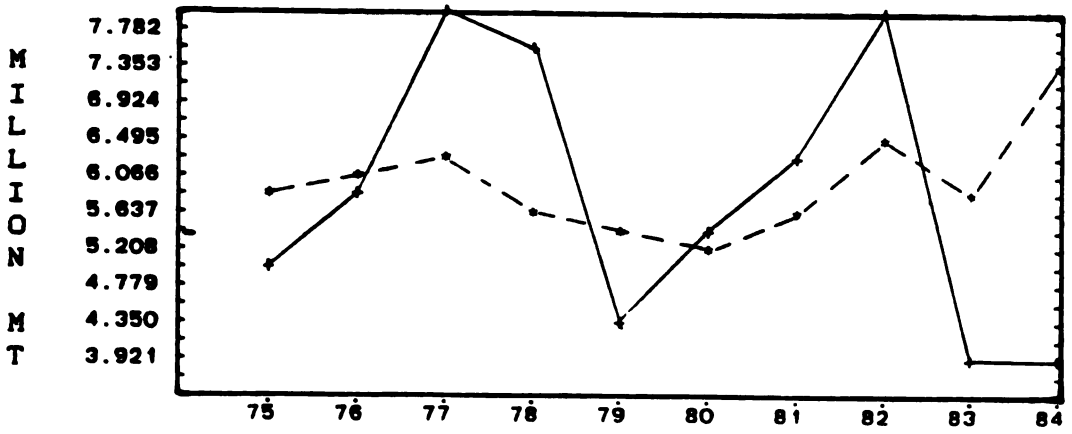
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FNECA	2416.5833	1995.1349	6071.0000	-314.00000
FDSCA	23635.583	4967.8118	31800.000	11908.000
FNIRES	38510.042	21683.184	79237.000	12004.000

	Covariance	Correlation
FNECA,FNECA	3814706.4	1.0000000
FNECA,FDSCA	8303827.6	0.8742272
FNECA,FNIRES	30980392.	0.7472656
FDSCA,FDSCA	23650856.	1.0000000
FDSCA,FNIRES	77214732.	0.7479893
FNIRES,FNIRES	450570437	1.0000000



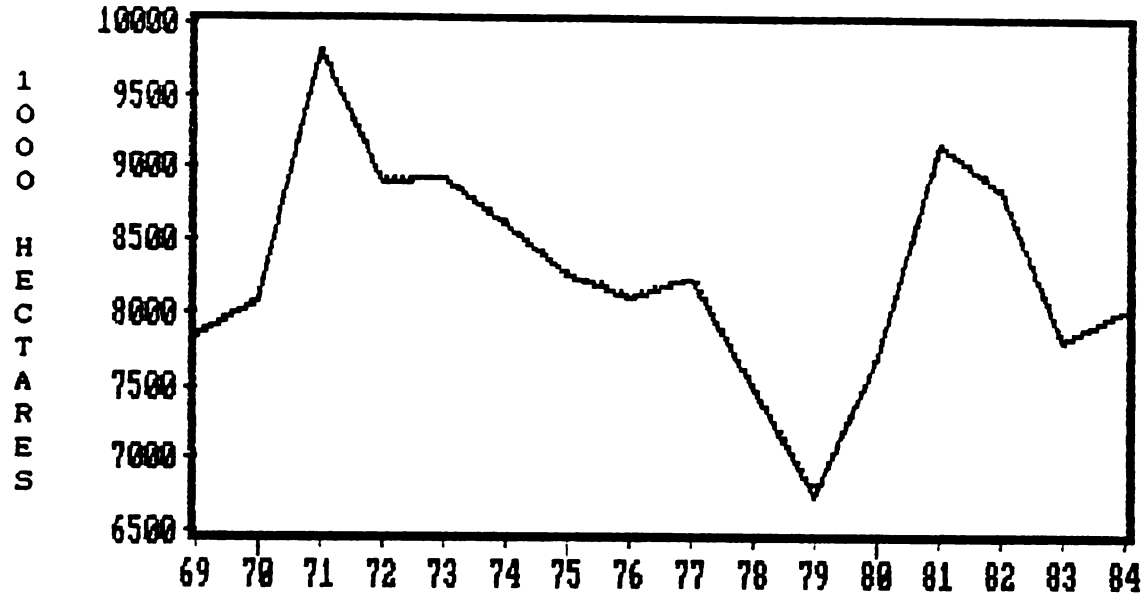
REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.14.a & b. Coarse Grain Ending Stocks - Canada



REGIONAL MODEL SIMULATION

EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.9.a & b. Coarse Grain Harvested Area - Canada

Canada
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is FHACA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2684.1912	1278.7882	2.0990116	0.052
FHACA(-1)	0.7422678	0.1812191	4.0959687	0.001
FRCA(-1)	924.07632	494.90856	1.6651082	0.115
WRCA(-1)	-661.34088	415.67224	-1.5910153	0.131
FESCA(-1)	-0.2503882	0.1239551	-2.0199907	0.060

R-squared	0.604391	Mean of dependent var	7995.571
Adjusted R-squared	0.505489	S.D. of dependent var	861.9758
S.E. of regression	606.1541	Sum of squared resid	5878764.
Durbin-Watson stat	1.294606	F-statistic	6.111001
Log likelihood	-161.4922	TPE	9/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1964	-791.964	6340.00	7131.96
*	1965	-218.249	6827.00	7045.25
*	1966	-303.810	7268.00	7571.81
*	1967	-196.298	7307.00	7503.30
*	1968	137.565	7625.00	7487.44
*	1969	567.407	7848.00	7280.59
*	1970	341.378	8081.00	7739.62
*	1971	1417.17	9825.00	8407.83
*	1972	-249.498	8905.00	9154.50
*	1973	-70.3652	8918.00	8988.37
*	1974	239.263	8604.00	8364.74
*	1975	-468.622	8260.00	8728.62
*	1976	-264.463	8114.00	8378.46
*	1977	117.282	8233.00	8115.72
*	1978	-203.758	7476.00	7679.76
*	1979	-373.389	6753.00	7126.39
*	1980	456.160	7686.00	7229.84
*	1981	939.842	9165.00	8225.16
*	1982	180.599	9851.00	8670.40
*	1983	-421.295	7799.00	8220.30
*	1984	-834.950	9022.00	8856.95

INDEPENDENT VARIABLES

FHACA = Coarse Grain Harvested Area (1000 HA)

FRCA = Coarse Grain Revenue per Hectare ($/HA)
(FYCA(-3)+FYCA(-2)+FYCA(-1)+FYCA)/4*FP*XRCA/CPICA

WRCA = Wheat Revenue per Hectare ($/HA)
(WYCA(-3)+WYCA(-2)+WYCA(-1)+WYCA)/4*WP*XRCA/CPICA

FESCA = Coarse Grain Ending Stocks (1000 MT)

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
FHACA	7993.5714	861.97584	9825.0000	6340.0000
FHACA(-1)	7951.4286	884.00953	9825.0000	6340.0000
FRCA(-1)	3.3042670	0.7799334	5.3477420	2.5303920
WRCA(-1)	3.1441207	0.9143173	5.7842160	2.0912100
FESCA(-1)	3587.9524	1244.8991	7996.0000	3706.0000

	Covariance	Correlation
FHACA,FHACA	707621.29	1.0000000
FHACA,FHACA(-1)	470781.80	0.6487195
FHACA,FRCA(-1)	160.71316	0.2510083
FHACA,WRCA(-1)	79.294560	0.1056430
FHACA,FESCA(-1)	7049.9320	0.0068983
FHACA(-1),FHACA(-1)	744259.86	1.0000000
FHACA(-1),FRCA(-1)	152.18143	0.2317589
FHACA(-1),WRCA(-1)	126.14014	0.1638660
FHACA(-1),FESCA(-1)	493816.54	0.4711550
FRCA(-1),FRCA(-1)	0.5793296	1.0000000
FRCA(-1),WRCA(-1)	0.6332988	0.9324885
FRCA(-1),FESCA(-1)	43.259510	0.0467820
WRCA(-1),WRCA(-1)	0.7961677	1.0000000
WRCA(-1),FESCA(-1)	38.673870	0.0356760
FESCA(-1),FESCA(-1)	1475975.1	1.0000000

Canada
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYCA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-14.111653	1.5227434	-9.2672563	0.000
LOGT	3.3430188	0.3569417	10.766517	0.000

R-squared	0.840485	Mean of dependent var	2.278711
Adjusted R-squared	0.833234	S.D. of dependent var	0.417308
S.E. of regression	0.170416	Sum of squared resid	0.638915
Durbin-Watson stat	1.748971	F-statistic	115.9179
Log likelihood	9.457929		

8 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.02756	1.65055	1.62299
*	1961	-0.39353	1.29298	1.68651
*	1962	0.12718	1.87618	1.74900
*	1963	0.17048	1.98097	1.81049
*	1964	-0.00761	1.86341	1.87101
*	1965	0.13209	2.06269	1.93060
*	1966	0.16868	2.15795	1.98927
*	1967	-0.18419	1.86287	2.04706
*	1968	0.04197	2.14597	2.10400
*	1969	0.03575	2.19585	2.16010
*	1970	0.13506	2.35045	2.21539
*	1971	0.15625	2.42616	2.26991
*	1972	-0.01349	2.31016	2.32366
*	1973	-0.11685	2.25981	2.37667
*	1974	-0.44766	1.98129	2.42895
*	1975	-0.12242	2.35811	2.48054
*	1976	0.01626	2.54769	2.53143
*	1977	0.08552	2.66719	2.58167
*	1978	0.00116	2.63242	2.63126
*	1979	0.04242	2.72264	2.68022
*	1980	0.09332	2.82188	2.72856
*	1981	0.05742	2.83371	2.77630
*	1982	0.17316	2.99661	2.82345
*	1983	-0.17853	2.69150	2.87003

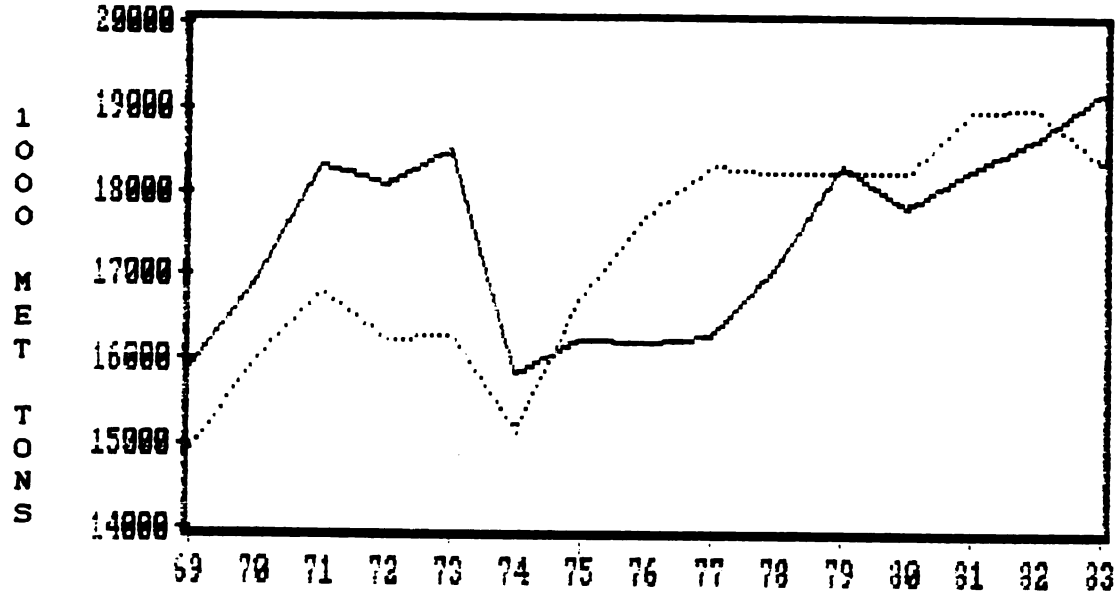
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

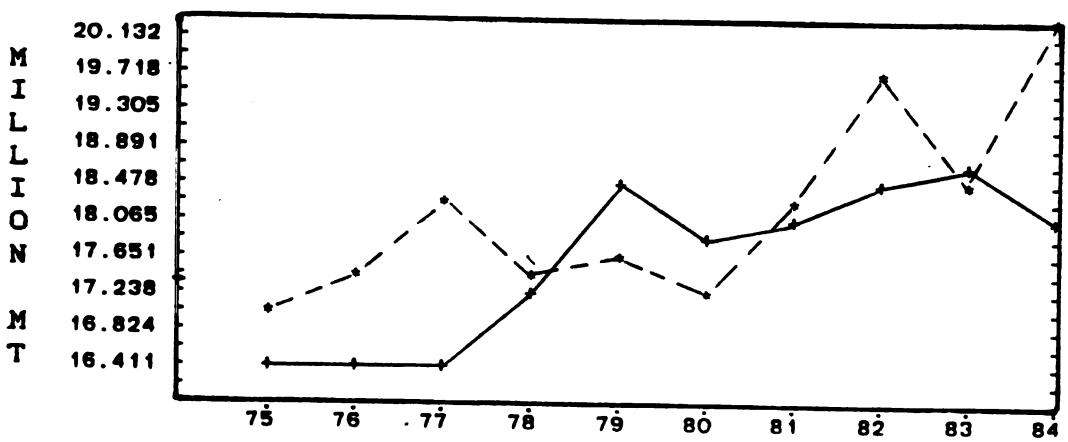
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYCA	2.2787112	0.4173079	2.9966110	1.2929830
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYCA,FYCA	0.1668898	1.0000000
FYCA,LOGT	0.0364995	0.9167796
LOGT,LOGT	0.0094976	1.0000000



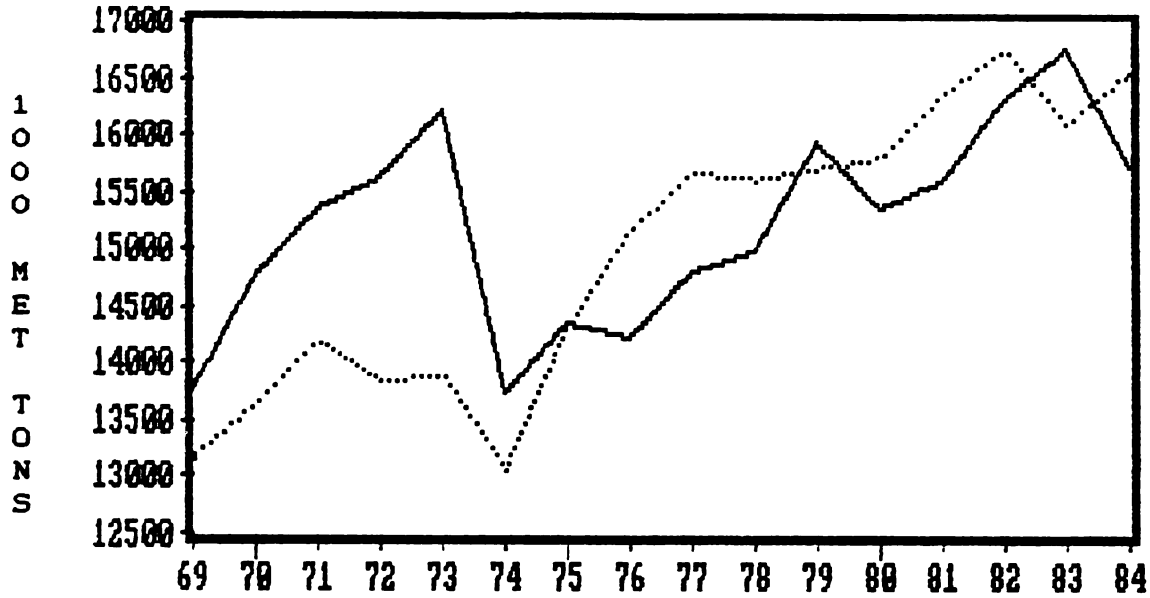
REGIONAL MODEL SIMULATION



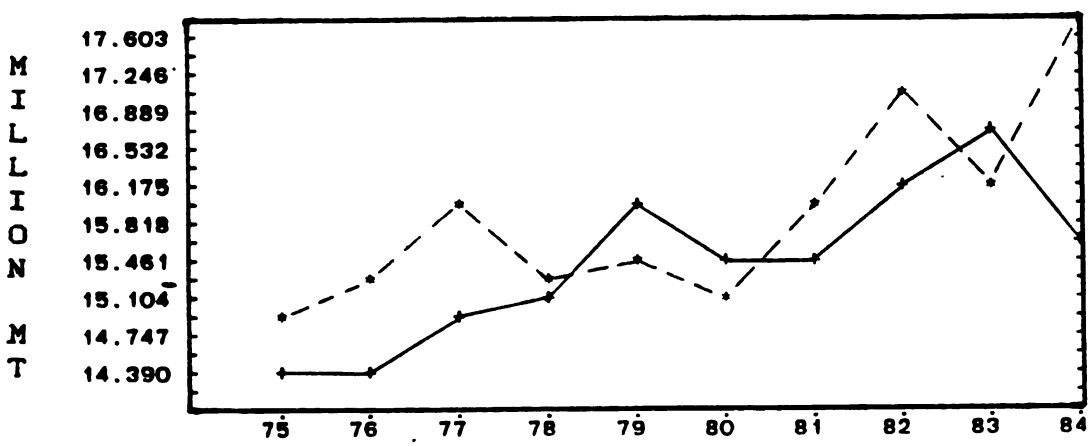
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure E.10 a & b. Total Coarse Grain Consumption - Canada



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.11.a & b. Coarse Grain Feed Consumption - Canada

Canada
Per Capita Coarse Grain Feed Consumption (1000 MT)

```
SMPL   1961  -  1983
23 Observations
LS // Dependent Variable is PCFFED
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2564458	0.0496900	5.1609160	0.000
PCFDS	0.3459729	0.0455044	7.6030665	0.000

R-squared	0.733525	Mean of dependent var	0.630054
Adjusted R-squared	0.720836	S.D. of dependent var	0.066968
S.E. of regression	0.035383	Sum of squared resid	0.026291
Durbin-Watson stat	1.117743	F-statistic	57.80662
Log likelihood	45.26561		

7 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.06465	0.41730	0.48194
	1962	-0.00382	0.55449	0.55830
	1963	-0.02519	0.56735	0.59255
	1964	0.00470	0.56999	0.56530
	1965	0.02802	0.60407	0.57605
	1966	0.03720	0.63736	0.60016
	1967	0.03033	0.59735	0.56702
	1968	-0.00098	0.59778	0.59876
	1969	0.00825	0.65483	0.64657
	1970	0.01618	0.69207	0.67590
	1971	0.00447	0.72510	0.72063
	1972	0.04101	0.71562	0.67461
	1973	0.07448	0.73507	0.66059
	1974	-0.00104	0.61250	0.61354
	1975	-0.00562	0.63115	0.63677
	1976	-0.02177	0.61706	0.63883
	1977	-0.03089	0.63570	0.66659
	1978	-0.02521	0.63814	0.66335
	1979	0.03952	0.67291	0.63340
	1980	0.00893	0.64040	0.63147
	1981	-0.05976	0.64026	0.70003
	1982	-0.05867	0.66212	0.72079
	1983	0.00454	0.67262	0.66809

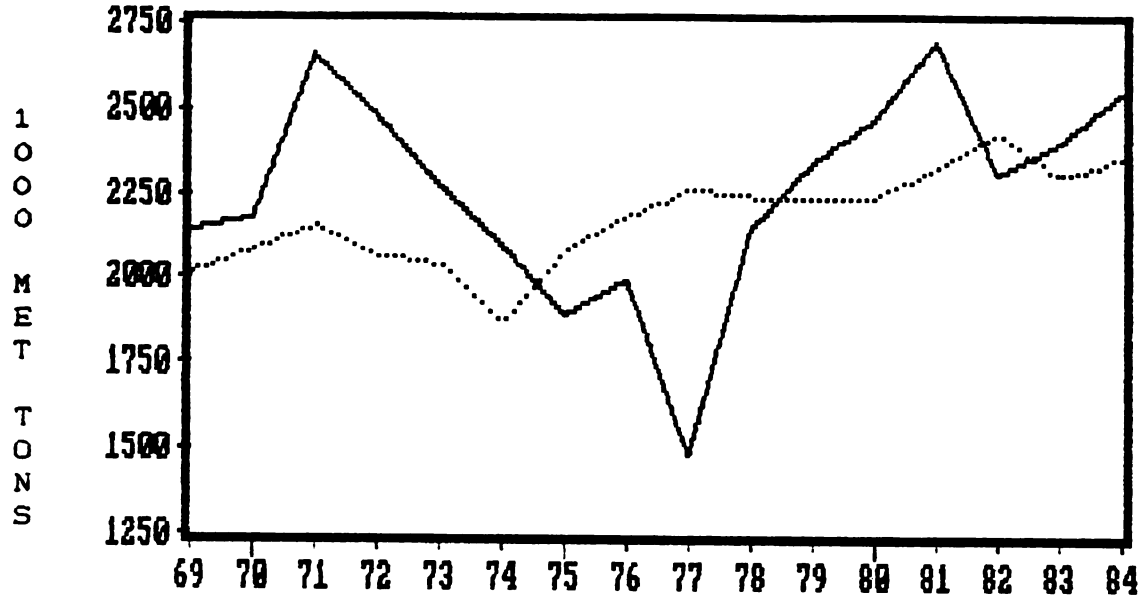
INDEPENDENT VARIABLES

PCFDS = Per Capita Domestic Coarse Grain Supply (1000 MT)
(FESCA(-1)+FPROCA)/POPCA

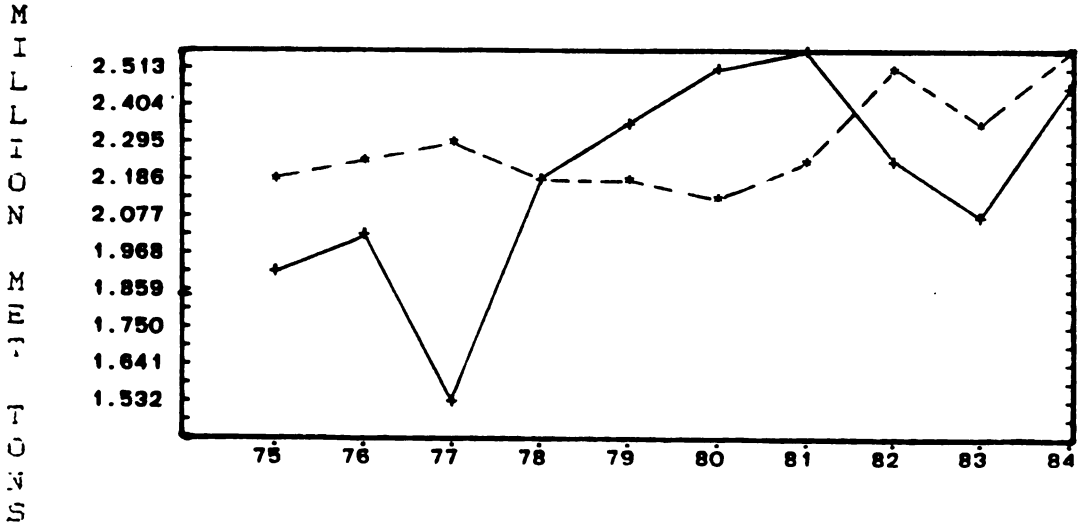
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFED	0.6300544	0.0669677	0.7350702	0.4172961
PCFDS	1.0798781	0.1657794	1.3421440	0.6517789

	Covariance	Correlation
PCFFED,PCFFED	0.0042897	1.0000000
PCFFED,PCFDS	0.0090949	0.8564607
PCFDS,PCFDS	0.0262879	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure E.12.a & b. Coarse Grain Food and Residual Consumption - Canada

Canada
Per Capita Coarse Grain Food and Residual Consumption
(1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0498798	0.0150226	3.3203228	0.003
PCRGDP	-195.72190	139.45347	-1.4034925	0.176
PCFDS	0.0587342	0.0192098	3.0575073	0.006

R-squared	0.342075	Mean of dependent var	0.093976
Adjusted R-squared	0.276283	S.D. of dependent var	0.012560
S.E. of regression	0.010685	Sum of squared resid	0.002283
Durbin-Watson stat	1.374241	F-statistic	5.199311
Log likelihood	73.36713		

10 TPE

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00549	0.08150	0.07601
	1962	0.00063	0.08898	0.08836
	1963	-0.00997	0.08376	0.09373
	1964	-0.00476	0.08365	0.08842
	1965	-0.00623	0.08323	0.08946
	1966	0.00076	0.09347	0.09271
	1967	0.00265	0.08947	0.08681
	1968	0.00250	0.09416	0.09167
	1969	0.00248	0.10171	0.09923
	1970	-0.00150	0.10225	0.10375
	1971	0.01304	0.12339	0.11036
	1972	0.01163	0.11324	0.10160
	1973	0.00519	0.10290	0.09771
	1974	0.00502	0.09344	0.08842
	1975	-0.00941	0.08302	0.09243
	1976	-0.00479	0.08654	0.09133
	1977	-0.03238	0.06345	0.09582
	1978	-0.00390	0.09119	0.09509
	1979	0.00973	0.09886	0.08913
	1980	0.01409	0.10267	0.08858
	1981	0.01060	0.11064	0.10004
	1982	-0.01145	0.09359	0.10503
	1983	0.00058	0.09635	0.09576

INDEPENDENT VARIABLES

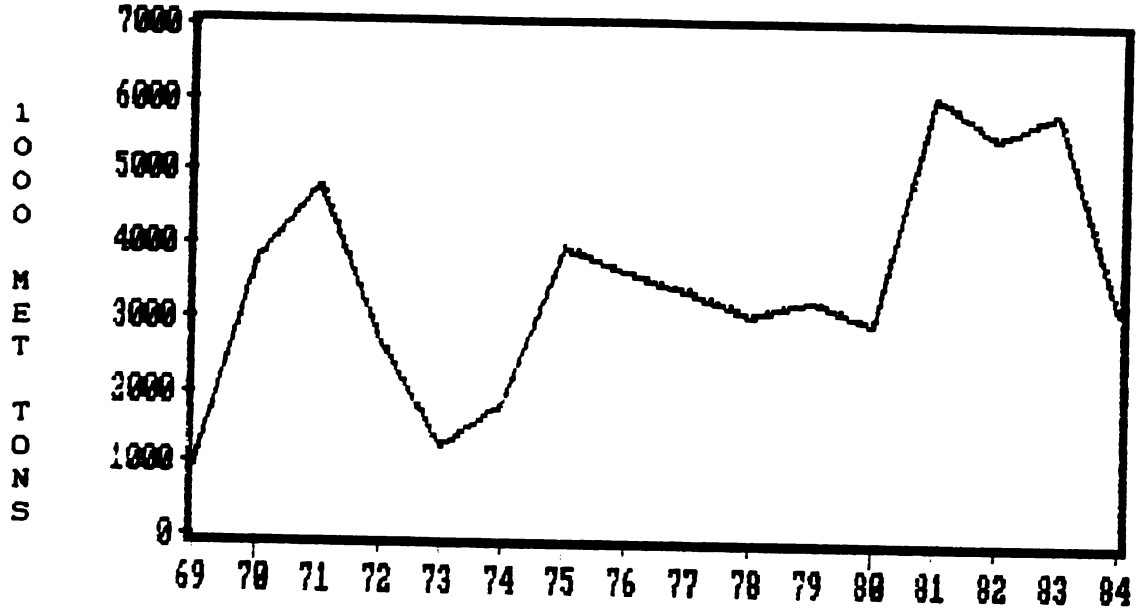
PCRGDP = Real Income Per Capita
GDPCA/CPICA/POPCA

PCFDS = Coarse Grain Supply Per Capita
(FESCA(-1)+FPROCA)/POPCA

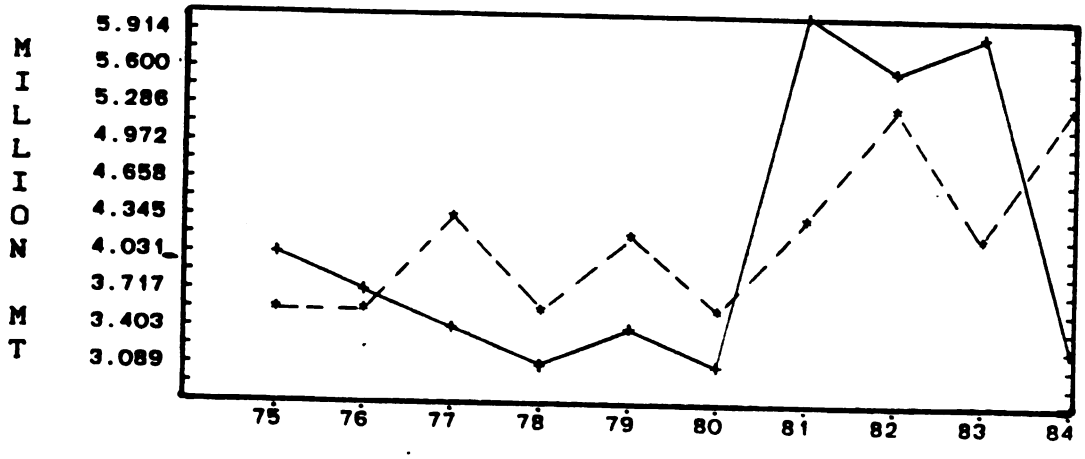
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFFOD	0.0939758	0.0125598	0.1233905	0.0634450
PCRGDP	9.876D-05	2.284D-05	0.0001285	6.207D-05
PCFDS	1.0798781	0.1657794	1.3421440	0.6517789

	Covariance	Correlation
PCFFOD,PCFFOD	0.0001509	1.0000000
PCFFOD,PCRGDP	5.099D-08	0.1858762
PCFFOD,PCFDS	0.0010487	0.5265707
PCRGDP,PCRGDP	4.988D-10	1.0000000
PCRGDP,PCFDS	2.530D-06	0.6987958
PCFDS,PCFDS	0.0262879	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure E.13.a & b. Coarse Grain Net Exports - Canada

Canada
Coarse Grain Net Exports (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is FNECA

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-5128.1387	1122.9772	-4.5665566	0.000
FDSCA	0.2874396	0.0613605	4.6844429	0.000
FNIRES	0.0194993	0.0140582	1.3870403	0.180

R-squared	0.784057	Mean of dependent var	2416.583
Adjusted R-squared	0.763491	S.D. of dependent var	1995.135
S.E. of regression	970.2788	Sum of squared resid	19770258
Durbin-Watson stat	1.400187	F-statistic	38.12385
Log likelihood	-197.5141	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	1575.24	104.000	-1471.24
	1962	74.0582	-102.000	-176.058
	1963	149.764	632.000	482.236
	1964	354.231	523.000	168.769
	1965	-68.9868	419.000	487.987
	1966	-427.067	556.000	983.067
	1967	-369.547	156.000	525.547
	1968	-1397.05	-314.000	1083.05
	1969	-1032.60	950.000	1982.60
	1970	1129.34	3783.00	2653.66
	1971	1112.13	4835.00	3722.87
	1972	-542.509	2663.00	3205.51
	1973	-1791.55	1214.00	3005.55
	1974	-449.890	1798.00	2247.89
	1975	937.479	3972.00	3034.52
	1976	405.196	3611.00	3205.80
	1977	-537.668	3375.00	3912.67
	1978	-988.594	3059.00	4047.59
	1979	-591.195	3248.00	3839.19
	1980	-657.060	2932.00	3589.06
	1981	1141.20	6071.00	4929.80
	1982	229.369	5483.00	5253.63
	1983	1768.88	5860.00	4091.12
	1984	-23.1674	3170.00	3193.17

INDEPENDENT VARIABLES

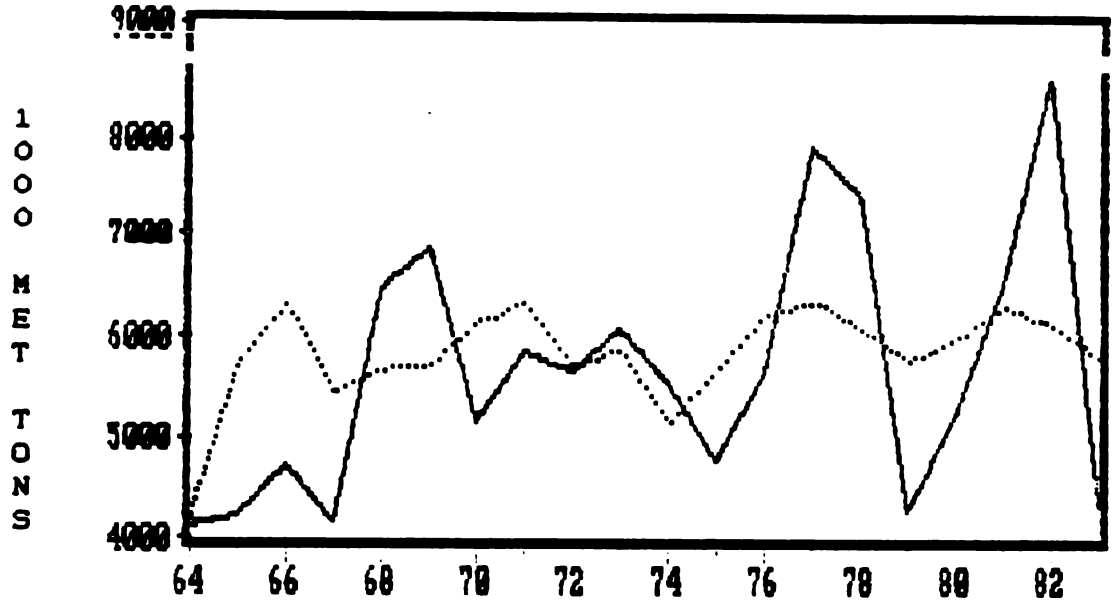
FNIRES = Residual Pool of Import Demand After Surplus Exporters have Exported (1000 MT)
FNIBR + FNIDM + FNILD + FNISB + FNIOP + FNILO + FNINI + FNICH - FNEAR - FNEAU

FDSCA = Coarse Grain Supply (1000 MT)
FESCA(-1) + FPROCA

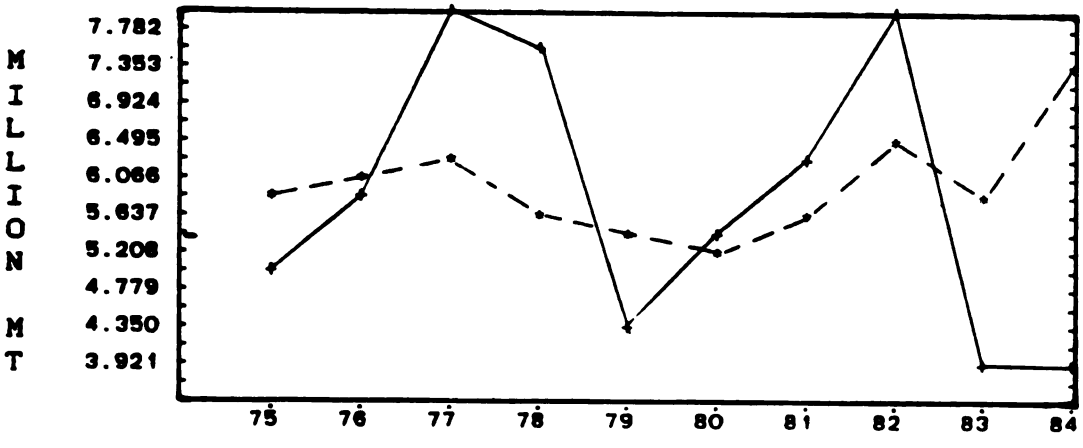
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FNECA	2416.5833	1995.1349	6071.0000	-314.00000
FDSCA	23635.583	4967.8118	31800.000	11908.000
FNIRES	38510.042	21683.184	79237.000	12004.000

	Covariance	Correlation
FNECA,FNECA	3814706.4	1.0000000
FNECA,FDSCA	8303827.6	0.8742272
FNECA,FNIRES	30980392.	0.7472656
FDSCA,FDSCA	23650856.	1.0000000
FDSCA,FNIRES	77214732.	0.7479893
FNIRES,FNIRES	450570437	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure E.14.a & b. Coarse Grain Ending Stocks - Canada

AN INTERNATIONAL AGRICULTURAL TRADE MODEL WITH LINKAGE CAPABILITY

VOLUME III

By

Shayle Daniel Shagam

A THESIS

Submitted to
Michigan State University
in partial Fulfillment of the requirements
for the degree of

MASTER OF SCIENCE

Department of Agricultural Economics

1987

APPENDIX F

EQUATION STATISTICS - DEVELOPED MARKETS

Wheat

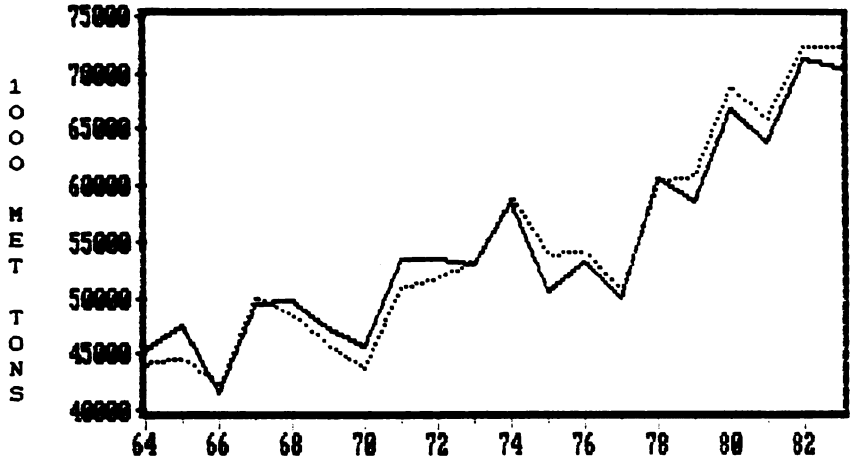
WPRODM.....Production
WHADM.....Harvested Area
WYDM.....Yield
WCONDM.....Total Consumption
WFEDDM.....Feed Consumption
WFODDM.....Food & Residual Consumption
WNIDM.....Net Imports
WESDM.....Ending Stocks

Coarse Grain

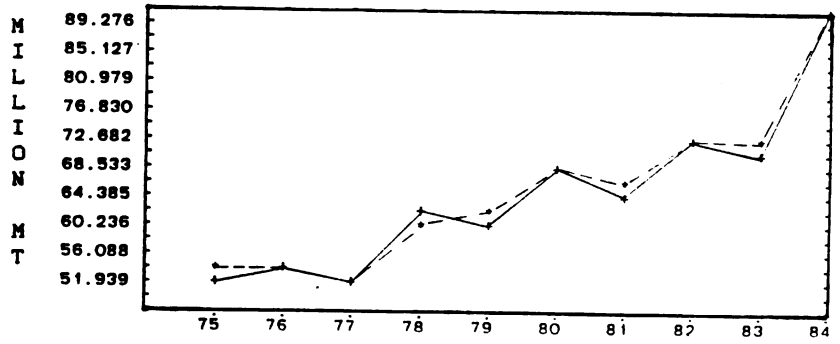
FPRODM.....Production
FHADM.....Harvested Area
FYDM.....Yield
FCONDM.....Total Consumption
FNIDM.....Net Imports
FESDM.....Ending Stocks

Soybean Complex

SPRODM.....Production
SHADM.....Harvested Area
SYDM.....Yield
SMCODM.....Soymeal Equiv. Consumption
SOCODM.....Soyoil Equiv. Consumption
SMEIDM.....Soymeal Equiv. Net Imports
SOEIDM.....Soyoil Equiv. Net Imports
PMELDM.....% SMEIDM Imported as SMNIDM
SMNIDM.....Soymeal Net Imports
SONIDM.....Soyoil Net Imports
SNIDM.....Soybean Net Imports
SMESDM.....Soymeal Ending Stocks
SOESDM.....Soyoil Ending Stocks
SESDM.....Soybean Ending Stocks



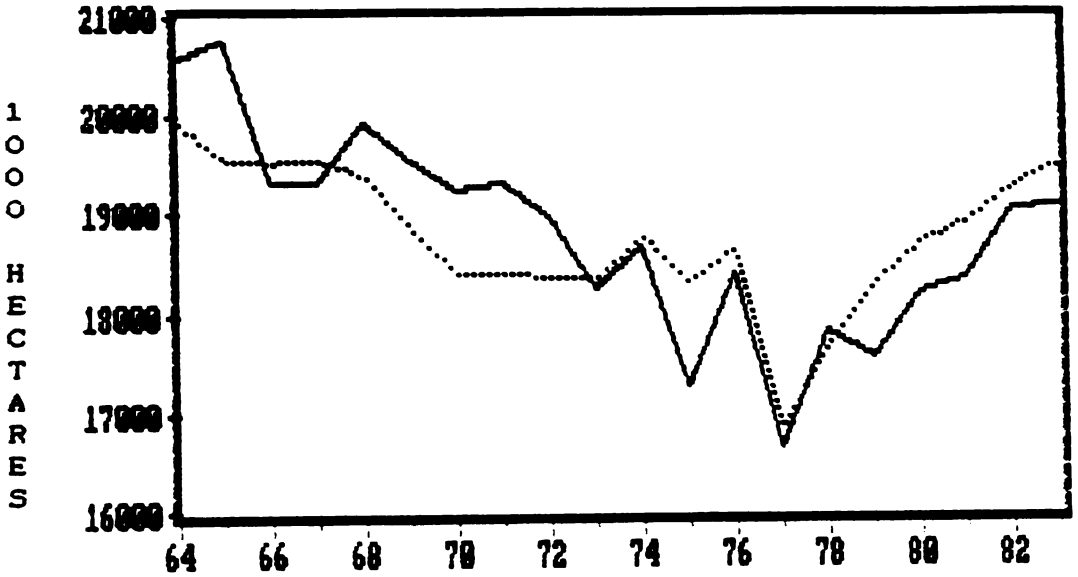
REGIONAL MODEL SIMULATION



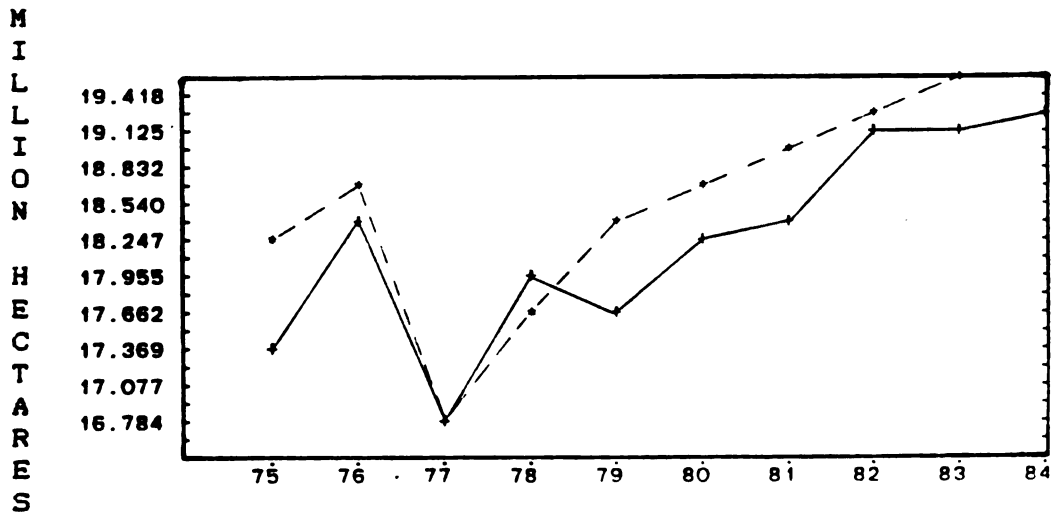
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.1.a & b. Wheat Production - Developed Markets



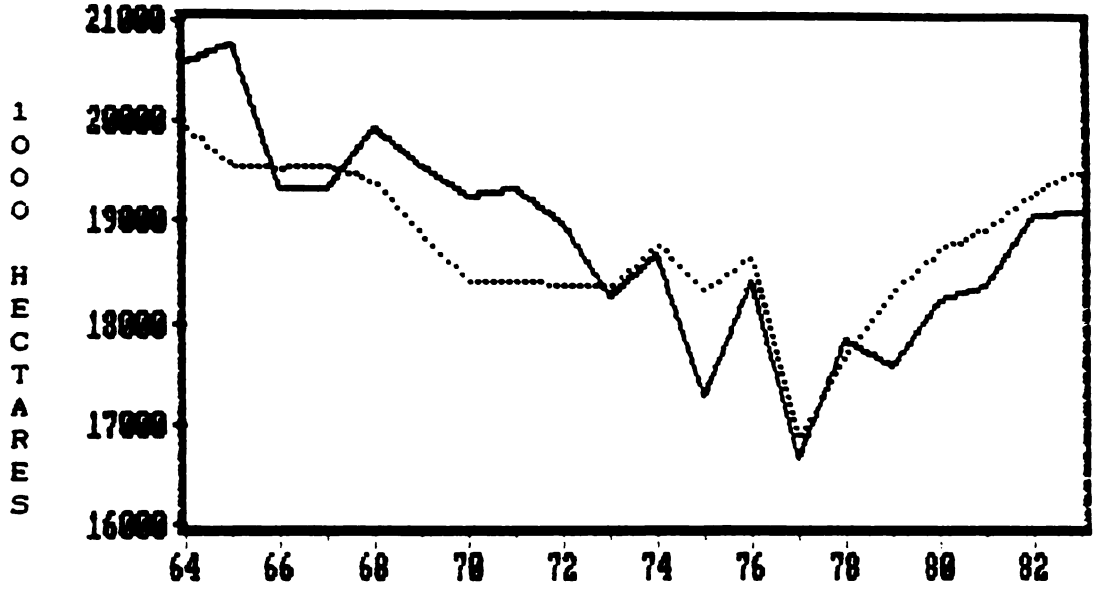
REGIONAL MODEL SIMULATION



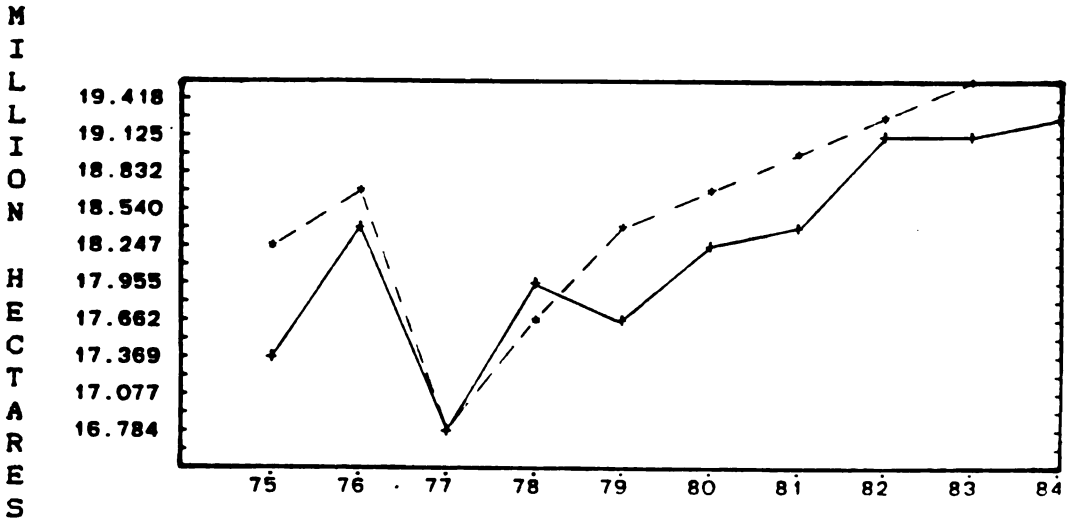
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.2.a & b. Wheat Harvested Area - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.2.a & b. Wheat Harvested Area - Developed Markets

Developed Markets
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is WHADM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-810.05210	5013.2459	-0.1615824	0.874
WHADM(-1)	0.7698595	0.1479979	5.2018265	0.000
WFRR(-1)	5058.8976	2897.7776	1.7457853	0.100
DV77	-2271.6661	634.08281	-3.5826015	0.002

R-squared	0.725762	Mean of dependent var	18815.85
Adjusted R-squared	0.674343	S.D. of dependent var	1038.082
S.E. of regression	592.3957	Sum of squared resid	5614923.
Durbin-Watson stat	2.217587	F-statistic	14.11452
Log likelihood	-153.8308	TPE	6/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	661.824	20577.0	19915.2
	1965	736.551	20763.0	20026.4
*	1966	-1163.86	19306.0	20469.9
*	1967	-51.7633	19319.0	19370.8
*	1968	737.113	19950.0	19212.9
*	1969	265.882	19545.0	19279.1
*	1970	309.407	19245.0	18935.6
*	1971	252.697	19309.0	19056.3
*	1972	-69.3462	18980.0	19049.3
*	1973	-558.367	18259.0	18817.4
*	1974	-37.9132	18655.0	18692.9
*	1975	-957.523	17275.0	18232.5
*	1976	557.012	18392.0	17835.0
*	1977	-2.1D-12	16638.0	16638.0
*	1978	318.733	17851.0	17532.3
*	1979	-853.932	17568.0	18421.9
*	1980	59.1913	18205.0	18145.8
*	1981	-164.222	18364.0	18528.2
*	1982	198.675	19043.0	18844.3
*	1983	-240.162	19073.0	19313.2

INDEPENDENT VARIABLES

WHADM = Wheat Harvested Area (1000 HA)

WFRR = Wheat Revenue/Coarse Grain Revenue Ratio

$$\frac{(WYDM(-3)+WYDM(-2)+WYDM(-1)+WYDM)/4*WP**XRDM/CPIDM}{(FYDM(-3)+FYDM(-2)+FYDM(-1)+FYDM)/4*FP**XRDM/CPIDM}$$

DV77 = 1 If(YEAR .EQ. 77)
0 Otherwise

---

* The relevant prices for determining revenue are the EC producer prices.

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
WHADM	18815.850	1038.0818	20763.000	16638.000
WHADM(-1)	18862.300	1070.4730	20763.000	16638.000
WFRR(-1)	1.0314826	0.0566632	1.0991450	0.9252701
DV77	0.0500000	0.2236068	1.0000000	0.0000000

	Covariance	Correlation
WHADM, WHADM	1023733.2	1.0000000
WHADM, WHADM(-1)	742192.05	0.7030486
WHADM, WFRR(-1)	-14.976373	-0.2680094
WHADM, DV77	-108.89250	-0.4938076
WHADM(-1), WHADM(-1)	1088616.9	1.0000000
WHADM(-1), WFRR(-1)	-29.513990	-0.5121854
WHADM(-1), DV77	-23.515000	-0.1034095
WFRR(-1), WFRR(-1)	0.0030502	1.0000000
WFRR(-1), DV77	0.0033831	0.2810658
DV77, DV77	0.0475000	1.0000000

Developed Markets
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-21.741812	1.3428036	-16.191356	0.000
LOGT	5.7434015	0.3147626	18.246775	0.000

R-squared	0.938019	Mean of dependent var	2.753630
Adjusted R-squared	0.935201	S.D. of dependent var	0.590354
S.E. of regression	0.150278	Sum of squared resid	0.496838
Durbin-Watson stat	1.949023	F-statistic	332.9448
Log likelihood	12.47602		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.08333	1.85699	1.77366
	1961	0.01039	1.87898	1.86859
	1962	0.24346	2.20543	1.96197
	1963	-0.10452	1.94936	2.05388
	1964	0.06450	2.20883	2.14432
	1965	0.04770	2.28108	2.23337
	1966	-0.17193	2.14913	2.32106
	1967	0.14974	2.55717	2.40743
	1968	-0.00054	2.49198	2.49252
	1969	-0.15539	2.42098	2.57636
	1970	-0.28602	2.37298	2.65900
	1971	0.01731	2.75778	2.74047
	1972	-0.01311	2.80769	2.82080
	1973	-0.00622	2.89381	2.90002
	1974	0.15901	3.13718	2.97816
	1975	-0.12993	2.92533	3.05526
	1976	-0.24268	2.88865	3.13133
	1977	-0.20935	2.99706	3.20640
	1978	0.11235	3.39286	3.28052
	1979	-0.03202	3.32166	3.35368
	1980	0.24268	3.66861	3.42593
	1981	-0.02298	3.47430	3.49727
	1982	0.18098	3.74873	3.56775
	1983	0.06321	3.70057	3.63736

INDEPENDENT VARIABLES

LOGT = Ln(TIME)

SMPL 1960 - 1983
24 Observations

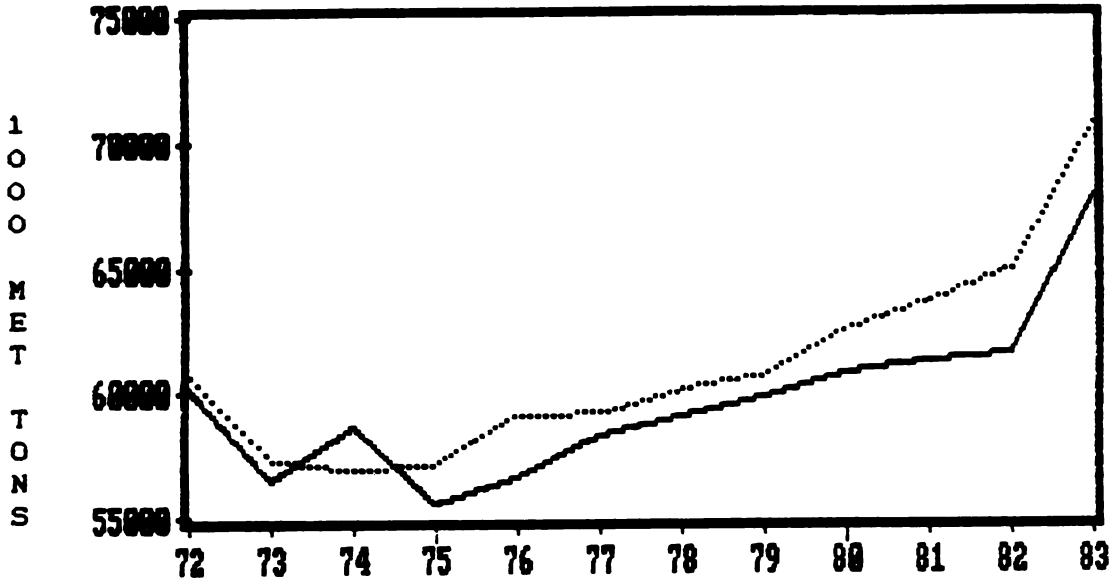
Series	Mean	S.D.	Maximum	Minimum
WYDM	2.7536297	0.5903539	3.7487270	1.8569900
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYDM, WYDM	0.3339962	1.0000000
WYDM, LOGT	0.0545486	0.9685136
LOGT, LOGT	0.0094976	1.0000000

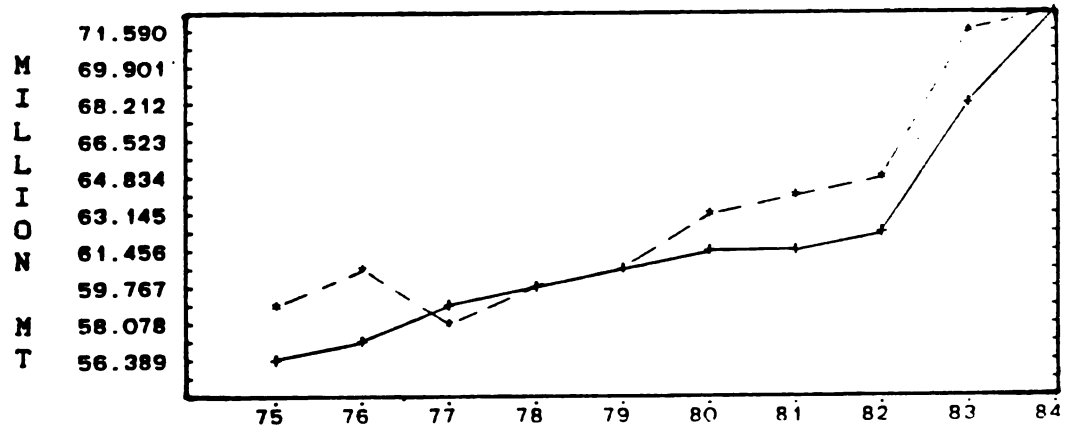
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYDM	2.7536297	0.5903539	3.7487270	1.8569900
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYDM, WYDM	0.3339962	1.0000000
WYDM, LOGT	0.0545486	0.9685136
LOGT, LOGT	0.0094976	1.0000000



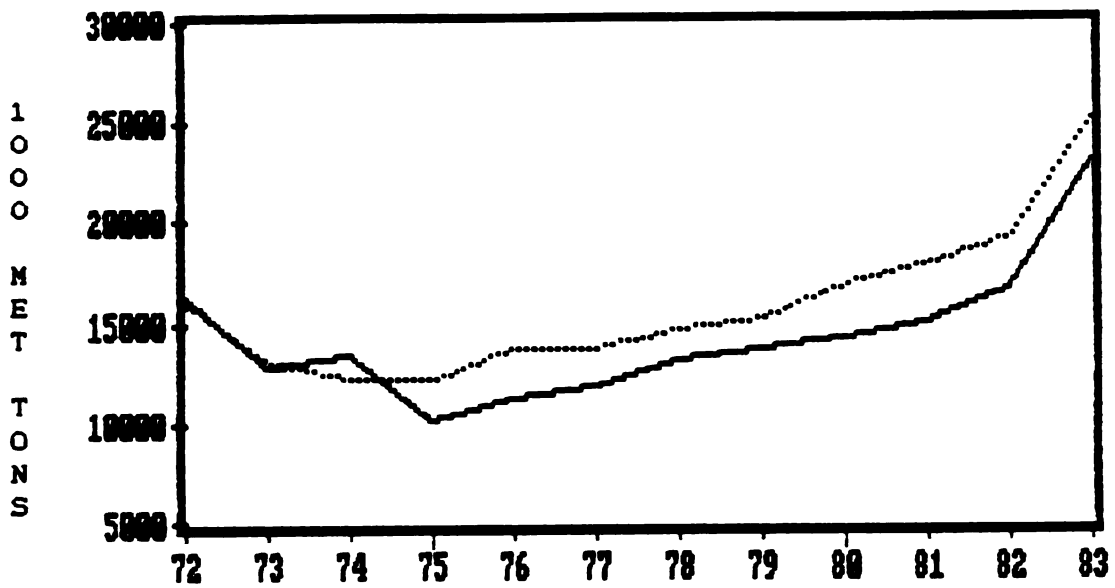
REGIONAL MODEL SIMULATION



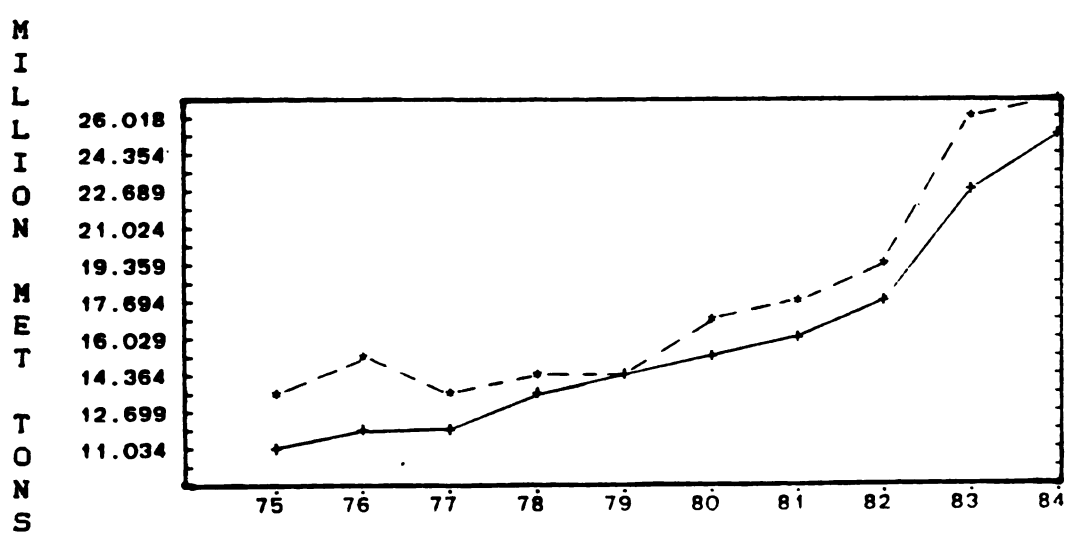
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.3.a & b. Total Wheat Consumption - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.4.a & b. Wheat Feed Consumption - Developed Markets

Developed Markets
Per Capita Wheat Feed Consumption (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWFED

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0236644	0.0054712	-4.3252781	0.000
PCWFED(-1)	0.8045101	0.1163623	6.9138377	0.000
SUBSI1	0.0044037	0.0013279	3.3163412	0.004
SMPECU	0.0016889	0.0006760	2.4984378	0.022
PCDWSU	0.1642453	0.0354874	4.6282668	0.000
DV83	0.0095874	0.0022879	4.1904998	0.001

R-squared	0.935938	Mean of dependent var	0.027952
Adjusted R-squared	0.918143	S.D. of dependent var	0.007360
S.E. of regression	0.002106	Sum of squared resid	7.98D-05
Durbin-Watson stat	2.252156	F-statistic	52.59549
Log likelihood	117.3121	TPE	6/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00172	0.01886	0.02058
	1962	-0.00066	0.02172	0.02238
	1963	-0.00236	0.01940	0.02176
	1964	0.00190	0.02259	0.02069
	1965	-0.00238	0.02259	0.02496
	1966	-0.00039	0.02195	0.02234
	1967	-0.00081	0.02350	0.02431
	1968	0.00110	0.02644	0.02534
	1969	0.00291	0.03050	0.02759
	1970	0.00347	0.03134	0.02787
	1971	-0.00098	0.03029	0.03127
	1972	0.00088	0.03480	0.03392
	1973	-0.00094	0.02703	0.02796
	1974	0.00324	0.02816	0.02491
	1975	-0.00444	0.02123	0.02567
	1976	-0.00049	0.02328	0.02377
	1977	0.00135	0.02436	0.02301
	1978	0.00118	0.02717	0.02599
	1979	0.00059	0.02789	0.02731
	1980	-0.00106	0.02910	0.03016
	1981	-2.0D-05	0.03055	0.03057
	1982	0.00060	0.03376	0.03316
	1983	6.1D-18	0.04591	0.04591
	1984	-0.00097	0.04843	0.04940

INDEPENDENT VARIABLES

PCWFED = **Wheat Fed Per Capita (1000 MT)**
WFEDDM/POPDM

SUBSID1 = **Real Export Subsidy**
$(WP^{DM}*XRDM/CPIDM)-(WP*XRDM/CPIDM)$

SMPECU = **Real Developed Market Soymeal Price**
SMP*XRDM/CPIDM

PCDWSU = **Domestic Wheat Supply Per Capita (1000 MT)**
(WESDM(-1) + WPRODM)/POPDM

DV83 = **1 If(YEAR .EQ. 83)**
0 Otherwise

SMPL 1961 - 1984
24 Observations

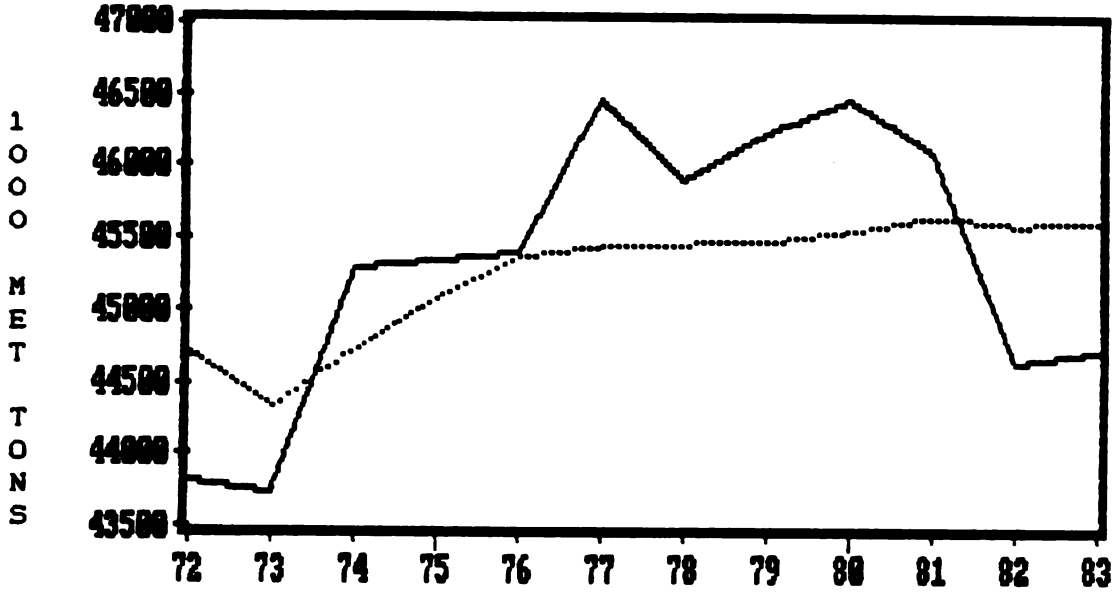
Series	Mean	S.D.	Maximum	Minimum
PCWFED	0.0279521	0.0072599	0.0484296	0.0188592
PCWFED(-1)	0.0268209	0.0060445	0.0459145	0.0188592
SUBSI1	0.5377127	0.4175873	0.9671328	-0.6899490
SMPECU	2.3408371	0.7670341	5.2486120	1.1522590
PCDWSU	0.1419710	0.0205178	0.2046272	0.1125684
DV83	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
PCWFED,PCWFED	5.191D-05	1.0000000
PCWFED,PCWFED(-1)	3.637D-05	0.8531180
PCWFED,SUBSI1	-0.0010930	-0.3711012
PCWFED,SMPECU	-0.0014662	-0.2710150
PCWFED,PCDWSU	0.0001183	0.8177976
PCWFED,DV83	0.0007484	0.5198430
PCWFED(-1),PCWFED(-1)	3.501D-05	1.0000000
PCWFED(-1),SUBSI1	-0.0014529	-0.6006196
PCWFED(-1),SMPECU	-0.0012986	-0.2422745
PCWFED(-1),PCDWSU	8.537D-05	0.7182696
PCWFED(-1),DV83	0.0002891	0.2445259
SUBSI1,SUBSI1	0.1671134	1.0000000
SUBSI1,SMPECU	0.0336430	0.1096016
SUBSI1,PCDWSU	-0.0037721	-0.4594010
SUBSI1,DV83	-0.0101537	-0.1242990
SMPECU,SMPECU	0.5638272	1.0000000
SMPECU,PCDWSU	-0.0076988	-0.5104553
SMPECU,DV83	-0.0268419	-0.1788905
PCDWSU,PCDWSU	0.0004034	1.0000000
PCDWSU,DV83	0.0013580	0.3383348
DV83,DV83	0.0399306	1.0000000

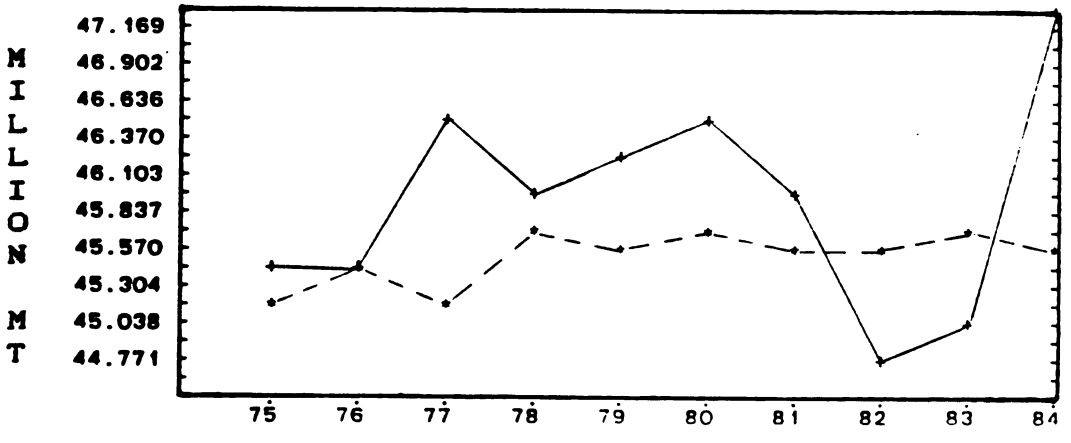
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFED	0.0279521	0.0072599	0.0484296	0.0188592
PCWFED(-1)	0.0268209	0.0060445	0.0459145	0.0188592
SUBSI1	0.5377127	0.4175873	0.9671328	-0.6899490
SMPECU	2.3408371	0.7670341	5.2486120	1.1522590
PCDWSU	0.1419710	0.0205178	0.2046272	0.1125684
DV83	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
PCWFED, PCWFED	5.191D-05	1.0000000
PCWFED, PCWFED(-1)	3.637D-05	0.8531180
PCWFED, SUBSI1	-0.0010930	-0.3711012
PCWFED, SMPECU	-0.0014662	-0.2710150
PCWFED, PCDWSU	0.0001183	0.8177976
PCWFED, DV83	0.0007484	0.5198430
PCWFED(-1), PCWFED(-1)	3.501D-05	1.0000000
PCWFED(-1), SUBSI1	-0.0014529	-0.6006196
PCWFED(-1), SMPECU	-0.0012986	-0.2922745
PCWFED(-1), PCDWSU	8.537D-05	0.7182696
PCWFED(-1), DV83	0.0002891	0.2445259
SUBSI1, SUBSI1	0.1671134	1.0000000
SUBSI1, SMPECU	0.0336430	0.1096016
SUBSI1, PCDWSU	-0.0037721	-0.4594010
SUBSI1, DV83	-0.0101537	-0.1242990
SMPECU, SMPECU	0.5638272	1.0000000
SMPECU, PCDWSU	-0.0076988	-0.5104553
SMPECU, DV83	-0.0268419	-0.1788905
PCDWSU, PCDWSU	0.0004034	1.0000000
PCDWSU, DV83	0.0013580	0.3383348
DV83, DV83	0.0399306	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.5.a & b. Wheat Food and Residual Consumption - Developed Markets

Developed Markets
Per Capita Wheat Food and Residual Consumption (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWFOD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1309894	0.0050745	25.813376	0.000
YEAR	-0.0004697	5.668D-05	-8.2866348	0.000
WPDM	-0.0010173	0.0008076	-1.2596819	0.222

R-squared	0.818267	Mean of dependent var	0.095376
Adjusted R-squared	0.800093	S.D. of dependent var	0.003229
S.E. of regression	0.001444	Sum of squared resid	4.17D-05
Durbin-Watson stat	0.908396	F-statistic	45.02567
Log likelihood	119.4006	TPE	4/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00094	0.10090	0.09996
	1962	0.00232	0.10188	0.09956
	1963	0.00089	0.10005	0.09917
	1964	-0.00100	0.09779	0.09879
	1965	0.00051	0.09914	0.09863
	1966	-0.00069	0.09728	0.09798
	1967	-0.00098	0.09671	0.09769
	1968	-0.00151	0.09573	0.09724
	1969	-0.00113	0.09598	0.09711
	1970	-0.00155	0.09499	0.09654
	1971	-0.00033	0.09586	0.09619
	1972	-0.00186	0.09337	0.09523
	1973	-0.00123	0.09236	0.09360
	1974	0.00121	0.09496	0.09375
	1975	0.00058	0.09436	0.09378
	1976	0.00012	0.09394	0.09382
	1977	0.00213	0.09559	0.09346
	1978	0.00091	0.09389	0.09298
	1979	0.00155	0.09400	0.09245
	1980	0.00190	0.09399	0.09209
	1981	0.00093	0.09266	0.09173
	1982	-0.00193	0.08924	0.09117
	1983	-0.00177	0.08897	0.09075

INDEPENDENT VARIABLES

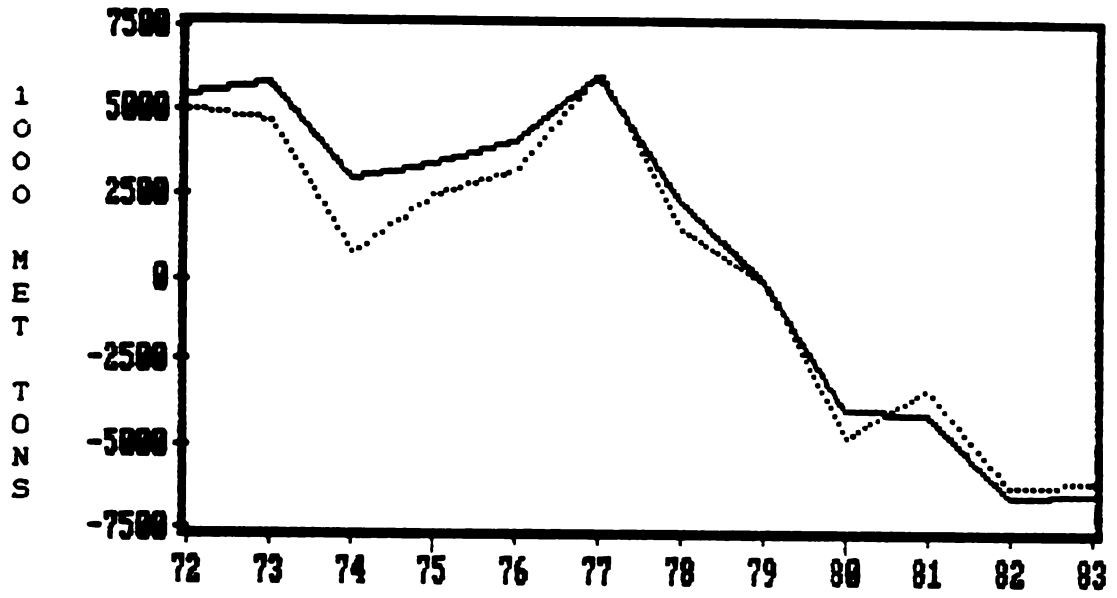
YEAR = 1960=60, 1961=61, ...

WPDM = Real Developed Market Border Wheat Price
WP*XRDM/CPIDM

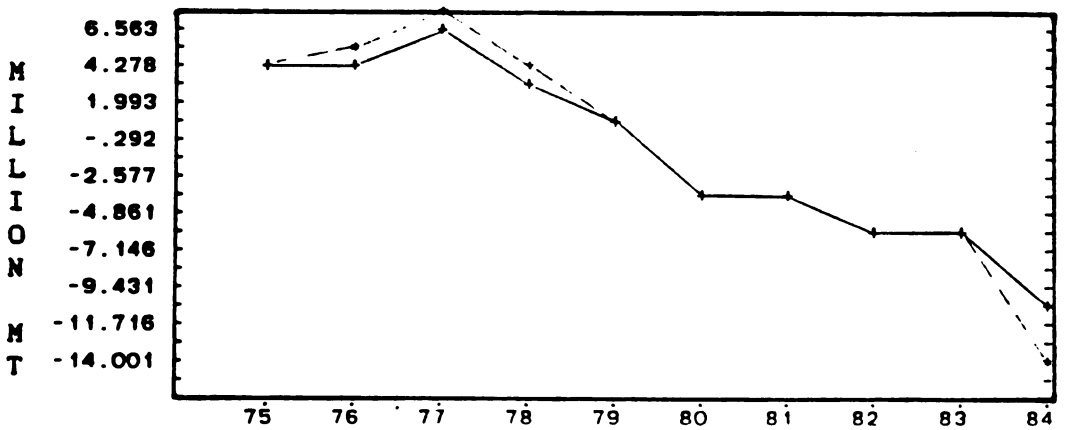
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWFOD	0.095376	0.003229	0.101876	0.088973
YEAR	72.000000	6.782330	83.000000	61.000000
WPDM	1.766128	0.475986	3.053849	1.193864

	Covariance	Correlation
PCWFOD, PCWFOD	9.976D-06	1.0000000
PCWFOD, YEAR	-0.018784	-0.8965757
PCWFOD, WPDM	0.000648	0.4407953
YEAR, YEAR	44.000000	1.0000000
YEAR, WPDM	-1.849353	-0.598897
WPDM, WPDM	0.216712	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.6.a & b. Wheat Net Imports - Developed Markets

Developed Markets
Per Capita Wheat Net Imports (1000 MT)

EMPL 1961 - 1994
24 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0940195	0.0073325	12.822241	0.000
PCDWSU	-0.6090029	0.0467331	-13.031522	0.000
SUBSI1	0.0032196	0.0022962	1.4021308	0.175

R-squared	0.919237	Mean of dependent var	0.009290
Adjusted R-squared	0.911545	S.D. of dependent var	0.013734
S.E. of regression	0.004085	Sum of squared resid	0.000350
Durbin-Watson stat	1.072123	F-statistic	119.5099
Log likelihood	99.56086	TPE	6/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00320	0.03173	0.02853
	1962	0.00435	0.02020	0.01584
	1963	0.00035	0.02417	0.02382
	1964	-0.00210	0.01623	0.01833
	1965	0.00267	0.01922	0.01655
	1966	0.00084	0.02267	0.02183
	1967	0.00073	0.01488	0.01415
	1968	0.00521	0.01623	0.01102
	1969	-0.00247	0.01393	0.01640
	1970	0.00311	0.02736	0.02425
	1971	0.00264	0.01749	0.01485
	1972	0.00123	0.01165	0.01042
	1973	0.00195	0.01228	0.01034
	1974	0.00384	0.00604	0.00220
	1975	-0.00403	0.00702	0.01105
	1976	-0.00388	0.00841	0.01229
	1977	-0.00384	0.01230	0.01614
	1978	-0.00141	0.00462	0.00602
	1979	-0.00438	-3.7D-05	0.00434
	1980	-0.00449	-0.00806	-0.00357
	1981	-0.00674	-0.00824	-0.00150
	1982	-0.00440	-0.01321	-0.00881
	1983	-0.00154	-0.01288	-0.01134
	1984	0.00916	-0.02102	-0.03018

INDEPENDENT VARIABLES

SUBSID1 = Real Export Subsidy
$(WP^{DM}*XRDM/CPIDM)-(WP*XRDM/CPIDM)$

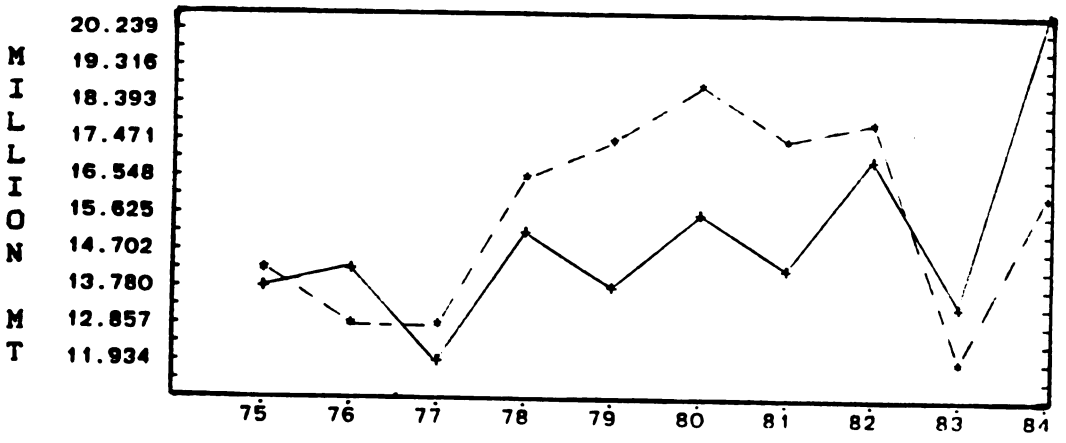
PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESDM(-1) + WPRODM)/POPDM

SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0092900	0.0137336	0.0317316	-0.0210204
PCDWSU	0.1419710	0.0205178	0.2046272	0.1125684
SUBSI1	0.5377127	0.4175873	0.9671328	-0.6899490

	Covariance	Correlation
PCWNI,PCWNI	0.0001808	1.0000000
PCWNI,PCDWSU	-0.0002576	-0.9548173
PCWNI,SUBSI1	0.0028353	0.5158783
PCDWSU,PCDWSU	0.0004034	1.0000000
PCDWSU,SUBSI1	-0.0037721	-0.4594010
SUBSI1,SUBSI1	0.1671134	1.0000000

REGIONAL MODEL SIMULATION

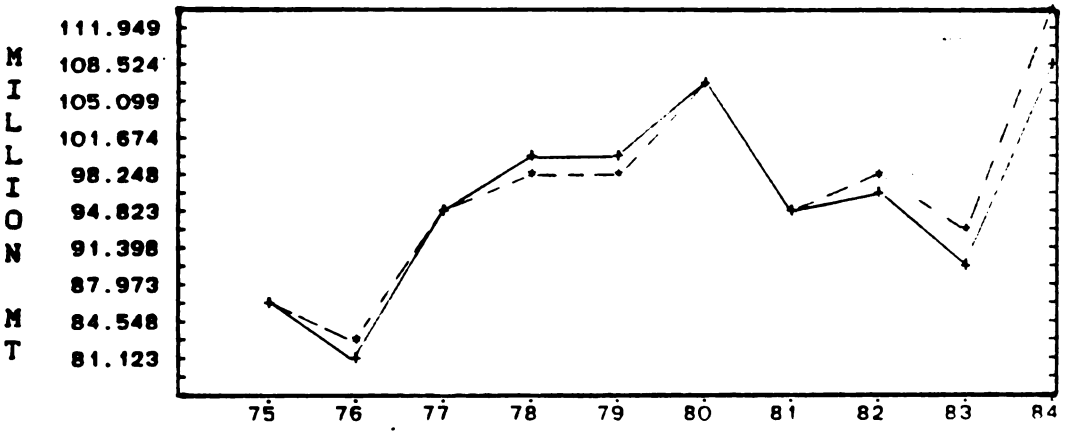


EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.7.a & b. Wheat Ending Stocks - Developed Markets

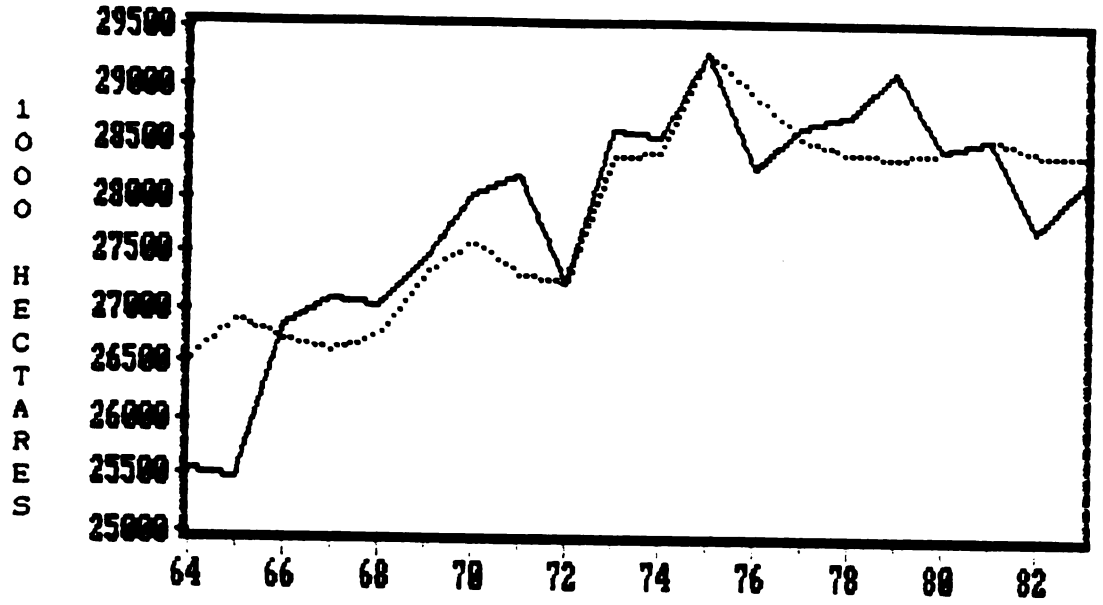
REGIONAL MODEL SIMULATION



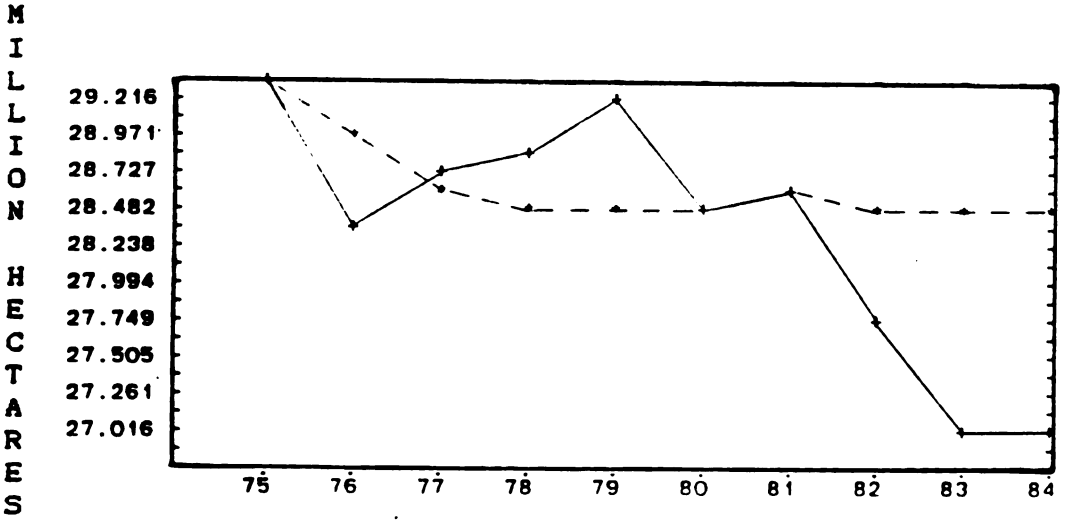
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.8.a & b. Coarse Grain Production - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.9.a & b. Coarse Grain Harvested Area - Developed Markets

Developed Markets
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is FHADM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	9282.8629	5207.7499	1.7825094	0.094
FHADM(-1)	0.4447501	0.1743560	2.5508165	0.021
FWRR(-1)	5725.3702	2677.6976	2.1381691	0.048
DV73ON	1177.0747	405.17375	2.9051109	0.010

R-squared	0.757761	Mean of dependent var	27846.70
Adjusted R-squared	0.712341	S.D. of dependent var	1054.102
S.E. of regression	565.3555	Sum of squared resid	5114030.
Durbin-Watson stat	1.694213	F-statistic	16.68346
Log likelihood	-152.8964	TPE	6/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1964	-986.715	25550.0	26536.7
*	1965	-961.723	25483.0	26444.7
*	1966	756.815	26843.0	26086.2
*	1967	415.193	27083.0	26667.8
*	1968	66.9067	27019.0	26952.1
*	1969	33.5680	27456.0	27422.4
*	1970	347.864	28006.0	27658.1
*	1971	735.471	28209.0	27473.5
*	1972	-407.379	27221.0	27628.4
*	1973	282.596	28624.0	28341.4
*	1974	24.2242	28533.0	28508.8
*	1975	-56.7726	29281.0	29337.8
*	1976	-629.845	28271.0	28900.8
*	1977	407.599	28650.0	28242.4
*	1978	309.564	28746.0	28436.4
*	1979	585.745	29107.0	28521.3
*	1980	-312.407	28426.0	28738.4
*	1981	-14.7288	28529.0	28543.7
*	1982	-669.486	27729.0	28398.5
*	1983	73.5109	28168.0	28094.5

INDEPENDENT VARIABLES

FHADM = Coarse Grain Harvested Area (1000 HA)

FWRR = Coarse Grain/Wheat Revenue Ratio

$$\frac{(FYDM(-3)+FYDM(-2)+FYDM(-1)+FYDM)/4*FP**XRDM/CPIDM}{(WYDM(-3)+WYDM(-2)+WYDM(-1)+WYDM)/4*WP**XRDM/CPIDM}$$

DV73ON = 1 If(TIME .GE. 73)
0 Otherwise

---

* The relevant prices for determining revenue are the EC producer prices.

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
FHADM	27846.700	1054.1017	29281.000	25483.000
FHADM(-1)	27766.700	1088.5847	29281.000	25483.000
FWRR(-1)	0.9723743	0.0555555	1.0807650	0.9097983
DV73ON	0.5500000	0.5104178	1.0000000	0.0000000

	Covariance	Correlation
FHADM, FHADM	1055573.9	1.0000000
FHADM, FHADM(-1)	853632.56	0.7830736
FHADM, FWRR(-1)	-6.2729328	-0.1127554
FHADM, DV73ON	387.51500	0.7581525
FHADM(-1), FHADM(-1)	1125765.9	1.0000000
FHADM(-1), FWRR(-1)	-17.333875	-0.3017050
FHADM(-1), DV73ON	384.16500	0.7277901
FWRR(-1), FWRR(-1)	0.0029321	1.0000000
FWRR(-1), DV73ON	-0.0130417	-0.4841240
DV73ON, DV73ON	0.2475000	1.0000000

Developed Markets
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-16.112811	1.4760391	-10.916250	0.000
LOGT	4.4501876	0.3459939	12.862042	0.000

R-squared	0.882624	Mean of dependent var	2.867111
Adjusted R-squared	0.877289	S.D. of dependent var	0.471563
S.E. of regression	0.165189	Sum of squared resid	0.600323
Durbin-Watson stat	1.485184	F-statistic	165.4321
Log likelihood	10.20556		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.06460	2.17239	2.10779
	1961	-0.06869	2.11266	2.18135
	1962	-0.04170	2.21200	2.25371
	1963	-0.09889	2.22602	2.32492
	1964	-0.07938	2.31562	2.39500
	1965	-0.08265	2.38135	2.46400
	1966	0.01889	2.55083	2.53194
	1967	0.02740	2.62626	2.59886
	1968	0.03379	2.69858	2.66479
	1969	0.03302	2.76278	2.72976
	1970	-0.05955	2.73424	2.79379
	1971	0.22721	3.08412	2.85691
	1972	0.07519	2.99434	2.91916
	1973	0.22299	3.20354	2.98054
	1974	0.12598	3.16707	3.04109
	1975	-0.17643	2.92439	3.10082
	1976	-0.35088	2.80889	3.15976
	1977	0.07009	3.28803	3.21794
	1978	0.15158	3.42695	3.27536
	1979	0.08345	3.41550	3.33205
	1980	0.35611	3.74414	3.38803
	1981	-0.16167	3.28164	3.44331
	1982	-0.07046	3.42746	3.49792
	1983	-0.30001	3.25185	3.55186

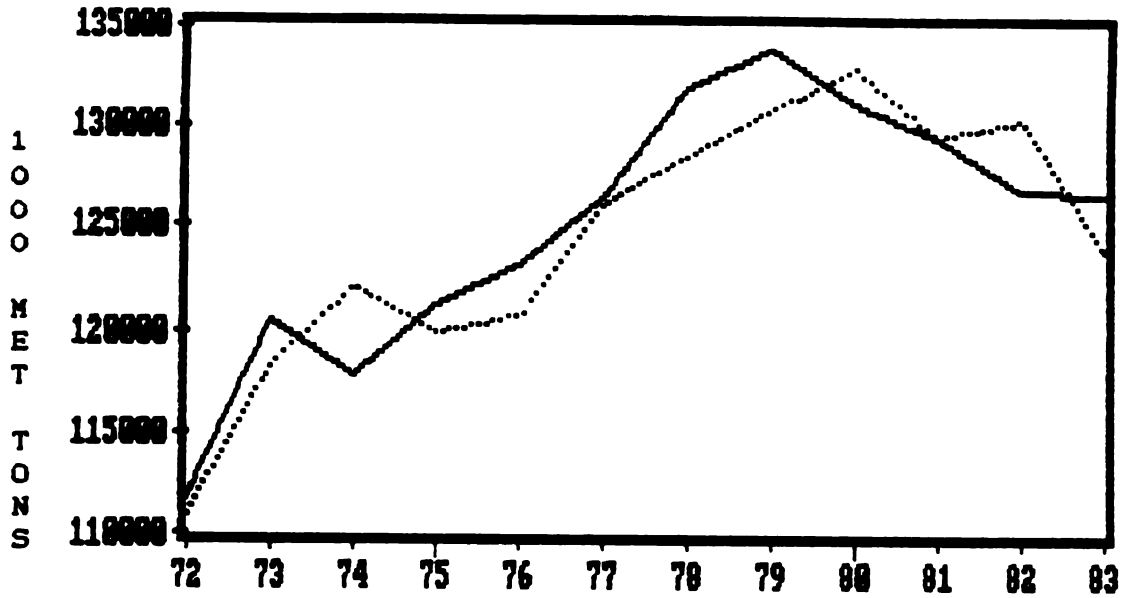
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

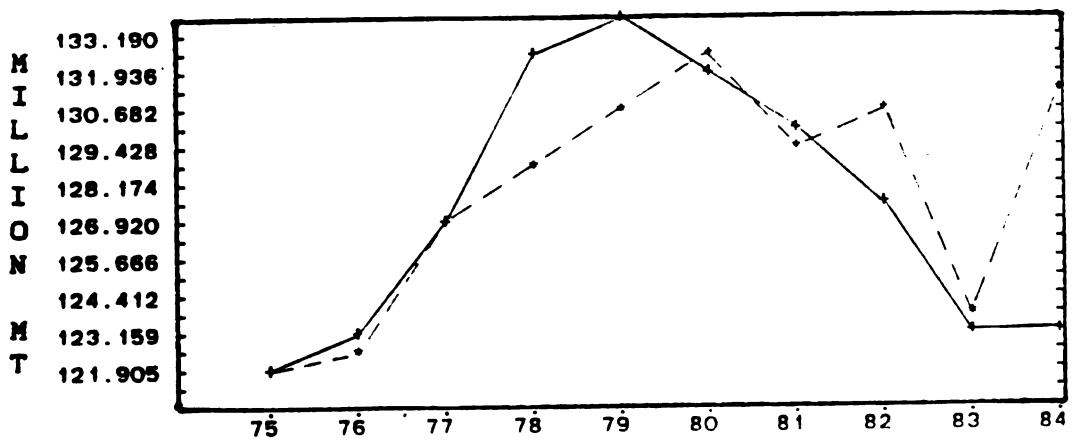
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYDM	2.8671105	0.4715626	3.7441430	2.1186630
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYDM, FYDM	0.2131059	1.0000000
FYDM, LOGT	0.0422662	0.9394808
LOGT, LOGT	0.0094976	1.0000000



REGIONAL MODEL SIMULATION

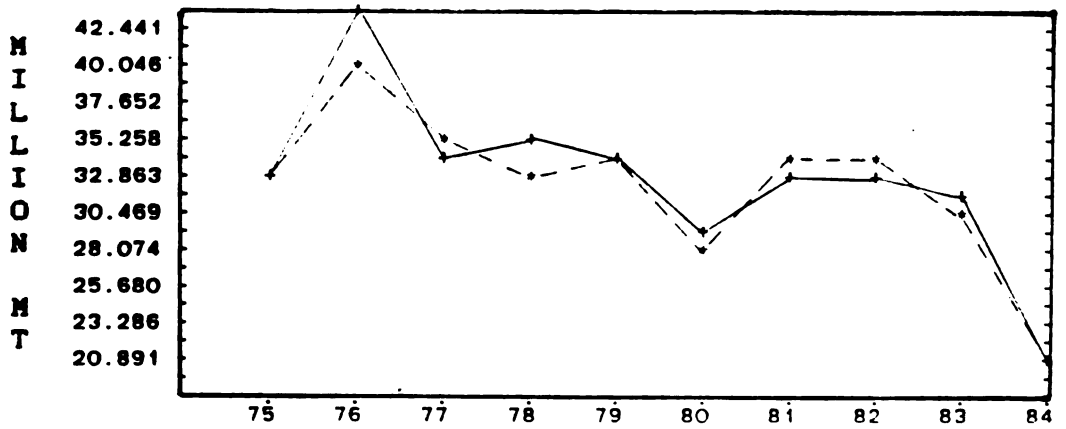


EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.10 a & b. Total Coarse Grain Consumption - Developed Markets

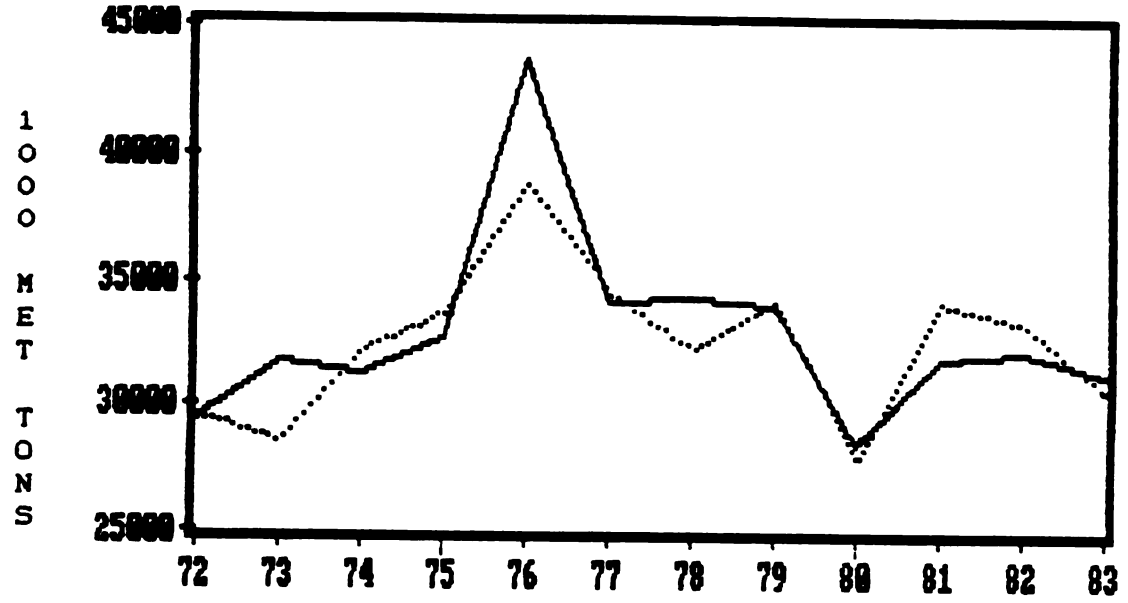
REGIONAL MODEL SIMULATION



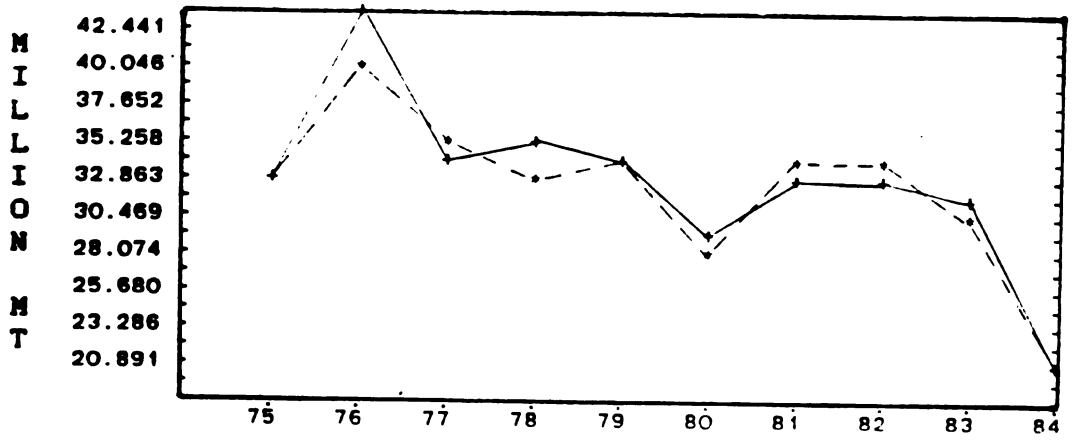
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.11.a & b. Coarse Grain Net Imports - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.11.a & b. Coarse Grain Net Imports - Developed Markets

Developed Markets
Coarse Grain Net Imports Per Capita (1000 MT)

```
SMPL   1961 -  1983
23 Observations
LS // Dependent Variable is PCFNI
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0923080	0.0176494	5.2717585	0.000
PCRGDP	57291.755	11561.471	4.9554037	0.000
PCDWSU	-0.2095423	0.1361149	-1.5394512	0.142
PCDFSU	-0.5290123	0.1458022	-3.6282868	0.002
CSMPEC	0.0049962	0.0023795	2.0997030	0.051
DV83ON	-0.0124214	0.0076019	-1.6342998	0.120

R-squared	0.792883	Mean of dependent var	0.059697
Adjusted R-squared	0.731967	S.D. of dependent var	0.011204
S.E. of regression	0.005800	Sum of squared resid	0.000572
Durbin-Watson stat	1.010736	F-statistic	13.01587
Log likelihood	89.28699	TPE	3/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-0.01129	0.03691	0.04820
*	1962	-0.00327	0.04161	0.04488
*	1963	0.00108	0.04888	0.04780
*	1964	-0.00135	0.05031	0.05166
*	1965	0.00815	0.06248	0.05433
*	1966	0.00661	0.05609	0.04948
*	1967	0.00860	0.05463	0.04603
*	1968	0.00741	0.05700	0.04959
*	1969	-0.00274	0.05339	0.05613
*	1970	-0.00584	0.05940	0.06524
*	1971	-0.00539	0.04761	0.05300
*	1972	-0.00151	0.06279	0.06429
*	1973	0.00426	0.06699	0.06273
*	1974	-0.00278	0.06542	0.06820
*	1975	-0.00113	0.06779	0.06892
*	1976	0.00674	0.09027	0.08354
*	1977	-0.00018	0.06989	0.07007
*	1978	0.00560	0.06974	0.06413
*	1979	0.00191	0.06895	0.06705
*	1980	-0.00075	0.05720	0.05795
*	1981	-0.00398	0.06371	0.06769
*	1982	-0.00617	0.06412	0.07029
*	1983	5.3D-19	0.06184	0.06184

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPDM/CPIDM/POPDM

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESDM(-1) + PRODM)/POPDM

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESDM(-1) + FPRODM)/POPDM

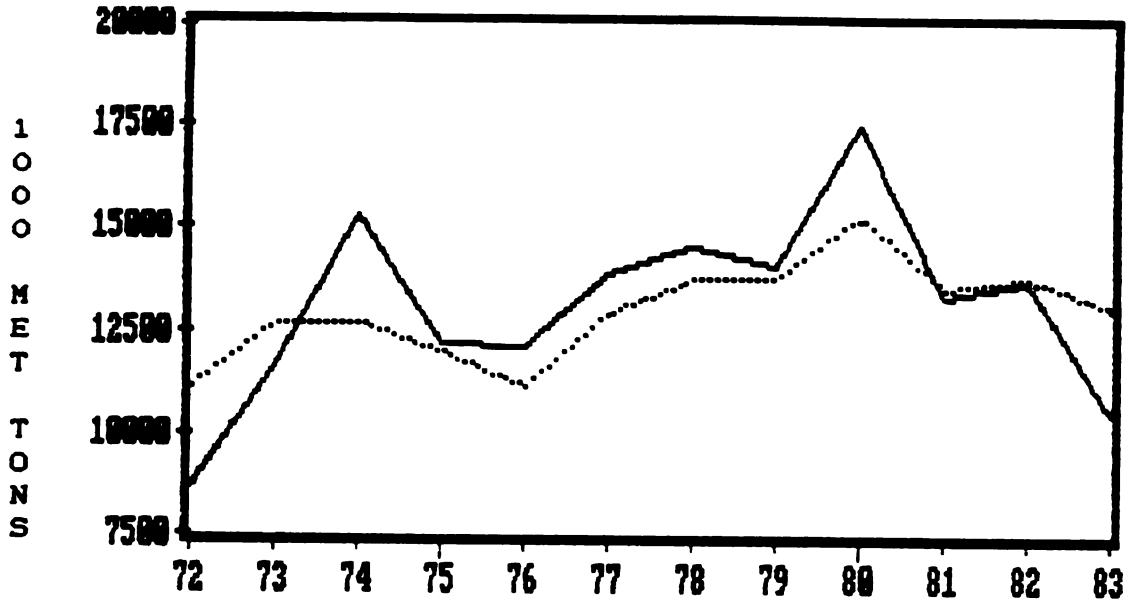
CSMPEC = Price of Enough Soymeal and Cassava to Replace 1 Ton of Coarse Grain
(CASP*XRDM/CPIDM)*.8 + (SMP*XRDM/CPIDM)*.2

DV83ON = 1 If(YEAR .GE. 83)
0 Otherwise

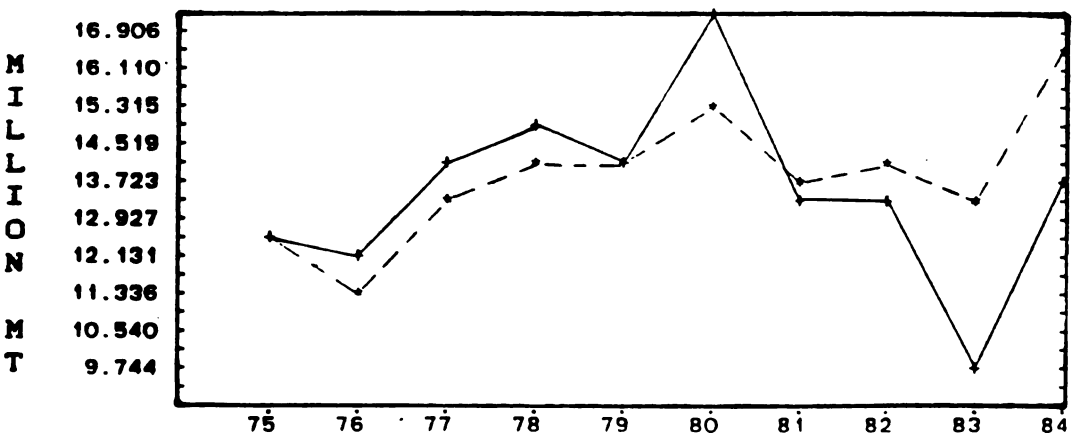
SMPL 1961 - - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0596966	0.0112036	0.0902746	0.0369094
PCRGDP	1.581D-06	3.970D-07	2.038D-06	9.042D-07
PCDWSU	0.1392468	0.0159347	0.1745622	0.1125684
PCDFSU	0.1941172	0.0289651	0.2436610	0.1481225
CSMPEC	0.6409965	0.7783870	2.2333140	0.0000000
DV83ON	0.0434783	0.2085144	1.0000000	0.0000000

	Covariance	Correlation
PCFNI,PCFNI	0.0001201	1.0000000
PCFNI,PCRGDP	3.015D-09	0.7086979
PCFNI,PCDWSU	6.369D-05	0.3729483
PCFNI,PCDFSU	0.0001727	0.5562709
PCFNI,CSMPEC	0.0056638	0.6789843
PCFNI,DV83ON	9.317D-05	0.0416938
PCRGDP,PCRGDP	1.508D-13	1.0000000
PCRGDP,PCDWSU	4.560D-09	0.7536006
PCRGDP,PCDFSU	1.041D-08	0.9465450
PCRGDP,CSMPEC	2.178D-07	0.7369229
PCRGDP,DV83ON	1.989D-08	0.2512436
PCDWSU,PCDWSU	0.0002429	1.0000000
PCDWSU,PCDFSU	0.0003096	0.7012958
PCDWSU,CSMPEC	0.0072442	0.6105983
PCDWSU,DV83ON	0.0015355	0.4831283
PCDFSU,PCDFSU	0.0008025	1.0000000
PCDFSU,CSMPEC	0.0147964	0.6861076
PCDFSU,DV83ON	0.0006710	0.1161492
CSMPEC,CSMPEC	0.5795434	1.0000000
CSMPEC,DV83ON	0.0294416	0.1896421
DV83ON,DV83ON	0.0415879	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.12.a & b. Coarse Grain Ending Stocks - Developed Markets

Developed Markets
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0072929	0.0043093	-1.6923718	0.105
PCDFSU	0.1569291	0.0219668	7.1439233	0.000

R-squared	0.708478	Mean of dependent var	0.023170
Adjusted R-squared	0.694596	S.D. of dependent var	0.005400
S.E. of regression	0.002984	Sum of squared resid	0.000187
Durbin-Watson stat	1.447388	F-statistic	51.03564
Log likelihood	102.1410		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00133	0.01728	0.01595
	1962	0.00228	0.01855	0.01627
	1963	0.00151	0.01855	0.01704
	1964	-0.00215	0.01469	0.01685
	1965	0.00158	0.01815	0.01658
	1966	0.00372	0.02340	0.01967
	1967	0.00040	0.02160	0.02121
	1968	-0.00216	0.01919	0.02135
	1969	-0.00404	0.01771	0.02175
	1970	-0.00160	0.01995	0.02156
	1971	-0.00421	0.02097	0.02518
	1972	-0.00486	0.01836	0.02323
	1973	-0.00142	0.02453	0.02596
	1974	0.00580	0.03206	0.02626
	1975	-0.00031	0.02536	0.02567
	1976	0.00263	0.02507	0.02244
	1977	0.00156	0.02859	0.02704
	1978	0.00097	0.02977	0.02880
	1979	-0.00050	0.02858	0.02908
	1980	0.00456	0.03551	0.03094
	1981	-0.00098	0.02680	0.02778
	1982	0.00070	0.02742	0.02672
	1983	-0.00481	0.02078	0.02559

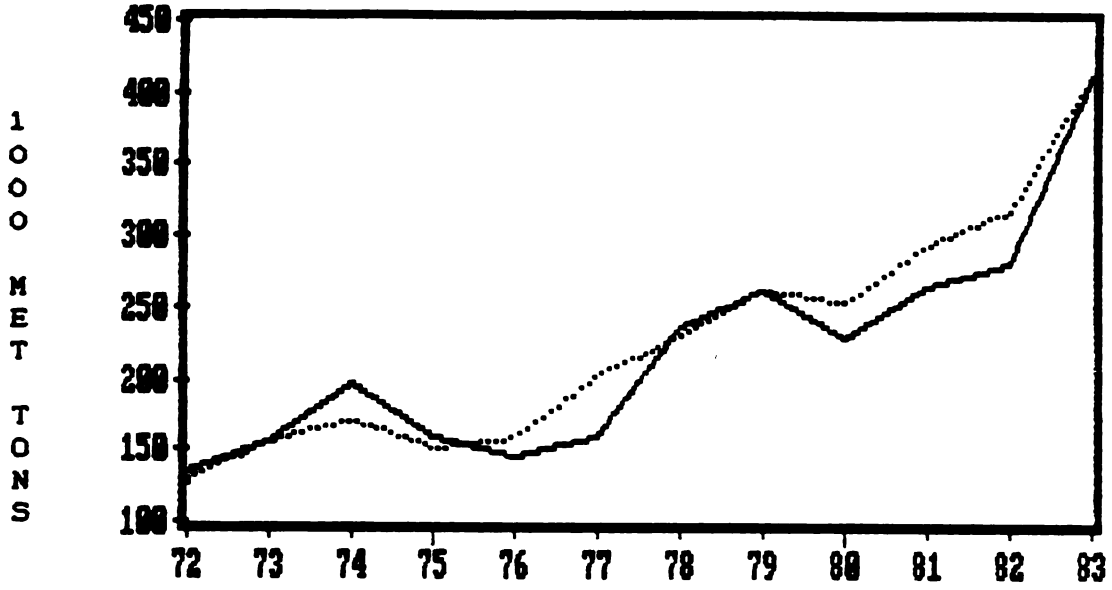
INDEPENDENT VARIABLES

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESDM(-1) + FRODM)/POPDM

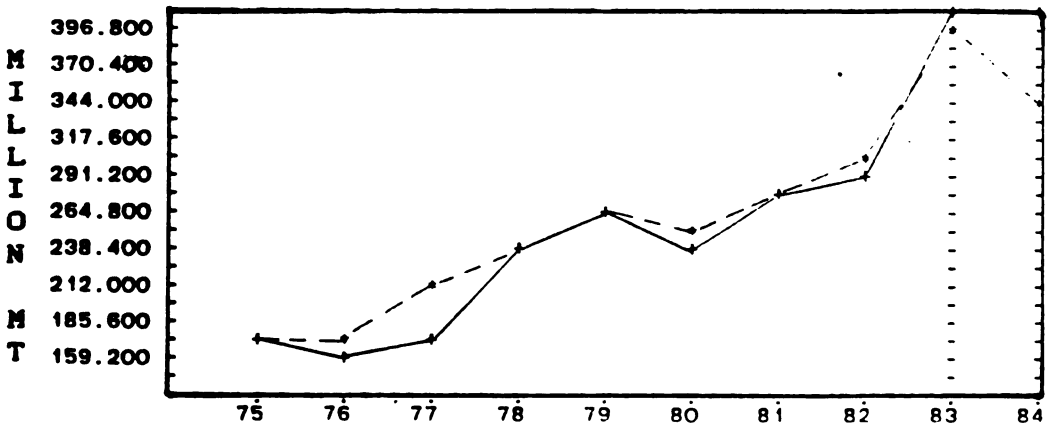
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0231697	0.0054003	0.0355079	0.0146939
PCFSUP	0.2538139	0.0364078	0.3008643	0.1850319

	Covariance	Correlation
PCFES, PCFES	2.789D-05	1.0000000
PCFES, PCFSUP	0.0001572	0.8361057
PCFSUP, PCFSUP	0.0012679	1.0000000



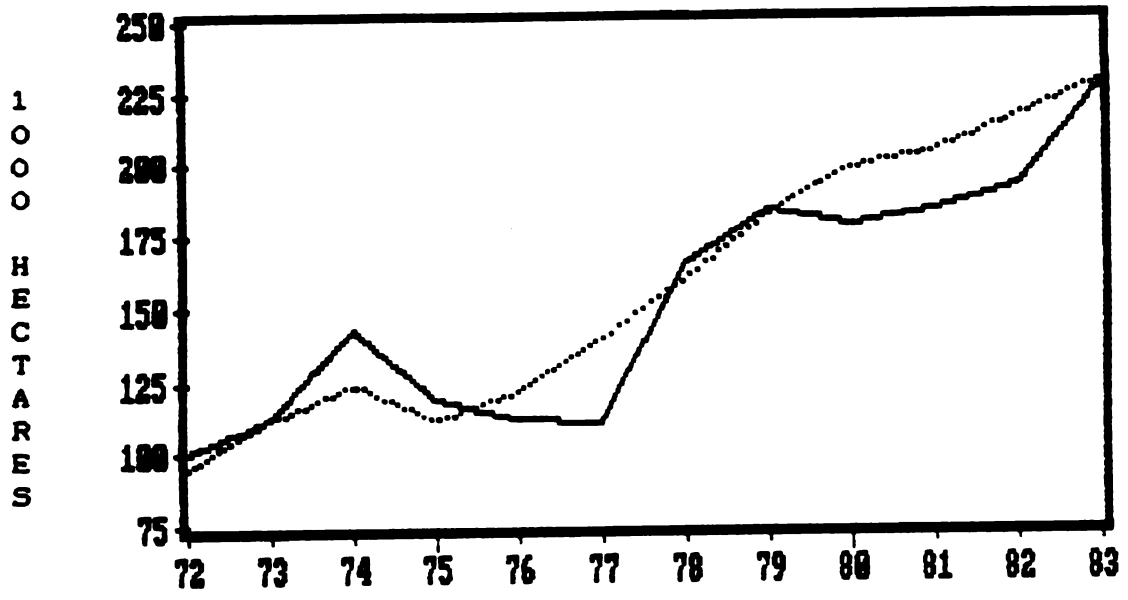
REGIONAL MODEL SIMULATION



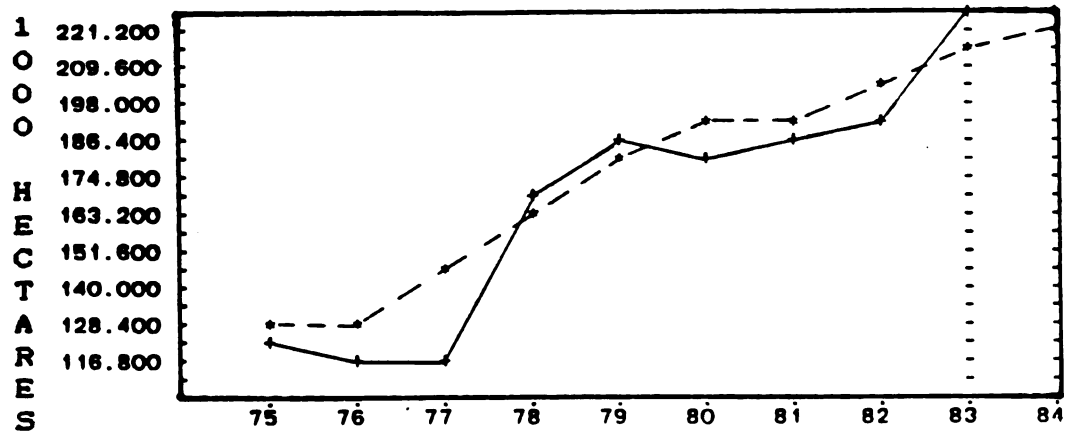
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.13.a & b. Soybean Production - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.14.a & b. Soybean Harvested Area - Developed Markets

Developed Markets
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SHADM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	150.70682	91.593082	1.6453953	0.122
SHADM(-1)	0.7781545	0.1155577	6.7339049	0.000
FRDM3(-1)	-27.155516	12.874298	-2.1092813	0.053
SRDM4(-1)	3.7065433	4.5080873	0.8221987	0.425
SNIDM(-1)	0.0018446	0.0009114	2.0238452	0.063

R-squared	0.879300	Mean of dependent var	149.0000
Adjusted R-squared	0.844814	S.D. of dependent var	38.20704
S.E. of regression	15.05116	Sum of squared resid	3171.523
Durbin-Watson stat	2.194647	F-statistic	25.49742
Log likelihood	-75.57635	TPE	7/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	4.78914	193.000	188.211
	1966	5.83237	180.000	174.168
*	1967	-11.2457	154.000	165.246
	1968	4.03229	136.000	131.968
	1969	6.57662	118.000	111.423
	1970	2.25228	107.000	104.748
	1971	3.05307	111.000	107.947
*	1972	-16.3246	100.000	116.325
	1973	-1.87223	113.000	114.872
	1974	19.2029	143.000	123.797
*	1975	-5.08343	119.000	124.083
*	1976	-13.3409	113.000	126.341
*	1977	-19.5210	111.000	130.521
	1978	28.5671	166.000	137.433
	1979	0.62814	184.000	183.372
*	1980	-19.2547	179.000	198.255
	1981	-1.35750	185.000	186.358
*	1982	-7.89172	192.000	199.892
	1983	20.9577	227.000	206.042

INDEPENDENT VARIABLES

SHADM = Soybean Harvested Area (1000 HA)

SRDM4 = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPIDM

FRDM = Coarse Grain Revenue per Hectare ($/HA)
(FYDM(-3)+FYDM(-2)+FYDM(1)+FYDM)/4*FP^{DM}*XRDM/CPIDM

SNIDM = Soybean Net Imports (1000 HA)

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SHADM	149.00000	38.207038	227.00000	100.00000
SHADM(-1)	149.00000	38.207038	227.00000	100.00000
FRDM3(-1)	5.7754562	0.3895795	6.6858110	5.2628600
SRDM4(-1)	3.9205954	0.9597084	6.5674920	2.7582880
SNIDM(-1)	13364.526	5183.6131	20874.000	5436.0000

	Covariance	Correlation
SHADM,SHADM	1382.9474	1.0000000
SHADM,SHADM(-1)	1138.8421	0.8234891
SHADM,FRDM3(-1)	-9.2645864	-0.6570036
SHADM,SRDM4(-1)	-16.383887	-0.4716452
SHADM,SNIDM(-1)	75341.684	0.4015508
SHADM(-1),SHADM(-1)	1382.9474	1.0000000
SHADM(-1),FRDM3(-1)	-4.7393852	-0.3360963
SHADM(-1),SRDM4(-1)	-17.979906	-0.5175900
SHADM(-1),SNIDM(-1)	346.00000	0.0018441
FRDM3(-1),FRDM3(-1)	0.1437841	1.0000000
FRDM3(-1),SRDM4(-1)	0.1356910	0.3830864
FRDM3(-1),SNIDM(-1)	-1179.1504	-0.6163419
SRDM4(-1),SRDM4(-1)	0.8725643	1.0000000
SRDM4(-1),SNIDM(-1)	-1052.9182	-0.2234107
SNIDM(-1),SNIDM(-1)	25455642.	1.0000000

Developed Markets
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SYDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-5.5006930	1.2015225	-4.5781023	0.000
LOGT	1.5902987	0.2797548	5.6846174	0.000

R-squared	0.642253	Mean of dependent var	1.328353
Adjusted R-squared	0.622378	S.D. of dependent var	0.160416
S.E. of regression	0.098577	Sum of squared resid	0.174914
Durbin-Watson stat	1.520889	F-statistic	32.31487
Log likelihood	19.01315		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * : :	1964	-0.04709	1.06608	1.11317
: : *:	1965	0.06942	1.20725	1.13783
: * : :	1966	-0.03433	1.12778	1.16211
: : *:	1967	0.08021	1.26623	1.18602
: : *:	1968	0.07718	1.28676	1.20959
: * : :	1969	-0.03789	1.19492	1.23280
: * : :	1970	-0.03138	1.22430	1.25568
*: : :	1971	-0.11608	1.16216	1.27824
: : * :	1972	0.04952	1.35000	1.30048
: : *:	1973	0.06696	1.38938	1.32242
: :* :	1974	0.02657	1.37063	1.34406
: *: :	1975	-0.02086	1.34454	1.36540
* : :	1976	-0.09443	1.29203	1.38647
: : * :	1977	0.03419	1.44144	1.40725
: * :	1978	-6.5D-05	1.42771	1.42778
: *: :	1979	-0.01869	1.42935	1.44803
* : : :	1980	-0.19430	1.27374	1.46804
: * : :	1981	-0.04996	1.43784	1.48779
: * : :	1982	-0.03856	1.46875	1.50731
: : : *	1983	0.27958	1.80617	1.52658

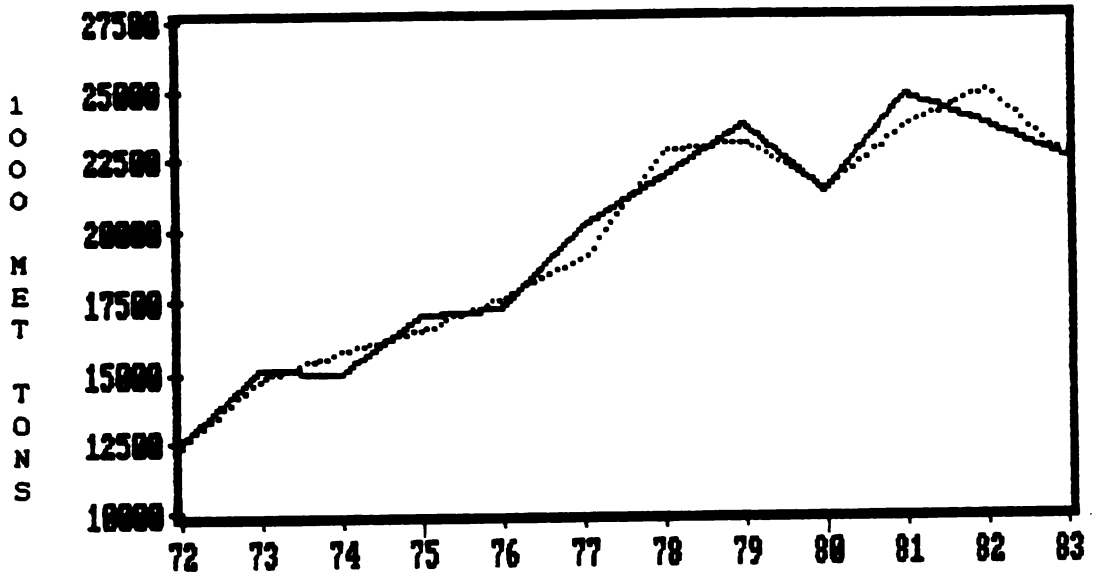
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

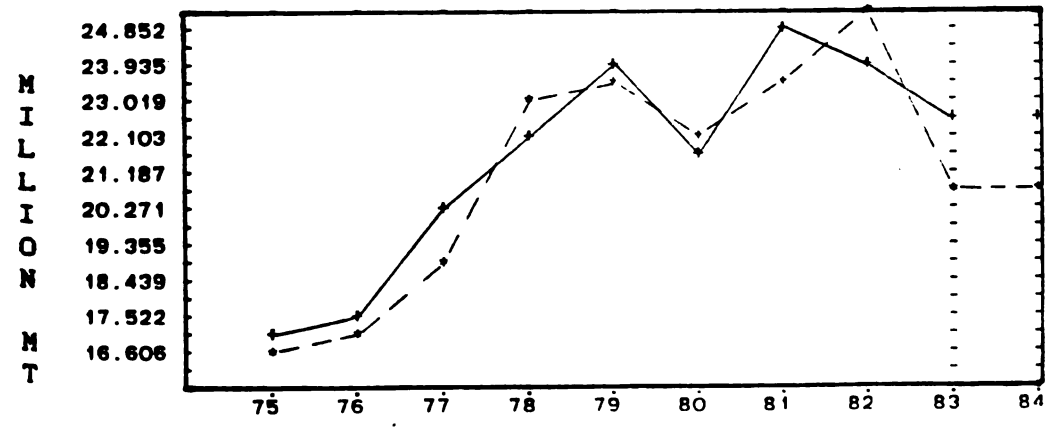
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SYDM	1.3283534	0.1604160	1.8061670	1.0660790
LOGT	4.2941910	0.0808392	4.4188400	4.1588830

	Covariance	Correlation
SYDM,SYDM	0.0244466	1.0000000
SYDM,LOGT	0.0098729	0.8014068
LOGT,LOGT	0.0062082	1.0000000



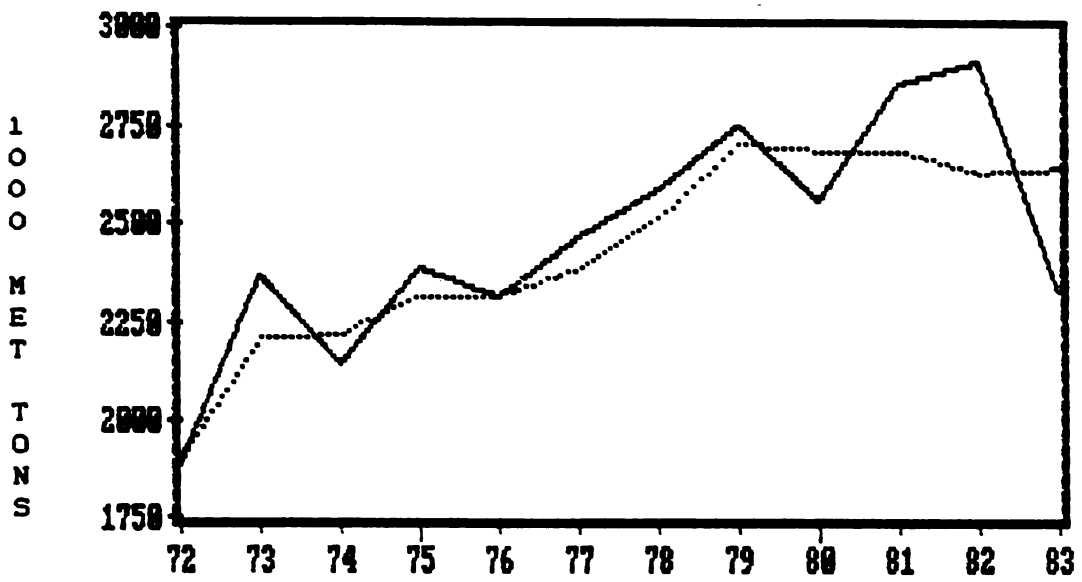
REGIONAL MODEL SIMULATION



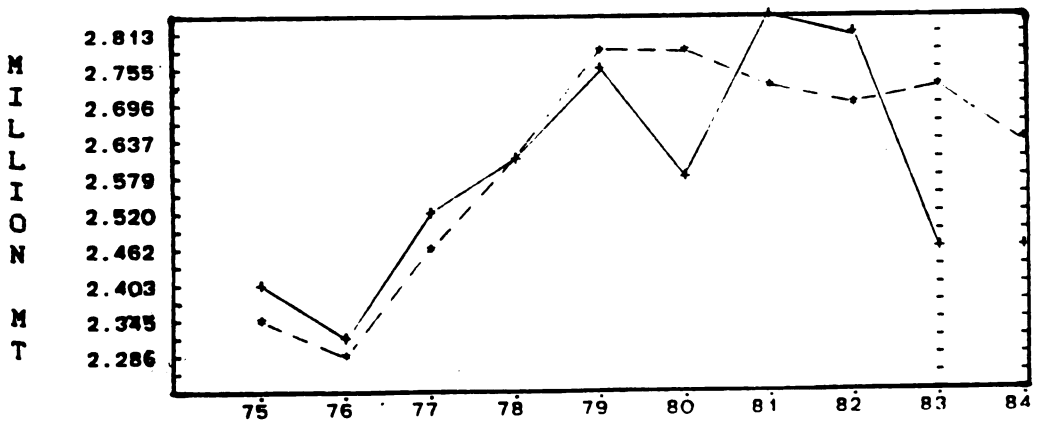
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.15.a & b. Soymeal Equivalent Consumption - Developed Markets



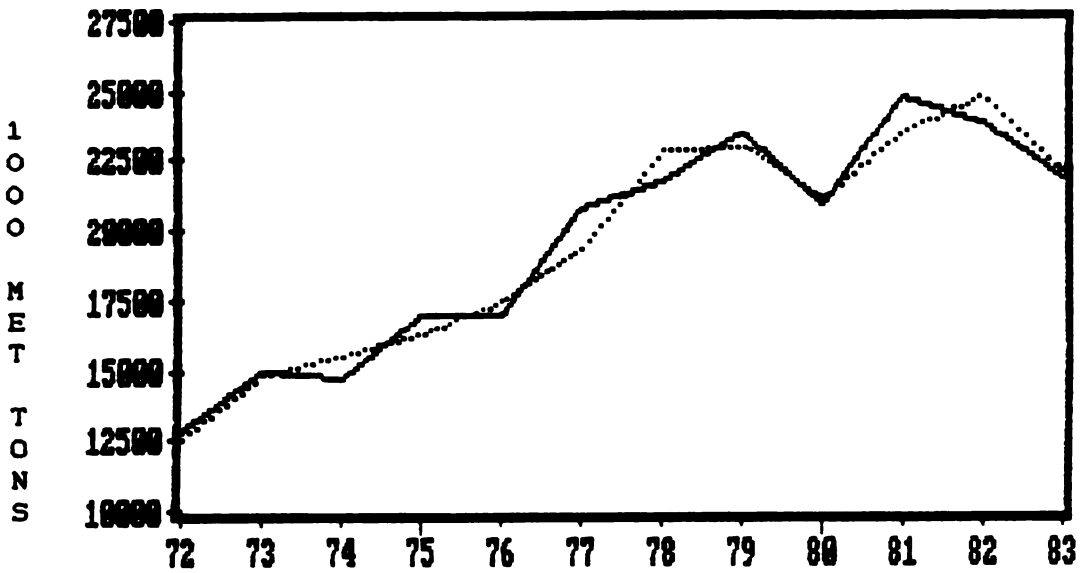
REGIONAL MODEL SIMULATION



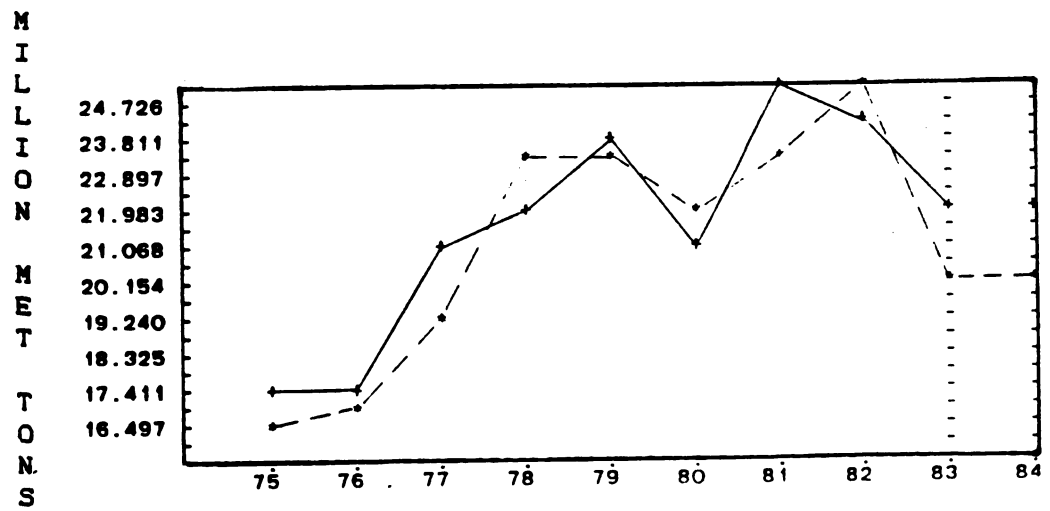
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.16.a & b. Soyoil Equivalent Consumption - Developed Markets



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.17.a & b. Soymeal Equivalent Imports - Developed Markets

Developed Markets
Per Capita Soymeal Equivalent Imports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is PTSMNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0104440	0.0035908	-2.9085616	0.011
SPDM	-0.0014844	0.0007534	-1.9703218	0.068
PCRNI	1.1101028	0.2505227	4.4311474	0.000
PCOSSU	-2.1343733	0.8130097	-2.6252741	0.019
PCRGDP	26862.855	2510.0453	10.702139	0.000

R-squared	0.981302	Mean of dependent var	0.031919
Adjusted R-squared	0.976316	S.D. of dependent var	0.011944
S.E. of regression	0.001838	Sum of squared resid	5.07D-05
Durbin-Watson stat	2.422411	F-statistic	196.8046
Log likelihood	100.4782	TPE	2/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.00120	0.01365	0.01245
	1965	0.00256	0.01648	0.01392
	1966	1.7D-05	0.01677	0.01676
	1967	-0.00123	0.01732	0.01855
	1968	-0.00189	0.01888	0.02077
	1969	-0.00086	0.02402	0.02488
	1970	-0.00189	0.02533	0.02722
	1971	-0.00101	0.02709	0.02810
	1972	0.00060	0.02721	0.02661
	1973	0.00046	0.03155	0.03109
	1974	-0.00160	0.03071	0.03231
	1975	0.00159	0.03539	0.03380
	1976	-0.00081	0.03517	0.03598
	1977	0.00321	0.04294	0.03973
	1978	-0.00202	0.04447	0.04649
	1979	0.00120	0.04779	0.04659
	1980	-0.00028	0.04234	0.04263
	1981	0.00262	0.04984	0.04722
	1982	-0.00179	0.04781	0.04960
	1983	-8.3D-05	0.04362	0.04370

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPDM/CPIDM/POPDM

PCOSSU = Per Capita Supply of Rapeseed and Sunflower Seed Meal (1000 MT)
(RPRODM*.59 +NPRODM)*.475)/POPDM

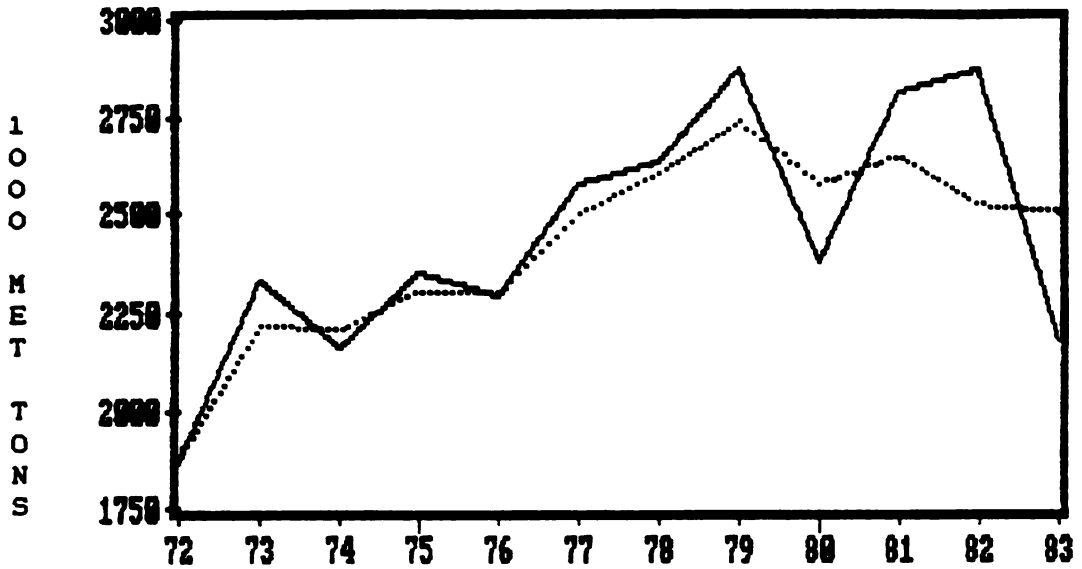
PCRNI = Per Capita Imports of Roots and Tubers (1000 MT)
RNIDM/POPDM

SPDM = Real Developed Market Soybean Price
SP*XRDM/CPIDM

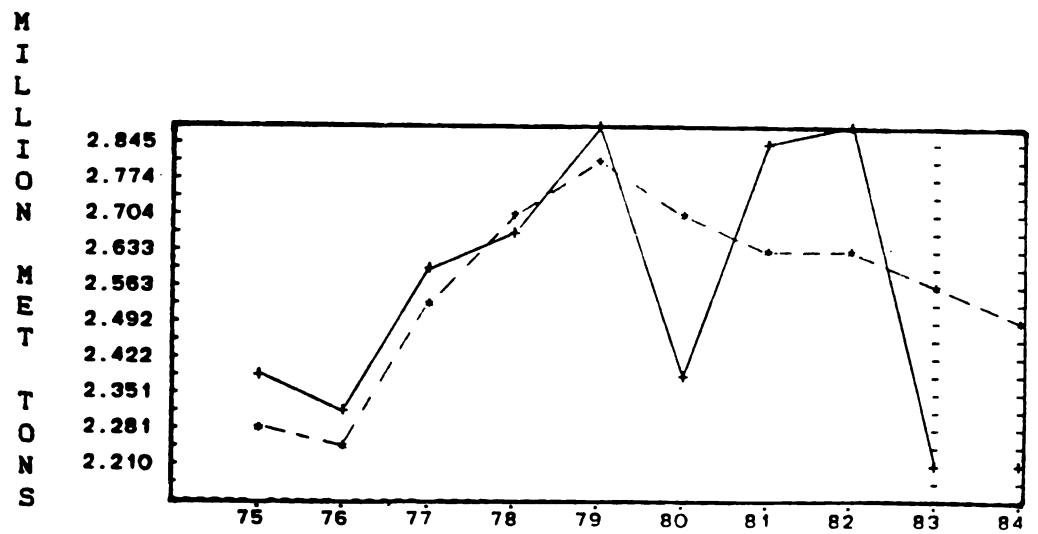
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMNI	0.0319195	0.0119439	0.0498396	0.0136513
SPDM	2.9852069	0.7811268	5.0500360	1.8539450
PCRNI	0.0063142	0.0049588	0.0178071	0.0013783
PCOSSU	0.0024559	0.0013454	0.0053468	0.0008975
PCRGDP	1.676D-06	3.299D-07	2.038D-06	1.075D-06

	Covariance	Correlation
PTSMNI,PTSMNI	0.0001355	1.0000000
PTSMNI,SPDM	-0.0049757	-0.5613944
PTSMNI,PCRNI	5.144D-05	0.9142237
PTSMNI,PCOSSU	1.293D-05	0.8472027
PTSMNI,PCRGDP	3.578D-09	0.9556858
SPDM,SPDM	0.5796511	1.0000000
SPDM,PCRNI	-0.0023640	-0.6424360
SPDM,PCOSSU	-0.0004927	-0.4934868
SPDM,PCRGDP	-9.465D-08	-0.3866048
PCRNI,PCRNI	2.336D-05	1.0000000
PCRNI,PCOSSU	5.733D-06	0.9046173
PCRNI,PCRGDP	1.274D-09	0.8200072
PCOSSU,PCOSSU	1.720D-06	1.0000000
PCOSSU,PCRGDP	3.539D-10	0.8393227
PCRGDP,PCRGDP	1.034D-13	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.18.a & b. Soyoil Equivalent Imports - Developed Markets

Developed Markets
Per Capita Soyoil Equivalent Imports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is PTSONI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0012905	0.0006818	-1.8928089	0.077
PCRGDP	4172.0962	495.33195	8.4228286	0.000
PCOSSU	-0.3286592	0.1383358	-2.3758061	0.030
SPDM	-0.0002329	0.0001250	-1.8626403	0.081

R-squared	0.921608	Mean of dependent var	0.004242
Adjusted R-squared	0.906909	S.D. of dependent var	0.001140
S.E. of regression	0.000348	Sum of squared resid	1.94D-06
Durbin-Watson stat	1.955150	F-statistic	62.70044
Log likelihood	133.1264	TPE	3/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.00030	0.00239	0.00209
	1965	0.00033	0.00257	0.00224
	1966	3.0D-05	0.00261	0.00258
	1967	-0.00022	0.00269	0.00291
	1968	-0.00039	0.00287	0.00327
	1969	1.1D-06	0.00378	0.00378
	1970	-0.00031	0.00378	0.00409
	1971	-0.00028	0.00396	0.00423
	1972	-1.9D-05	0.00398	0.00400
	1973	0.00026	0.00492	0.00466
	1974	-8.6D-05	0.00452	0.00461
	1975	8.0D-05	0.00489	0.00481
	1976	-1.1D-05	0.00475	0.00476
	1977	0.00016	0.00531	0.00514
	1978	9.3D-05	0.00540	0.00530
	1979	0.00031	0.00585	0.00553
	1980	-0.00045	0.00482	0.00527
	1981	0.00026	0.00567	0.00541
	1982	0.00063	0.00576	0.00514
	1983	-0.00070	0.00433	0.00502

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPDM/CPIDM/POPDM

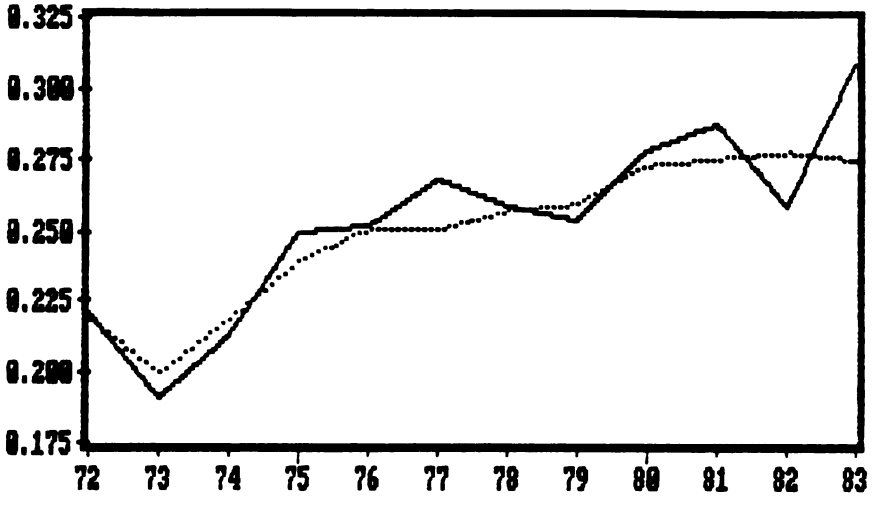
PCOSSU = Per Capita Supply of Rape Seed and Sunflower Seed Oil (1000 MT)
((RPRODM*.39 +NPRODM)*.41)/POPDM

SPDM = Real Developed Market Soybean Price
SP*XRDM/CPIDM

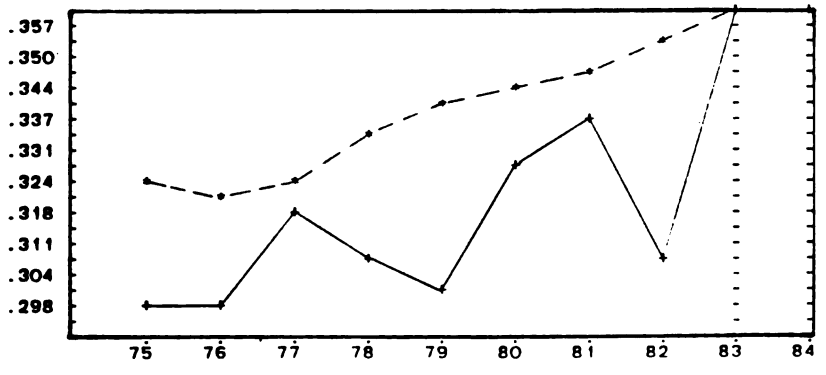
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSONI	0.0042422	0.0011401	0.0058455	0.0023886
PCRGDP	1.676D-06	3.299D-07	2.038D-06	1.075D-06
PCDOSU	0.0023281	0.0013031	0.0049313	0.0008682
SPDM	2.9852069	0.7811268	5.0500360	1.8539450

	Covariance	Correlation
PTSONI,PTSONI	1.235D-06	1.0000000
PTSONI,PCRGDP	3.372D-10	0.9435786
PTSONI,PCDOSU	1.069D-06	0.7576184
PTSONI,SPDM	-0.0003555	-0.4202169
PCRGDP,PCRGDP	1.034D-13	1.0000000
PCRGDP,PCDOSU	3.538D-10	0.8661822
PCRGDP,SPDM	-9.465D-08	-0.3866048
PCDOSU,PCDOSU	1.613D-06	1.0000000
PCDOSU,SPDM	-0.0005305	-0.5486443
SPDM,SPDM	0.5796511	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.19.a & b. Percentage Soymeal Equivalent Imported as Soymeal - Developed Markets

Developed Markets
Percentage Soymeal Equivalent Imported as Soymeal

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.2408981	0.0132040	18.244372	0.000
MARGIN	-0.0399522	0.0175262	-2.2795630	0.038
MARGIN(-1)	-0.0355279	0.0173752	-2.0447495	0.059
TOSSUP	1.380D-05	3.289D-06	4.1953164	0.001

R-squared	0.789063	Mean of dependent var	0.242280
Adjusted R-squared	0.746875	S.D. of dependent var	0.030192
S.E. of regression	0.015190	Sum of squared resid	0.003461
Durbin-Watson stat	2.199429	F-statistic	18.70374
Log likelihood	54.84074	TPE	9/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	0.02605	0.23964	0.21358
	1966	0.00411	0.22003	0.21592
	1967	-0.00625	0.22579	0.23204
	1968	-0.01254	0.22449	0.23703
	1969	-0.01453	0.20363	0.21816
	1970	0.01743	0.22986	0.21243
	1971	-0.01121	0.21945	0.23066
	1972	0.00164	0.22052	0.21887
	1973	-0.01132	0.19157	0.20288
	1974	-0.00890	0.21316	0.22205
	1975	0.00827	0.24934	0.24107
	1976	-0.00211	0.25210	0.25422
	1977	0.01574	0.26799	0.25225
	1978	-0.00449	0.25891	0.26340
	1979	-0.01240	0.25390	0.26630
	1980	0.00034	0.27830	0.27796
	1981	0.00958	0.28731	0.27774
	1982	-0.02350	0.25831	0.28181
	1983	0.02408	0.30902	0.28494

INDEPENDENT VARIABLES

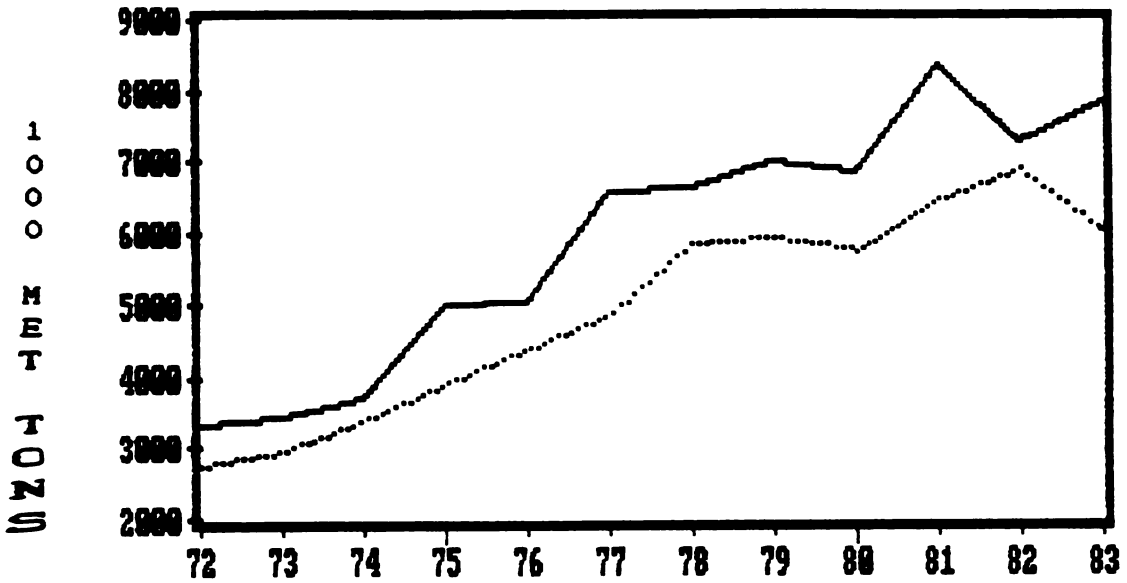
MARGIN = Soybean Crush Margin
(SMP*XRDM/CPIDM)*.795 + (SOP*XRDM/CPIDM)*.175 -
(SP*XRDM/CPIDM)

TOSSUP = Total Domestic Supply of Oilseed Meals (1000 MT)
(RPRODM*.59 +NPRODM*.475)+(SESDM(-1)+SPRODM)*.795
+ SMESDM(-1)

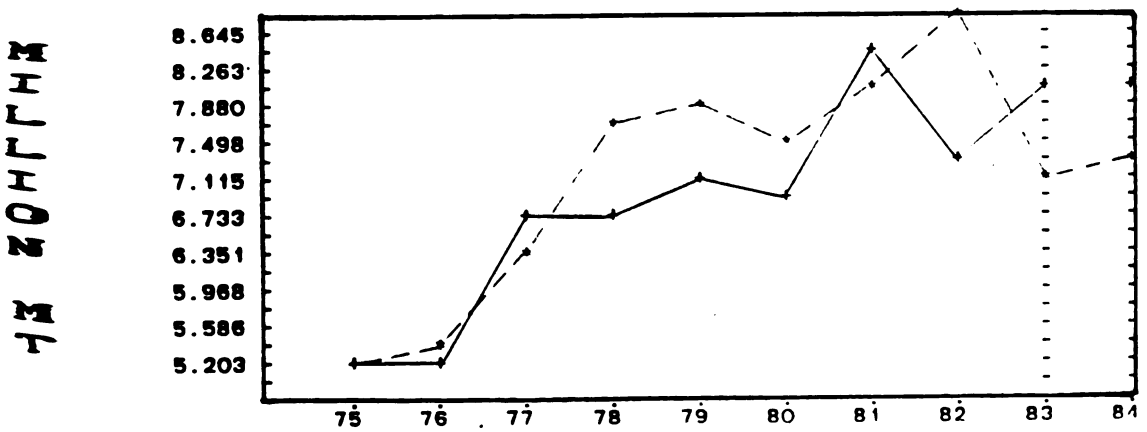
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.2422799	0.0301925	0.3090176	0.1915666
MARGIN(-1)	0.3782452	0.2308313	0.8615059	0.1293650
MARGIN	0.3740984	0.2318814	0.8615059	0.1293650
TOSSUP	2157.0213	1221.7408	4838.6950	892.03000

	Covariance	Correlation
PMEAL,PMEAL	0.0008636	1.0000000
PMEAL,MARGIN(-1)	-0.0039175	-0.5933327
PMEAL,MARGIN	-0.0041891	-0.6315921
PMEAL,TOSSUP	27.167215	0.7774066
MARGIN(-1),MARGIN(-1)	0.0504787	1.0000000
MARGIN(-1),MARGIN	0.0196941	0.3883793
MARGIN(-1),TOSSUP	-96.908231	-0.3627171
MARGIN,MARGIN	0.0509391	1.0000000
MARGIN,TOSSUP	-105.38601	-0.3926621
TOSSUP,TOSSUP	1414090.0	1.0000000



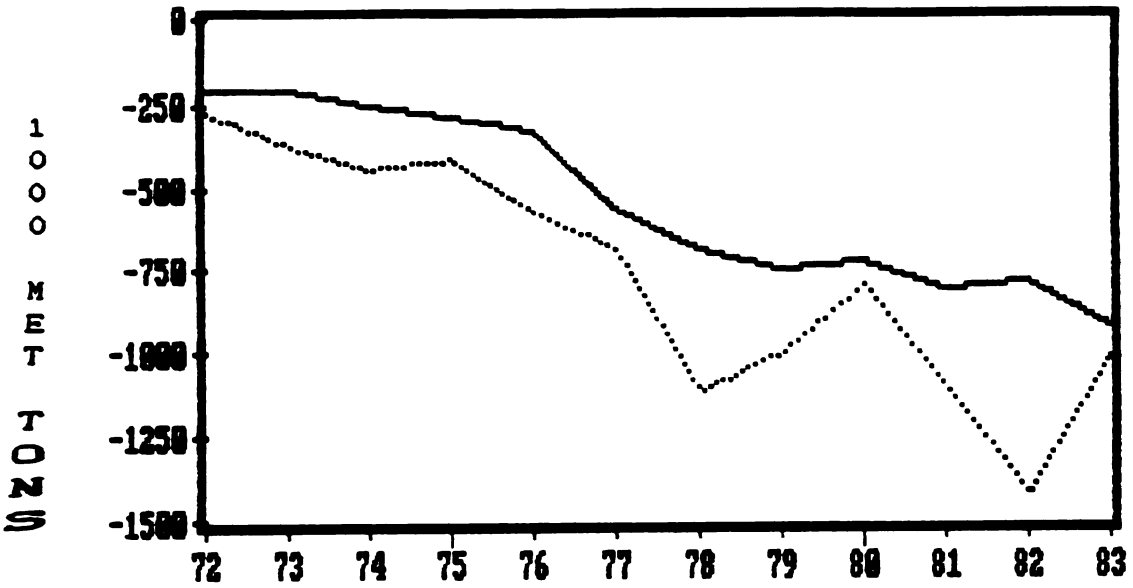
REGIONAL MODEL SIMULATION



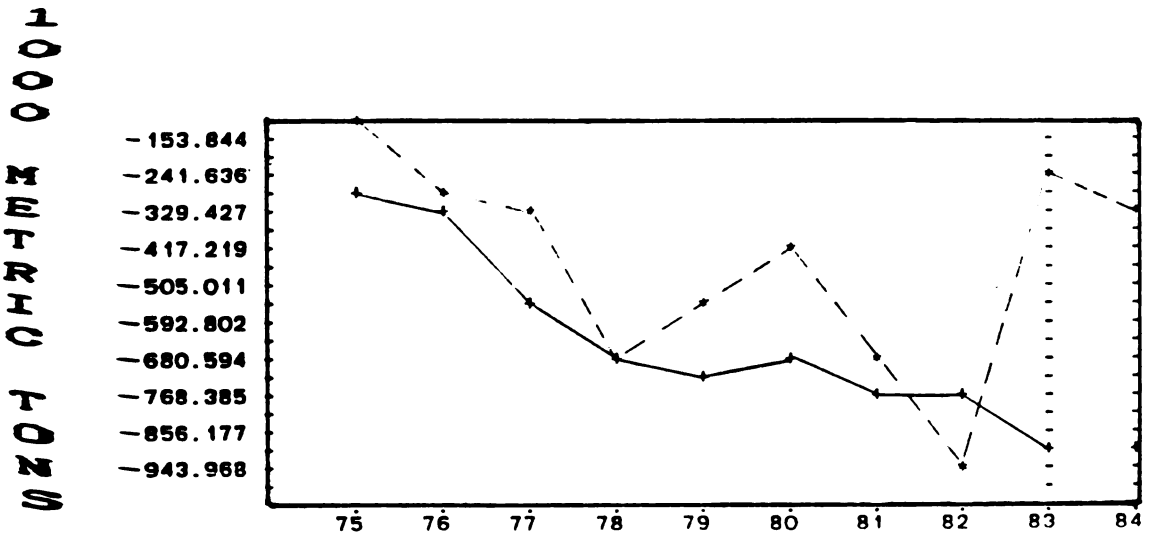
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.20.a & b. Soymeal Net Imports - Developed Markets



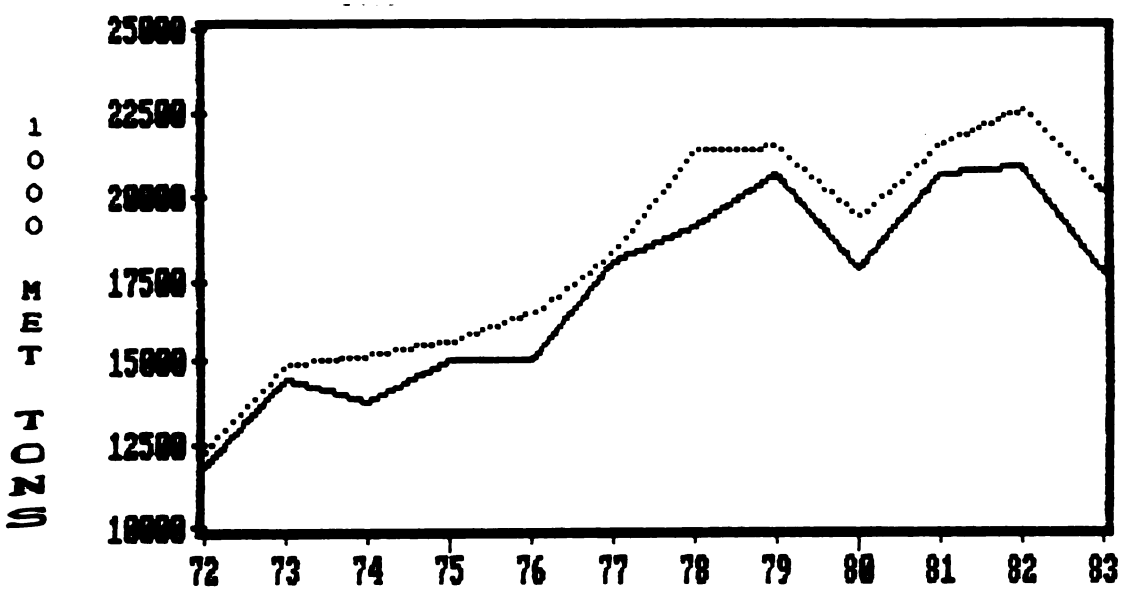
REGIONAL MODEL SIMULATION



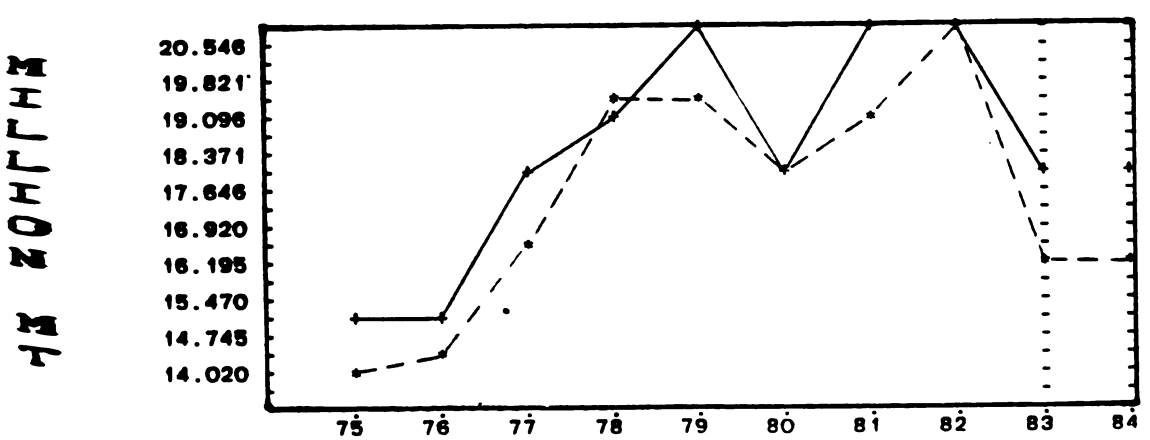
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.21.a & b. Soyoil Net Imports - Developed Markets



REGIONAL MODEL SIMULATION

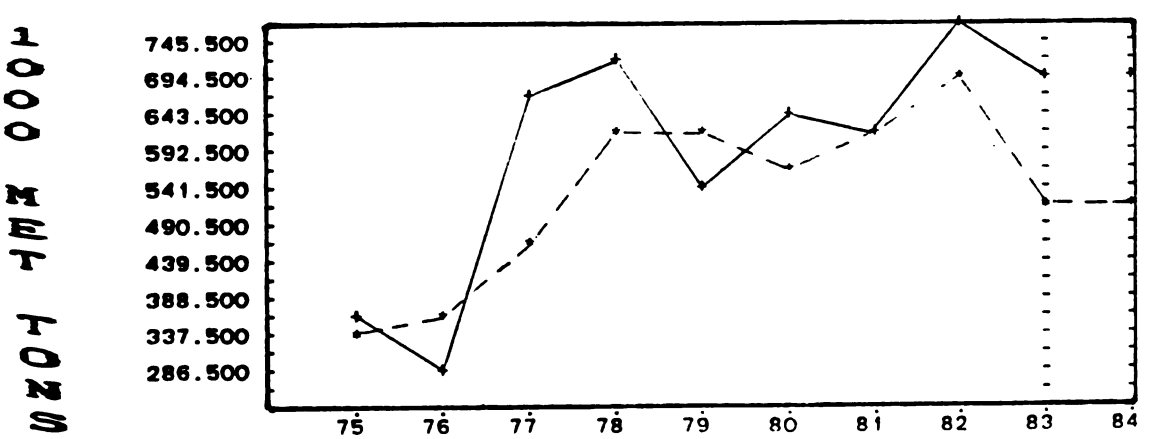


EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.22.a & b. Soybean Net Imports - Developed Markets

REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.23.a & b. Soymeal Ending Stocks - Developed Markets

Developed Markets
Soymeal Ending Stocks (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SMESDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-252.01979	74.365817	-3.3889197	0.003
SMSUP	0.0344719	0.0030933	11.143897	0.000
MARGIN	143.98495	93.005807	1.5481286	0.140

R-squared	0.888172	Mean of dependent var	363.8500
Adjusted R-squared	0.875016	S.D. of dependent var	236.2555
S.E. of regression	83.52360	Sum of squared resid	118595.3
Durbin-Watson stat	2.335166	F-statistic	67.50971
Log likelihood	-115.2562	TPE	6/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	74.0015	86.0000	11.9985
	1965	4.77814	117.000	112.222
	1966	16.3460	90.0000	73.6540
	1967	49.2538	121.000	71.7462
	1968	43.6928	139.000	95.3072
	1969	-64.7095	179.000	243.709
	1970	-67.8641	172.000	239.864
	1971	-99.4696	144.000	243.470
	1972	-14.3820	318.000	332.382
	1973	62.1351	480.000	417.865
	1974	-55.3973	291.000	346.397
	1975	-51.8090	348.000	399.809
	1976	-123.210	261.000	384.210
	1977	125.158	657.000	531.842
	1978	108.031	697.000	588.969
	1979	-82.6861	573.000	655.686
	1980	119.435	668.000	548.565
	1981	-111.308	566.000	677.308
	1982	62.8719	742.000	679.128
	1983	5.13331	628.000	622.867

INDEPENDENT VARIABLES

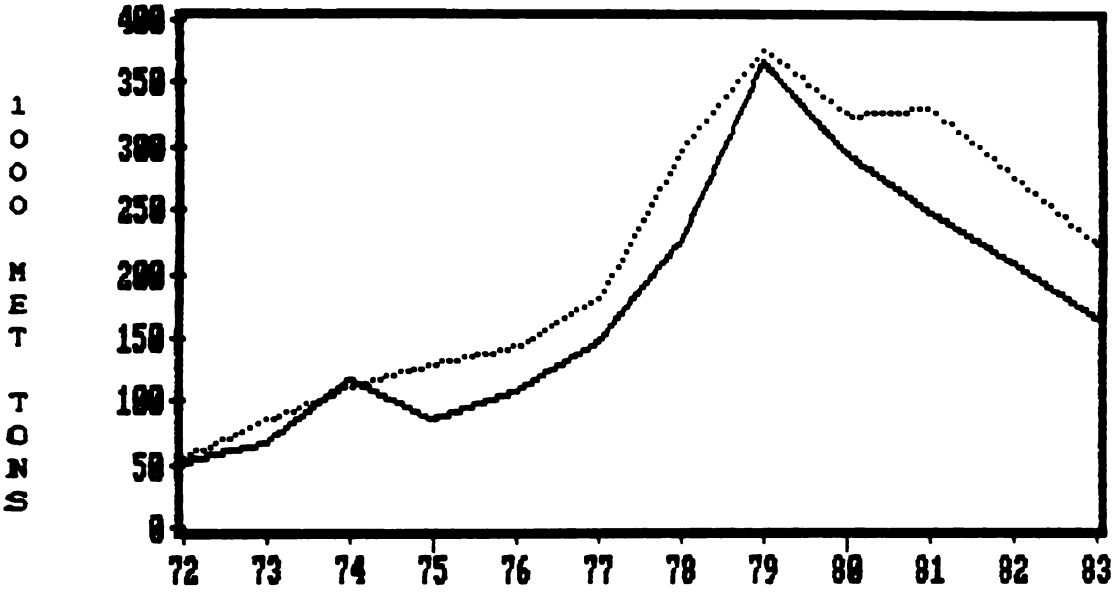
SMSUP = Total Soymeal Equivalent Supply (1000 MT)
(SESDM(-1) +(SESDM(-1)+SPRODM+SNIDM-SESDM)*.795 + SMNIDM)

MARGIN = Soybean Crush Margin
(SMP*XRDM/CPIDM)*.795 + (SOP*XRDM/CPIDM)*.175 - (SP*XRDM/CPIDM)

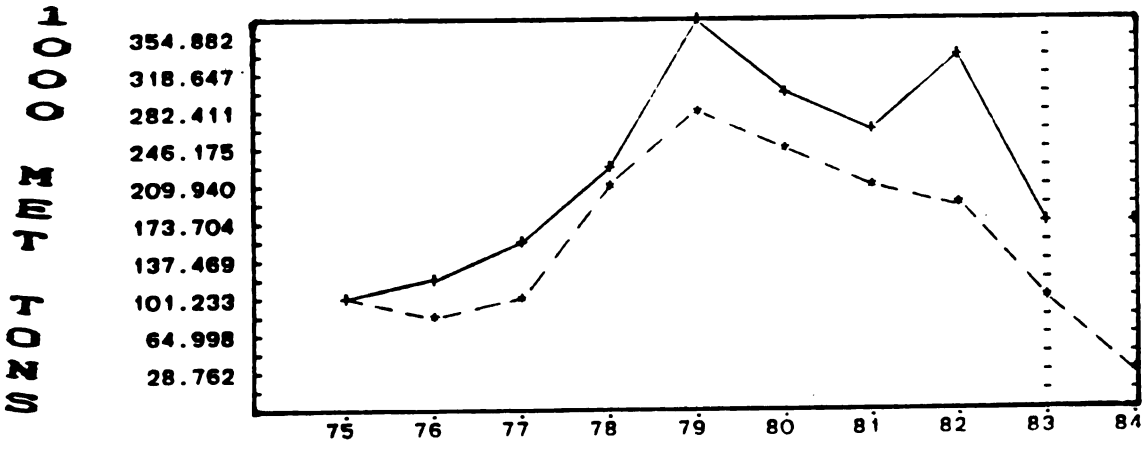
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SMESDM	363.85000	236.25550	742.00000	86.000000
SMSUP	16306.223	6786.5569	26370.620	6155.0100
MARGIN	0.3733966	0.2257186	0.8615059	0.1293650

	Covariance	Correlation
SMESDM.SMESDM	53025.827	1.0000000
SMESDM,SMSUP	1422703.7	0.9340270
SMESDM,MARGIN	-13.523759	-0.2669467
SMSUP,SMSUP	43754487.	1.0000000
SMSUP.MARGIN	-594.47978	-0.4085042
MARGIN.MARGIN	0.0484015	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure F.24.a & b. Soyoil Ending Stocks - Developed Markets

Developed Markets
Soyoil Ending Stocks (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SOESDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-81.760213	19.705710	-4.1490621	0.001
SODSU	0.6281575	0.0931648	6.7424337	0.000
OSOSU	-0.1588203	0.0321604	-4.9383744	0.000
SNIDM	0.0127746	0.0023766	5.3752015	0.000

R-squared	0.940609	Mean of dependent var	117.6500
Adjusted R-squared	0.929473	S.D. of dependent var	102.0641
S.E. of regression	27.10501	Sum of squared resid	11754.91
Durbin-Watson stat	2.255851	F-statistic	84.46727
Log likelihood	-92.14171	TPE	2/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	49.3379	15.0000	-34.3379
	1965	8.06319	23.0000	14.9368
	1966	-16.4903	26.0000	42.4903
	1967	-3.52816	24.0000	27.5282
	1968	-0.96047	31.0000	31.9605
	1969	-21.6234	38.0000	59.6234
	1970	-27.0685	44.0000	71.0685
	1971	-7.65137	73.0000	80.6514
	1972	0.15791	52.0000	51.8421
	1973	-19.1740	67.0000	86.1740
	1974	45.9764	115.000	69.0236
	1975	-32.6138	86.0000	118.614
	1976	6.02682	106.000	99.9732
	1977	1.99814	148.000	146.002
	1978	-14.5690	226.000	240.569
	1979	57.5519	366.000	308.448
	1980	-5.01769	292.000	297.018
	1981	-18.7946	247.000	265.795
	1982	9.72197	208.000	198.278
	1983	-11.3429	166.000	177.343

INDEPENDENT VARIABLES

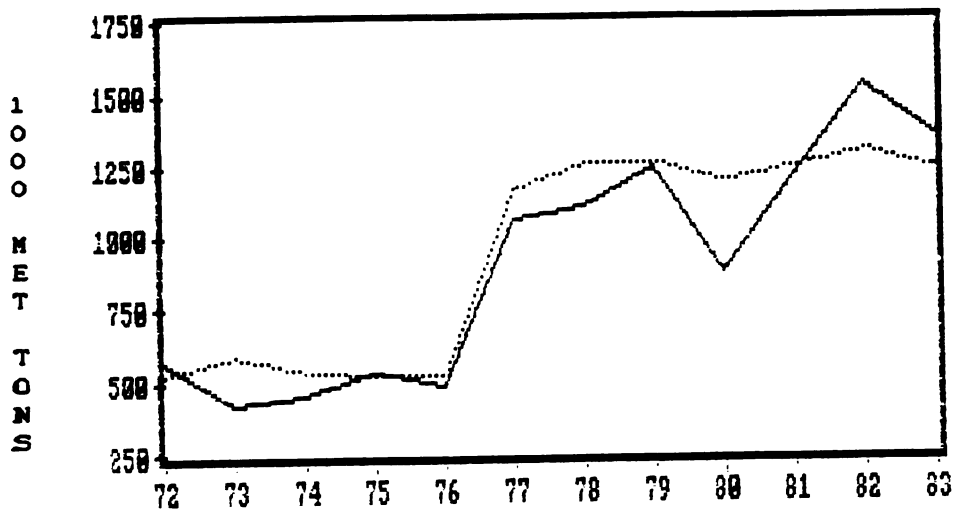
SODSU = Soyoil Equivalent Domestic Supply (1000 MT)
(SESDM(-1) + SPRODM)*.175 + SOESDM(-1)

OSOSU = Supply of Rapeseed and Sunflowerseed Oil (1000 MT)
(RPRODM*.41 + NPRODM*.39)

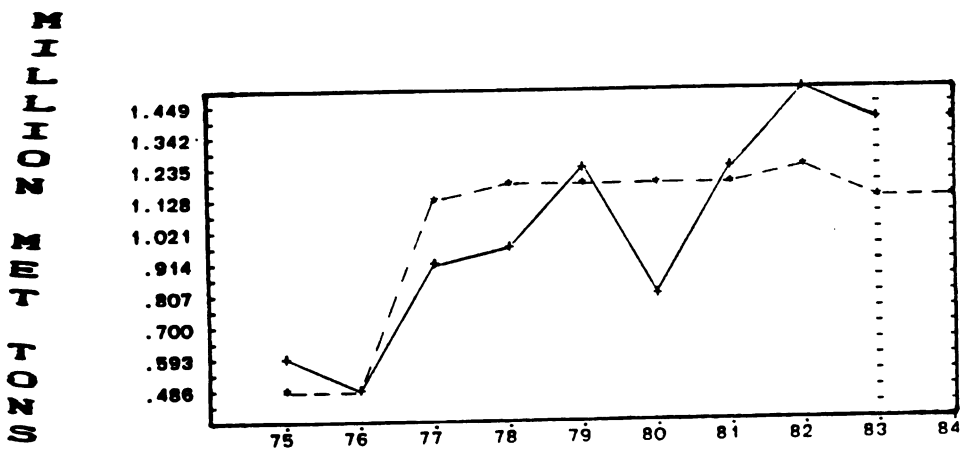
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SOESDM	117.65000	102.06411	366.00000	15.000000
SODSU	254.62625	176.66770	624.12500	42.350000
OSOSU	843.74900	516.65551	1952.7500	264.03000
SNIDM	13579.250	5136.1275	20909.000	5436.0000

	Covariance	Correlation
SOESDM,SOESDM	9896.2275	1.0000000
SOESDM,SODSU	15248.962	0.8901977
SOESDM,OSOSU	36891.538	0.7364259
SOESDM,SNIDM	437498.14	0.8785041
SODSU,SODSU	29650.902	1.0000000
SODSU,OSOSU	79566.129	0.9175852
SODSU,SNIDM	724895.58	0.8409282
OSOSU,OSOSU	253586.27	1.0000000
OSOSU,SNIDM	2128141.2	0.8441895
SNIDM,SNIDM	25060816.	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure F.25.a & b. Soybean Ending Stocks - Developed Markets

Developed Markets
Soybean Ending Stocks (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SESDM

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	93.597828	124.22712	0.7534412	0.462
SBSUP	0.0239482	0.0095889	2.4974962	0.024
MARGIN	137.76529	141.82042	0.9714066	0.346
DV77ON	581.08999	113.95853	5.0991357	0.000

R-squared	0.922816	Mean of dependent var	693.5000
Adjusted R-squared	0.908344	S.D. of dependent var	404.5355
S.E. of regression	122.4723	Sum of squared resid	239991.3
Durbin-Watson stat	1.479328	F-statistic	63.76542
Log likelihood	-122.3050	TPE	4/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-3.17987	276.000	279.180
	1965	16.8512	372.000	355.149
	1966	36.1965	356.000	319.804
	1967	72.9443	387.000	314.056
	1968	-18.5071	309.000	327.507
	1969	-43.5058	407.000	450.506
	1970	45.1597	473.000	427.840
	1971	-3.52883	422.000	425.529
	1972	64.7106	574.000	509.289
	1973	-155.361	421.000	576.361
	1974	-42.8966	452.000	494.897
	1975	34.3280	541.000	506.672
	1976	-3.21108	485.000	488.211
	1977	-90.7329	1066.00	1156.73
	1978	-85.6656	1107.00	1192.67
	1979	9.30166	1247.00	1237.70
	1980	-277.555	875.000	1152.56
	1981	-2.02781	1215.00	1217.03
	1982	273.167	1529.00	1255.83
	1983	173.513	1356.00	1182.49

INDEPENDENT VARIABLES

SBSUP = Total Soybean Supply (1000 MT)
(SESDM(-1) +SPRODM +SNIDM)

MARGIN = Soybean Crush Margin
(SMP*XRDM/CPIDM)*.795 + (SOP*XRDM/CPIDM)*.175 -
(SP*XRDM/CPIDM)

DV77ON = 1 If(YEAR .GE. 77)
0 Otherwise

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SESDM	693.50000	404.53554	1529.0000	276.00000
SBSUP	14409.400	5494.3081	22406.000	5678.0000
MARGIN	0.3733966	0.2257186	0.8615059	0.1293650
DV77ON	0.3500000	0.4893605	1.0000000	0.0000000

	Covariance	Correlation
SESDM, SESDM	155466.55	1.0000000
SESDM, SBSUP	1881926.8	0.8912703
SESDM, MARGIN	-32.441260	-0.3739814
SESDM, DV77ON	177.02500	0.9412943
SBSUP, SBSUP	28678050.	1.0000000
SBSUP, MARGIN	-426.61378	-0.3621019
SBSUP, DV77ON	2157.8600	0.8448075
MARGIN, MARGIN	0.0484015	1.0000000
MARGIN, DV77ON	-0.0497215	-0.4738318
DV77ON, DV77ON	0.2275000	1.0000000

APPENDIX G

EQUATION STATISTICS - LESS DEVELOPED COUNTRIES

Wheat

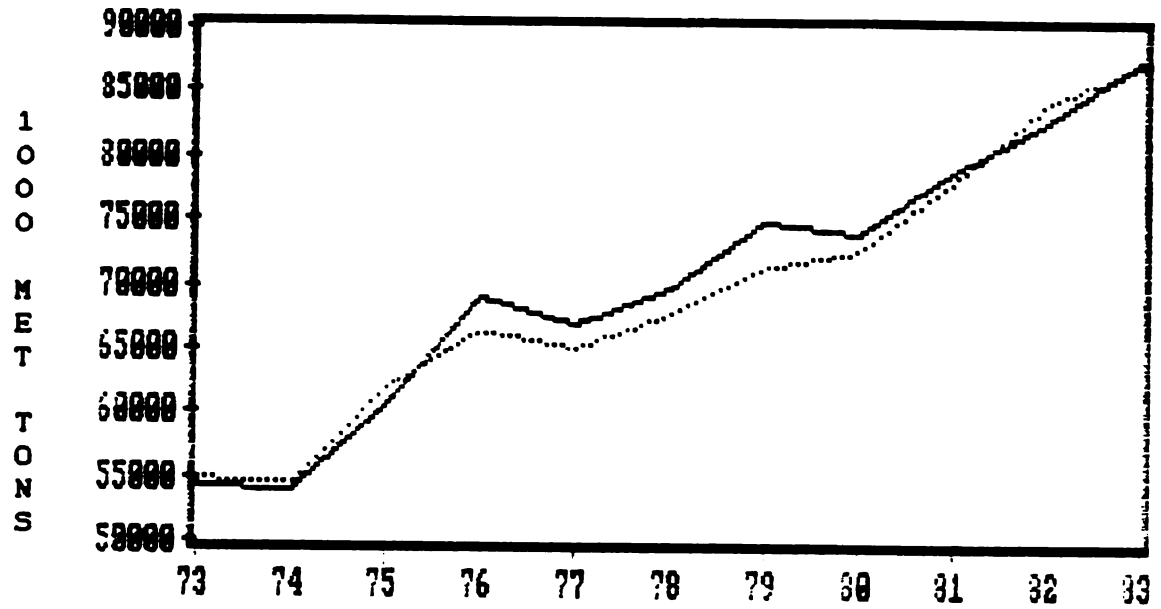
WPROLD.....Production
WHALD.....Harvested Area
WYLD.....Yield
WCONLD.....Total Consumption
WNILD.....Net Imports
WESLD.....Ending Stocks

Coarse Grain

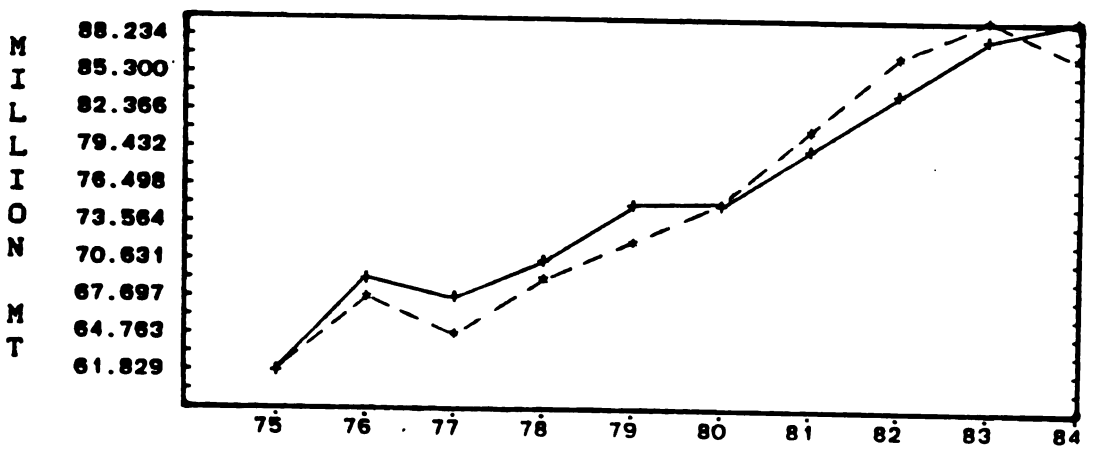
FPROLD.....Production
FHALD.....Harvested Area
FYLD.....Yield
FCONLD.....Total Consumption
FNILD.....Net Imports
FESLD.....Ending Stocks

Soybean Complex

SPROLD.....Production
SHALD.....Harvested Area
SYLD.....Yield
SMCOLD.....Soymeal Equiv. Consumption
SOCOLD.....Soyoil Equiv. Consumption
SMEILD.....Soymeal Equiv. Net Imports
SOEILD.....Soyoil Equiv. Net Imports
PMELLD.....% SMEILD Imported as SMNILD
SMNILD.....Soymeal Net Imports
SONILD.....Soyoil Net Imports
SNILD.....Soybean Net Imports
SMESLD.....Soymeal Ending Stocks
SOESLD.....Soyoil Ending Stocks
SESLD.....Soybean Ending Stocks



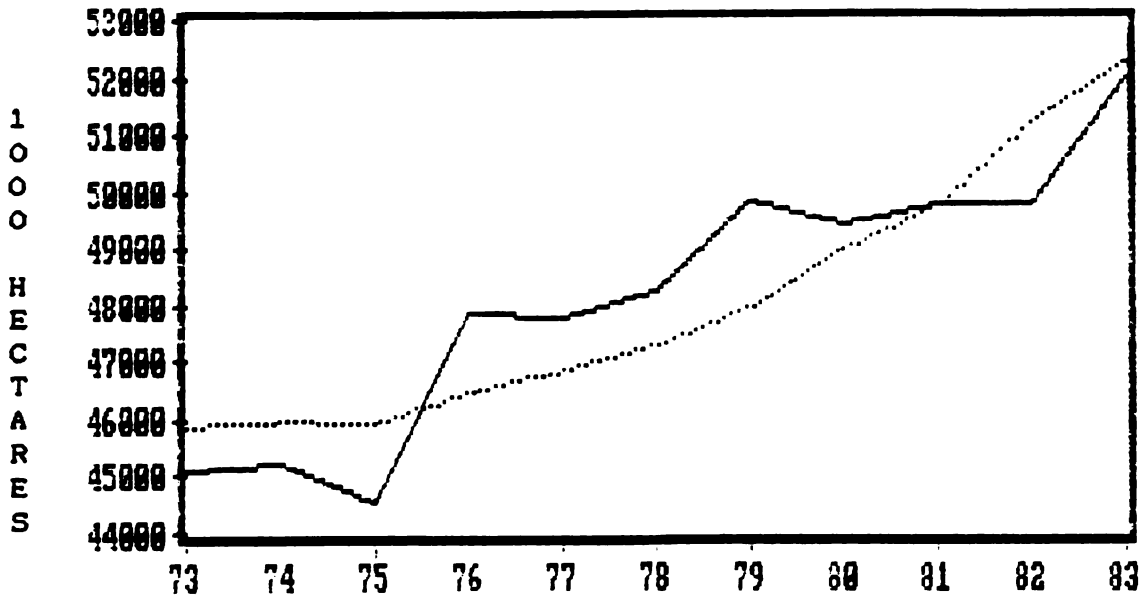
REGIONAL MODEL SIMULATION



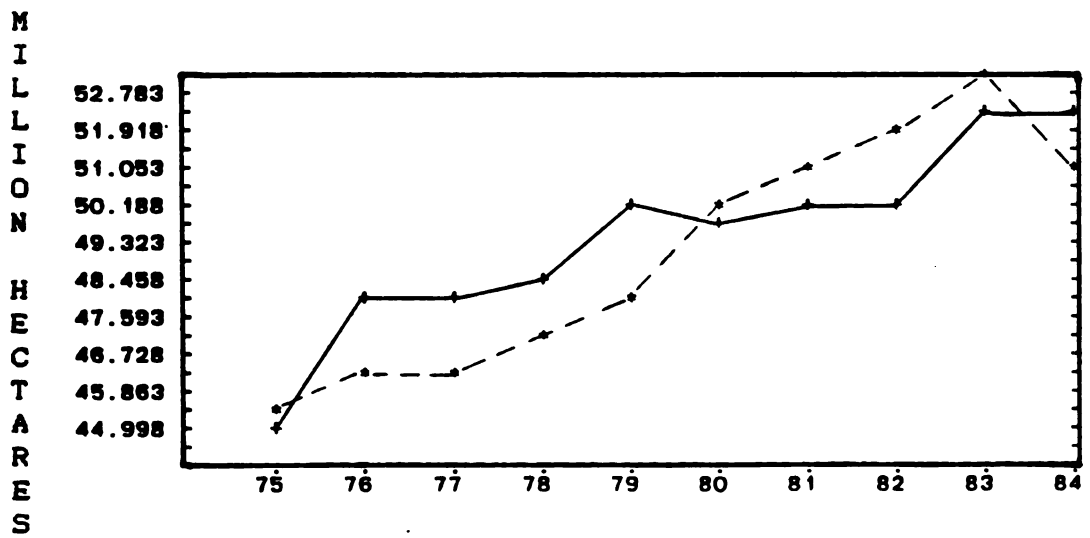
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.1.a & b. Wheat Production - Less Developed Countries



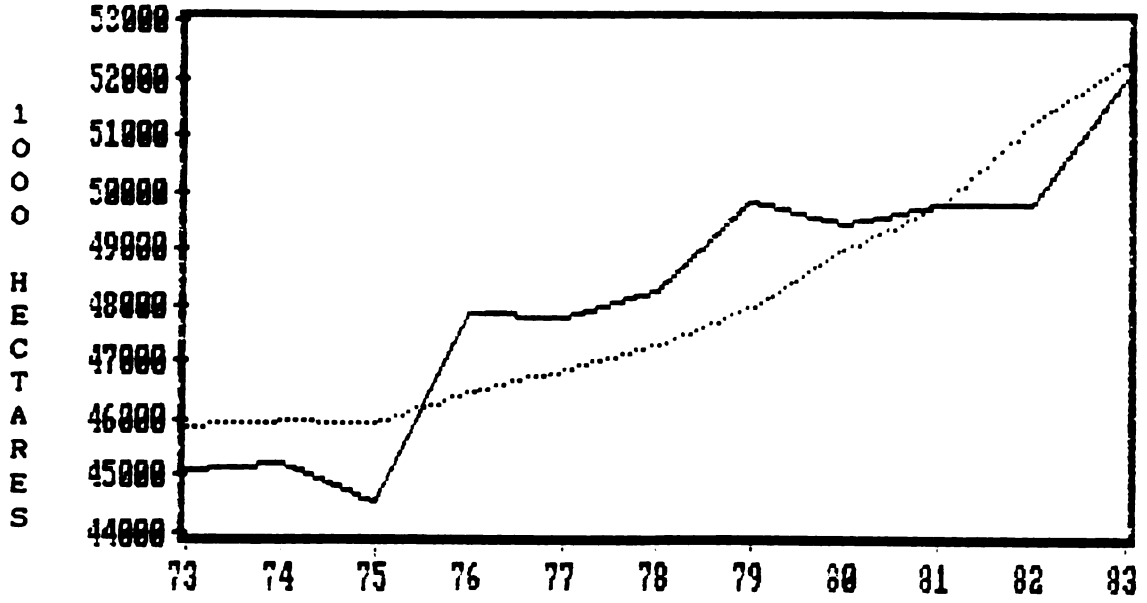
REGIONAL MODEL SIMULATION



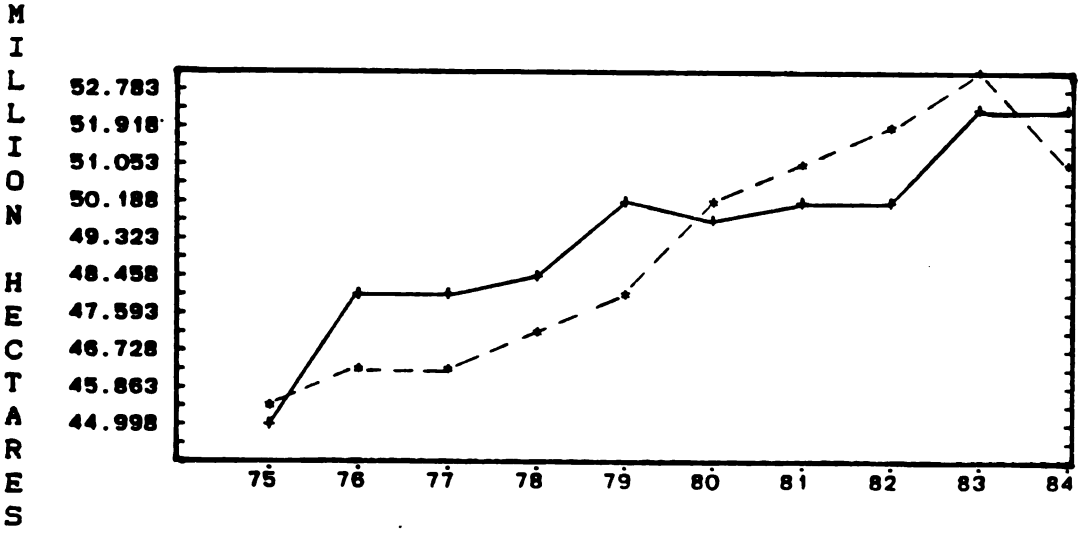
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.2.a & b. Wheat Harvested Area - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.2.a & b. Wheat Harvested Area - Less Developed Countries

Less Developed Countries
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHALD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	3496.9683	3466.5406	1.0087775	0.327
WHALD(-1)	0.9937235	0.0800000	12.421546	0.000
FRLD4(-1)	-4174.5752	2777.8062	-1.5028317	0.151
WRLD4(-1)	1210.3215	1133.3799	1.0678869	0.301

R-squared	0.944399	Mean of dependent var	45240.10
Adjusted R-squared	0.934587	S.D. of dependent var	4742.388
S.E. of regression	1212.913	Sum of squared resid	25009692
Durbin-Watson stat	2.116756	F-statistic	96.24961
Log likelihood	-176.6954		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-714.889	38492.0	39206.9
	1965	-562.551	38585.0	39147.6
*	1966	-2338.81	36879.0	39217.8
	1967	29.5328	37763.0	37733.5
	1968	1508.93	40632.0	39123.1
	1969	210.450	42037.0	41826.5
	1970	583.782	43255.0	42671.2
	1971	1072.86	44753.0	43680.1
	1972	-137.975	45696.0	45834.0
	1973	-450.704	45128.0	45578.7
	1974	3.99012	45230.0	45226.0
	1975	-650.654	44565.0	45215.7
	1976	2756.16	47861.0	45104.8
	1977	-446.302	47793.0	48239.3
	1978	59.4784	48279.0	48219.5
	1979	870.523	49843.0	48972.5
*	1980	-1437.35	49405.0	50842.3
	1981	-369.334	49756.0	50125.3
*	1982	-1451.50	49789.0	51240.5
	1983	1128.63	51968.0	50839.4
	1984	335.728	52333.0	51997.3

INDEPENDENT VARIABLES

WHALD = Wheat Harvested Area (1000 HA)

WRLD4 = Wheat Revenue Per Hectare ($/HA)
(WYLD(-3)+WYLD(-2)+WYLD(-1)+WYLD)/4*WP*XRLD/CPILD

FRLD4 = Coarse Grain Revenue Per Hectare ($/HA)
(FYLD(-3)+FYLD(-2)+FYLD(-1)+FYLD)/4*FP*XRLD/CPILD

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHALD	45240.095	4742.3884	52333.000	36879.000
WHALD(-1)	44581.333	4668.1063	51968.000	36879.000
FRLD4(-1)	1.2023171	0.2580301	1.8351450	0.8346143
WRLD4(-1)	2.0331537	0.7001682	3.7553960	1.1695090

	Covariance	Correlation
WHALD, WHALD	21419283.	1.0000000
WHALD, WHALD(-1)	20397553.	0.9674518
WHALD, FRLD4(-1)	588.60842	0.5050663
WHALD, WRLD4(-1)	1996.1696	0.6312295
WHALD(-1), WHALD(-1)	20753557.	1.0000000
WHALD(-1), FRLD4(-1)	665.15488	0.5798302
WHALD(-1), WRLD4(-1)	2107.6991	0.6771028
FRLD4(-1), FRLD4(-1)	0.0634091	1.0000000
FRLD4(-1), WRLD4(-1)	0.1589117	0.9235756
WRLD4(-1), WRLD4(-1)	0.4668909	1.0000000

Less Developed Countries
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-10.099582	0.4940279	-20.443343	0.000
LOGT	2.6522604	0.1158036	22.903093	0.000

R-squared	0.959748	Mean of dependent var	1.212232
Adjusted R-squared	0.957918	S.D. of dependent var	0.269517
S.E. of regression	0.055289	Sum of squared resid	0.067250
Durbin-Watson stat	1.191409	F-statistic	524.5517
Log likelihood	36.47417		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.05935	0.81904	0.75969
	1961	0.05051	0.85404	0.80353
	1962	0.08298	0.92963	0.84665
	1963	0.01519	0.90428	0.88909
	1964	-0.05205	0.87881	0.93086
	1965	-0.00238	0.96960	0.97198
	1966	-0.08769	0.92478	1.01247
	1967	-0.05707	0.99529	1.05236
	1968	0.03162	1.12328	1.09165
	1969	-0.01876	1.11162	1.13037
	1970	-0.03988	1.12866	1.16853
	1971	0.03383	1.23998	1.20616
	1972	0.02032	1.26357	1.24325
	1973	-0.07859	1.20125	1.27984
	1974	-0.12368	1.19224	1.31592
	1975	0.00295	1.35447	1.35152
	1976	0.05068	1.43733	1.38665
	1977	-0.02335	1.39797	1.42132
	1978	-0.01200	1.44355	1.45555
	1979	0.00947	1.49881	1.48933
	1980	-0.02787	1.49483	1.52270
	1981	0.02915	1.58479	1.55564
	1982	0.07198	1.66017	1.58819
	1983	0.06528	1.68561	1.62033

INDEPENDENT VARIABLES

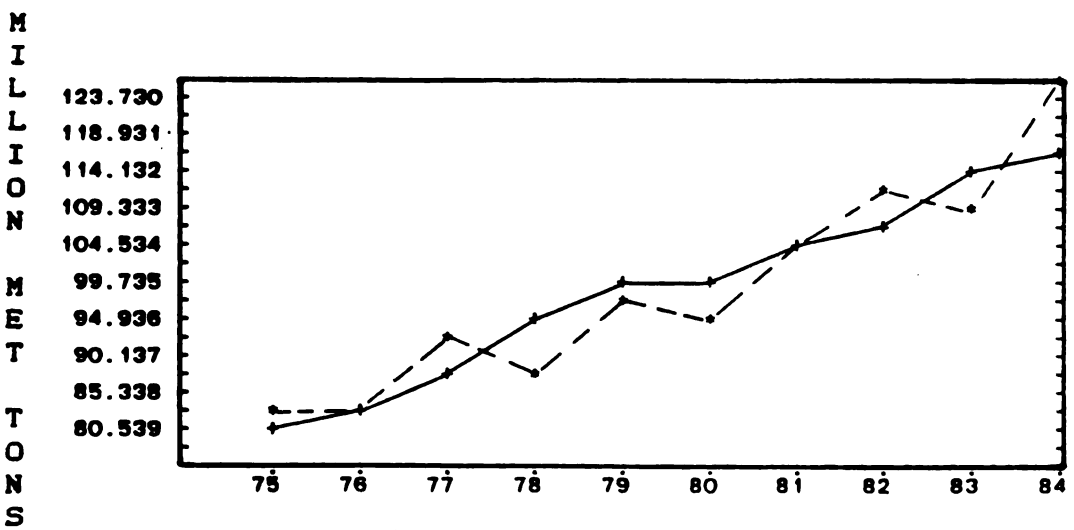
LOGT = Ln(TIME)

SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYLD	1.2122324	0.2695173	1.6856140	0.8190420
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYLD, WYLD	0.0696129	1.0000000
WYLD. LOGT	0.0251901	0.9796671
LOGT, LOGT	0.0094976	1.0000000

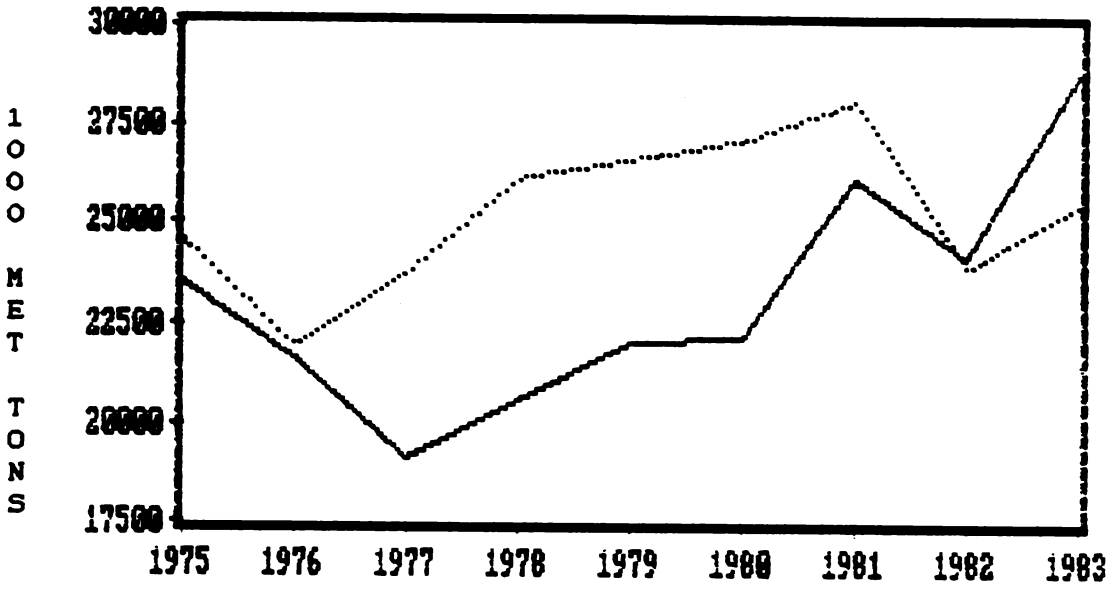
REGIONAL MODEL SIMULATION



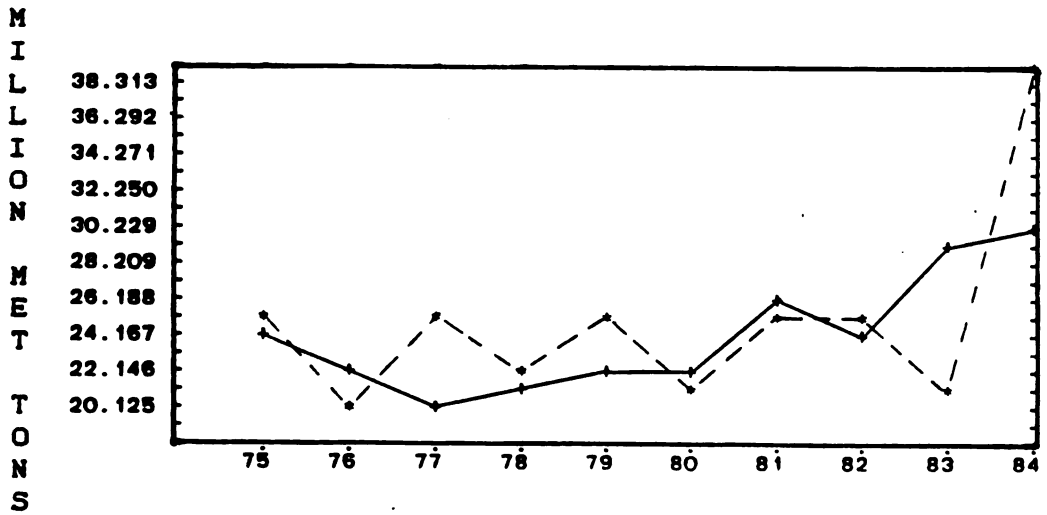
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.3.a & b. Total Wheat Consumption - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.4.a & b. Wheat Net Imports - Less Developed Countries

Less Developed Countries
Per Capita Wheat Net Imports (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0098316	0.0022307	4.4074904	0.000
PCRGDP	23406.339	7631.4861	3.0670748	0.006
PCDWSU	-0.2599733	0.0866777	-2.9993107	0.007
WPLD(-1)	-0.0046456	0.0016317	-2.8470852	0.010
FPLD(-1)	0.0098281	0.0025147	3.9082636	0.001

R-squared	0.621530	Mean of dependent var	0.013882
Adjusted R-squared	0.541852	S.D. of dependent var	0.001890
S.E. of regression	0.001279	Sum of squared resid	3.11D-05
Durbin-Watson stat	1.096869	F-statistic	7.800517
Log likelihood	128.6199	TPE	5/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00091	0.01163	0.01254
	1962	-0.00045	0.01130	0.01175
	1963	-0.00142	0.01174	0.01317
	1964	-0.00094	0.01347	0.01442
	1965	0.00029	0.01480	0.01451
	1966	0.00246	0.01813	0.01566
	1967	0.00138	0.01585	0.01447
	1968	0.00043	0.01190	0.01147
	1969	0.00015	0.01209	0.01194
	1970	-0.00107	0.01313	0.01420
	1971	-0.00046	0.01329	0.01376
	1972	0.00047	0.01173	0.01125
	1973	-0.00028	0.01621	0.01648
	1974	0.00095	0.01688	0.01594
	1975	-0.00080	0.01573	0.01653
	1976	0.00132	0.01464	0.01332
	1977	-0.00069	0.01258	0.01328
	1978	-0.00139	0.01270	0.01410
	1979	-0.00102	0.01325	0.01427
	1980	-0.00169	0.01282	0.01451
	1981	-0.00045	0.01484	0.01529
	1982	0.00043	0.01324	0.01281
	1983	0.00234	0.01539	0.01305
	1984	0.00135	0.01581	0.01446

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLD/CPILD/POPLD

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLD(-1) + WPROLD)/POPLD

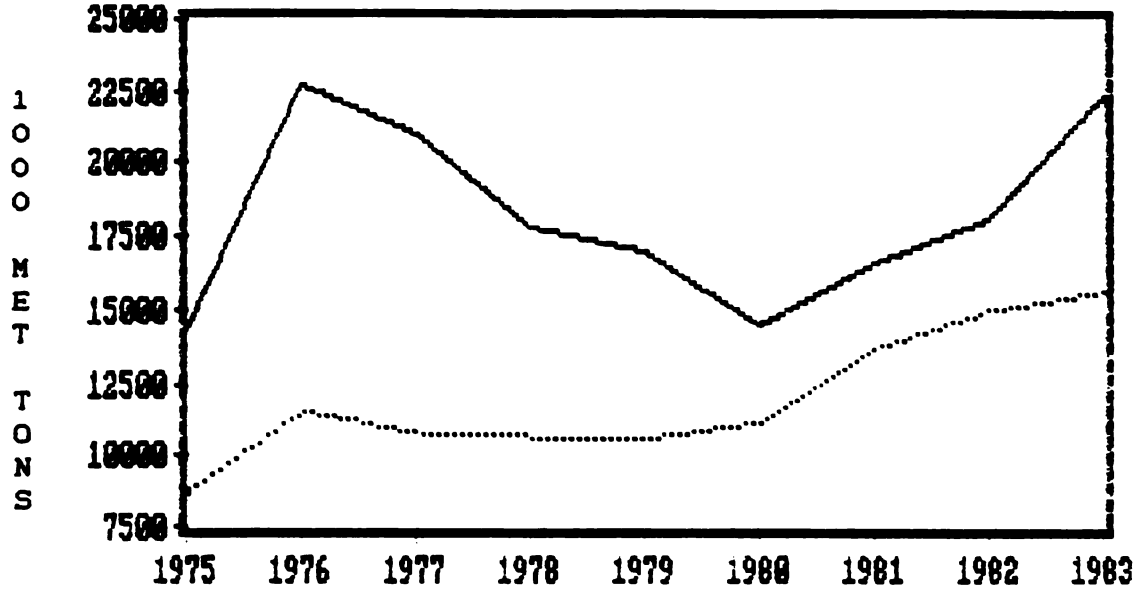
WPLD = Real LDC Wheat Price ($/MT)
WP*XRLD/CPILD

FPLD = Real LDC Coarse Grain Price ($/MT)
FP*XRLD/CPILD

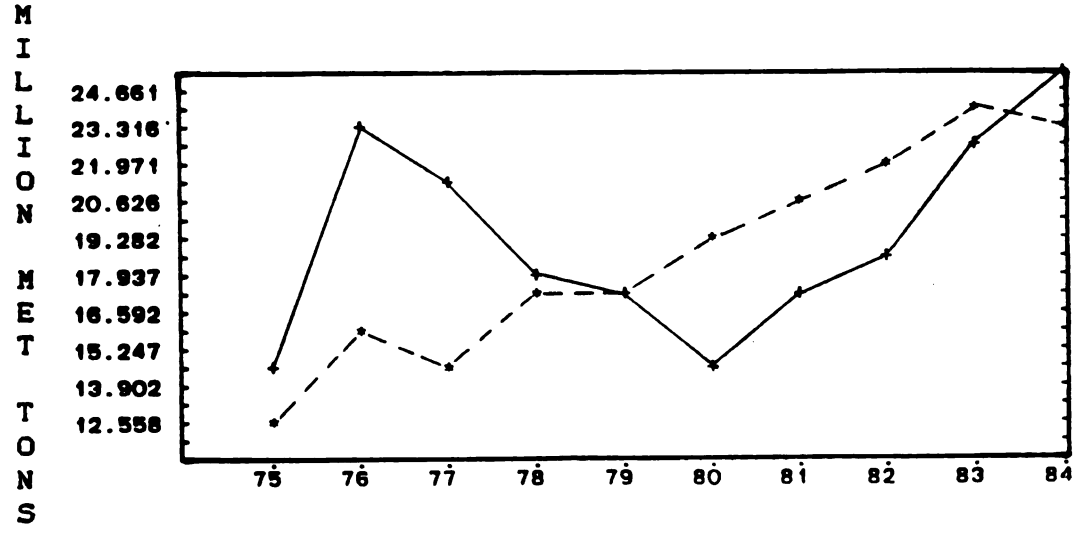
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0138822	0.0018903	0.0181257	0.0113048
PCRGDP	4.413D-07	1.028D-07	5.852D-07	2.782D-07
PCDWSU	0.0464305	0.0087525	0.0589431	0.0334222
WPLD(-1)	1.6592309	0.4082723	3.1078340	1.1258520
FPLD(-1)	1.3735413	0.2512123	2.1484590	1.0606360

	Covariance	Correlation
PCWNI, PCWNI	3.424D-06	1.0000000
PCWNI, PCRGDP	3.874D-11	0.2081229
PCWNI, PCDWSU	-3.513D-08	-0.0022157
PCWNI, WPLD(-1)	0.0003153	0.4263036
PCWNI, FPLD(-1)	0.0002724	0.5985574
PCRGDP, PCRGDP	1.012D-14	1.0000000
PCRGDP, PCDWSU	7.916D-10	0.9183749
PCRGDP, WPLD(-1)	1.067D-08	0.2653673
PCRGDP, FPLD(-1)	5.823D-09	0.2353748
PCDWSU, PCDWSU	7.341D-05	1.0000000
PCDWSU, WPLD(-1)	0.0002551	0.0745050
PCDWSU, FPLD(-1)	0.0001737	0.0824568
WPLD(-1), WPLD(-1)	0.1597410	1.0000000
WPLD(-1), FPLD(-1)	0.0889270	0.9047449
FPLD(-1), FPLD(-1)	0.0604781	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.5.a & b. Wheat Ending Stocks - Less Developed Countries

Less Developed Countries
Wheat Ending Stocks Per Capita (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0050351	0.0018666	-2.6975159	0.013
PCDWSU	0.3371967	0.0346621	9.7281000	0.000
WPLD	-0.0014755	0.0007401	-1.9936411	0.059

R-squared	0.818480	Mean of dependent var	0.008154
Adjusted R-squared	0.801193	S.D. of dependent var	0.003209
S.E. of regression	0.001431	Sum of squared resid	4.30D-05
Durbin-Watson stat	0.841292	F-statistic	47.34499
Log likelihood	124.7361	TPE	5/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00111	0.00505	0.00395
	1962	0.00137	0.00628	0.00492
	1963	0.00079	0.00584	0.00505
	1964	-0.00026	0.00423	0.00449
	1965	-9.0D-06	0.00516	0.00516
	1966	0.00019	0.00428	0.00409
	1967	0.00023	0.00495	0.00472
	1968	-0.00031	0.00661	0.00692
	1969	-0.00200	0.00585	0.00785
	1970	-0.00157	0.00613	0.00770
	1971	6.2D-05	0.00923	0.00917
	1972	-0.00207	0.00752	0.00959
	1973	-0.00085	0.00551	0.00636
	1974	-0.00032	0.00610	0.00642
	1975	0.00199	0.00953	0.00754
	1976	0.00369	0.01543	0.01174
	1977	0.00118	0.01378	0.01261
	1978	-0.00043	0.01099	0.01142
	1979	-0.00049	0.01023	0.01071
	1980	-0.00170	0.00840	0.01010
	1981	-0.00125	0.00947	0.01072
	1982	-0.00110	0.00992	0.01102
	1983	0.00023	0.01194	0.01171
	1984	0.00154	0.01326	0.01172

INDEPENDENT VARIABLES

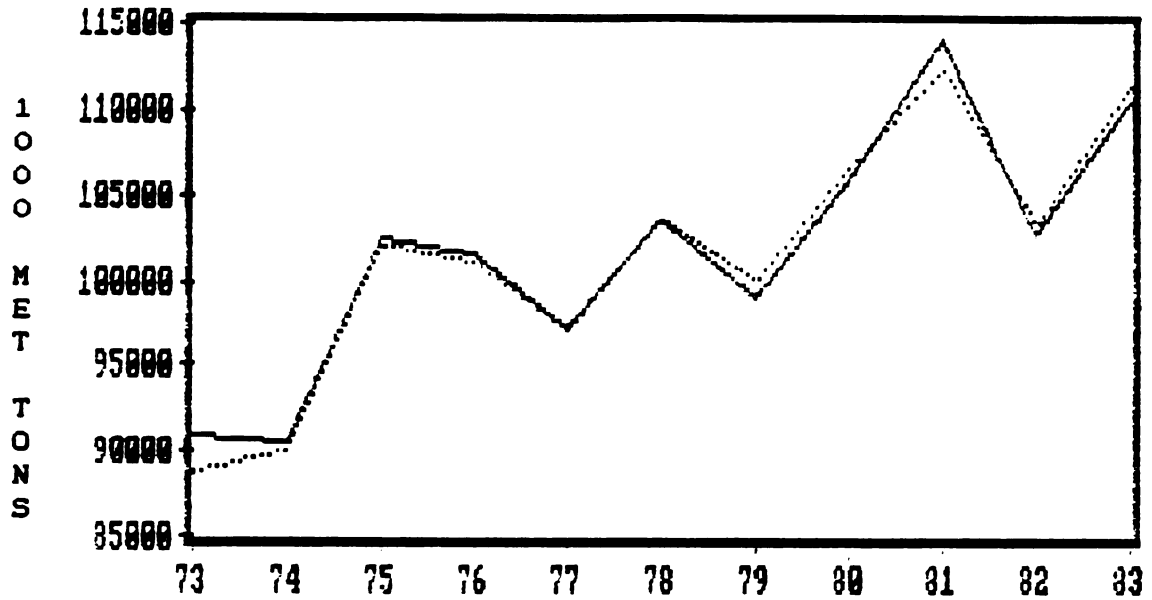
PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLD(-1) + WPROLD)/POPLD

WPLD = Real LDC Wheat Price ($/MT)
WP*XRLD/CPILD

SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0081539	0.0032090	0.0154290	0.0042328
PCDWSU	0.0464305	0.0087525	0.0589431	0.0334222
WPLD	1.6720417	0.4099074	3.1078340	1.1258920

	Covariance	Correlation
PCWES, PCWES	9.869D-06	1.0000000
PCWES, PCDWSU	2.383D-05	0.8855082
PCWES, WPLD	-2.725D-05	-0.0216151
PCDWSU, PCDWSU	7.341D-05	1.0000000
PCDWSU, WPLD	0.0006238	0.1814341
WPLD, WPLD	0.1610231	1.0000000

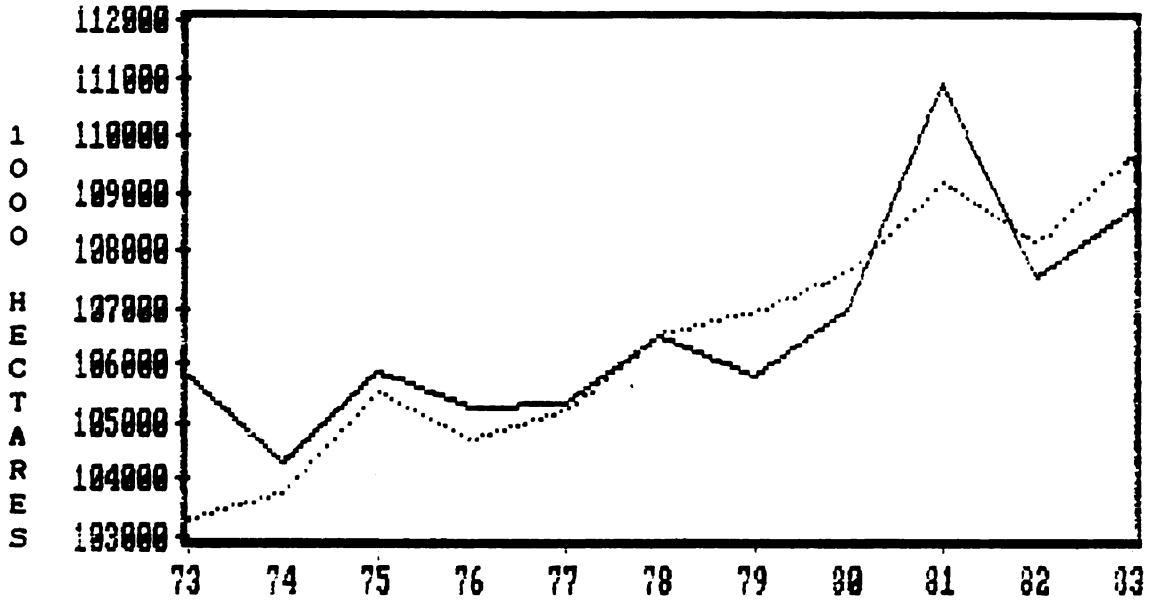


REGIONAL MODEL SIMULATION

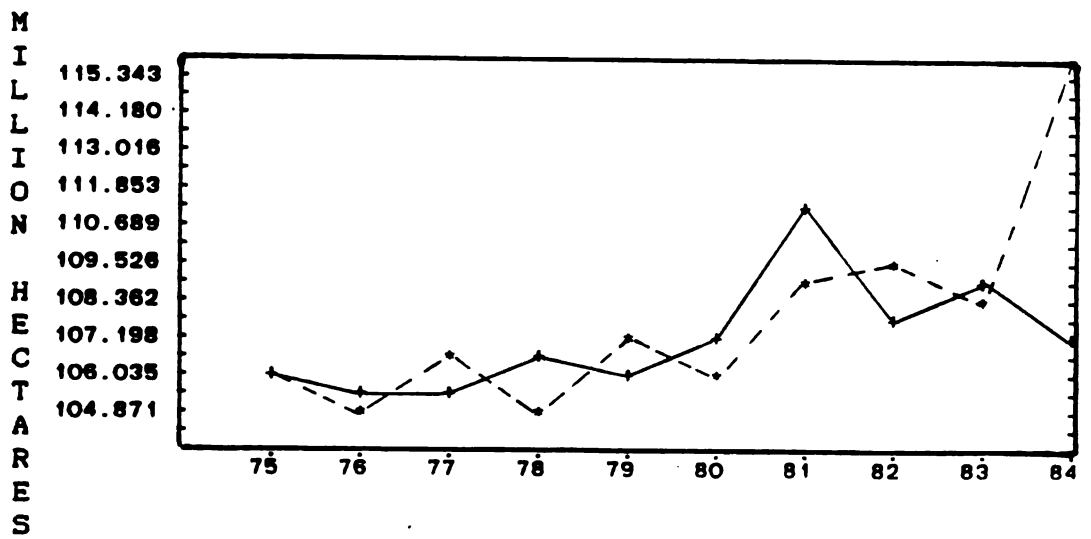
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.6.a & b. Coarse Grain Production - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.7.a & b. Coarse Grain Harvested Area - Less Developed Countries

Less Developed Countries
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is FHALD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	48954.655	17848.309	2.7428176	0.015
FHALD(-1)	0.4860211	0.1647114	2.9507435	0.010
FRLD4(-1)	9020.1103	5059.8314	1.7826899	0.095
FNILD(-1)	0.6308636	0.1567332	4.0250800	0.001
WRLD4(-1)	-3810.8996	2205.1779	-1.7281597	0.104

R-squared	0.815640	Mean of dependent var	104156.6
Adjusted R-squared	0.766477	S.D. of dependent var	3508.297
S.E. of regression	1695.358	Sum of squared resid	43113573
Durbin-Watson stat	1.980818	F-statistic	16.59059
Log likelihood	-174.2149	TPE	4/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1964	-2036.22	97969.0	100005.
*	1965	-718.097	99059.0	99777.1
*	1966	-1336.55	99648.0	100985.
*	1967	1586.35	103072.	101486.
*	1968	646.301	102325.	101679.
*	1969	3935.45	103776.	99840.6
*	1970	179.476	103728.	103549.
*	1971	-1019.84	102379.	103399.
*	1972	-2968.78	97964.0	100933.
*	1973	2550.42	105845.	103295.
*	1974	-485.513	104312.	104798.
*	1975	169.004	105907.	105738.
*	1976	265.013	105273.	105008.
*	1977	-455.553	105365.	105821.
*	1978	-113.627	106500.	106614.
*	1979	-38.0531	105839.	105877.
*	1980	-615.669	107019.	107635.
*	1981	612.059	110917.	110305.
*	1982	436.935	107545.	107108.
*	1983	-593.100	108689.	109282.

INDEPENDENT VARIABLES

FHALD = Coarse Grain Harvested Area (1000 HA)

FRLD4 = Coarse Grain Revenue Per Hectare ($/MT)
(FYLD(-3)+FYLD(-2)+FYLD(-1)+FYLD)/4*FP*XRLD/CPILD

WRLD4 = Wheat Revenue Per Hectare ($/HA)
(WYLD(-3)+WYLD(-2)+WYLD(-1)+WYLD)/4*WP*XRLD/CPILD

FNILD = Coarse Grain Net Imports (1000 MT)

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
FHALD	104156.55	3508.2968	110917.00	97964.000
FHALD(-1)	103601.95	3628.7431	110917.00	97597.000
FRLD4(-1)	1.1878229	0.2558121	1.8351450	0.8346143
FNILD(-1)	2828.3500	3937.6758	11381.000	-2581.0000
WRLD4(-1)	2.0072511	0.7079590	3.7553960	1.1695090

	Covariance	Correlation
FHALD, FHALD	11692739.	1.0000000
FHALD, FHALD(-1)	8860336.8	0.7326121
FHALD, FRLD4(-1)	426.47240	0.5002072
FHALD, FNILD(-1)	11033201.	0.8407011
FHALD, WRLD4(-1)	1463.3088	0.6201660
FHALD(-1), FHALD(-1)	12509388.	1.0000000
FHALD(-1), FRLD4(-1)	280.75137	0.3183619
FHALD(-1), FNILD(-1)	8517230.8	0.6274493
FHALD(-1), WRLD4(-1)	1344.8553	0.5510457
FRLD4(-1), FRLD4(-1)	0.0621678	1.0000000
FRLD4(-1), FNILD(-1)	531.16268	0.5550639
FRLD4(-1), WRLD4(-1)	0.1589731	0.9239978
FNILD(-1), FNILD(-1)	14730026.	1.0000000
FNILD(-1), WRLD4(-1)	1886.7295	0.7124231
WRLD4(-1), WRLD4(-1)	0.4761456	1.0000000

Less Developed Countries
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.1422580	0.2537120	-12.385135	0.000
LOGT	0.9393656	0.0594719	15.795122	0.000

R-squared	0.918964	Mean of dependent var	0.864109
Adjusted R-squared	0.915281	S.D. of dependent var	0.097552
S.E. of regression	0.028394	Sum of squared resid	0.017737
Durbin-Watson stat	2.180777	F-statistic	249.4859
Log likelihood	52.46758		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.01537	0.71920	0.70383
	1961	-0.01619	0.70316	0.71936
	1962	0.02097	0.75560	0.73463
	1963	0.01499	0.76465	0.74966
	1964	0.00389	0.76835	0.76445
	1965	-0.03585	0.74317	0.77902
	1966	-0.00830	0.78506	0.79336
	1967	0.01382	0.82131	0.80749
	1968	0.01701	0.83842	0.82140
	1969	-0.02362	0.81150	0.83512
	1970	0.02163	0.87027	0.84863
	1971	-0.00508	0.85687	0.86196
	1972	-0.04418	0.83092	0.87509
	1973	-0.02944	0.85861	0.88805
	1974	-0.03400	0.86683	0.90083
	1975	0.05294	0.96639	0.91344
	1976	0.03755	0.96344	0.92588
	1977	-0.01662	0.92154	0.93816
	1978	0.02197	0.97225	0.95028
	1979	-0.02811	0.93415	0.96225
	1980	0.01552	0.98959	0.97407
	1981	0.04228	1.02801	0.98574
	1982	-0.04318	0.95408	0.99726
	1983	0.00660	1.01524	1.00865

INDEPENDENT VARIABLES

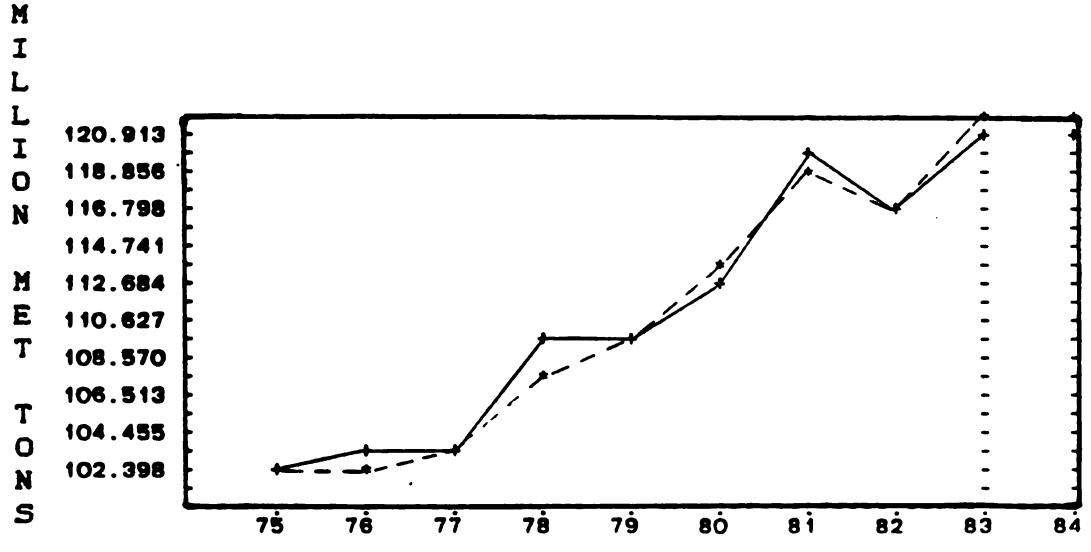
LOGT = Ln(TIME)

SMPL . 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYLD	0.8641091	0.0975516	1.0280120	0.7031642
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYLD, FYLD	0.0091198	1.0000000
FYLD, LOGT	0.0089217	0.9586264
LOGT, LOGT	0.0094976	1.0000000

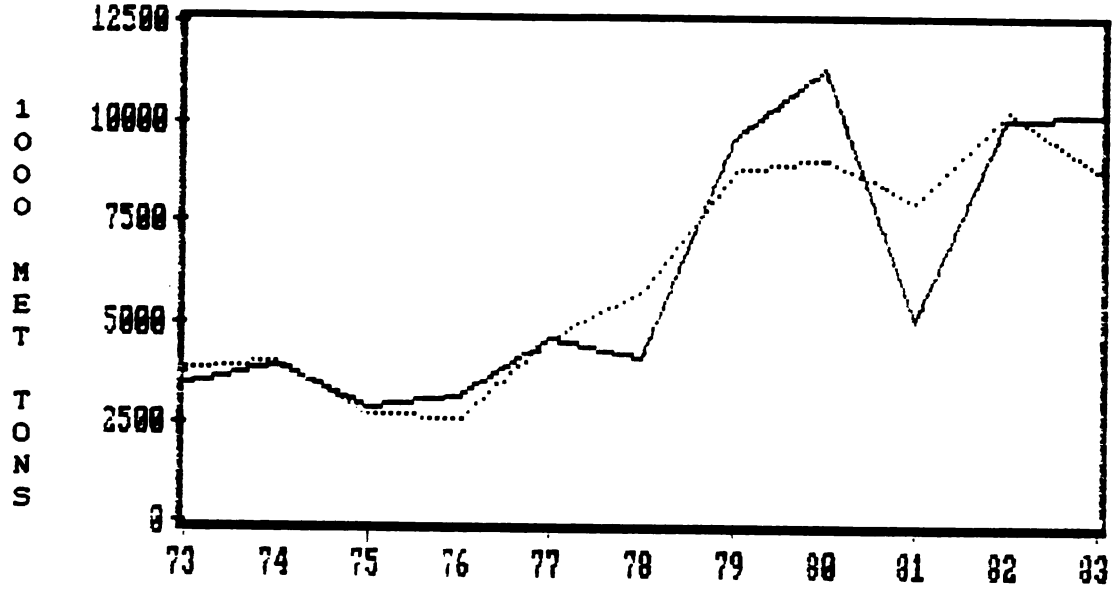
REGIONAL MODEL SIMULATION



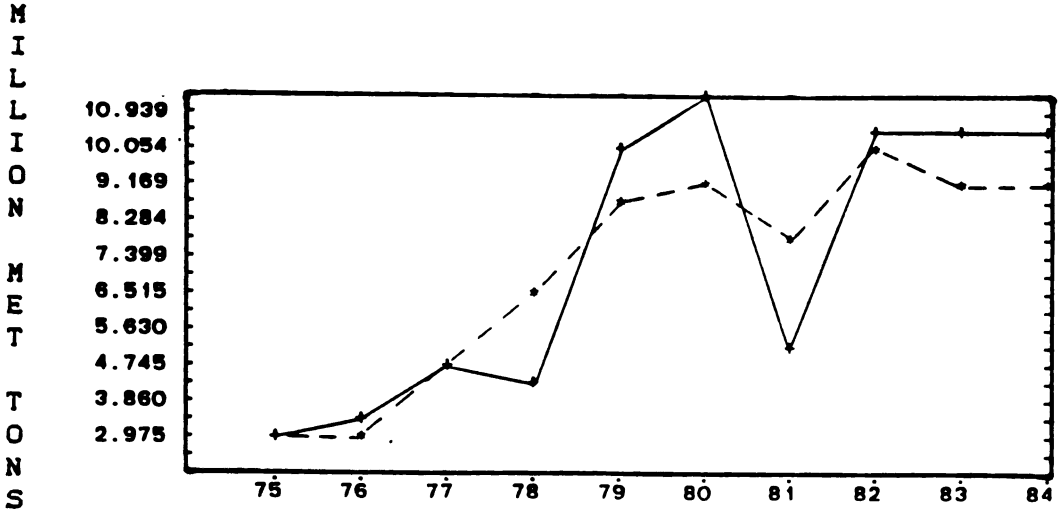
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.8.a & b. Total Coarse Grain Consumption - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.9.a & b. Coarse Grain Net Imports - Less Developed Countries

Less Developed Countries
Coarse Grain Net Imports Per Capita (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0143015	0.0037712	3.7923430	0.001
PCRGDP	23066.367	4409.2722	5.2313320	0.000
PCDFSU	-0.2564119	0.0464252	-5.5231148	0.000
PCDWSU	-0.0973670	0.0528360	-1.8428146	0.081

R-squared	0.894112	Mean of dependent var	0.001770
Adjusted R-squared	0.877392	S.D. of dependent var	0.002390
S.E. of regression	0.000837	Sum of squared resid	1.33D-05
Durbin-Watson stat	1.939165	F-statistic	53.47810
Log likelihood	132.5372	TPE	7/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00051	0.00069	0.00018
	1962	0.00107	0.00032	-0.00075
	1963	0.00072	-0.00014	-0.00086
	1964	-0.00070	-0.00093	-0.00023
	1965	-0.00102	-0.00037	0.00065
	1966	8.5D-05	0.00073	0.00064
	1967	0.00082	0.00012	-0.00070
	1968	-0.00094	-0.00207	-0.00113
	1969	-7.3D-05	-7.5D-05	-2.0D-06
	1970	0.00019	-0.00047	-0.00066
	1971	-0.00190	-0.00076	0.00114
	1972	-0.00020	0.00245	0.00265
	1973	0.00015	0.00252	0.00237
	1974	5.0D-05	0.00283	0.00278
	1975	-5.6D-07	0.00190	0.00190
	1976	0.00089	0.00211	0.00122
	1977	0.00070	0.00302	0.00232
	1978	-0.00061	0.00251	0.00312
	1979	0.00033	0.00582	0.00549
	1980	0.00107	0.00662	0.00556
	1981	-0.00117	0.00287	0.00404
	1982	-0.00038	0.00556	0.00594
	1983	0.00040	0.00545	0.00505

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLD/CPILD/POPLD

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLD(-1) + WPROLD)/POPLD

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESLD(-1) + FPROLD)/POPLD

Less Developed Countries
Coarse Grain Net Imports Per Capita (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0143015	0.0037718	3.7923430	0.001
PCRGDP	23066.367	4409.2722	5.2313320	0.000
PCDFSU	-0.2564119	0.0464252	-5.5231148	0.000
PCDWSU	-0.0973670	0.0528360	-1.8426146	0.081

R-squared	0.894112	Mean of dependent var	0.001770
Adjusted R-squared	0.877392	S.D. of dependent var	0.002390
S.E. of regression	0.000837	Sum of squared resid	1.33D-05
Durbin-Watson stat	1.939165	F-statistic	53.47810
Log likelihood	132.5372	TPE	7/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00051	0.00069	0.00018
	1962	0.00107	0.00032	-0.00075
	1963	0.00072	-0.00014	-0.00086
	1964	-0.00070	-0.00093	-0.00023
	1965	-0.00102	-0.00037	0.00065
	1966	8.5D-05	0.00073	0.00064
	1967	0.00082	0.00012	-0.00070
	1968	-0.00094	-0.00207	-0.00113
	1969	-7.3D-05	-7.5D-05	-2.0D-06
	1970	0.00019	-0.00047	-0.00066
	1971	-0.00190	-0.00076	0.00114
	1972	-0.00020	0.00245	0.00265
	1973	0.00015	0.00252	0.00237
	1974	5.0D-05	0.00283	0.00278
	1975	-5.6D-07	0.00190	0.00190
	1976	0.00089	0.00211	0.00122
	1977	0.00070	0.00302	0.00232
	1978	-0.00061	0.00251	0.00312
	1979	0.00033	0.00582	0.00549
	1980	0.00107	0.00662	0.00556
	1981	-0.00117	0.00287	0.00404
	1982	-0.00038	0.00556	0.00594
	1983	0.00040	0.00545	0.00505

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLD/CPILD/POPLD

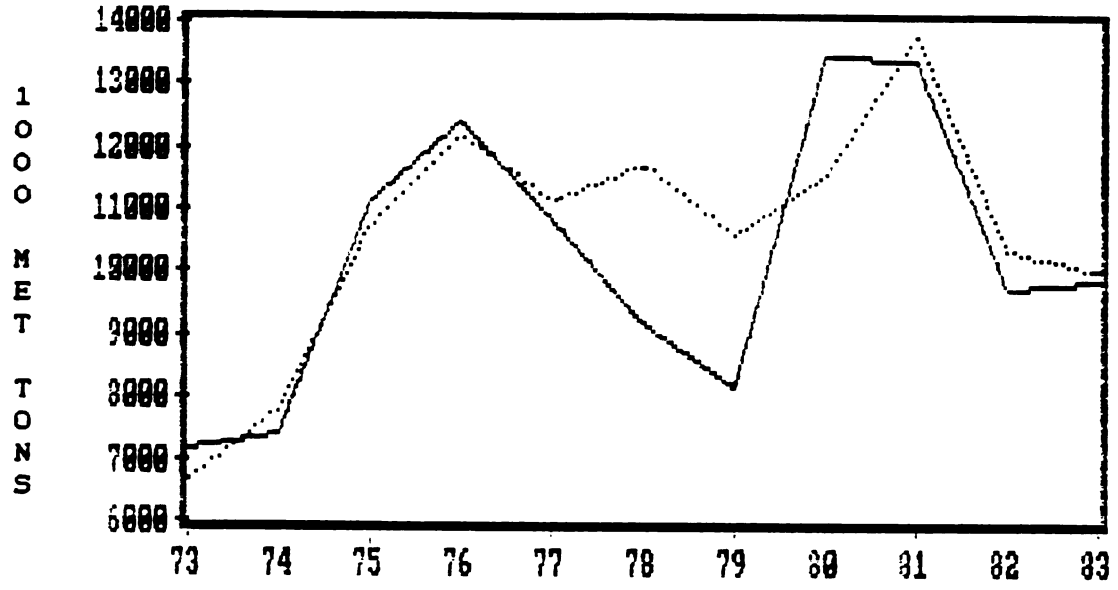
PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLD(-1) + WPROLD)/POPLD

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESLD(-1) + FPROLD)/POPLD

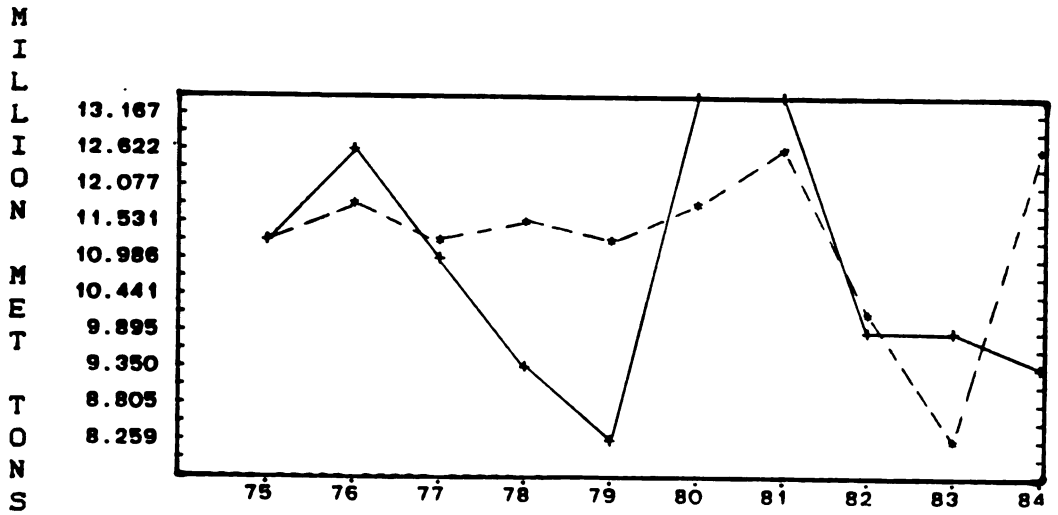
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0017696	0.0023899	0.0066234	-0.0020704
PCRGDP	4.376D-07	1.034D-07	5.852D-07	2.782D-07
PCDFSU	0.0707992	0.0041530	0.0774084	0.0635373
PCDWSU	0.0459333	0.0085957	0.0589431	0.0334222

	Covariance	Correlation
PCFNI, PCFNI	5.463D-06	1.0000000
PCFNI, PCRGDP	1.993D-10	0.8432981
PCFNI, PCDFSU	-6.568D-06	-0.6918743
PCFNI, PCDWSU	1.435D-05	0.7304775
PCRGDP, PCRGDP	1.023D-14	1.0000000
PCRGDP, PCDFSU	-1.541D-10	-0.3752682
PCRGDP, PCDWSU	7.816D-10	0.9193248
PCDFSU, PCDFSU	1.650D-05	1.0000000
PCDFSU, PCDWSU	-1.250D-05	-0.3661759
PCDWSU, PCDWSU	7.067D-05	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.10.a & b. Coarse Grain Ending Stocks - Less Developed Countries

Less Developed Countries
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0179987	0.0044813	-4.0164103	0.001
PCFSUP	0.3630243	0.0586916	6.1852910	0.000
FPLD	-0.0013756	0.0006662	-2.0649258	0.053
DV70	-0.0038977	0.0008460	-4.6069781	0.000

R-squared	0.740250	Mean of dependent var	0.006278
Adjusted R-squared	0.699237	S.D. of dependent var	0.001432
S.E. of regression	0.000785	Sum of squared resid	1.17D-05
Durbin-Watson stat	1.800206	F-statistic	18.04913
Log likelihood	134.0015	TPE	3/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1961	0.00035	0.00543	0.00507
: * :	1962	0.00054	0.00658	0.00604
: * :	1963	0.00056	0.00717	0.00661
: *	1964	0.00079	0.00706	0.00627
: * :	1965	0.00044	0.00594	0.00550
: *	1966	0.00093	0.00737	0.00645
* : :	1967	-0.00052	0.00786	0.00838
* : :	1968	-0.00050	0.00699	0.00749
: : *	1969	0.00137	0.00819	0.00683
: * :	1970	-1.2D-18	0.00428	0.00428
* : :	1971	-0.00165	0.00401	0.00566
: * : :	1972	-0.00033	0.00331	0.00364
: * : :	1973	-0.00015	0.00527	0.00542
: * : :	1974	-0.00057	0.00531	0.00588
: * : :	1975	0.00024	0.00743	0.00719
: * : :	1976	-0.00020	0.00843	0.00863
: * : :	1977	-0.00028	0.00714	0.00742
* : : :	1978	-0.00108	0.00568	0.00677
*: : :	1979	-0.00083	0.00492	0.00575
: : : *	1980	0.00128	0.00782	0.00654
: * : :	1981	-0.00030	0.00761	0.00791
: * : :	1982	-7.2D-05	0.00534	0.00541
: * : :	1983	-6.7D-06	0.00526	0.00527

INDEPENDENT VARIABLES

PCFSUP = **Total Coarse Grain Supply Per Capita (1000 MT)**
(FESLD(-1) + FPROLD + FNILD)/POPLD

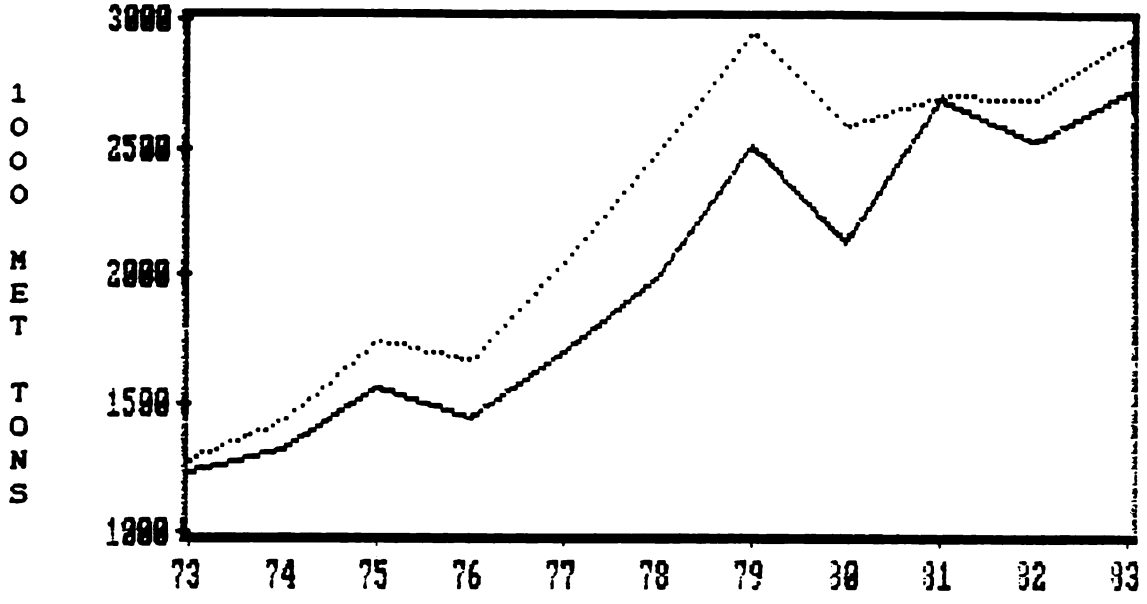
FPLD = **Real LDC Coarse Grain Price ($/MT)**
FP*XRLD/CPILD

DV70 = 1 If(YEAR .EQ. 70)
0 Otherwise

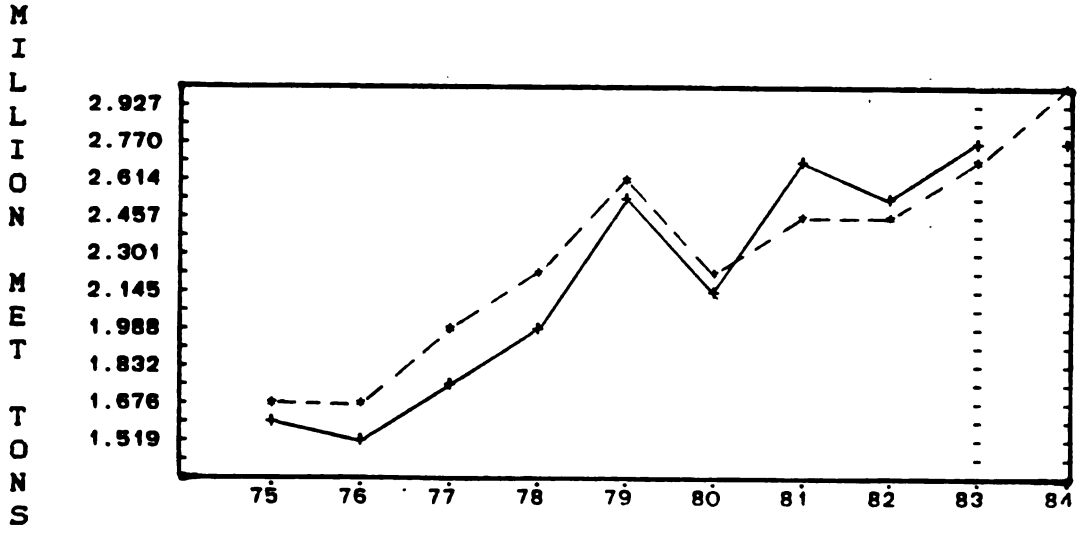
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0062784	0.0014318	0.0084314	0.0033098
PCFSUP	0.0725688	0.0030373	0.0785067	0.0659864
FPLD	1.3795523	0.2550873	2.1484590	1.0606360
DV70	0.0434783	0.2085144	1.0000000	0.0000000

	Covariance	Correlation
PCFES, PCFES	1.961D-06	1.0000000
PCFES, PCFSUP	2.634D-06	0.6333153
PCFES, FPLD	-0.0001134	-0.3245191
PCFES, DV70	-8.703D-05	-0.3047694
PCFSUP, PCFSUP	8.824D-06	1.0000000
PCFSUP, FPLD	-0.0001244	-0.1678284
PCFSUP, DV70	0.0001899	0.3134273
FPLD, FPLD	0.0622404	1.0000000
FPLD, DV70	-0.0044643	-0.0877477
DV70, DV70	0.0415879	1.0000000



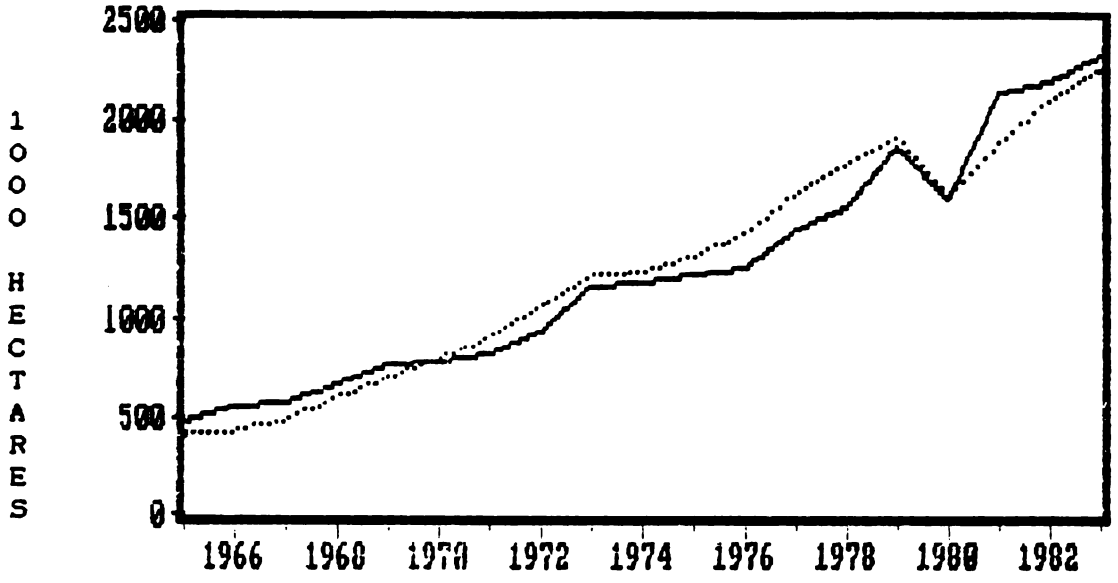
REGIONAL MODEL SIMULATION



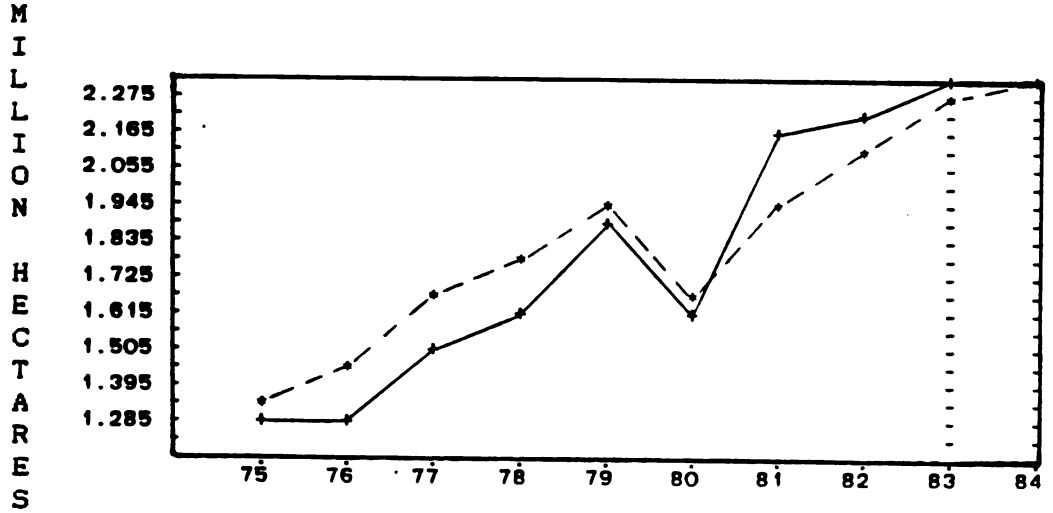
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.11.a & b. Soybean Production - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.12.a & b. Soybean Harvested Area - Less Developed Countries

Less Developed Countries
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SHALD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2895.9105	1575.5448	-1.8380375	0.089
SHALD(-1)	0.6095887	0.2514208	2.4245752	0.031
SRLD4(-1)	47.160926	52.601530	0.8931735	0.388
FRLD4(-1)	-206.85817	168.79470	-1.2255016	0.242
DV80	-379.09997	119.73521	-3.1661529	0.007
YEAR	48.059345	25.619312	1.8759031	0.083

R-squared	0.976801	Mean of dependent var	1239.053
Adjusted R-squared	0.967878	S.D. of dependent var	585.3775
S.E. of regression	104.9144	Sum of squared resid	143091.4
Durbin-Watson stat	1.788155	F-statistic	109.4739
Log likelihood	-111.7644	TPE	0/18

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	77.7449	484.000	406.255
	1966	82.3783	549.000	466.622
	1967	7.38230	565.000	557.618
	1968	16.8795	659.000	642.121
	1969	31.3884	767.000	735.612
	1970	-54.7946	780.000	834.795
	1971	-76.2910	813.000	889.291
	1972	-66.1725	935.000	1001.17
	1973	21.2153	1157.00	1135.78
	1974	-13.8703	1184.00	1197.87
	1975	-56.1821	1230.00	1286.18
	1976	-114.757	1257.00	1371.76
	1977	-81.9563	1451.00	1532.96
	1978	-92.4701	1566.00	1658.47
	1979	98.6129	1879.00	1780.39
	1980	-1.0D-13	1597.00	1597.00
	1981	264.659	2137.00	1872.34
	1982	-59.1143	2202.00	2261.11
	1983	15.3471	2330.00	2314.65

INDEPENDENT VARIABLES

SHALD = Soybean Harvested Area (1000 HA)

SRLD4 = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPILD

FRLD = Coarse Grain Revenue per Hectare ($/HA)
(FYLD(-3)+FYLD(-2)+FYLD(1)+FYLD)/4*FP^{LD}*XRLD/CPILD

DV80 = 1 If(YEAR .EQ. 80)
0 Otherwise

YEAR = 1960=60, 1961=61, ...

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SHALD	1239.0526	565.37751	2330.0000	484.00000
SHALD(-1)	1141.9474	546.06028	2202.0000	484.00000
SRLD4(-1)	3.1739477	1.0094403	5.2428740	2.0675800
FRLD4(-1)	1.1954096	0.2805000	1.8351450	0.8348143
DV80	0.0526316	0.2294157	1.0000000	0.0000000
YEAR	74.000000	5.6273143	83.000000	65.000000

	Covariance	Correlation
SHALD, SHALD	324631.73	1.0000000
SHALD, SHALD(-1)	291576.06	0.9628449
SHALD, SRLD4(-1)	264.88442	0.4731737
SHALD, FRLD4(-1)	59.003172	0.4084254
SHALD, DV80	18.839335	0.1480769
SHALD, YEAR	3042.3684	0.9748902
SHALD(-1), SHALD(-1)	282488.05	1.0000000
SHALD(-1), SRLD4(-1)	213.86593	0.4095446
SHALD(-1), FRLD4(-1)	56.999400	0.4229637
SHALD(-1), DV80	38.792244	0.3268603
SHALD(-1), YEAR	2825.3684	0.9705422
SRLD4(-1), SRLD4(-1)	0.9653408	1.0000000
SRLD4(-1), FRLD4(-1)	0.1991484	0.7994094
SRLD4(-1), DV80	0.0217261	0.0990283
SRLD4(-1), YEAR	2.8801817	0.5352035
FRLD4(-1), FRLD4(-1)	0.0642887	1.0000000
FRLD4(-1), DV80	0.0101845	0.1798827
FRLD4(-1), YEAR	0.6663540	0.4798187
DV80, DV80	0.0498615	1.0000000
DV80, YEAR	0.3157895	0.2581989
YEAR, YEAR	30.000000	1.0000000

Less Developed Countries
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SYLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-15.230091	3.6237677	-4.2028331	0.001
LOGT	3.8785812	0.8760272	4.4274665	0.000
SHALD	-0.0002821	0.0001192	-2.3667008	0.030

R-squared	0.813107	Mean of dependent var	1.086412
Adjusted R-squared	0.791120	S.D. of dependent var	0.174941
S.E. of regression	0.079954	Sum of squared resid	0.108675
Durbin-Watson stat	1.386545	F-statistic	36.98066
Log likelihood	23.77251		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-0.02759	0.73608	0.76367
	1965	-0.05343	0.77066	0.82409
	1966	-0.03072	0.83424	0.86497
	1967	0.02281	0.94159	0.91878
	1968	0.16256	1.11229	0.94973
	1969	0.06714	1.04303	0.97589
	1970	-0.05880	0.96923	1.02803
	1971	-0.08235	0.99139	1.07374
	1972	-0.05828	1.03529	1.09357
	1973	-0.02395	1.06050	1.08445
	1974	-0.01136	1.11824	1.12960
	1975	0.10367	1.27236	1.16869
	1976	-0.06607	1.14638	1.21245
	1977	-0.03199	1.17643	1.20842
	1978	0.04280	1.26884	1.22604
	1979	0.15185	1.33901	1.18716
	1980	0.01638	1.33187	1.31549
	1981	0.04836	1.25971	1.21135
	1982	-0.09120	1.14941	1.24061
	1983	-0.07984	1.17167	1.25151

INDEPENDENT VARIABLES

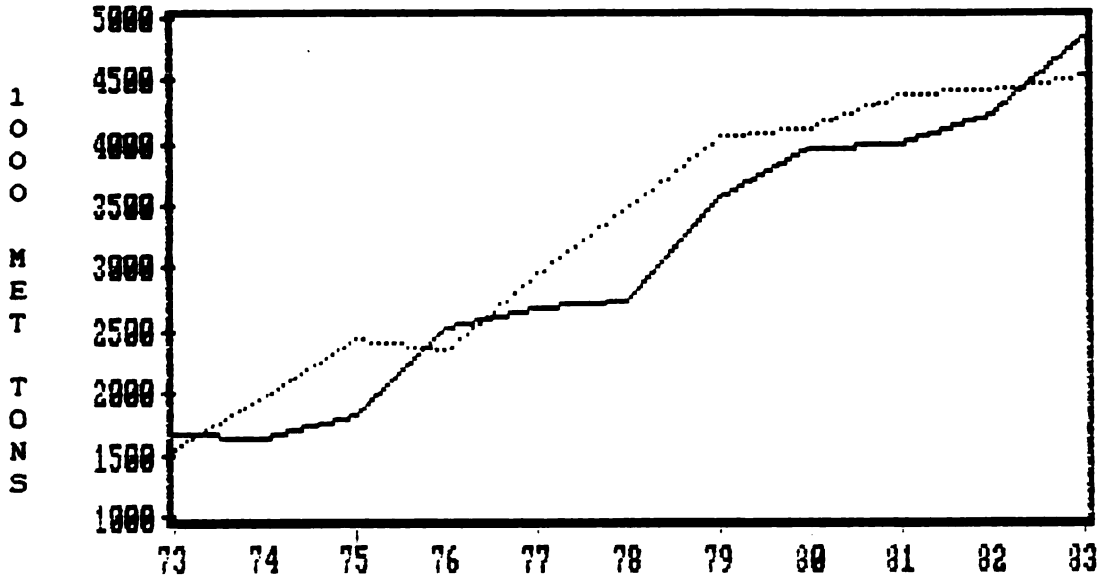
LOGT = Ln(YEAR)

SHALD = Soybean Harvested Area (1000 HA)

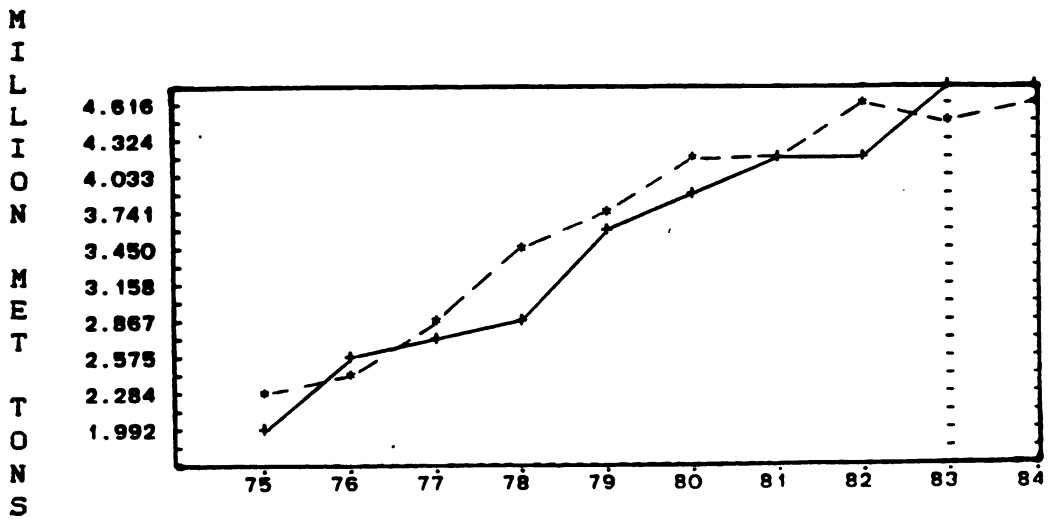
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SYLD	1.0864119	0.1749410	1.3390100	0.7360825
LOGT	4.2941910	0.0806392	4.4188400	4.1588830
SHALD	1201.3500	594.18979	2330.0000	484.00000

	Covariance	Correlation
SYLD, SYLD	0.0290741	1.0000000
SYLD, LOGT	0.0116469	0.8663076
SYLD, SHALD	76.339121	0.7730487
LOGT, LOGT	0.0062082	1.0000000
LOGT, SHALD	44.074870	0.9658735
SHALD, SHALD	335408.43	1.0000000



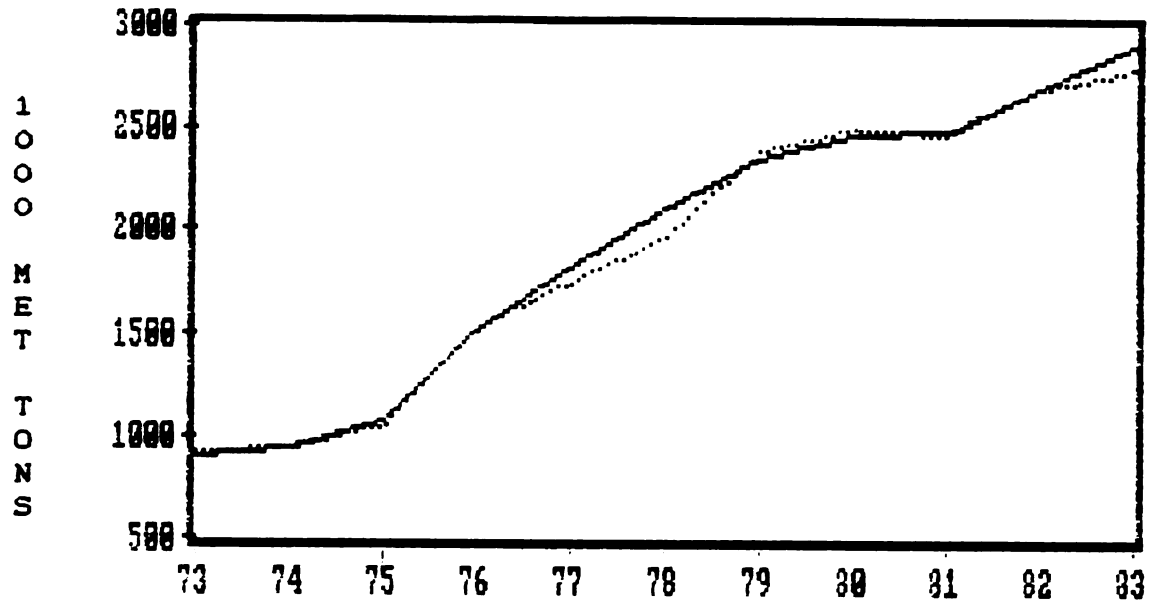
REGIONAL MODEL SIMULATION



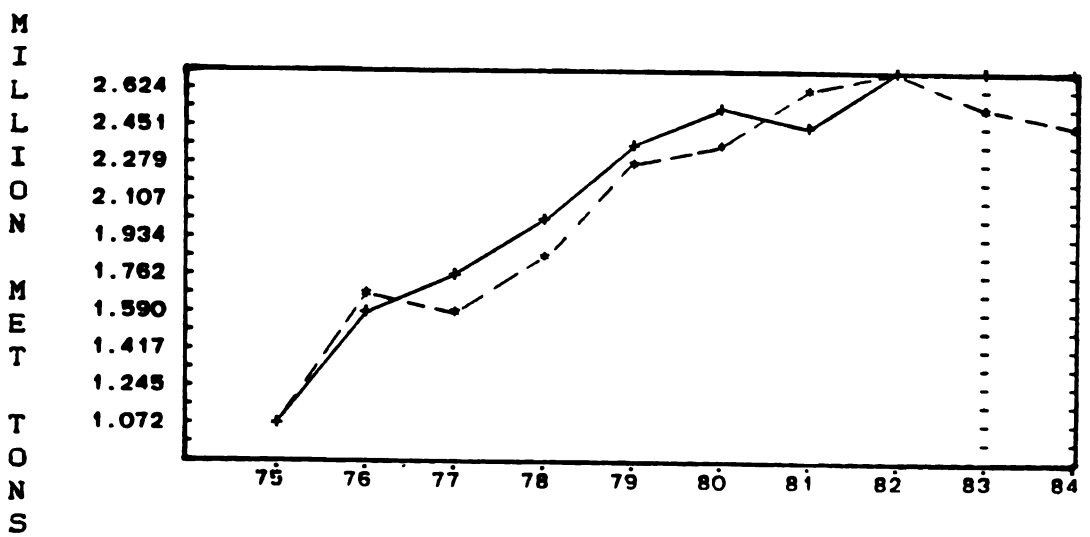
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.13.a & b. Soymeal Equivalent Consumption - Less Developed Countries



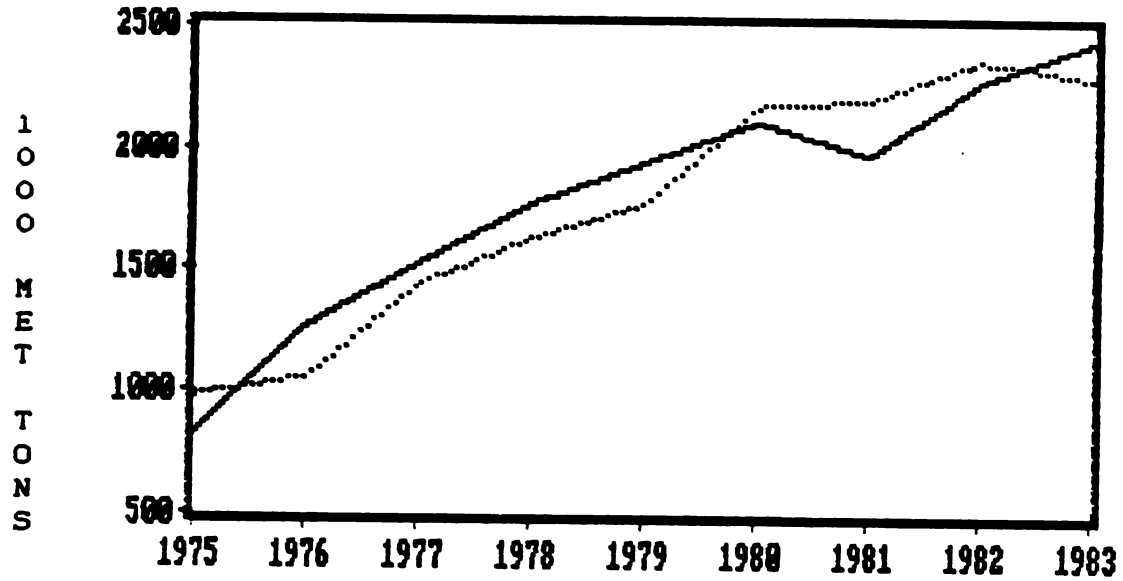
REGIONAL MODEL SIMULATION



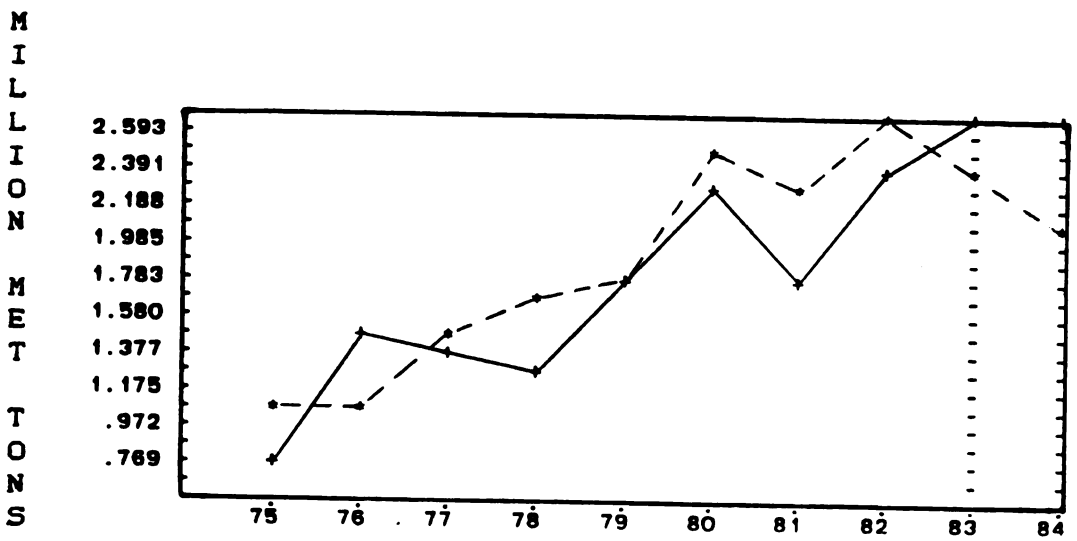
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.14.a & b. Soyoil Equivalent Consumption - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.15.a & b. Soymeal Equivalent Imports - Less Developed Countries

Less Developed Countries
Per Capita Soymeal Equivalent Imports (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PTSMNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0012720	0.0001287	-9.8817449	0.000
PCRGDP(-1)	4738.3358	371.61841	12.750541	0.000
PCOSSU	-0.0607771	0.0233612	-2.6016242	0.019

R-squared	0.943979	Mean of dependent var	0.000704
Adjusted R-squared	0.936977	S.D. of dependent var	0.000389
S.E. of regression	9.77D-05	Sum of squared resid	1.53D-07
Durbin-Watson stat	1.756351	F-statistic	134.8046
Log likelihood	150.1079	TPE	4/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	4.3D-05	0.00028	0.00024
	1966	-1.4D-05	0.00027	0.00028
	1967	-2.5D-05	0.00027	0.00029
	1968	4.9D-05	0.00037	0.00032
	1969	4.9D-05	0.00040	0.00035
	1970	5.7D-05	0.00048	0.00042
	1971	-0.00019	0.00035	0.00054
	1972	-6.2D-05	0.00038	0.00044
	1973	7.3D-05	0.00052	0.00044
	1974	-0.00015	0.00050	0.00065
	1975	-0.00010	0.00055	0.00065
	1976	0.00014	0.00086	0.00072
	1977	6.2D-05	0.00101	0.00094
	1978	8.4D-05	0.00109	0.00101
	1979	9.6D-05	0.00116	0.00107
	1980	-3.5D-05	0.00122	0.00126
	1981	-0.00011	0.00112	0.00124
	1982	-4.5D-05	0.00125	0.00129
	1983	8.2D-05	0.00131	0.00122

INDEPENDENT VARIABLES

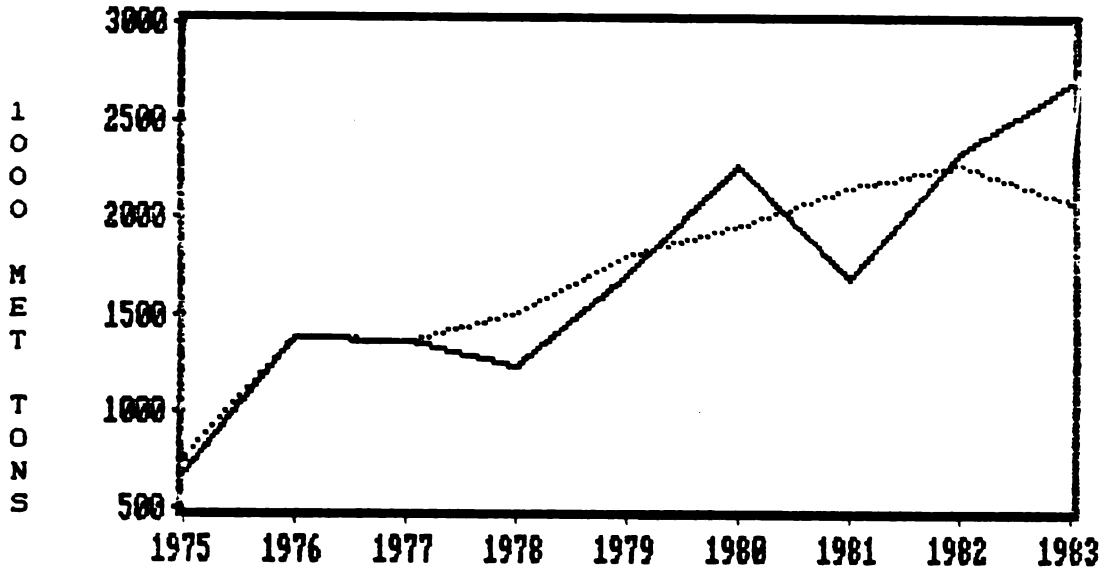
PCRGDP = Real GDP Per Capita
GDPLD/CPILD/POPLD

PCOSSU = Per Capita Supply of Peanut, Rapeseed, Sunflower Seed and Palm Kernel Meals (1000 MT)
(PPROLD*.41 + RPROLD*.59 + NPROLD*.475 + KPROLD*.52)/POPLD

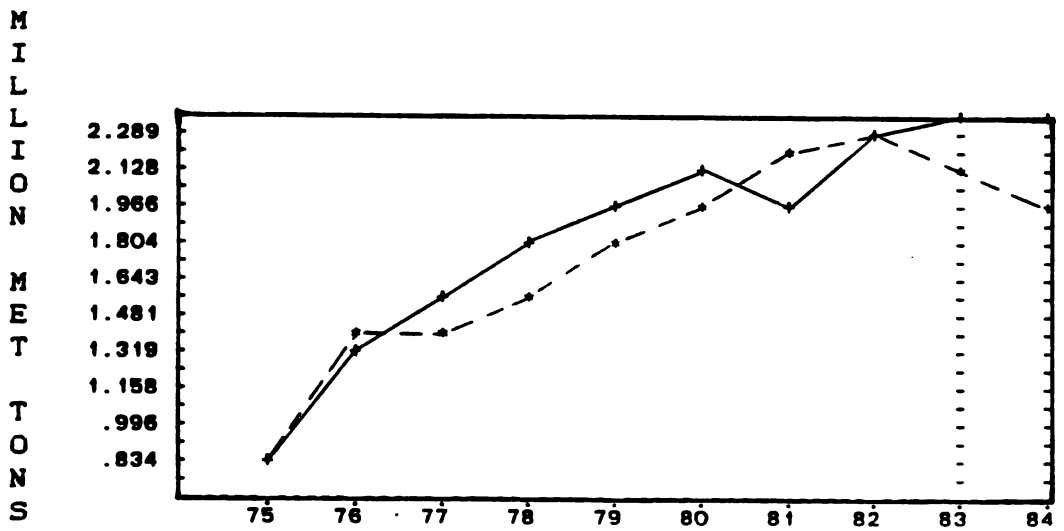
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMNI	0.0007041	0.0003892	0.0013055	0.0002662
PCRGDP(-1)	4.540D-07	9.294D-08	5.852D-07	3.319D-07
PCOSSU	0.0028838	0.0014784	0.0046537	0.0009434

	Covariance	Correlation
PTSMNI, PTSMNI	1.435D-07	1.0000000
PTSMNI, PCRGDP(-1)	3.288D-11	0.9593128
PTSMNI, PCOSSU	3.337D-07	0.6121707
PCRGDP(-1), PCRGDP(-1)	8.182D-15	1.0000000
PCRGDP(-1), PCOSSU	9.699D-11	0.7451522
PCOSSU, PCOSSU	2.071D-06	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.16.a & b. Soyoil Equivalent Imports - Less Developed Countries

Less Developed Countries
Per Capita Soyoil Equivalent Imports (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PTSONI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0009607	0.0001855	-5.1786162	0.000
PCRGDP	4190.5367	357.07648	11.735684	0.000
SOPLD(-1)	-5.317D-05	1.596D-05	-3.3307644	0.004

R-squared	0.898407	Mean of dependent var	0.000662
Adjusted R-squared	0.885707	S.D. of dependent var	0.000403
S.E. of regression	0.000136	Sum of squared resid	2.97D-07
Durbin-Watson stat	1.905880	F-statistic	70.74527
Log likelihood	143.7910		

TPE 6/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	7.6D-05	0.00021	0.00013
	1966	8.7D-05	0.00025	0.00016
	1967	-5.2D-06	0.00023	0.00023
	1968	-6.2D-05	0.00025	0.00032
	1969	-7.5D-05	0.00031	0.00039
	1970	7.4D-05	0.00049	0.00042
	1971	-1.9D-05	0.00043	0.00045
	1972	-0.00011	0.00040	0.00051
	1973	-5.4D-05	0.00054	0.00060
	1974	6.4D-05	0.00040	0.00034
	1975	-5.7D-05	0.00045	0.00050
	1976	5.8D-06	0.00094	0.00093
	1977	5.9D-06	0.00089	0.00089
	1978	-0.00017	0.00076	0.00092
	1979	-5.4D-05	0.00103	0.00108
	1980	0.00018	0.00132	0.00114
	1981	-0.00027	0.00096	0.00122
	1982	3.9D-05	0.00128	0.00124
	1983	0.00033	0.00144	0.00111

INDEPENDENT VARIABLES

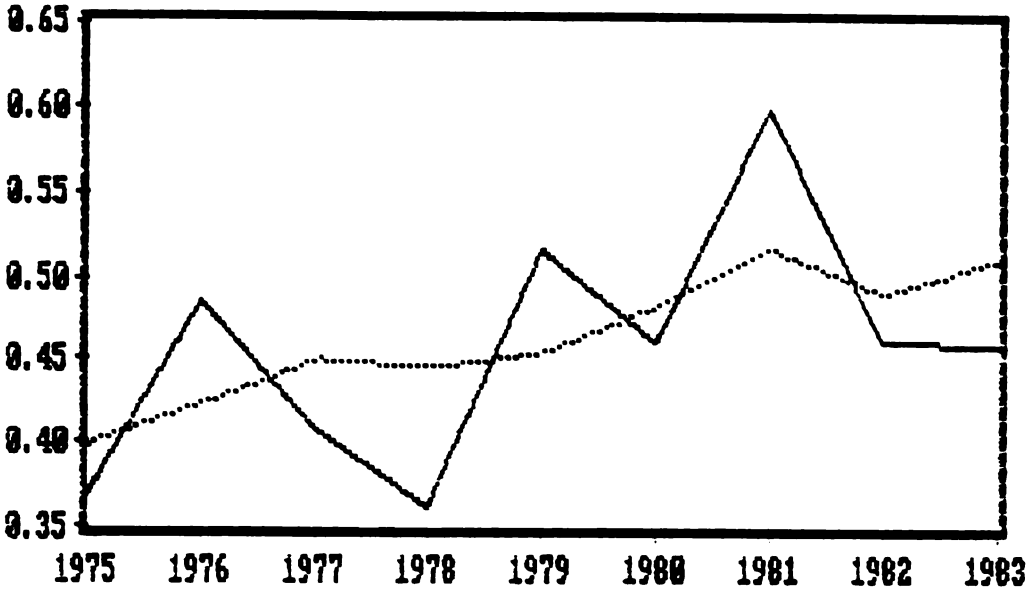
PCRGDP = Real GDP Per Capita
GDPLD/CPILD/POPLD

SOPLD = Real Less Developed Market Soyoil Price ($/MT)
SOP*XRLD/CPILD

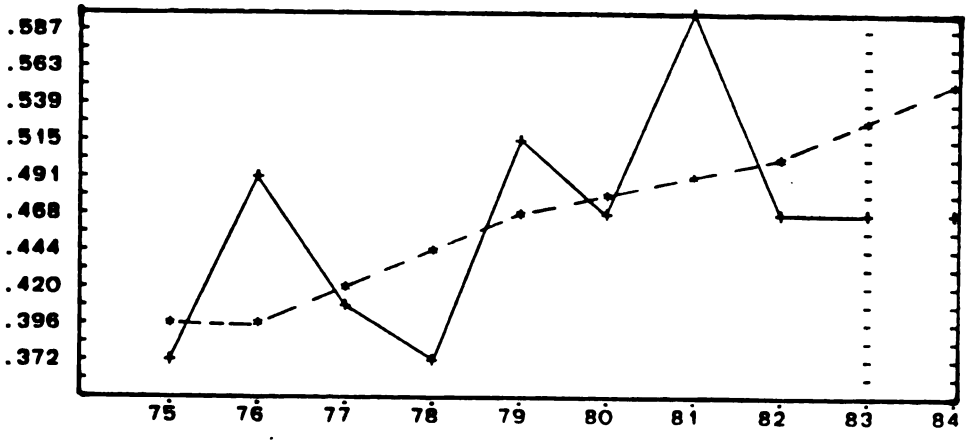
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSONI	0.0006624	0.0004030	0.0014435	0.0002084
PCRGDP	4.656D-07	9.059D-08	5.852D-07	3.400D-07
SOPLD(-1)	6.1734909	2.0265182	12.198120	3.8791210

	Covariance	Correlation
PTSONI,PTSONI	1.539D-07	1.0000000
PTSONI,PCRGDP	3.148D-11	0.9099255
PTSONI,SOPLD(-1)	-0.0001196	-0.1546012
PCRGDP,PCRGDP	7.775D-15	1.0000000
PCRGDP,SOPLD(-1)	2.082D-08	0.1196810
SOPLD(-1),SOPLD(-1)	3.8906300	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.17.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Less Developed Countries

Less Developed Countries
Percentage Soymeal Equivalent Imported as Soymeal

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.9894089	0.2487695	-3.9772120	0.001
MARGIN	-0.1170586	0.1028258	-1.1384170	0.273
MARGIN(-1)	-0.1436476	0.0675564	-2.1263361	0.050
YEAR	0.0181480	0.0033326	5.4456505	0.000

R-squared	0.801606	Mean of dependent var	0.344771
Adjusted R-squared	0.761927	S.D. of dependent var	0.145261
S.E. of regression	0.070877	Sum of squared resid	0.075353
Durbin-Watson stat	1.634391	F-statistic	20.20239
Log likelihood	25.57528	TPE	6/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-0.01366	0.02470	0.03836
	1966	0.01656	0.21461	0.19806
	1967	-0.03162	0.21071	0.24232
	1968	-0.10435	0.15500	0.25935
	1969	-0.05157	0.19135	0.24292
	1970	0.06818	0.31238	0.24420
	1971	0.15569	0.46185	0.30616
	1972	0.04140	0.32220	0.28081
	1973	0.00463	0.25084	0.24621
	1974	-0.03917	0.29667	0.33584
	1975	-0.02989	0.36818	0.39807
	1976	0.06280	0.48516	0.42235
	1977	-0.04188	0.40696	0.44883
	1978	-0.08346	0.36056	0.44402
	1979	0.06116	0.51397	0.45281
	1980	-0.02124	0.45906	0.48029
	1981	0.08460	0.59843	0.51382
	1982	-0.02853	0.45936	0.48789
	1983	-0.04968	0.45866	0.50833

INDEPENDENT VARIABLES

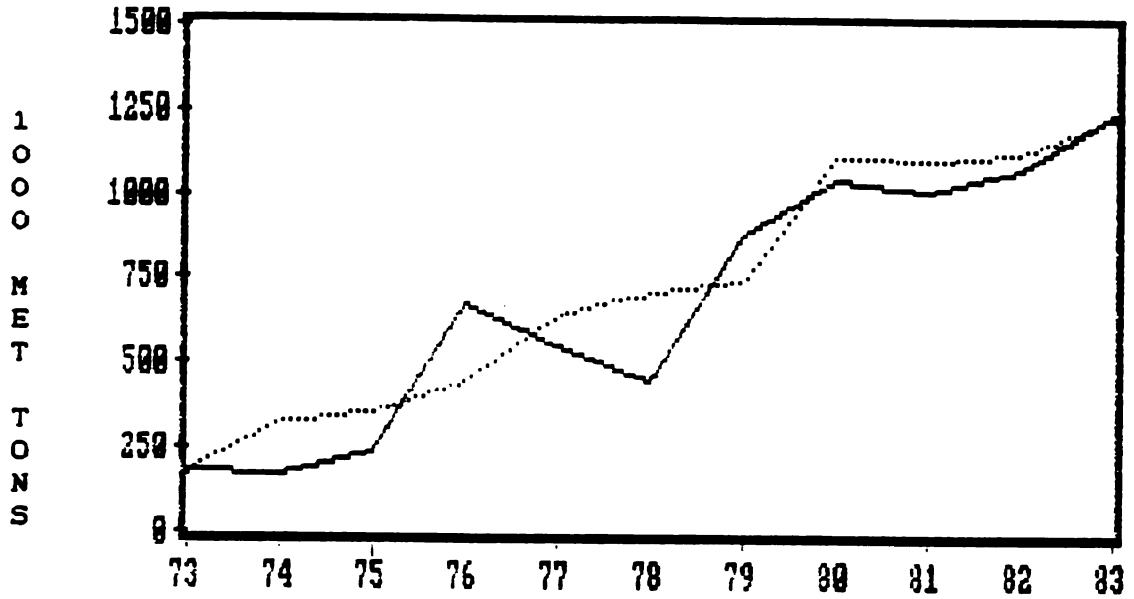
MARGIN = Soybean Crush Margin
(SMP*XRLD/CPILD)*.795 + (SOP*XRLD/CPILD)*.175 -
(SP*XRLD/CPILD)

YEAR = 1960=60, 1961=61, ...

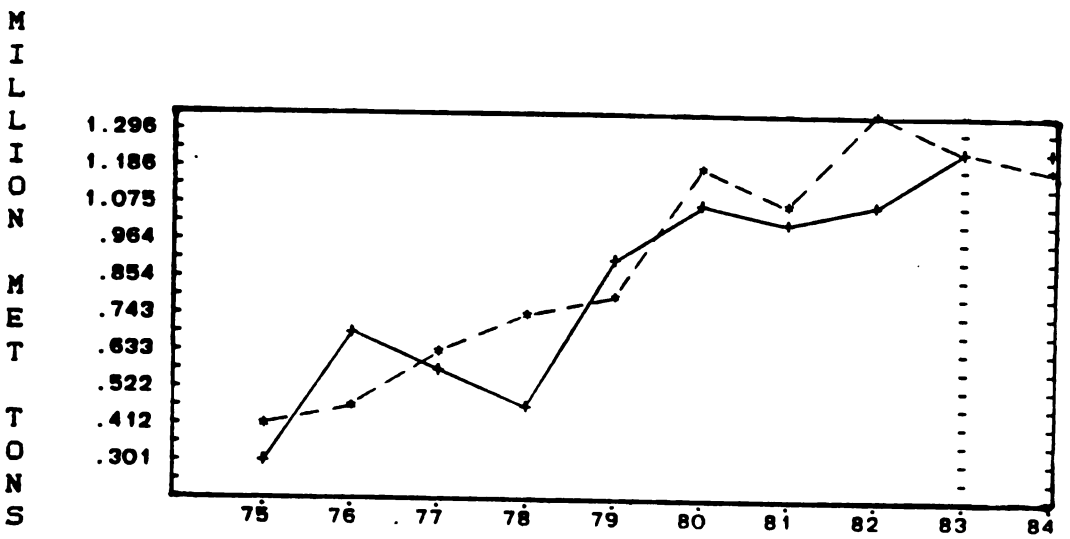
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.3447709	0.1452612	0.5984252	0.0247005
MARGIN	0.0011334	0.1684776	0.4206032	-0.2275892
MARGIN(-1)	0.0601397	0.2719108	0.9568636	-0.2275892
YEAR	74.000000	5.6273143	83.000000	65.000000

	Covariance	Correlation
PMEAL, PMEAL	0.0199902	1.0000000
PMEAL, MARGIN	-0.0083564	-0.3604201
PMEAL, MARGIN(-1)	-0.0217180	-0.5803980
PMEAL, YEAR	0.6571727	0.8486133
MARGIN, MARGIN	0.0268908	1.0000000
MARGIN, MARGIN(-1)	0.0070843	0.1632333
MARGIN, YEAR	-0.2309331	-0.2571128
MARGIN(-1), MARGIN(-1)	0.0700441	1.0000000
MARGIN(-1), YEAR	-0.5966004	-0.4115637
YEAR, YEAR	30.000000	1.0000000



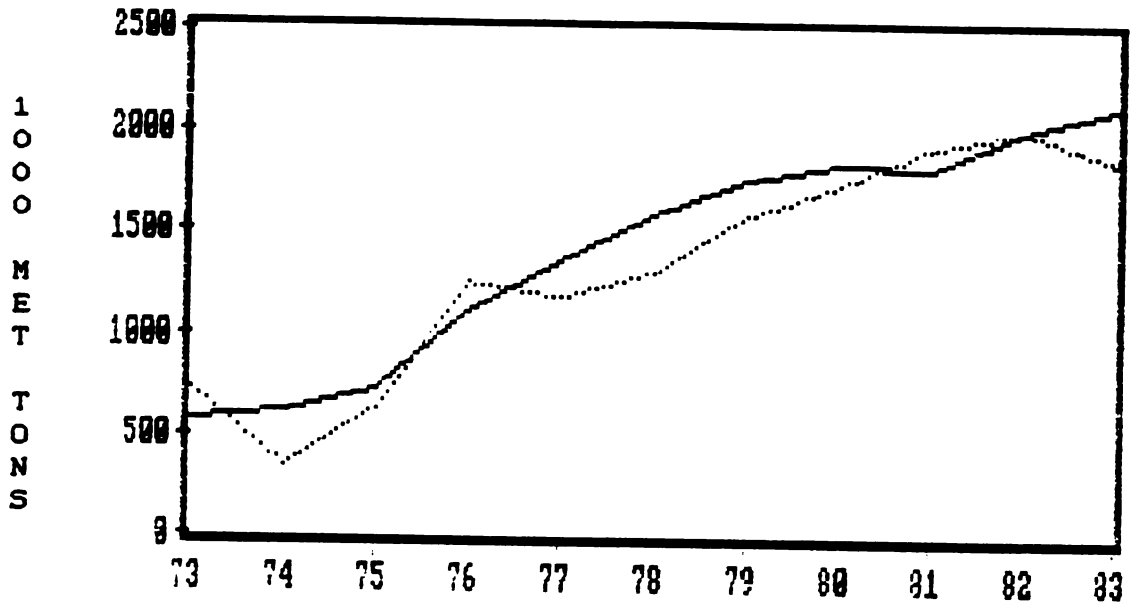
REGIONAL MODEL SIMULATION



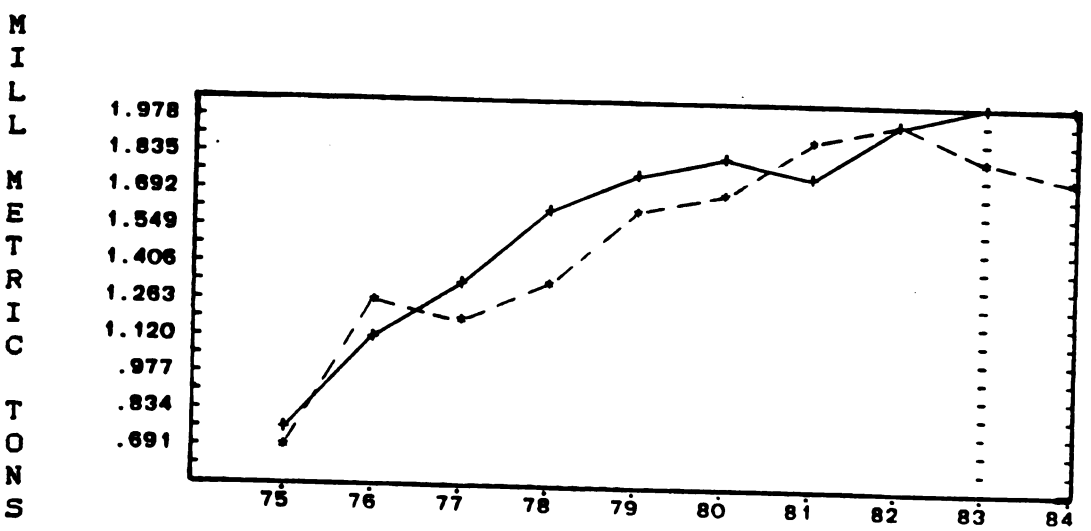
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.18.a & b. Soymeal Net Imports - Less Developed Countries



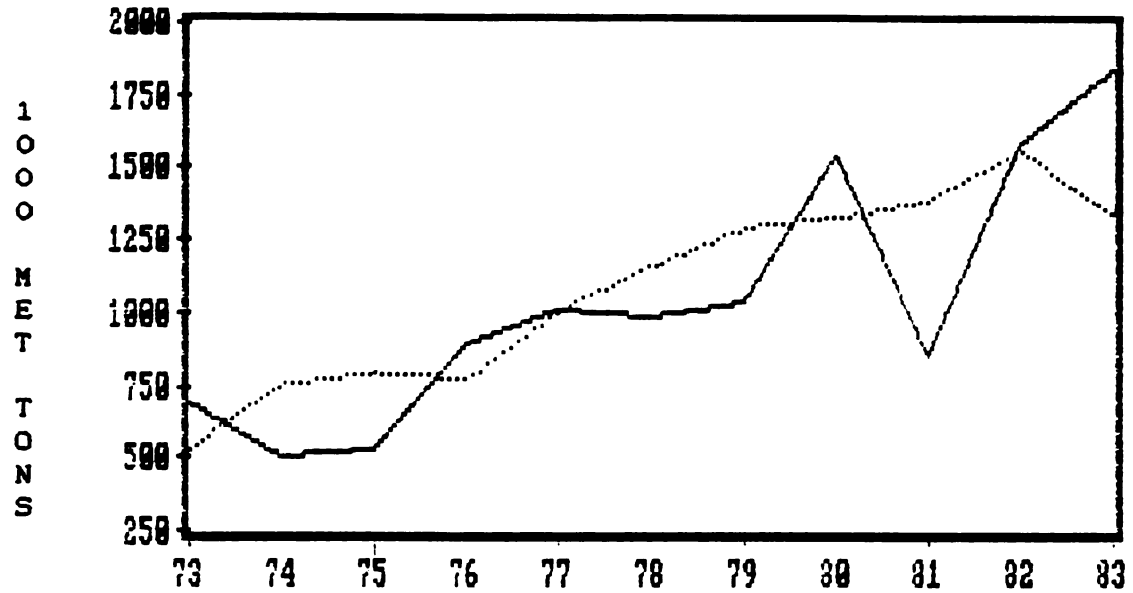
REGIONAL MODEL SIMULATION



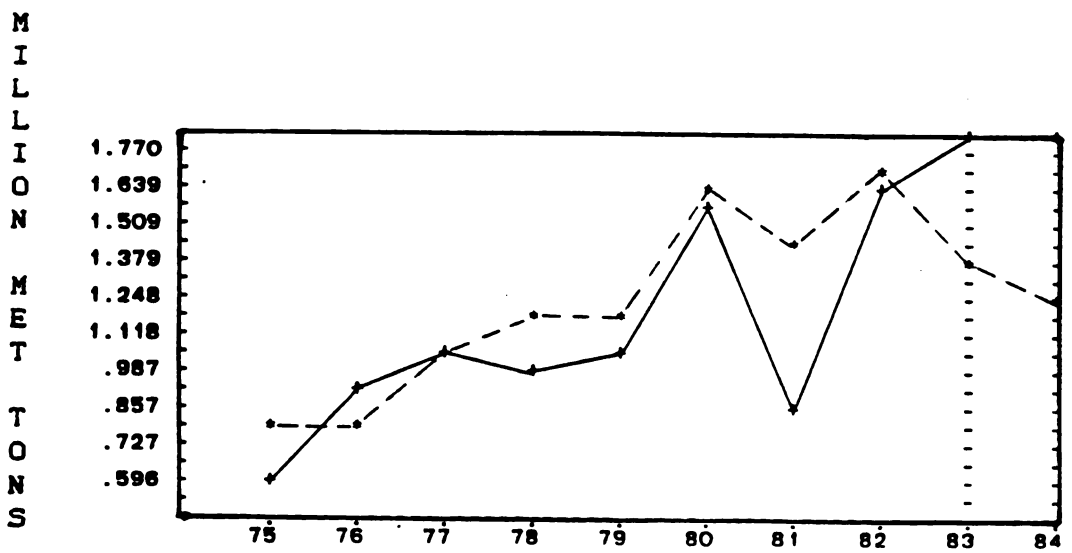
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.19.a & b. Soyoil Net Imports - Less Developed Countries



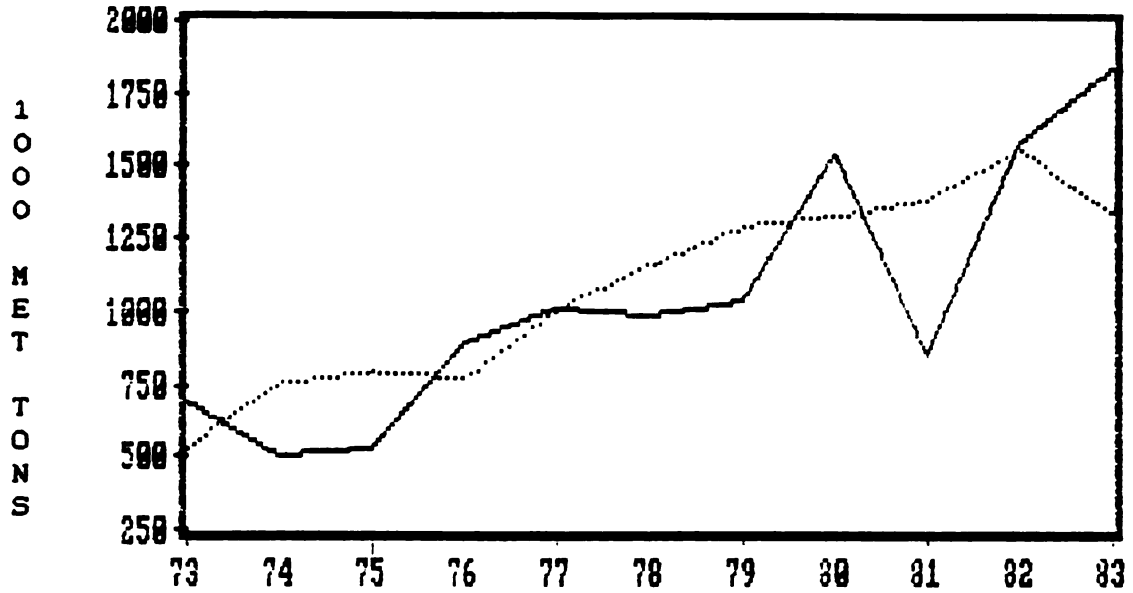
REGIONAL MODEL SIMULATION



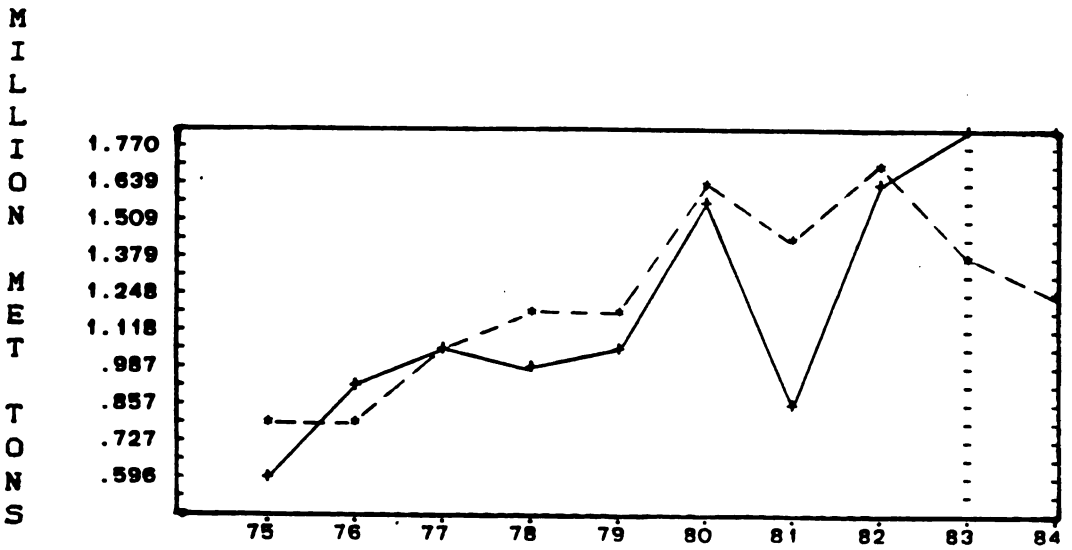
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.20.a & b. Soybean Net Imports - Less Developed Countries



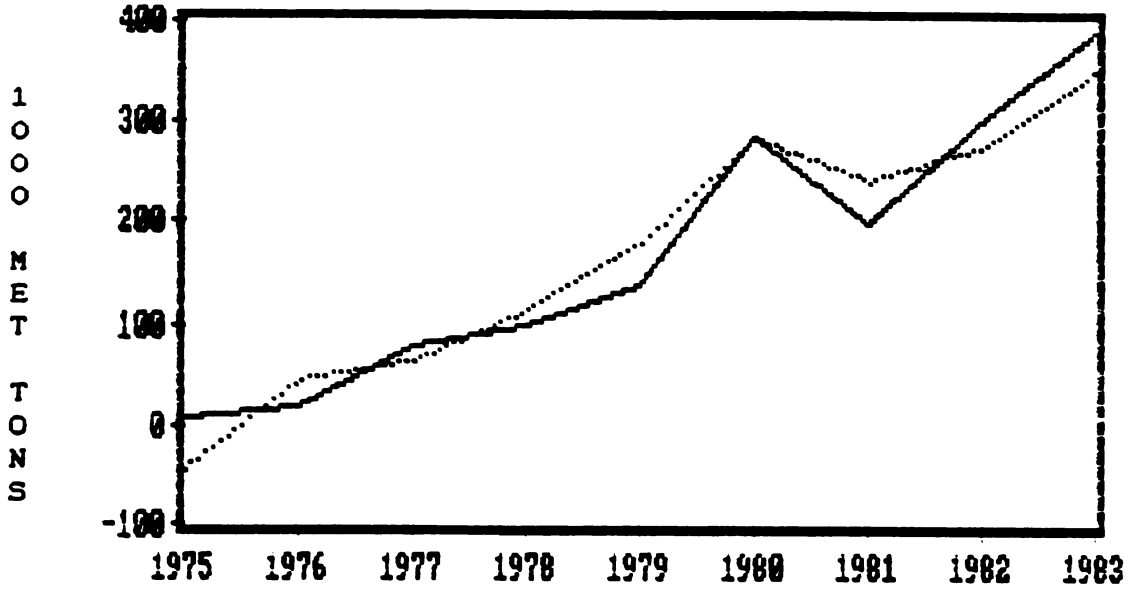
REGIONAL MODEL SIMULATION



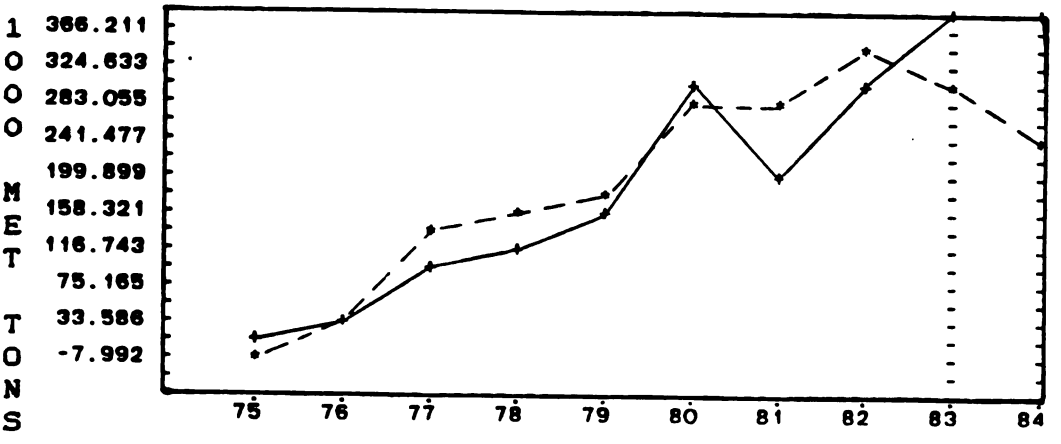
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.20.a & b. Soybean Net Imports - Less Developed Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure G.21.a & b. Soymeal Ending Stocks - Less Developed Countries

Less Developed Countries
Soymeal Ending Stocks (1000 MT)

SMPL 1973 - 1983
11 Observations
LS // Dependent Variable is SMESLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-839.70552	228.75813	-3.6707134	0.008
MARGIN(-1)	264.38631	70.933815	3.7272253	0.007
SMNILD	0.1152188	0.0723284	1.5929941	0.155
PCRGDP(-1)	1.730D+09	521836815	3.3145927	0.013

R-squared	0.946268	Mean of dependent var	141.0000
Adjusted R-squared	0.923239	S.D. of dependent var	133.5425
S.E. of regression	36.99890	Sum of squared resid	9582.430
Durbin-Watson stat	2.463785	F-statistic	41.09170
Log likelihood	-52.84218	TPE	0/11

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1973	-0.26505	15.0000	15.2650
	1974	-19.4993	25.0000	44.4993
	1975	51.6533	5.00000	-46.6533
	1976	-24.3961	19.0000	43.3961
	1977	17.9766	81.0000	63.0234
	1978	-12.7837	98.0000	110.784
	1979	-37.6842	138.000	175.684
	1980	4.21154	286.000	281.788
	1981	-43.4351	196.000	239.435
	1982	26.3821	301.000	274.618
	1983	37.8398	387.000	349.160

INDEPENDENT VARIABLES

SMNILD = Soymeal Net Imports (1000 MT)

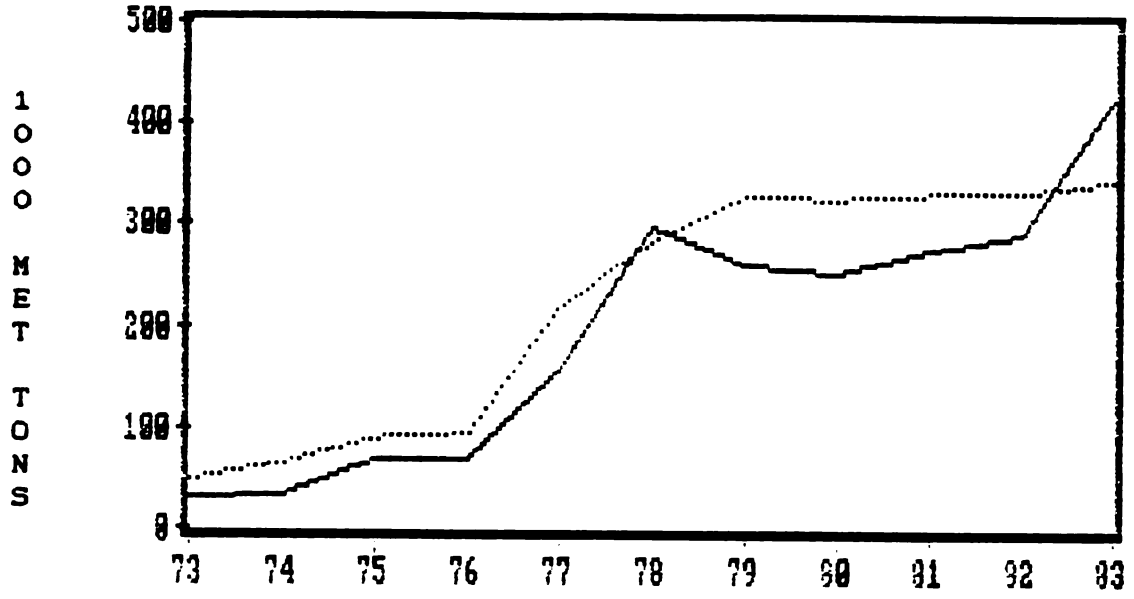
MARGIN = Soybean Crush Margin
(SMP*XRLD/CPILD)*.795 + (SOP*XRLD/CPILD)*.175 -
(SP*XRLD/CPILD)

PCRGDP = Real Income Per Capita
GDPLD/CPILD/POPLD

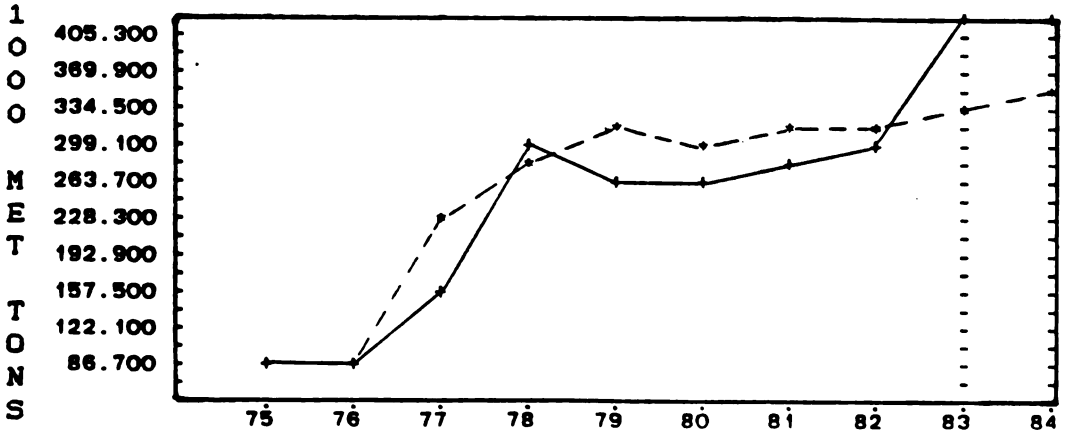
SMPL 1973 - 1983
11 Observations

Series	Mean	S.D.	Maximum	Minimum
SMESLD	141.00000	133.54250	387.00000	5.0000000
MARGIN(-1)	0.0060914	0.1983958	0.4206032	-0.2275892
SMNILD	681.54545	388.57570	1236.0000	167.00000
PCRGDP(-1)	5.207D-07	5.835D-08	5.852D-07	4.177D-07

	Covariance	Correlation
SMESLD, SMESLD	16212.364	1.0000000
SMESLD, MARGIN(-1)	-1.1304524	-0.0469346
SMESLD, SMNILD	42673.636	0.9046013
SMESLD, PCRGDP(-1)	6.200D-06	0.8752289
MARGIN(-1), MARGIN(-1)	0.0357826	1.0000000
MARGIN(-1), SMNILD	-19.199943	-0.2739584
MARGIN(-1), PCRGDP(-1)	-4.844D-09	-0.4603163
SMNILD, SMNILD	137264.61	1.0000000
SMNILD, PCRGDP(-1)	1.846D-05	0.8957675
PCRGDP(-1), PCRGDP(-1)	3.095D-15	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.22.a & b. Soyoil Ending Stocks - Less Developed Countries

Less Developed Countries
Soyoil Ending Stocks (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SOESLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-28.863788	18.441884	-1.5651215	0.137
SODSU	0.2887740	0.0756927	3.8150840	0.002
DV77ON	106.30467	41.786174	2.5440153	0.022

R-squared	0.930080	Mean of dependent var	120.4737
Adjusted R-squared	0.921340	S.D. of dependent var	133.3947
S.E. of regression	37.41232	Sum of squared resid	22394.91
Durbin-Watson stat	1.727846	F-statistic	106.4170
Log likelihood	-94.14526	TPE	4/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
| : |* : |	1965	10.3071	5.00000	-5.30705
| : | * : |	1966	16.5059	14.0000	-2.50594
| : |* : |	1967	8.51039	13.0000	4.48961
| : *| : |	1968	-7.37988	9.00000	16.3799
| : *| : |	1969	-9.16654	10.0000	19.1665
| : |* : |	1970	6.49715	21.0000	14.5028
| : |* : |	1971	7.62085	30.0000	22.3792
| : * : |	1972	2.27155	32.0000	29.7285
| : * | : |	1973	-15.7193	30.0000	45.7193
| : * | : |	1974	-18.2780	35.0000	53.2780
| : |* : |	1975	4.56465	70.0000	65.4354
| : *| : |	1976	-5.73388	69.0000	74.7339
| *: | : |	1977	-38.6976	156.000	194.698
| . : | : * |	1978	63.1594	299.000	235.841
| * : | : |	1979	-46.3555	261.000	307.356
| * | : |	1980	-34.8600	250.000	284.860
| * | : |	1981	-37.5898	273.000	310.590
| : *| : |	1982	-9.17972	289.000	298.180
| : | : * |	1983	103.523	423.000	319.477

INDEPENDENT VARIABLES

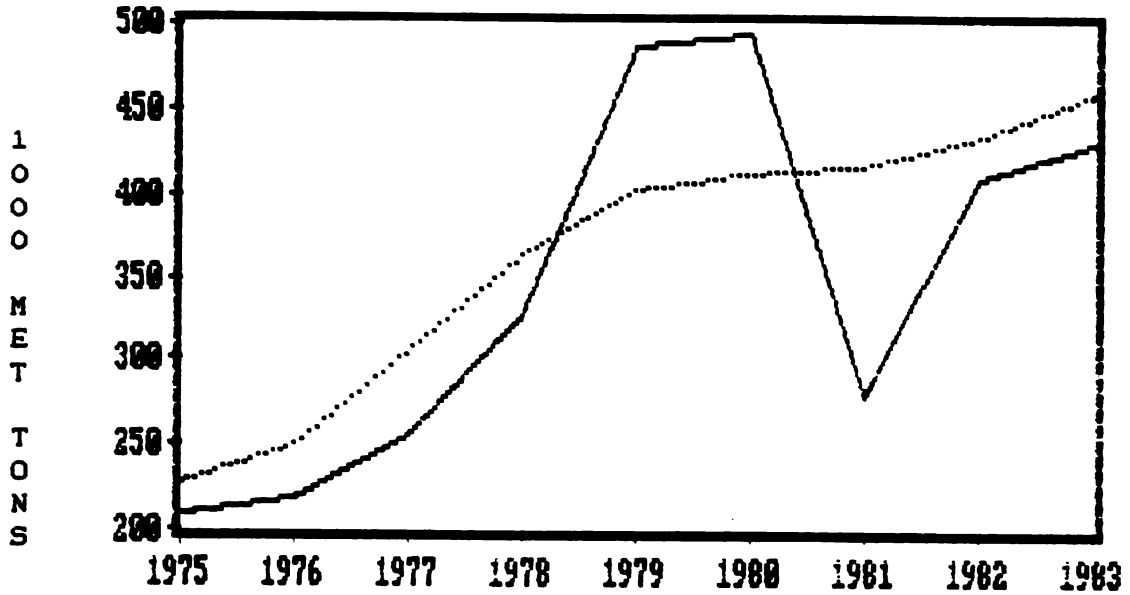
SODSU = Soyoil Equivalent Domestic Supply (1000 MT)
(SESLD(-1) + SPROLD)*.175 + SOESLD(-1)

DV77ON = 1 If(YEAR .GE. 77)
0 Otherwise

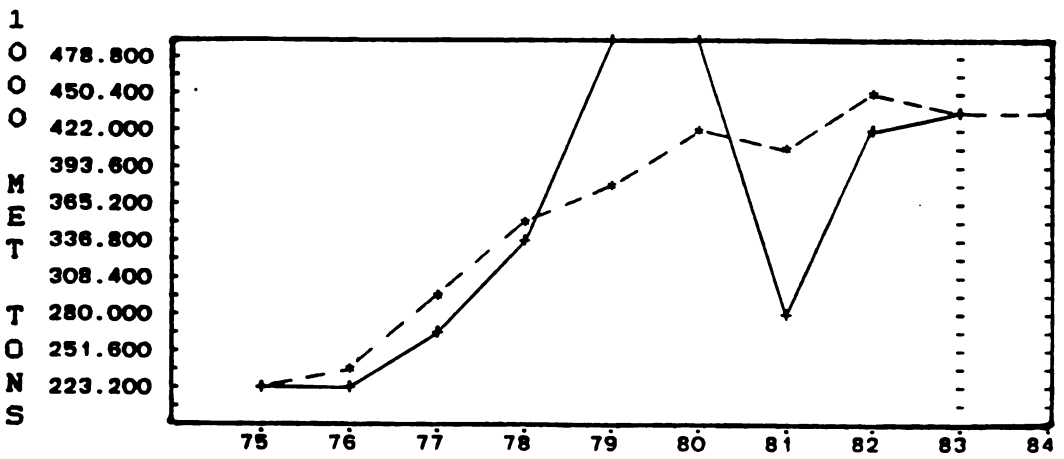
SMFL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SOESLD	120.47368	133.39472	423.00000	5.0000000
SODSU	381.51842	273.59316	838.15000	81.575000
DV77ON	0.3684211	0.4955946	1.0000000	0.0000000

	Covariance	Correlation
SOESLD, SOESLD	16857.618	1.0000000
SOESLD, SODSU	32833.513	0.9496303
SOESLD, DV77ON	58.299169	0.9308468
SODSU, SODSU	70913.574	1.0000000
SODSU, DV77ON	116.22743	0.9048110
DV77ON, DV77ON	0.2326870	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure G.23.a & b. Soybean Ending Stocks - Less Developed Countries

Less Developed Countries
Soybean Ending Stocks (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SESLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-55.269935	28.359776	-1.9488848	0.070
SBDSU	0.0867635	0.0303440	2.8593280	0.012
SNILD	0.1525617	0.0592881	2.5732283	0.021
MARGIN	-53.509022	85.375308	-0.6267506	0.540

R-squared	0.888907	Mean of dependent var	201.2105
Adjusted R-squared	0.866689	S.D. of dependent var	160.4877
S.E. of regression	58.59694	Sum of squared resid	51504.03
Durbin-Watson stat	1.400829	F-statistic	40.00747
Log likelihood	-102.0571	TPE	2/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	15.9028	35.0000	19.0972
	1966	12.8844	48.0000	35.1156
	1967	47.4386	88.0000	40.5614
	1968	28.8586	99.0000	70.1414
	1969	-26.6969	45.0000	71.6969
	1970	-9.03578	88.0000	97.0358
	1971	-65.6465	20.0000	85.6465
	1972	-13.8029	66.0000	79.8029
	1973	-19.7962	130.000	149.796
	1974	-53.9040	101.000	154.904
	1975	36.5232	209.000	172.477
	1976	-17.9158	219.000	236.916
	1977	-13.6515	256.000	269.652
	1978	31.6337	325.000	293.366
	1979	136.325	486.000	349.675
	1980	77.3507	493.000	415.649
	1981	-78.1423	277.000	355.142
	1982	-12.5910	408.000	420.591
	1983	-75.7340	430.000	505.734

INDEPENDENT VARIABLES

SBSUP = Domestic Soybean Supply (1000 MT)
(SESLD(-1) +SPROLD)

MARGIN = Soybean Crush Margin
(SMP*XRLD/CPILD)*.795 + (SOP*XRLD/CPILD)*.175 -
(SP*XRLD/CPILD)

SNILD = Soybean Net Imports (1000 MT)

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SESLD	201.21053	160.48765	493.00000	20.000000
SBDSU	1615.8947	937.91974	3185.0000	409.00000
SNILD	762.57895	474.02090	1835.0000	278.00000
MARGIN	0.0011334	0.1684776	0.4206032	-0.2275892

	Covariance	Correlation
SESLD, SESLD	24400.693	1.0000000
SESLD, SBDSU	130498.23	0.9151208
SESLD, SNILD	65241.247	0.9052410
SESLD, MARGIN	-7.7397870	-0.3021525
SBDSU, SBDSU	833393.78	1.0000000
SBDSU, SNILD	366794.85	0.8708456
SBDSU, MARGIN	-41.697320	-0.2785360
SNILD, SNILD	212869.72	1.0000000
SNILD, MARGIN	-17.586852	-0.2324500
MARGIN, MARGIN	0.0268908	1.0000000

APPENDIX H

EQUATION STATISTICS - LESS DEVELOPED OIL EXPORTERS

Wheat

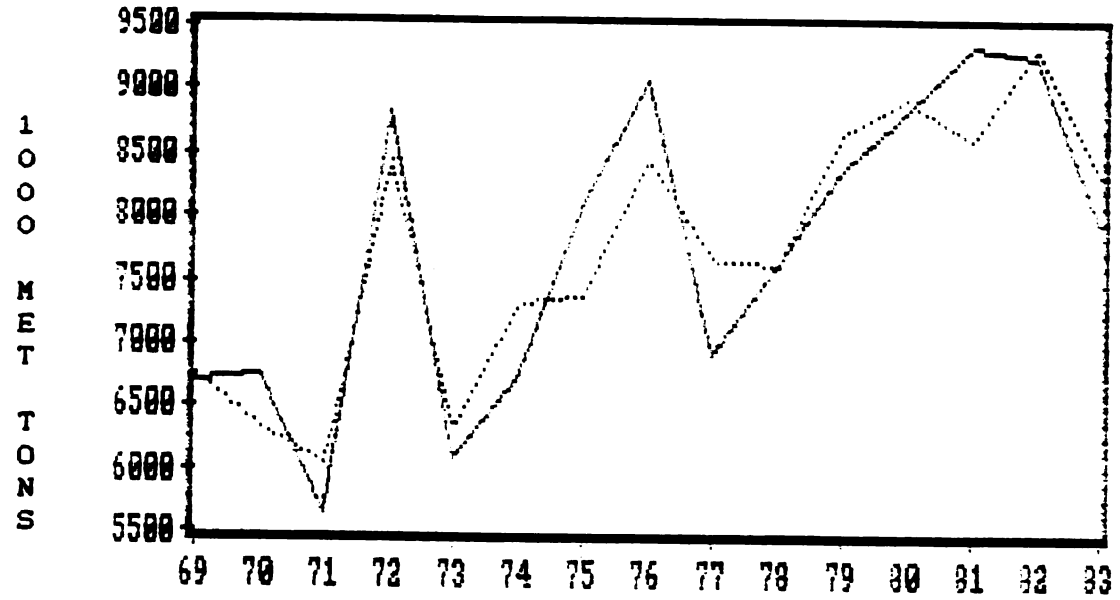
WPROLO.....Production
WHALO.....Harvested Area
WYLO.....Yield
WCONLO.....Total Consumption
WNILO.....Net Imports
WESLO.....Ending Stocks

Coarse Grain

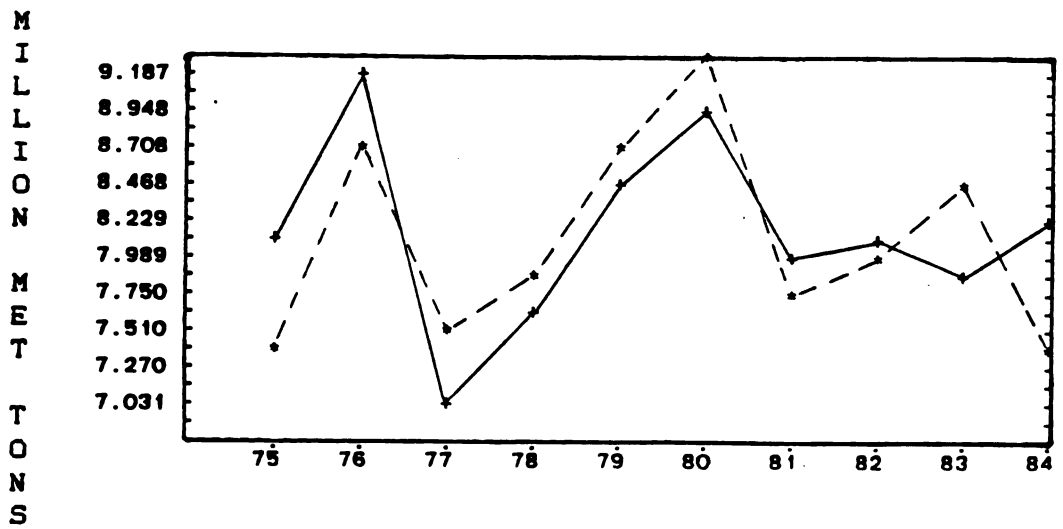
FPROLO.....Production
FHALO.....Harvested Area
FYLO.....Yield
FCONLO.....Total Consumption
FNILO.....Net Imports
FESLO.....Ending Stocks

Soybean Complex

SPROLO.....Production
SHALO.....Harvested Area
SYLO.....Yield
SMCOLO.....Soymeal Equiv. Consumption
SOCOLO.....Soyoil Equiv. Consumption
SMEILO.....Soymeal Equiv. Net Imports
SOEILO.....Soyoil Equiv. Net Imports
PMELLO.....% SMEILO Imported as SMNILO
SMNILO.....Soymeal Net Imports
SONILO.....Soyoil Net Imports
SNILO.....Soybean Net Imports



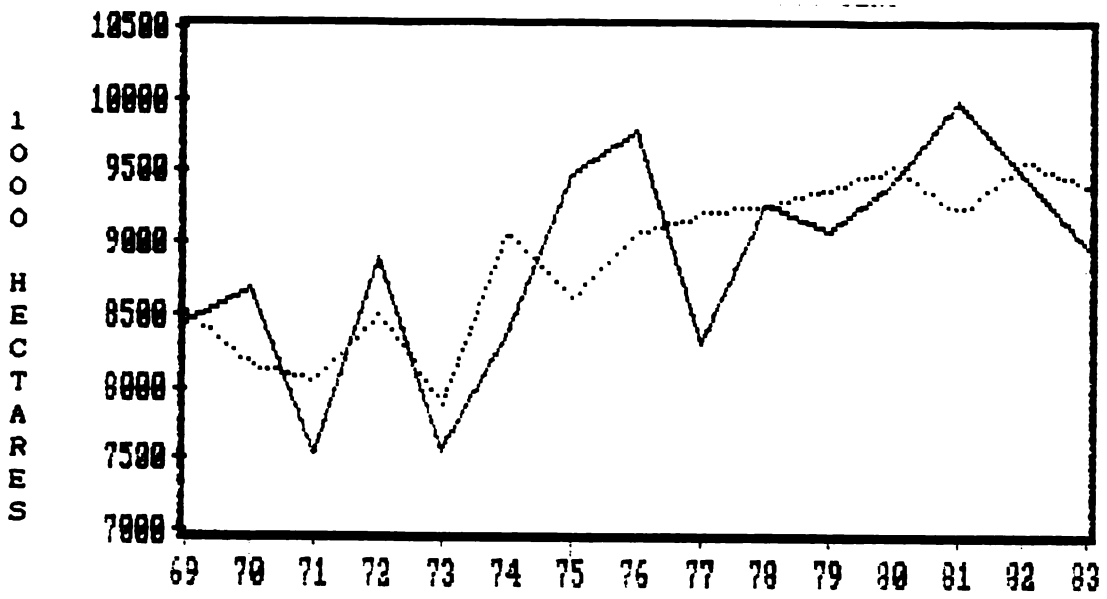
REGIONAL MODEL SIMULATION



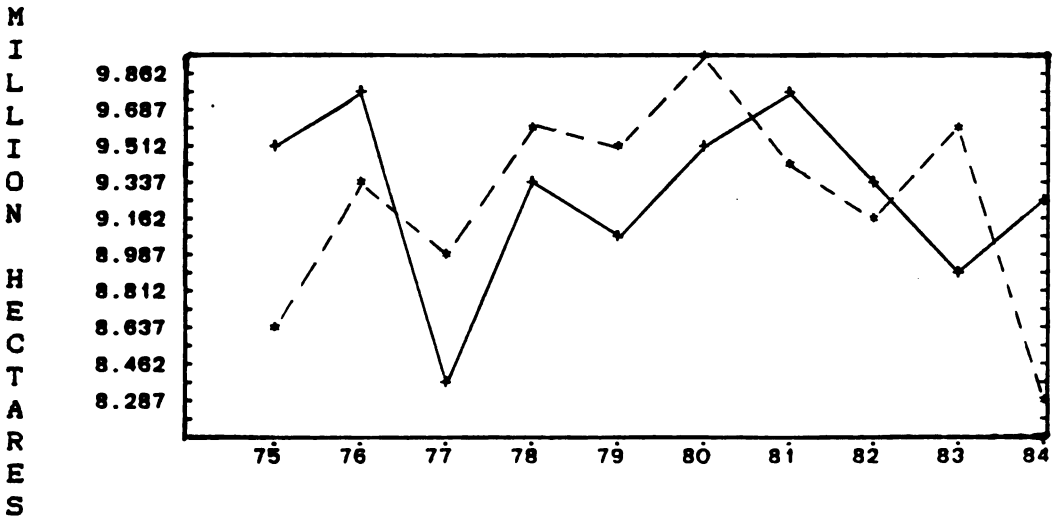
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.1.a & b. Wheat Production - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure H.2.a & b. Wheat Harvested Area - Less Developed Oil Exporters

Less Developed Oil Exporters
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependant Variable is WHALO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	10392.959	2620.8141	3.9655461	0.001
WHALO(-1)	0.0192173	0.2320337	0.0828211	0.935
WRL04(-1)	772.48965	615.34594	1.2553746	0.229
FRL04(-1)	-1816.7790	1033.9475	-1.7571290	0.099
DV6073	-867.99833	388.82338	-2.2323717	0.041

R-squared	0.613936	Mean of dependent var	8627.250
Adjusted R-squared	0.510985	S.D. of dependent var	867.3063
S.E. of regression	606.5038	Sum of squared resid	5517702.
Durbin-Watson stat	2.260569	F-statistic	5.963409
Log likelihood	-153.6562	TPE = 8/19	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1964	-700.275	7193.00	7893.28
*	1965	-57.0020	7601.00	7658.00
*	1966	-384.162	7162.00	7546.16
*	1967	389.710	8201.00	7811.29
*	1968	639.934	9040.00	8400.07
*	1969	-52.2743	8453.00	8505.27
*	1970	552.108	8684.00	8131.89
*	1971	-501.078	7540.00	8041.08
*	1972	426.700	8901.00	8474.30
*	1973	-313.660	7565.00	7878.66
*	1974	-703.642	8357.00	9060.64
*	1975	896.208	9490.00	8593.79
*	1976	693.417	9766.00	9072.58
*	1977	-886.160	8319.00	9205.16
*	1978	41.3868	9271.00	9229.61
*	1979	-293.912	9074.00	9367.91
*	1980	-71.4151	9441.00	9512.42
*	1981	806.065	10003.0	9196.93
*	1982	-78.9202	9497.00	9575.92
*	1983	-403.028	8987.00	9390.03

INDEPENDENT VARIABLES

WHALO = Wheat Harvested Area (1000 HA)

WRL04 = Wheat Revenue Per Hectare ($/HA)
(WYLO(-3)+WYLO(-2)+WYLO(-1)+WYLO)/4*WP*XRLO/CPILO

FRL04 = Coarse Grain Revenue Per Hectare ($/HA)
(FYLO(-3)+FYLO(-2)+FYLO(-1)+FYLO)/4*FP*XRLO/CPILO

DV6073 = 1 If(YEAR .GE. 60 .OR. YEAR .LE. 73)
0 Otherwise

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
WHALO	8627.2500	967.30635	10003.000	7162.0000
WHALO(-1)	8537.4000	919.58208	10003.000	7162.0000
WRLO4(-1)	1.9929112	0.5857240	3.6917110	1.3265350
FRLO4(-1)	1.6281726	0.3663666	2.3830660	1.1195660
DV6073	0.5000000	0.5129892	1.0000000	0.0000000

	Covariance	Correlation
WHALO,WHALO	714609.29	1.0000000
WHALO,WHALO(-1)	426035.00	0.5622878
WHALO,WRLO4(-1)	-64.994389	-0.1346749
WHALO,FRLO4(-1)	-122.89575	-0.4071223
WHALO,DV6073	-296.62500	-0.7017839
WHALO(-1),WHALO(-1)	803349.64	1.0000000
WHALO(-1),WRLO4(-1)	-194.71464	-0.3805323
WHALO(-1),FRLO4(-1)	-179.58248	-0.5610919
WHALO(-1),DV6073	-270.45000	-0.6034825
WRLO4(-1),WRLO4(-1)	0.3259190	1.0000000
WRLO4(-1),FRLO4(-1)	0.1817979	0.8917773
WRLO4(-1),DV6073	-0.0198907	-0.0696523
FRLO4(-1),FRLO4(-1)	0.1275133	1.0000000
FRLO4(-1),DV6073	0.0325096	0.1820806
DV6073,DV6073	0.2500000	1.0000000

Less Developed Oil Exporters
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2.2135000	0.5250811	-4.2155391	0.000
LOGT	0.7117560	0.1230827	5.7827466	0.000

R-squared	0.603176	Mean of dependent var	0.822119
Adjusted R-squared	0.585138	S.D. of dependent var	0.091234
S.E. of regression	0.058764	Sum of squared resid	0.075970
Durbin-Watson stat	2.240229	F-statistic	33.44016
Log likelihood	35.01111	TPE = 8/23	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.02281	0.72349	0.70067
	1961	0.00088	0.71331	0.71244
	1962	0.07060	0.79461	0.72401
	1963	0.01495	0.75035	0.73540
	1964	-0.07207	0.67454	0.74661
	1965	-0.03116	0.72648	0.75765
	1966	-0.08197	0.68654	0.76851
	1967	0.02178	0.80100	0.77922
	1968	0.06500	0.85476	0.78976
	1969	-0.00978	0.79037	0.80015
	1970	-0.03322	0.77718	0.81039
	1971	-0.06929	0.75119	0.82049
	1972	0.16091	0.99135	0.83044
	1973	-0.03735	0.80291	0.84026
	1974	-0.04607	0.80388	0.84994
	1975	-0.00544	0.85406	0.85950
	1976	0.06042	0.92935	0.86892
	1977	-0.04748	0.83075	0.87823
	1978	-0.06604	0.82138	0.88741
	1979	0.02571	0.92220	0.89648
	1980	0.02995	0.93539	0.90543
	1981	0.02044	0.93472	0.91428
	1982	0.05298	0.97599	0.92301
	1983	-0.04658	0.88506	0.93164

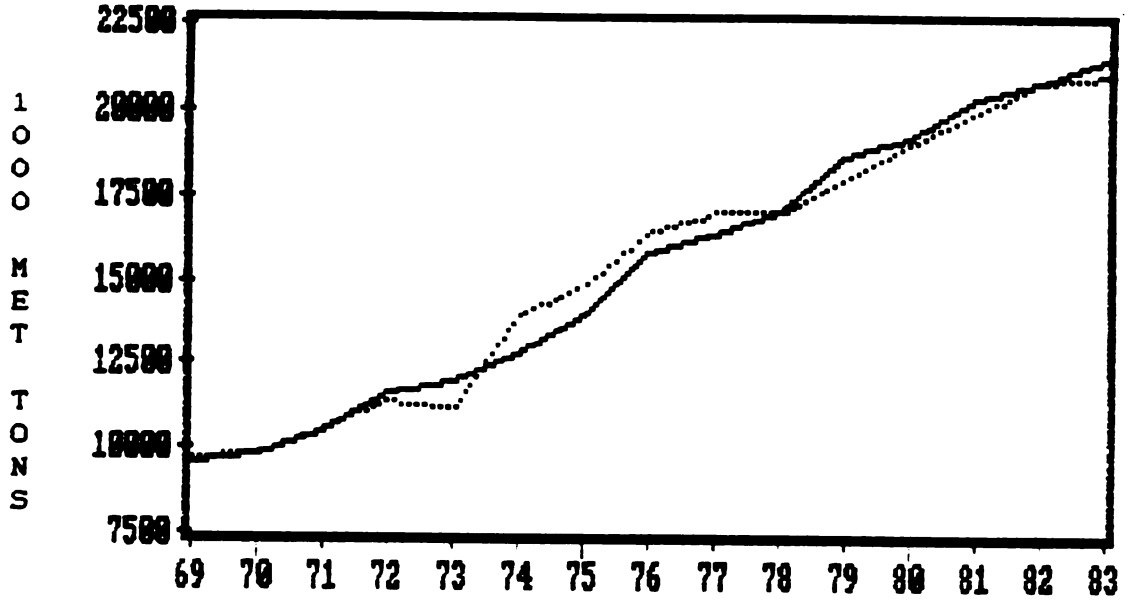
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

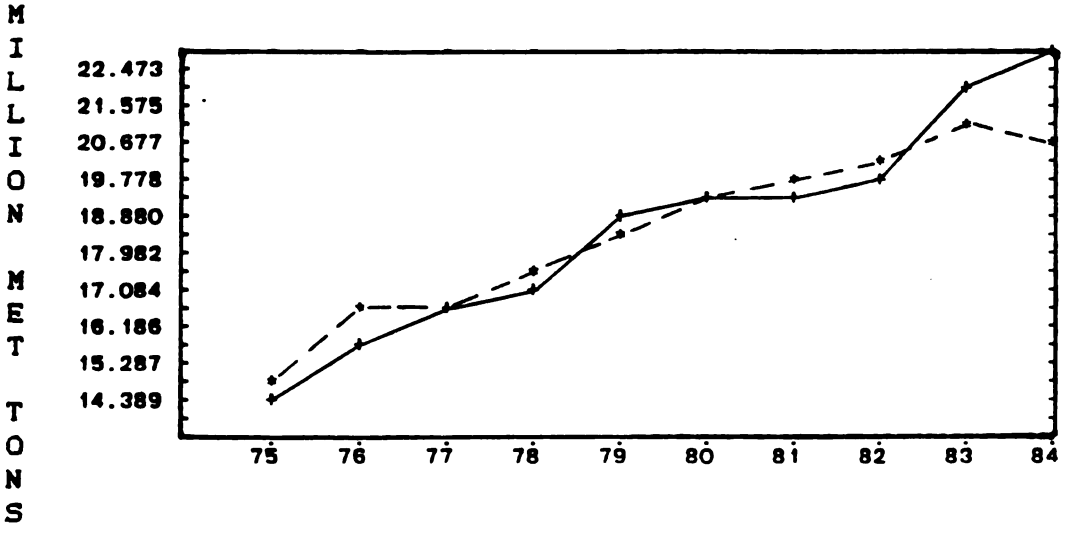
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYLO	0.8221187	0.0912343	0.9913493	0.6745447
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYLO,WYLO	0.0079769	1.0000000
WYLO,LOGT	0.0067600	0.7766439
LOGT,LOGT	0.0094976	1.0000000



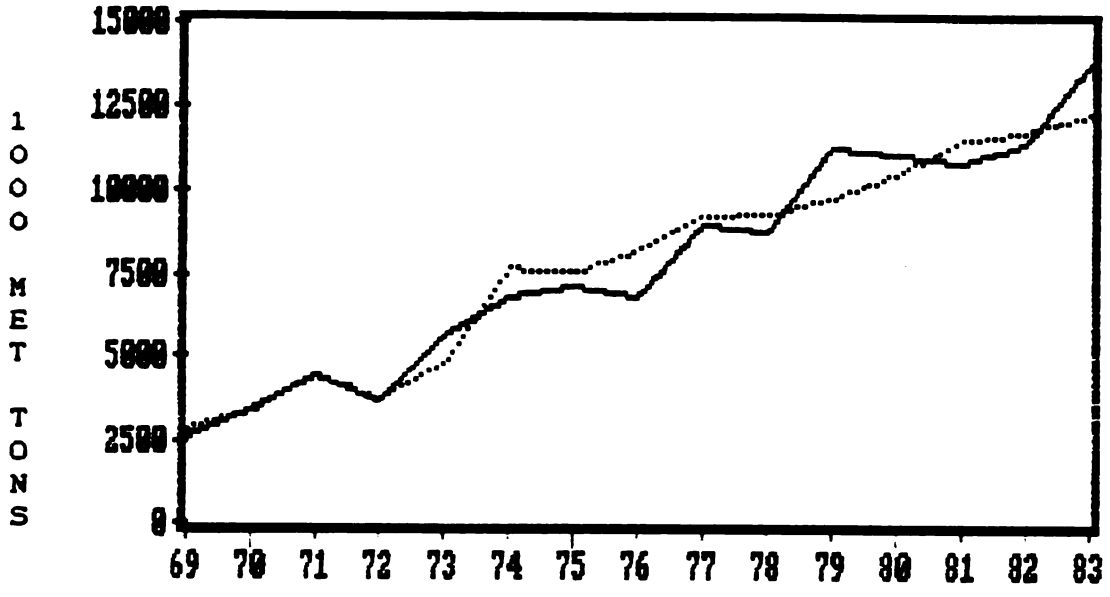
REGIONAL MODEL SIMULATION



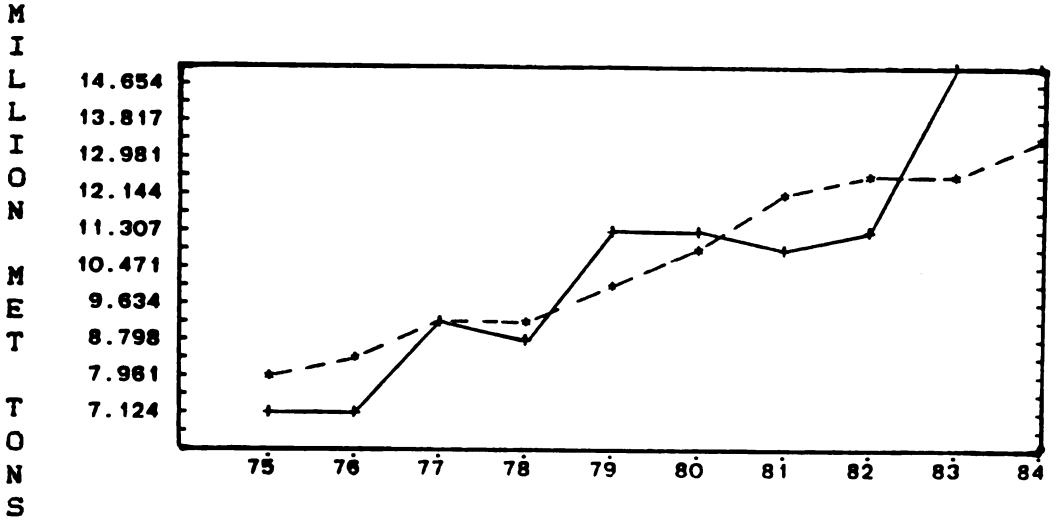
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure H.3.a & b. Total Wheat Consumption - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.4.a & b. Wheat Net Imports - Less Developed Oil Exporters

Less Developed Oil Exporters
Per Capita Wheat Net Imports (1000 MT)

SMPL 1962 - 1983
22 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0280965	0.0078549	3.5769458	0.002
PCRGDP	11750.807	915.83411	12.830716	0.000
WPLO	-0.0011037	0.0007563	-1.4592873	0.163
PCDWSU	-0.5135143	0.1480605	-3.4682727	0.003
PCDFSU	-0.2345096	0.0845436	-2.7738302	0.013

R-squared	0.959293	Mean of dependent var	0.019519
Adjusted R-squared	0.949715	S.D. of dependent var	0.009950
S.E. of regression	0.002231	Sum of squared resid	8.46D-05
Durbin-Watson stat	1.817207	F-statistic	100.1555
Log likelihood	105.9335	TPE = 2/21	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1962	0.00259	0.00688	0.00429
	1963	-0.00103	0.00714	0.00818
	1964	8.9D-05	0.00969	0.00961
	1965	-0.00306	0.00790	0.01096
	1966	-0.00223	0.01118	0.01341
	1967	-0.00074	0.01045	0.01119
	1968	0.00145	0.00961	0.00816
	1969	6.5D-05	0.01083	0.01077
	1970	0.00159	0.01354	0.01195
	1971	6.7D-05	0.01727	0.01720
	1972	-0.00032	0.01369	0.01401
	1973	0.00365	0.02012	0.01647
	1974	-0.00341	0.02378	0.02719
	1975	-0.00167	0.02377	0.02544
	1976	-0.00197	0.02232	0.02429
	1977	-0.00051	0.02847	0.02898
	1978	-0.00117	0.02709	0.02825
	1979	0.00293	0.03372	0.03080
	1980	0.00188	0.03240	0.03052
	1981	1.7D-05	0.03089	0.03087
	1982	-0.00138	0.03141	0.03279
	1983	0.00317	0.03725	0.03408

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLO/CPILO/POPLO

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLO(-1) + WPROLO)/POPLO

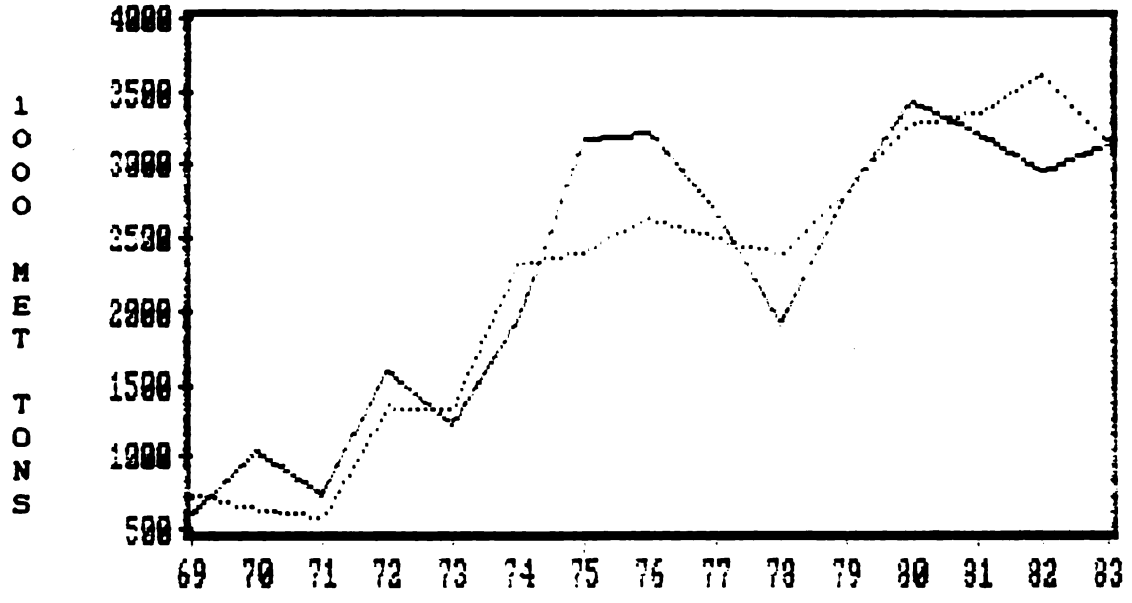
PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESLO(-1) + FPROLO)/POPLO

WPLO = Real LDO Wheat Price ($/MT)
WP*XRLO/CPILO

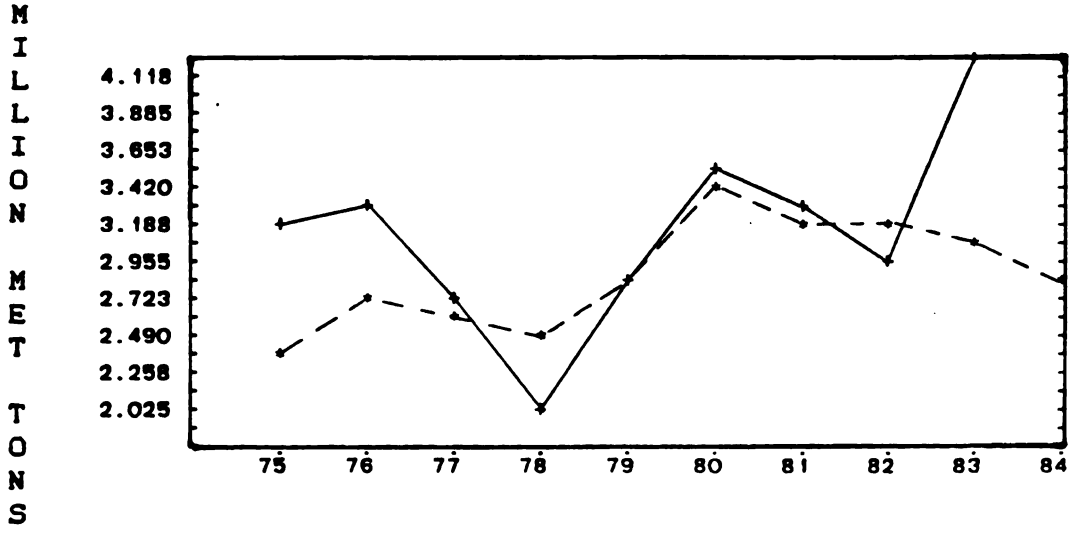
SMPL 1962 - 1983
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0195186	0.0099503	0.0372490	0.0068833
PCRGDP	1.923D-06	7.804D-07	3.039D-06	9.839D-07
WPLO	2.3152471	0.7494025	4.4443270	1.2888420
PCDWSU	0.0306595	0.0042368	0.0401792	0.0234038
PCDFSU	0.0549186	0.0079601	0.0734191	0.0444570

	Covariance	Correlation
PCWNI, PCWNI	9.451D-05	1.0000000
PCWNI, PCRGDP	7.095D-09	0.9571647
PCWNI, WPLO	-0.0034145	-0.4797089
PCWNI, PCDWSU	1.812D-05	0.4503652
PCWNI, PCDFSU	-5.470D-05	-0.7235391
PCRGDP, PCRGDP	5.814D-13	1.0000000
PCRGDP, WPLO	-2.521D-07	-0.4515358
PCRGDP, PCDWSU	1.835D-09	0.5812904
PCRGDP, PCDFSU	-3.954D-09	-0.6668348
WPLO, WPLO	0.5360766	1.0000000
WPLO, PCDWSU	-0.0013353	-0.4405798
WPLO, PCDFSU	0.0023301	0.4092006
PCDWSU, PCDWSU	1.713D-05	1.0000000
PCDWSU, PCDFSU	-1.659D-05	-0.5152274
PCDFSU, PCDFSU	6.048D-05	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.5.a & b. Wheat Ending Stocks - Less Developed Oil Exporters

Less Developed Oil Exporters
Wheat Ending Stocks Per Capita (1000 MT)

SMPL 1962 - 1983
22 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0100181	0.0022089	-4.5352677	0.000
PCRGDP	3283.7044	356.92830	9.1998993	0.000
WPLO	0.0003659	0.0003369	1.0861448	0.292
PCDWSU	0.2709784	0.0653461	4.1468190	0.001

R-squared	0.924208	Mean of dependent var	0.005453
Adjusted R-squared	0.911576	S.D. of dependent var	0.003366
S.E. of regression	0.001001	Sum of squared resid	1.80D-05
Durbin-Watson stat	1.954021	F-statistic	73.16373
Log likelihood	122.9437	TPE = 5/21	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1962	-5.6D-05	0.00213	0.00218
	1963	-0.00065	0.00154	0.00219
	1964	0.00025	0.00150	0.00124
	1965	-6.5D-05	0.00180	0.00187
	1966	-0.00010	0.00098	0.00108
	1967	-0.00050	0.00207	0.00256
	1968	-0.00087	0.00320	0.00408
	1969	-0.00042	0.00247	0.00289
	1970	0.00125	0.00404	0.00280
	1971	0.00062	0.00280	0.00218
	1972	0.00041	0.00593	0.00552
	1973	-0.00032	0.00443	0.00475
	1974	-0.00065	0.00684	0.00748
	1975	0.00221	0.01066	0.00845
	1976	0.00072	0.01060	0.00987
	1977	0.00074	0.00860	0.00786
	1978	-0.00166	0.00592	0.00758
	1979	0.00054	0.00844	0.00790
	1980	0.00053	0.01005	0.00952
	1981	-0.00105	0.00921	0.01026
	1982	-0.00167	0.00822	0.00989
	1983	0.00073	0.00851	0.00778

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLO/CPILO/POPLO

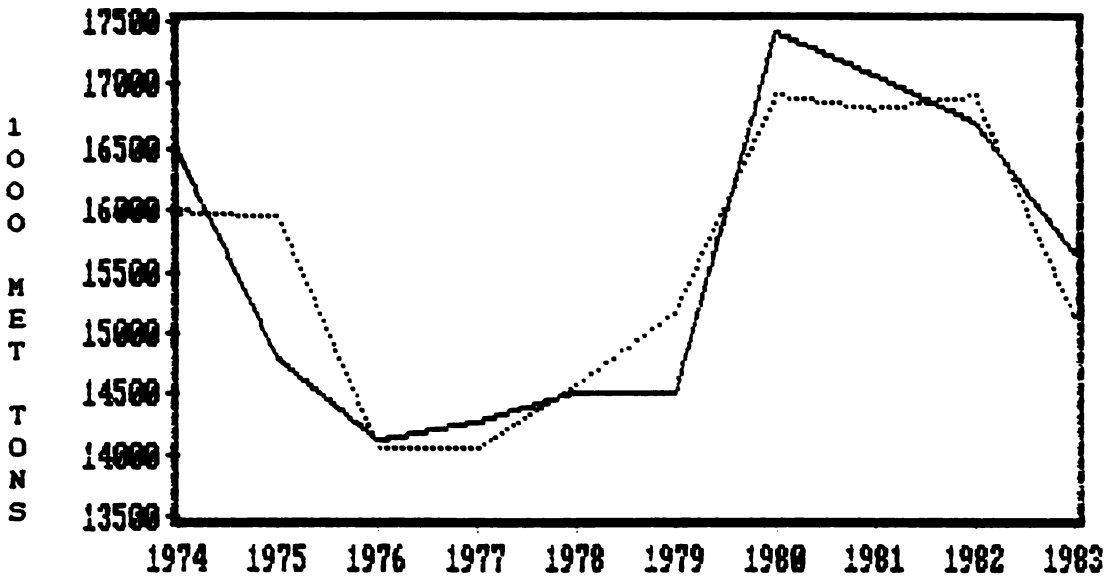
PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESLO(-1) + WPROLO)/POPLO

WPLO = Real LDO Wheat Price ($/MT)
WP*XRLO/CPILO

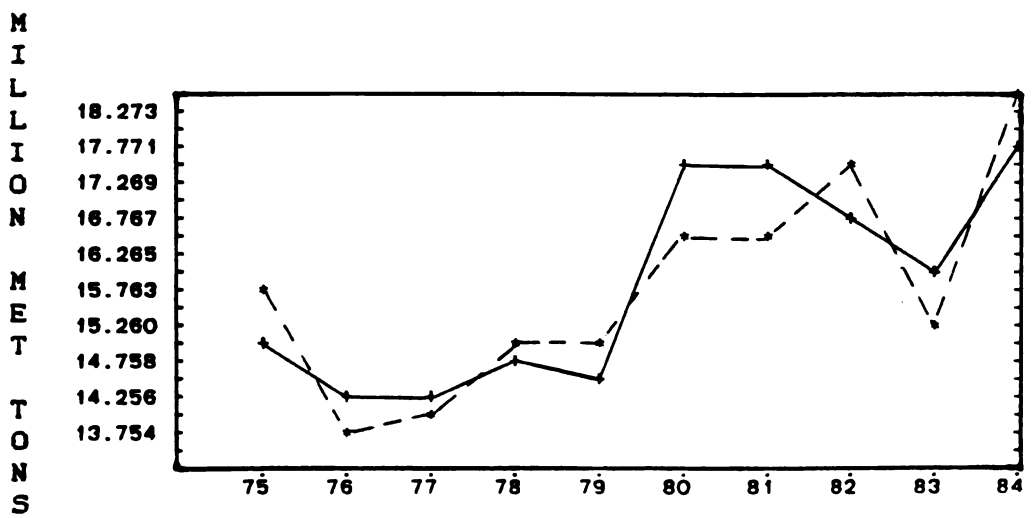
SMPL 1962 - 1983
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0054528	0.0033656	0.0106616	0.0009821
PCRGDP	1.923D-06	7.804D-07	3.039D-06	9.839D-07
WPLO	2.3152471	0.7494025	4.4443270	1.2888420
PCDWSU	0.0306595	0.0042368	0.0401791	0.0234038

	Covariance	Correlation
PCWES, PCWES	1.081D-05	1.0000000
PCWES, PCRGDP	2.314D-09	0.9229188
PCWES, WPLO	-0.0009934	-0.4126186
PCWES, PCDWSU	1.018D-05	0.7478275
PCRGDP, PCRGDP	5.814D-13	1.0000000
PCRGDP, WPLO	-2.521D-07	-0.4515358
PCRGDP, PCDWSU	1.835D-09	0.5812904
WPLO, WPLO	0.5360766	1.0000000
WPLO, PCDWSU	-0.0013353	-0.4405798
PCDWSU, PCDWSU	1.713D-05	1.0000000



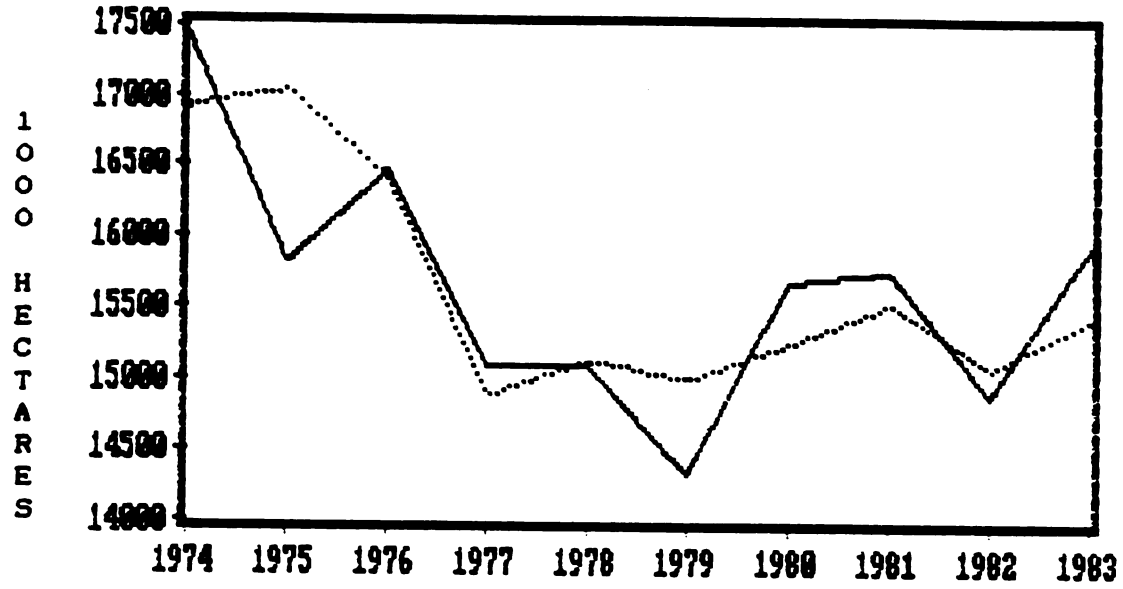
REGIONAL MODEL SIMULATION



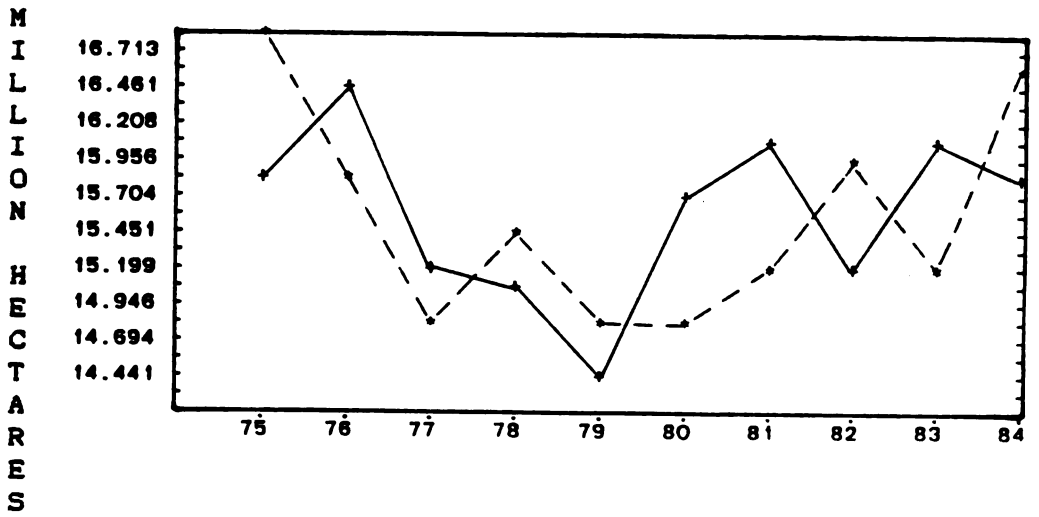
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.6.a & b. Coarse Grain Production - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.7.a & b. Coarse Grain Harvested Area - Less Developed Oil Exporters

Less Developed Oil Exporters
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1968 - 1983
16 Observations
LS // Dependent Variable is FHALO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	13364.252	1079.0469	12.385238	0.000
FRL04(-1)	2518.5055	1026.2722	2.4540326	0.030
SRL04(-1)	-609.72653	486.91310	-1.2522287	0.234
DV6073	2459.3717	518.18628	4.7461150	0.000

R-squared	0.697657	Mean of dependent var	16489.00
Adjusted R-squared	0.622071	S.D. of dependent var	1576.298
S.E. of regression	969.0443	Sum of squared resid	11268563
Durbin-Watson stat	2.000172	F-statistic	9.229993
Log likelihood	-130.4225		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
. *	1968	484.612	18401.0	17916.4
*	1969	903.670	18859.0	17955.3
*	1970	839.688	18972.0	18132.3
* *	1971	-685.810	17591.0	18276.8
*	1972	-2362.55	15082.0	17444.6
*	1973	820.392	18568.0	17747.6
*	1974	520.319	17436.0	16915.7
* *	1975	-1203.98	15826.0	17030.0
*	1976	66.1364	16449.0	16382.9
*	1977	222.097	15081.0	14858.9
*	1978	-35.5764	15060.0	15095.6
* *	1979	-645.824	14315.0	14960.8
*	1980	458.394	15667.0	15208.6
*	1981	251.496	15741.0	15489.5
*	1982	-172.850	14855.0	15027.8
*	1983	539.792	15921.0	15381.2

INDEPENDENT VARIABLES

FHALO = Wheat Harvested Area (1000 HA)

FRL04 = Coarse Grain Revenue Per Hectare ($/HA)
(FYLO(-3)+FYLO(-2)+FYLO(-1)+FYLO)/4*FP*XRLO/CPILO

SRL04 = Soybean Revenue Per Hectare ($/HA)
(Forecast Soybean Yield)*SP*XRLO/CPILO

DV6073 = 1 If(YEAR .GE 60 .OR. YEAR .LE73)
0 Otherwise

SMPL 1968 - 1983
16 Observations

Series	Mean	S.D.	Maximum	Minimum
FHALO	16489.000	1576.2985	18972.000	14315.000
FRL04(-1)	1.5597334	0.3798399	2.3830660	1.1195660
SRL04(-1)	2.8303080	0.8111283	4.9687080	1.7317520
DV6073	0.3750000	0.5000000	1.0000000	0.0000000

	Covariance	Correlation
FHALO,FHALO	2329422.1	1.0000000
FHALO,FRL04(-1)	202.46908	0.3607018
FHALO,SRL04(-1)	323.61798	0.2699811
FHALO,DV6073	533.68750	0.7222828
FRL04(-1),FRL04(-1)	0.1352610	1.0000000
FRL04(-1),SRL04(-1)	0.2180149	0.7547875
FRL04(-1),DV6073	-0.0021375	-0.0120052
SRL04(-1),SRL04(-1)	0.6168086	1.0000000
SRL04(-1),DV6073	0.0612477	0.1610864
DV6073,DV6073	0.2343750	1.0000000

Less Developed Oil Exporters
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYLO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.3611073	0.7407894	-4.5371967	0.000
LOGT	0.9918797	0.1736462	5.7120718	0.000

R-squared	0.597274	Mean of dependent var	0.869231
Adjusted R-squared	0.578969	S.D. of dependent var	0.127768
S.E. of regression	0.082905	Sum of squared resid	0.151210
Durbin-Watson stat	0.711234	F-statistic	32.62776
Log likelihood	26.75119	TPE = 6/23	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.06555	0.76554	0.69999
	1961	0.02703	0.74342	0.71639
	1962	0.09633	0.82885	0.73251
	1963	0.10249	0.85087	0.74838
	1964	0.12771	0.89171	0.76400
	1965	-0.04076	0.73863	0.77938
	1966	-0.08305	0.71148	0.79453
	1967	-0.07701	0.73243	0.80944
	1968	-0.06717	0.75697	0.82414
	1969	-0.05936	0.77926	0.83862
	1970	-0.06641	0.78647	0.85289
	1971	-0.12709	0.73987	0.86696
	1972	-0.10680	0.77404	0.88083
	1973	-0.09233	0.80219	0.89451
	1974	0.03659	0.94460	0.90801
	1975	0.01309	0.93441	0.92132
	1976	-0.07708	0.85738	0.93446
	1977	-0.00220	0.94523	0.94742
	1978	0.00365	0.96388	0.96022
	1979	0.03971	1.01257	0.97286
	1980	0.12566	1.11100	0.98534
	1981	0.08645	1.08411	0.99766
	1982	0.11478	1.12460	1.00983
	1983	-0.03981	0.98204	1.02185

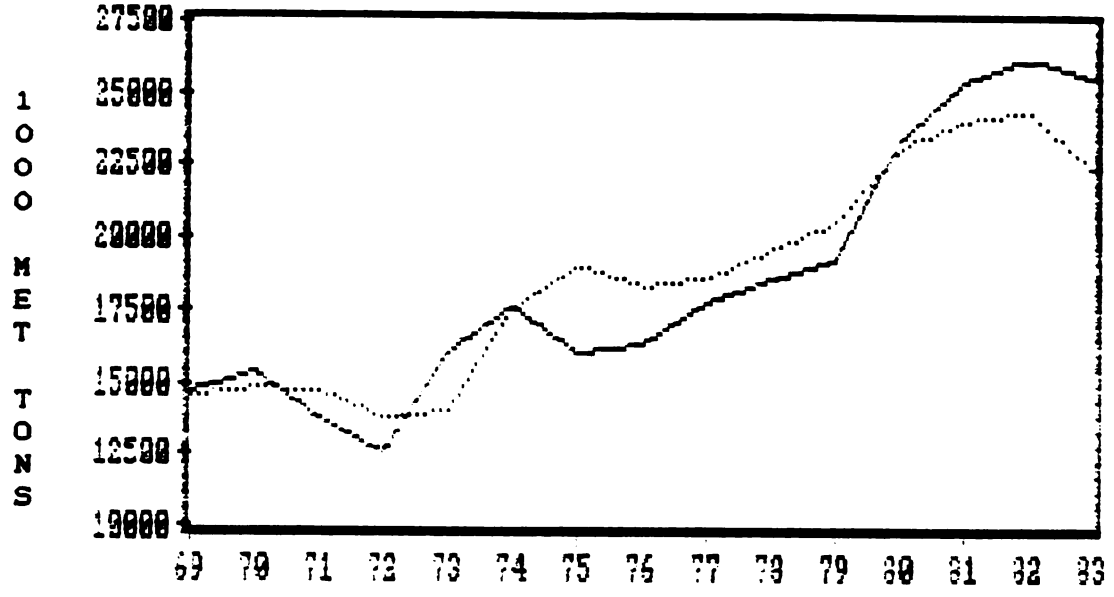
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

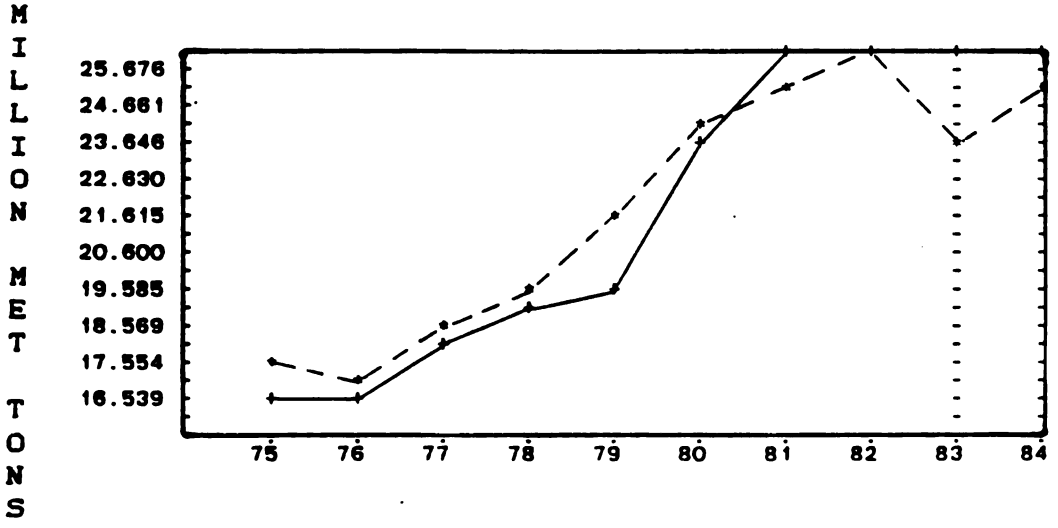
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYLO	0.8692308	0.1277677	1.1246040	0.7114765
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYLO,FYLO	0.0156444	1.0000000
FYLO,LOGT	0.0094205	0.7728353
LOGT,LOGT	0.0094976	1.0000000



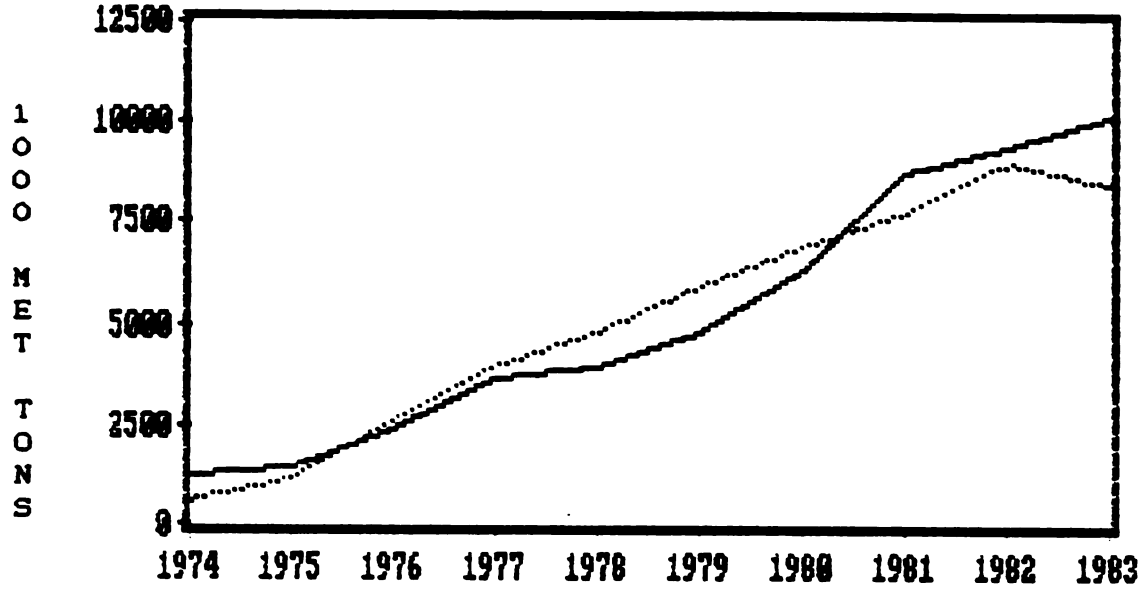
REGIONAL MODEL SIMULATION



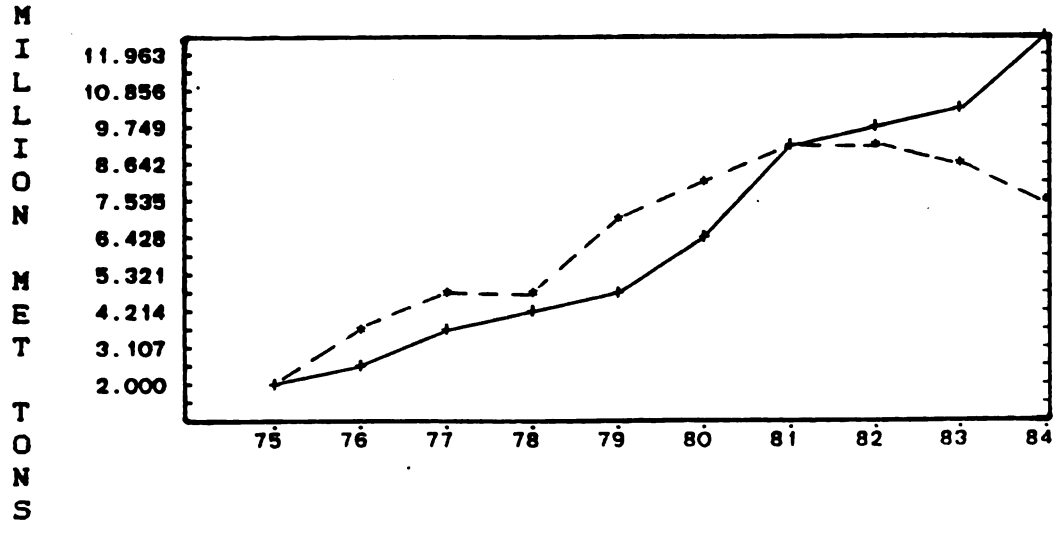
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.8.a & b. Total Coarse Grain Consumption - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.9.a & b. Coarse Grain Net Imports - Less Developed Oil Exporters

Less Developed Oil Exporters
Coarse Grain Net Imports Per Capita (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0110977	0.0059419	-1.8676976	0.079
PCRGDP	7620.8453	798.51736	9.5437441	0.000
PCFCON(-1)	0.2947971	0.0665819	4.4275858	0.000
FPLO	-0.0035955	0.0029057	-1.2373956	0.233
WPLO	0.0040553	0.0018268	2.2198885	0.040
FPLO(-1)	-0.0083211	0.0014930	-5.5732380	0.000

R-squared	0.959616	Mean of dependent var	0.007102
Adjusted R-squared	0.947738	S.D. of dependent var	0.009180
S.E. of regression	0.002099	Sum of squared resid	7.49D-05
Durbin-Watson stat	1.362431	F-statistic	80.79086
Log likelihood	112.6684	TPE	5/23

Residual Plot	OBS	RESIDUAL	ACTUAL	FITTED
	1961	-0.00224	-0.00012	0.00212
	1962	-0.00027	2.9D-05	0.00030
	1963	-0.00310	-0.00050	0.00260
	1964	0.00037	0.00031	-6.6D-05
	1965	0.00021	0.00011	-0.00010
	1966	0.00090	-0.00015	-0.00104
	1967	0.00204	6.9D-05	-0.00197
	1968	0.00025	0.00101	0.00077
	1969	3.7D-05	-0.00029	-0.00032
	1970	0.00085	0.00113	0.00028
	1971	0.00170	0.00312	0.00143
	1972	-0.00067	0.00254	0.00321
	1973	0.00270	0.00418	0.00148
	1974	-0.00028	0.00426	0.00455
	1975	-0.00089	0.00488	0.00577
	1976	-0.00016	0.00795	0.00810
	1977	-0.00119	0.01154	0.01273
	1978	-0.00281	0.01227	0.01508
	1979	-0.00320	0.01437	0.01757
	1980	-0.00069	0.01836	0.01905
	1981	0.00256	0.02479	0.02223
	1982	-0.00012	0.02603	0.02615
	1983	0.00402	0.02745	0.02343

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLO/CPILO/POPLO

PCFCON = Coarse Grain Consumption Per Capita (1000 MT)
FCONLO/POPLO

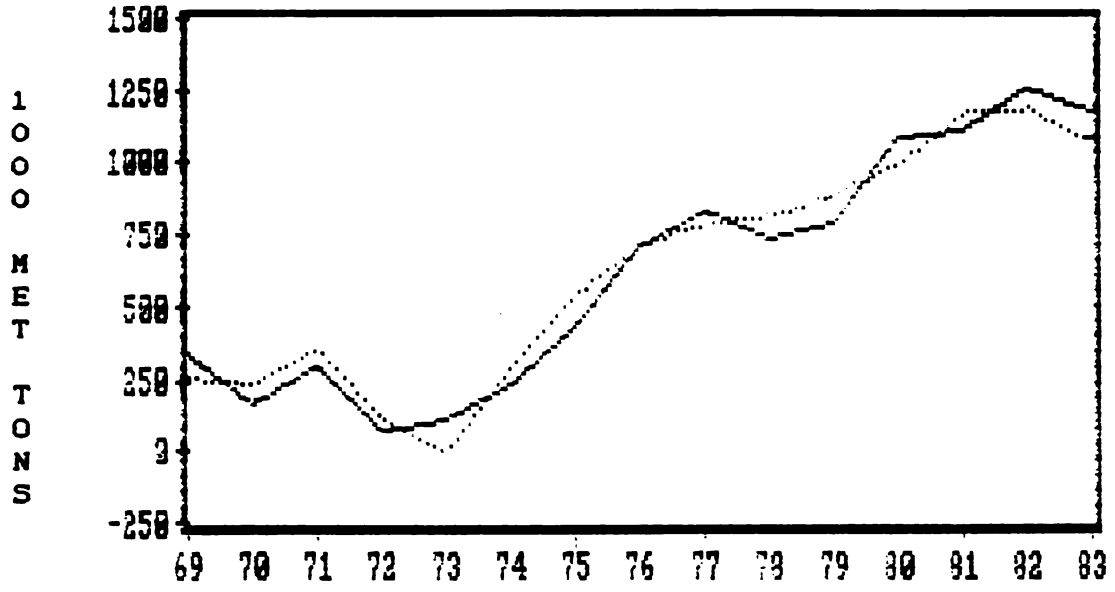
WPLO = Real LDO Wheat Price ($/MT)
WP*XRLO/CPILO

FPLO = Real LDO Coarse Grain Price ($/MT)
FP*XRLO/CPILO

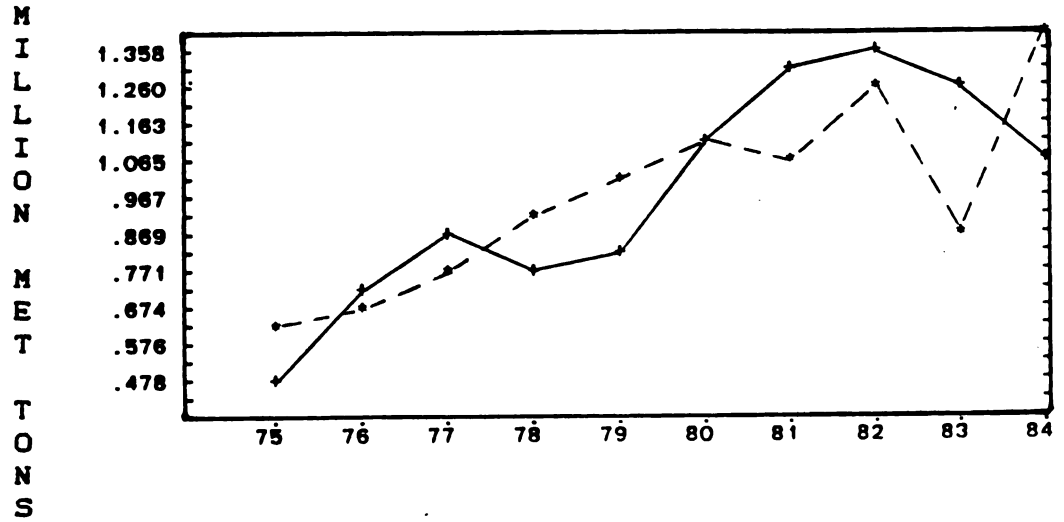
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0071024	0.0091804	0.0274509	-0.0004973
PCRGDP	1.884D-06	7.835D-07	3.039D-06	9.839D-07
PCFCON(-1)	0.0608609	0.0072230	0.0727465	0.0467222
FPLO	1.9474356	0.5510429	3.0723820	1.0735220
WPLO	2.3364015	0.7391680	4.4443270	1.2888420
FPLO(-1)	1.9914943	0.5297108	3.0723820	1.0735220

	Covariance	Correlation
PCFNI, PCFNI	8.062D-05	1.0000000
PCFNI, PCRGDP	6.005D-09	0.8705823
PCFNI, PCFCON(-1)	1.805D-05	0.2846554
PCFNI, FPLO	-0.0037458	-0.7741179
PCFNI, WPLO	-0.0040911	-0.6302950
PCFNI, FPLO(-1)	-0.0035328	-0.7594884
PCRGDP, PCRGDP	5.902D-13	1.0000000
PCRGDP, PCFCON(-1)	8.590D-11	0.0158291
PCRGDP, FPLO	-2.571D-07	-0.6210249
PCRGDP, WPLO	-2.594D-07	-0.4671420
PCRGDP, FPLO(-1)	-1.934D-07	-0.4860150
PCFCON(-1), PCFCON(-1)	4.990D-05	1.0000000
PCFCON(-1), FPLO	-0.0010450	-0.2744913
PCFCON(-1), WPLO	-0.0016255	-0.3183029
PCFCON(-1), FPLO(-1)	-0.0006638	-0.1813784
FPLO, FPLO	0.2904461	1.0000000
FPLO, WPLO	0.3628714	0.9313853
FPLO, FPLO(-1)	0.2290014	0.8201988
WPLO, WPLO	0.5226141	1.0000000
WPLO, FPLO(-1)	0.2943649	0.7859759
FPLO(-1), FPLO(-1)	0.2683938	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure H.10.a & b. Coarse Grain Ending Stocks - Less Developed Oil Exporters

Less Developed Oil Exporters
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1962 - 1983
22 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0012200	0.0006958	1.7534705	0.097
PCRGDP	769.33540	105.55509	7.2884725	0.000
FPLO	-0.0011935	0.0001269	-9.4060377	0.000
PCDFSU	0.0213037	0.0094211	2.2612609	0.038

R-squared	0.952100	Mean of dependent var	0.001557
Adjusted R-squared	0.944116	S.D. of dependent var	0.001069
S.E. of regression	0.000253	Sum of squared resid	1.15D-06
Durbin-Watson stat	2.303539	F-statistic	119.2600
Log likelihood	153.2228	TPE = 7/21	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1962	-9.1D-05	0.00070	0.00079
	1963	2.4D-05	0.00071	0.00068
	1964	-5.4D-05	0.00068	0.00074
	1965	4.5D-05	0.00068	0.00064
	1966	7.8D-05	0.00063	0.00055
	1967	-0.00038	0.00061	0.00099
	1968	0.00040	0.00145	0.00105
	1969	0.00028	0.00136	0.00108
	1970	-0.00029	0.00066	0.00095
	1971	-0.00014	0.00114	0.00128
	1972	8.1D-06	0.00028	0.00027
	1973	0.00039	0.00042	2.6D-05
	1974	-0.00026	0.00079	0.00105
	1975	-0.00027	0.00145	0.00172
	1976	-7.8D-06	0.00232	0.00233
	1977	0.00012	0.00266	0.00254
	1978	-0.00023	0.00227	0.00250
	1979	-0.00022	0.00239	0.00261
	1980	0.00028	0.00320	0.00291
	1981	-0.00018	0.00317	0.00335
	1982	0.00021	0.00348	0.00327
	1983	0.00027	0.00320	0.00293

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPLO/CPILO/POPLO

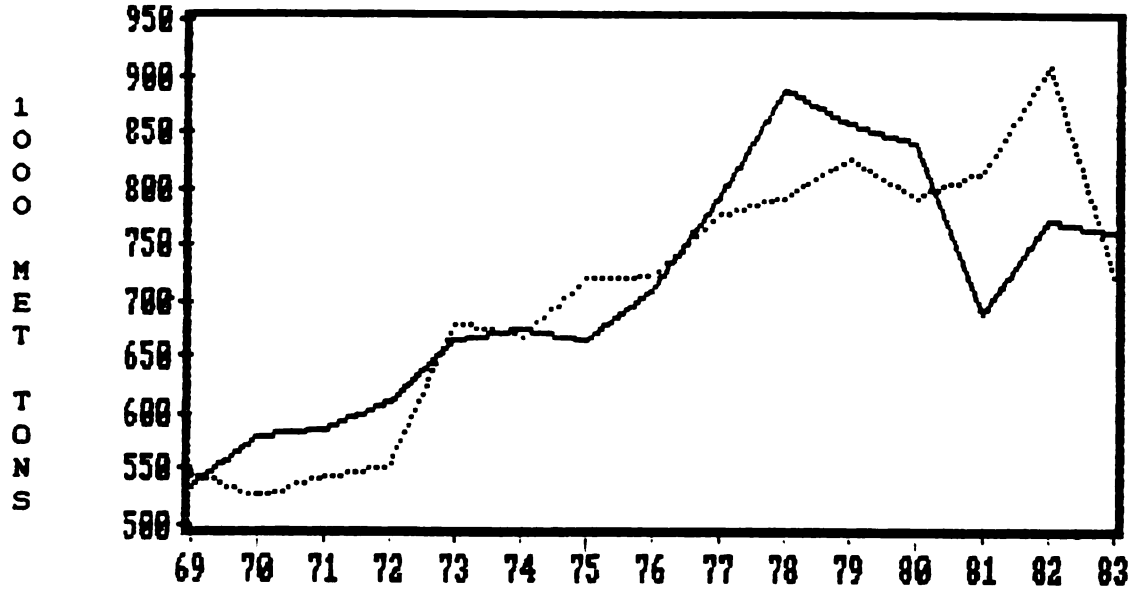
PCFDSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESLO(-1) + FPROLO)/POPLO

FPLO = Real LDO Coarse Grain Price ($/MT)
FP*XRLO/CPILO

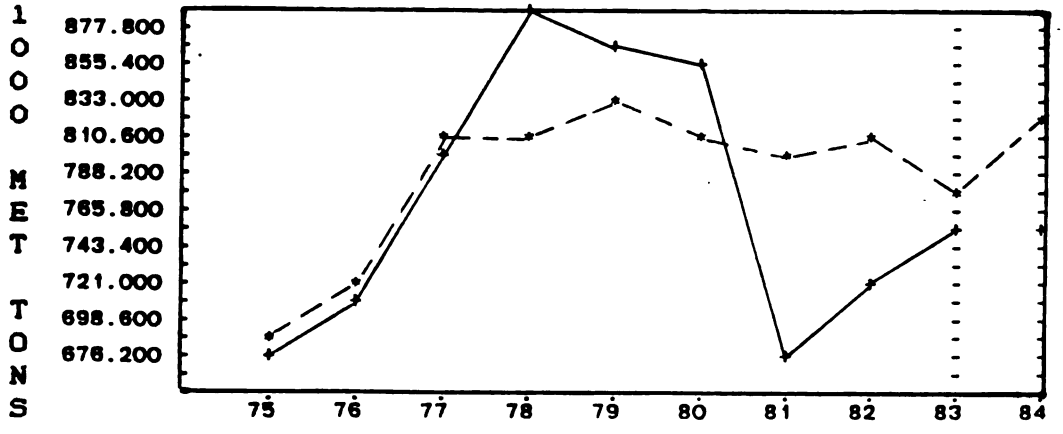
SMPL 1962 - 1983
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0015568	0.0010690	0.0034834	0.0002785
PCRGDP	1.923D-06	7.804D-07	3.039D-06	9.839D-07
FPLO	1.9378095	0.5620276	3.0723820	1.0735220
PCDFSU	0.0549186	0.0079601	0.0734191	0.0444570

	Covariance	Correlation
PCFES,PCFES	1.091D-06	1.0000000
PCFES,PCRGDP	6.734D-10	0.8456838
PCFES,FPLO	-0.0005137	-0.8956711
PCFES,PCDFSU	-4.348D-06	-0.5352744
PCRGDP,PCRGDP	5.814D-13	1.0000000
PCRGDP,FPLO	-2.601D-07	-0.6212235
PCRGDP,PCDFSU	-3.954D-09	-0.6668348
FPLO,FPLO	0.3015170	1.0000000
FPLO,PCDFSU	0.0021735	0.5089741
PCDFSU,PCDFSU	6.048D-05	1.0000000



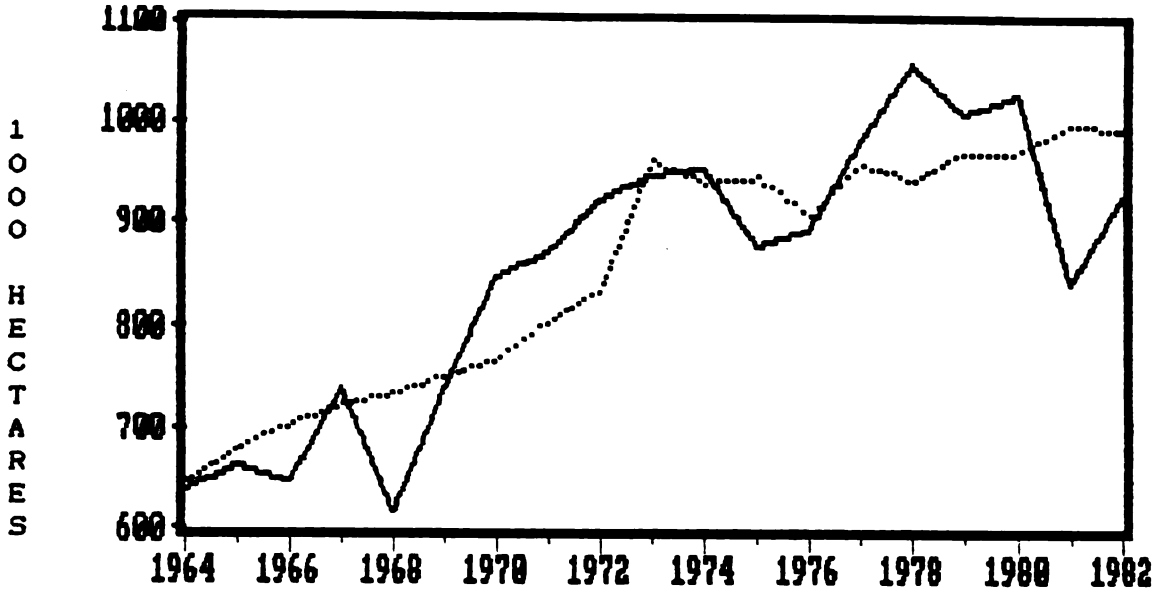
REGIONAL MODEL SIMULATION



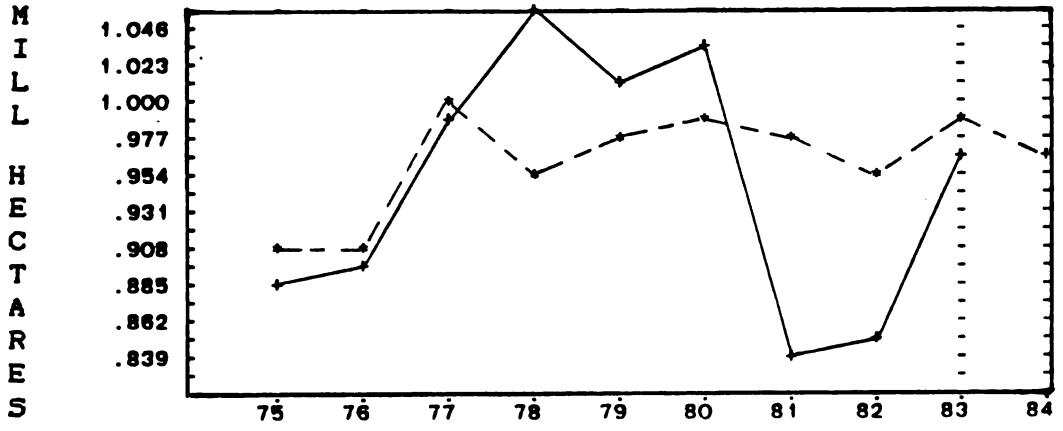
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.11.a & b. Soybean Production - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.12.a & b. Soybean Harvested Area - Less Developed Oil Exporters

Less Developed Oil Exporters
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SHALO

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-188.29451	419.99175	-0.4483291	0.661
SHALO(-1)	0.3579090	0.2770914	1.2916641	0.217
SRLOX(-1)	59.337435	35.293781	1.6812433	0.115
FRLO4(-1)	-105.70959	74.372618	-1.4213509	0.177
YEAR	10.124626	7.2886812	1.3890889	0.187

R-squared	0.767318	Mean of dependent var	868.6316
Adjusted R-squared	0.700837	S.D. of dependent var	132.0098
S.E. of regression	72.20379	Sum of squared resid	72987.42
Durbin-Watson stat	2.352019	F-statistic	11.54197
Log likelihood	-105.3691	TPE	9/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-1.04055	661.000	662.041
	1966	-41.5569	645.000	686.557
	1967	38.4881	737.000	698.512
	1968	-153.102	614.000	767.102
	1969	7.49267	738.000	730.507
	1970	75.5953	849.000	773.405
	1971	41.4173	872.000	830.583
	1972	36.1228	924.000	887.877
	1973	-36.2378	948.000	984.238
	1974	48.3838	954.000	905.616
	1975	-24.3272	877.000	901.327
	1976	27.8431	894.000	866.157
	1977	14.4494	980.000	965.551
	1978	89.0385	1057.00	967.961
	1979	-4.55987	1009.00	1013.56
	1980	47.4413	1029.00	981.559
	1981	-148.218	842.000	990.218
	1982	-8.96723	927.000	935.967
	1983	-8.26193	947.000	955.262

INDEPENDENT VARIABLES

SHALO = Soybean Harvested Area (1000 HA)

SRLOX = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP*XRLO/CPILO

FRLO4 = Coarse Grain Revenue per Hectare ($/HA)
(FYLO(-3)+FYLO(-2)+FYLO(1)+FYLO)/4*FP*XRLO/CPILO

YEAR = 1960=60, 1961=61, ...

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SHALO	868.63158	132.00977	1057.0000	614.00000
SHALO(-1)	852.36842	140.57470	1057.0000	614.00000
SRLOX(-1)	2.9226815	0.8350820	5.2351810	1.6921530
FRLO4(-1)	1.6156625	0.3719912	2.3830660	1.1195660
YEAR	74.000000	5.6273143	83.000000	65.000000

	Covariance	Correlation
SHALO, SHALO	16509.391	1.0000000
SHALO, SHALO(-1)	14569.609	0.8287352
SHALO, SRLOX(-1)	8.0462903	0.0770445
SHALO, FRLO4(-1)	-13.389088	-0.2878017
SHALO, YEAR	549.21053	0.7803918
SHALO(-1), SHALO(-1)	18721.180	1.0000000
SHALO(-1), SRLOX(-1)	12.715757	0.1143371
SHALO(-1), FRLO4(-1)	-8.1883171	-0.1652860
SHALO(-1), YEAR	617.21053	0.8235806
SRLOX(-1), SRLOX(-1)	0.6606587	1.0000000
SRLOX(-1), FRLO4(-1)	0.2173623	0.7385903
SRLOX(-1), YEAR	-1.2572615	-0.2824076
FRLO4(-1), FRLO4(-1)	0.1310944	1.0000000
FRLO4(-1), YEAR	-0.9381286	-0.4730528
YEAR, YEAR	30.000000	1.0000000

Less Developed Oil Exporters
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SYLD

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2.9027920	0.6253946	-4.6415370	0.000
LOGT	0.8473014	0.1456128	5.8188648	0.000

R-squared	0.652906	Mean of dependent var	0.735682
Adjusted R-squared	0.633623	S.D. of dependent var	0.084769
S.E. of regression	0.051310	Sum of squared resid	0.047388
Durbin-Watson stat	1.591976	F-statistic	33.85919
Log likelihood	32.07239		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.05138	0.67241	0.62104
	1965	0.02695	0.66112	0.63417
	1966	0.02421	0.67132	0.64711
	1967	-0.06691	0.59294	0.65985
	1968	-0.02582	0.64658	0.67240
	1969	0.03880	0.72358	0.68477
	1970	-0.01616	0.68080	0.69696
	1971	-0.03696	0.67202	0.70898
	1972	-0.06066	0.66017	0.72083
	1973	-0.02999	0.70253	0.73252
	1974	-0.03545	0.70860	0.74405
	1975	0.00285	0.75827	0.75542
	1976	0.02642	0.79306	0.76664
	1977	0.03044	0.80816	0.77772
	1978	0.05241	0.84106	0.78865
	1979	0.05090	0.85035	0.79945
	1980	0.00622	0.81633	0.81011
	1981	-0.00234	0.81829	0.82063
	1982	0.08591	0.91694	0.83103
	1983	-0.12218	0.71911	0.84130

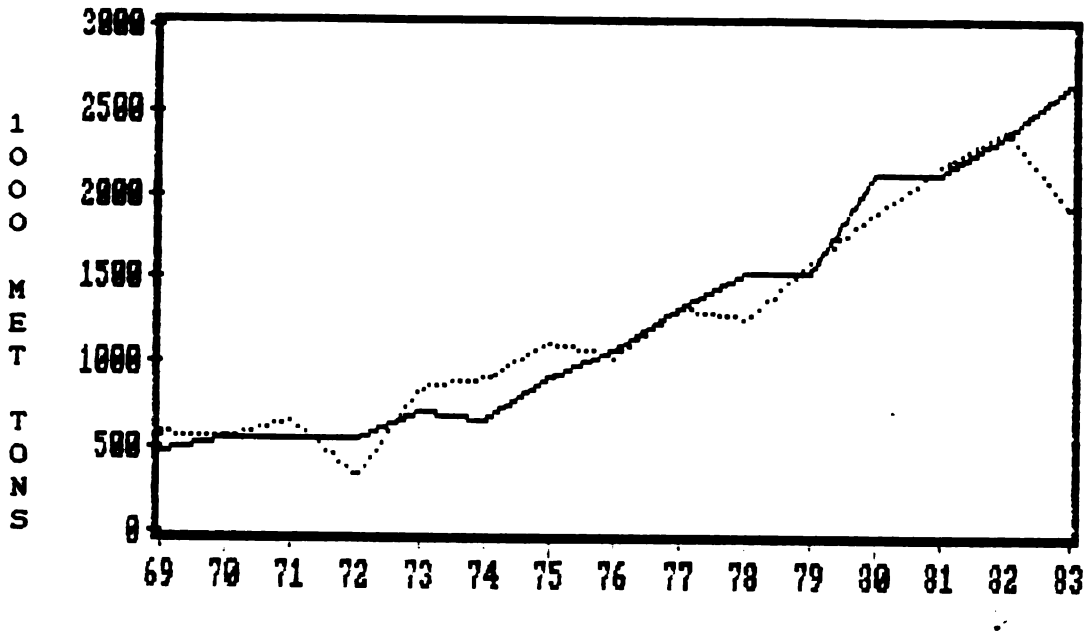
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

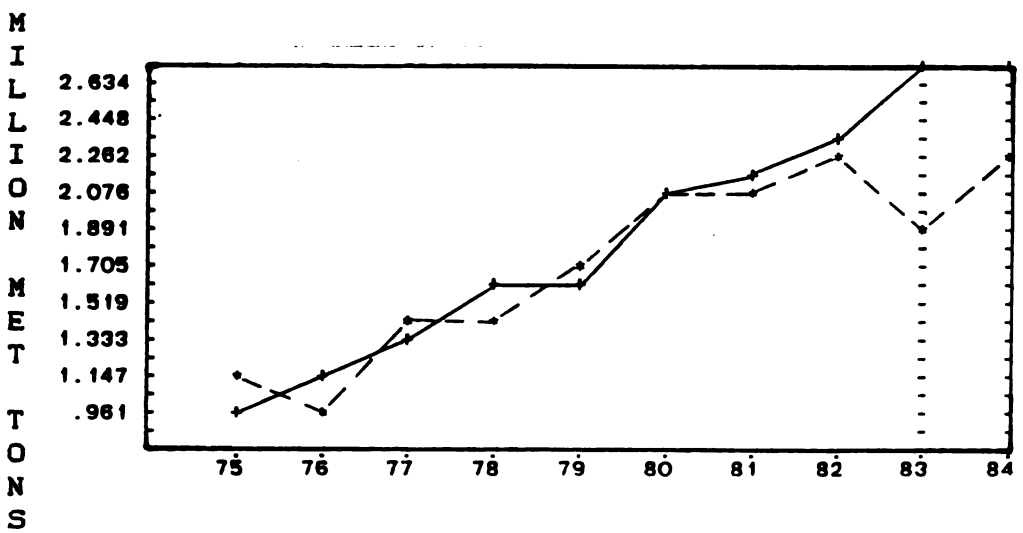
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SYLO	0.7356820	0.0847685	0.9169363	0.5929444
LOGT	4.2941910	0.0808392	4.4188400	4.1588830

	Covariance	Correlation
SYLO,SYLO	0.0068264	1.0000000
SYLO,LOGT	0.0052602	0.8080261
LOGT,LOGT	0.0062082	1.0000000



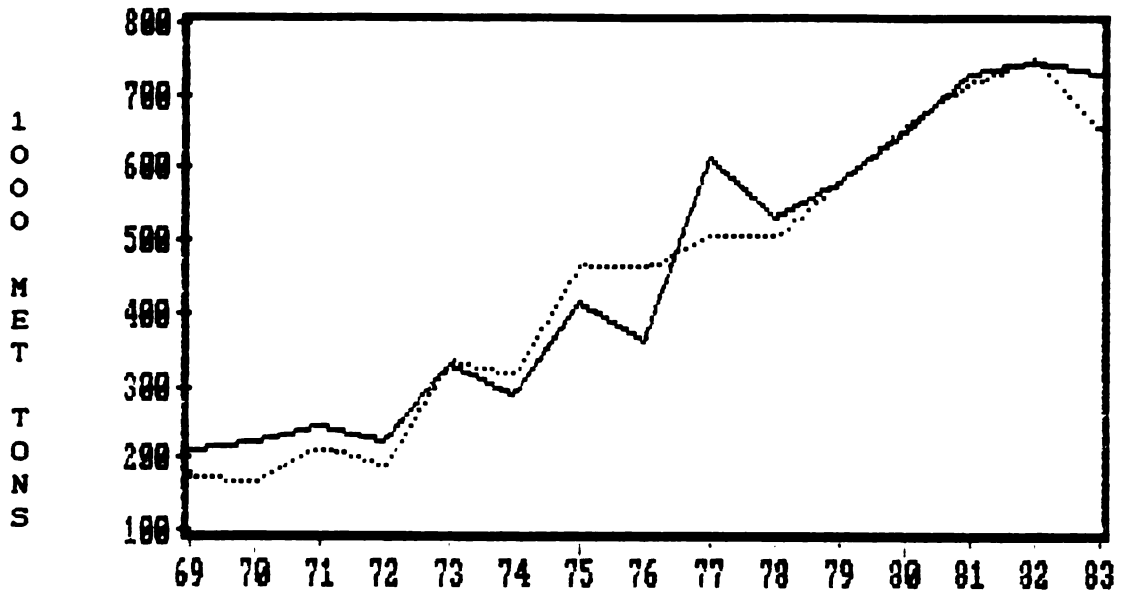
REGIONAL MODEL SIMULATION



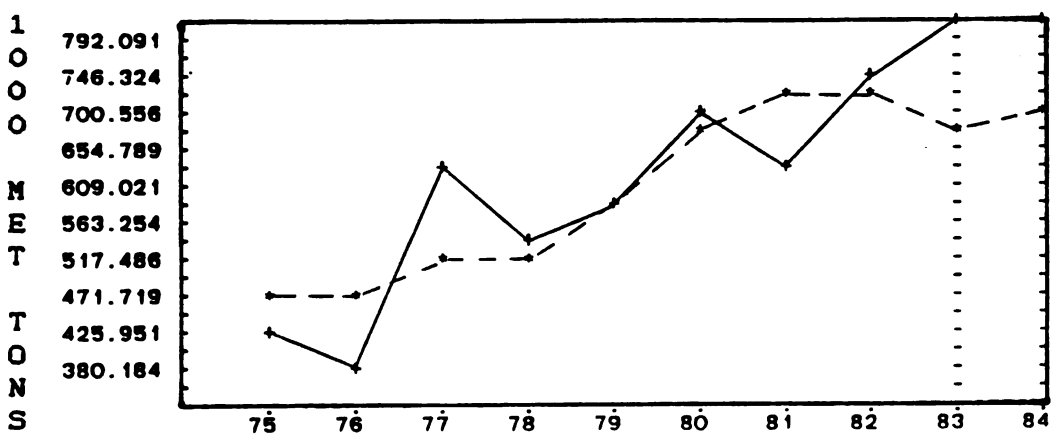
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.13.a & b. Soymeal Equivalent Consumption - Less Developed Oil Exporters



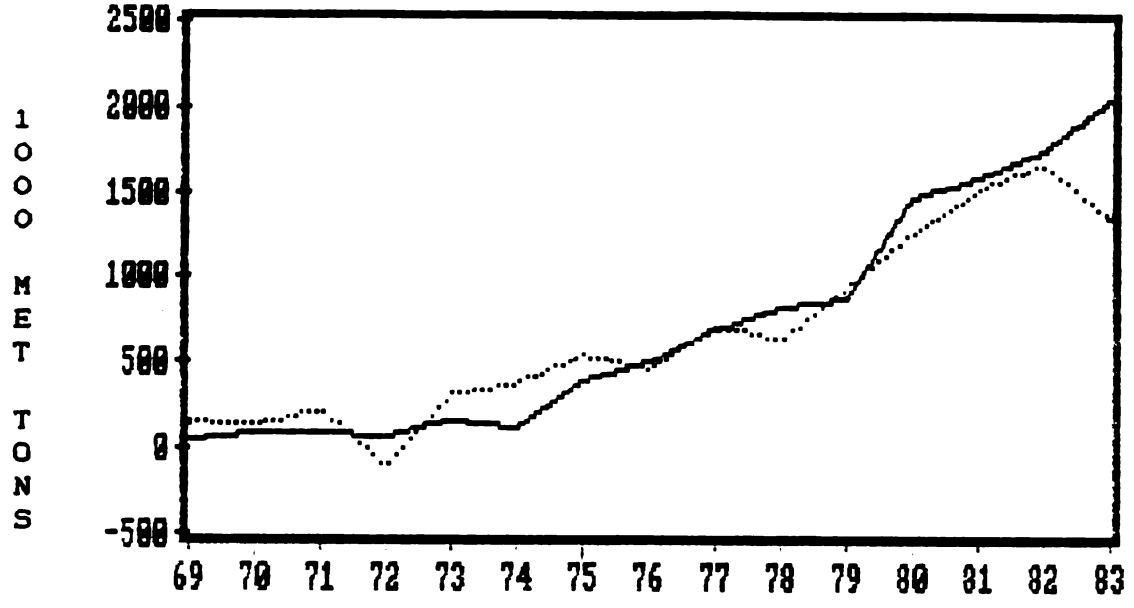
REGIONAL MODEL SIMULATION



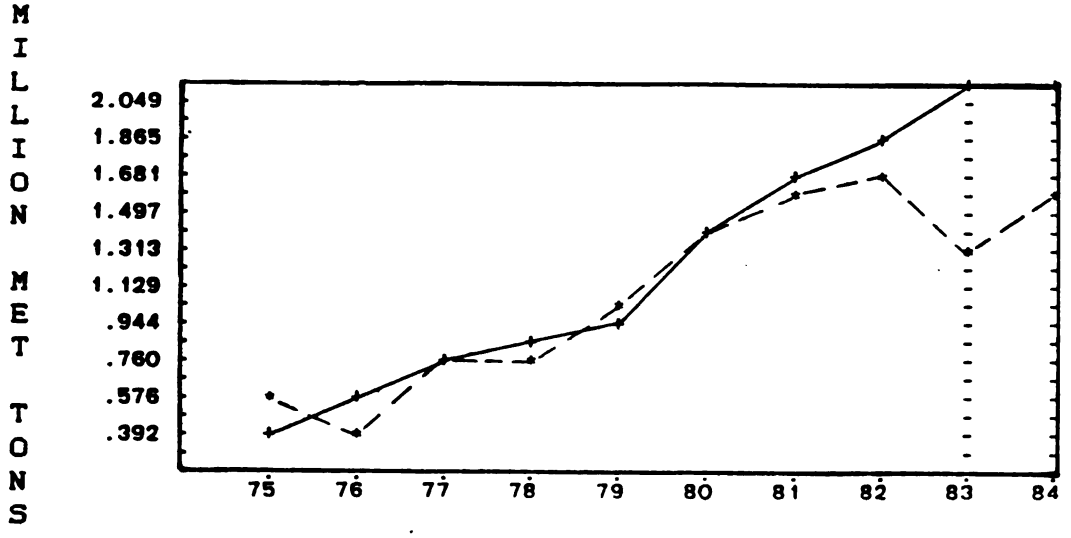
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.14.a & b. Soyoil Equivalent Consumption - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.15.a & b. Soymeal Equivalent Imports - Less Developed Oil Exporters

Less Developed Oil Exporters
Per Capita Soymeal Equivalent Imports (1000 MT)

SMPL 1964 - 1981
18 Observations
LS // Dependent Variable is PTSMNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0019805	0.0009583	-2.0666047	0.058
PCRGDP	3674.1656	668.84350	5.4933115	0.000
SPLO	-0.0005460	0.0001202	-4.5411585	0.000
DV74ON	-0.0034808	0.0009907	-3.5136619	0.003

R-squared	0.905094	Mean of dependent var	0.001208
Adjusted R-squared	0.884757	S.D. of dependent var	0.001467
S.E. of regression	0.000498	Sum of squared resid	3.47D-06
Durbin-Watson stat	1.718183	F-statistic	44.50487
Log likelihood	113.6151	TPE = 6/17	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.00041	3.4D-05	-0.00037
	1965	0.00035	0.00010	-0.00025
	1966	0.00025	4.0D-05	-0.00021
	1967	4.7D-05	9.7D-05	5.0D-05
	1968	-0.00022	0.00011	0.00033
	1969	-0.00039	0.00020	0.00058
	1970	-0.00016	0.00036	0.00052
	1971	-0.00049	0.00033	0.00081
	1972	0.00069	0.00025	-0.00044
	1973	-0.00049	0.00061	0.00110
	1974	-0.00088	0.00041	0.00129
	1975	-0.00052	0.00129	0.00181
	1976	0.00019	0.00168	0.00149
	1977	-4.1D-05	0.00221	0.00225
	1978	0.00065	0.00259	0.00193
	1979	-0.00022	0.00260	0.00282
	1980	0.00060	0.00430	0.00370
	1981	0.00021	0.00454	0.00433

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPLO/CPILO/POPLO

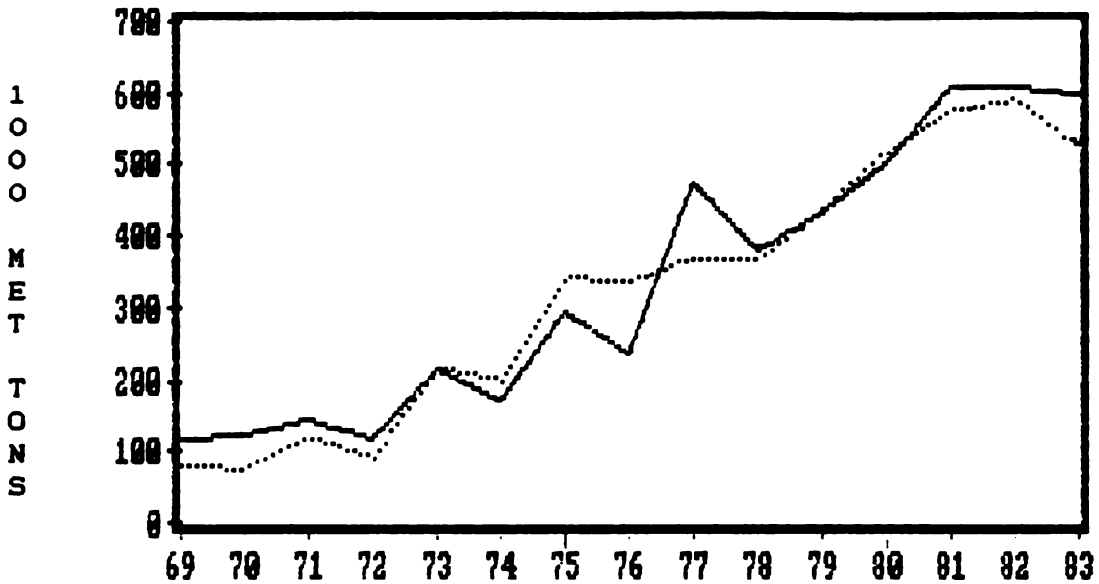
SPLO = Real LDO Soybean Price ($/MT)
SPLO*XRLO/CPILO

DV74ON = 1 If(YEAR .GE. 74)
0 Otherwise

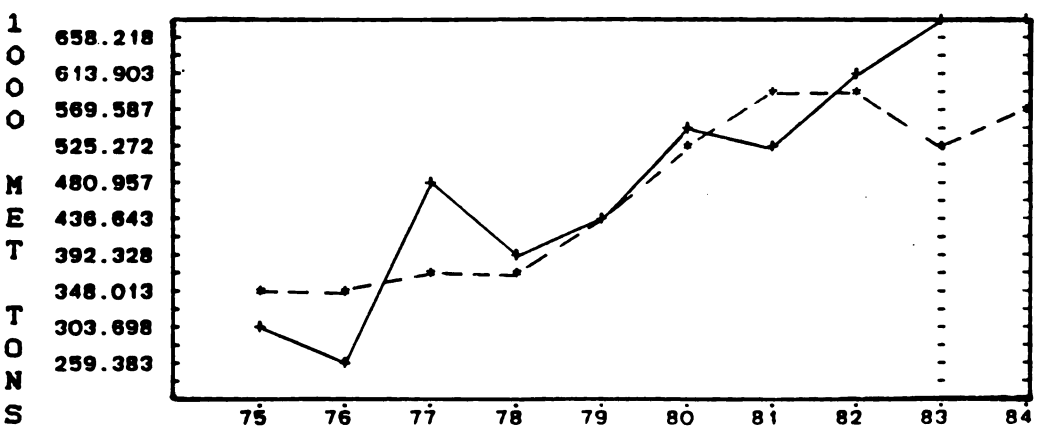
SMPL 1964 - 1981
18 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMNI	0.0012081	0.0014665	0.0045359	3.425D-05
PCRGDP	1.908D-06	7.339D-07	3.002D-06	1.132D-06
SPLO	4.1681091	1.1709218	7.2626800	2.2801890
DV74ON	0.4444444	0.5113100	1.0000000	0.0000000

	Covariance	Correlation
PTSMNI,PTSMNI	2.031D-06	1.0000000
PTSMNI,PCRGDP	8.688D-10	0.8547308
PTSMNI,SPLO	-0.0010476	-0.6459557
PTSMNI,DV74ON	0.0005532	0.7811147
PCRGDP,PCRGDP	5.086D-13	1.0000000
PCRGDP,SPLO	-3.562D-07	-0.4389037
PCRGDP,DV74ON	3.432D-07	0.9683198
SPLO,SPLO	1.2948881	1.0000000
SPLO,DV74ON	-0.2781111	-0.4918467
DV74ON,DV74ON	0.2469136	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.16.a & b. Soyoil Equivalent Imports - Less Developed Oil Exporters

Less Developed Oil Exporters
Per Capita Soyoil Equivalent Imports (1000 MT)

SMPL 1964 - 1981
18 Observations
LS // Dependent Variable is PTSONI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0002321	0.0002388	0.9718296	0.348
PCRGDP	553.93147	63.907904	8.6676521	0.000
SOPLO	-6.714D-05	1.889D-05	-3.5544850	0.003
DV73	0.0007541	0.0002475	3.0464585	0.009

R-squared	0.903280	Mean of dependent var	0.000733
Adjusted R-squared	0.882554	S.D. of dependent var	0.000520
S.E. of regression	0.000178	Sum of squared resid	4.44D-07
Durbin-Watson stat	1.791053	F-statistic	43.58247
Log likelihood	132.1117	TPE * 2/17	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	3.1D-05	0.00018	0.00015
	1965	4.5D-05	0.00019	0.00015
	1966	-0.00015	0.00012	0.00026
	1967	-0.00018	0.00020	0.00038
	1968	-0.00020	0.00021	0.00042
	1969	0.00015	0.00048	0.00032
	1970	0.00019	0.00047	0.00028
	1971	9.6D-05	0.00054	0.00045
	1972	0.00010	0.00044	0.00033
	1973	6.4D-21	0.00077	0.00077
	1974	-9.4D-05	0.00060	0.00069
	1975	-0.00014	0.00100	0.00114
	1976	-0.00032	0.00078	0.00109
	1977	0.00035	0.00152	0.00117
	1978	4.3D-05	0.00117	0.00113
	1979	-6.1D-06	0.00131	0.00131
	1980	-4.1D-05	0.00148	0.00152
	1981	0.00011	0.00174	0.00163

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPLO/CPILO/POPLO

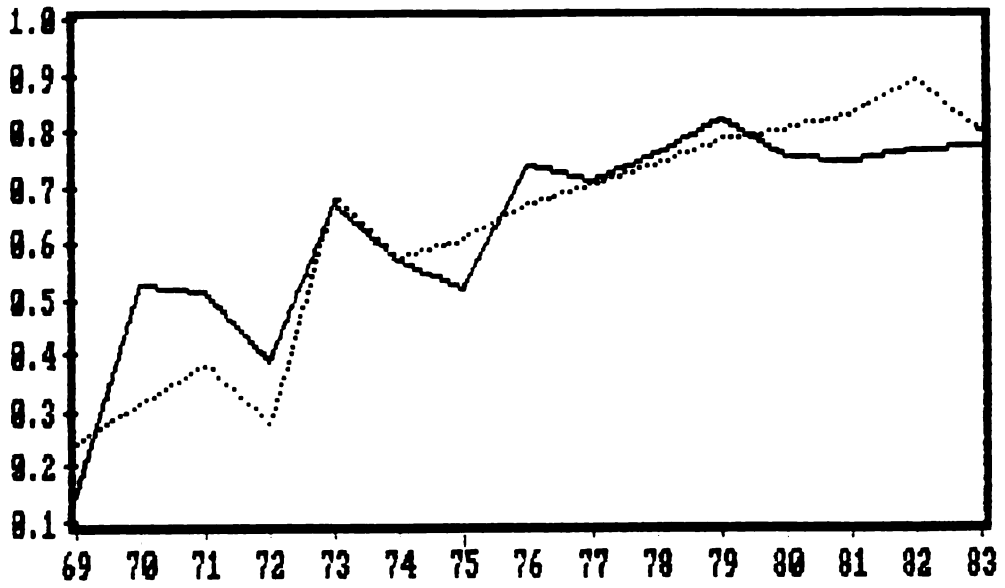
SOPLO = Real Less Developed Market Soyboil Price ($/MT)
SOP*XRLO/CPILO

DV73 = 1 If(YEAR .EQ. 73)
0 Otherwise

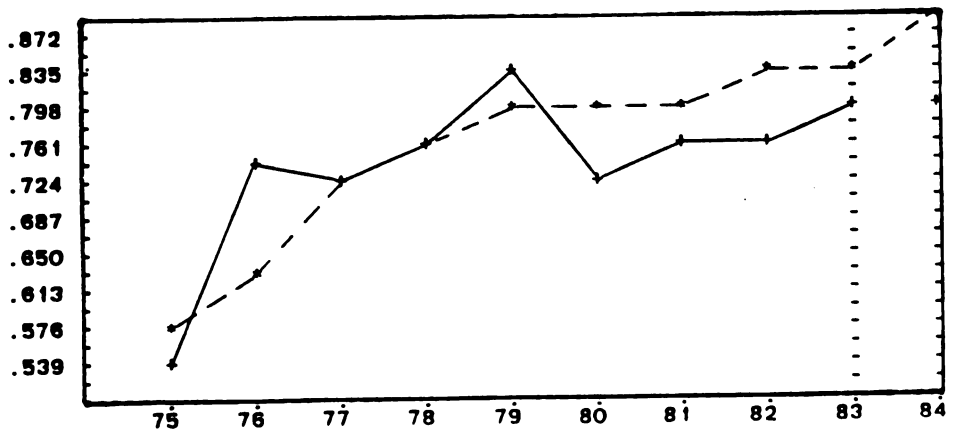
SMPL 1964 - 1981
18 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSONI	0.0007334	0.0005199	0.0017415	0.0001170
PCRGDP	1.908D-06	7.339D-07	3.002D-06	1.132D-06
SOPLO	8.9007821	3.2685824	17.443790	3.9262510
DV73	0.0555556	0.2357023	1.0000000	0.0000000

	Covariance	Correlation
PTSONI,PTSONI	2.552D-07	1.0000000
PTSONI,PCRGDP	3.244D-10	0.9002567
PTSONI,SOPLO	-0.0007372	-0.4593828
PTSONI,DV73	1.830D-06	0.0158141
PCRGDP,PCRGDP	5.086D-13	1.0000000
PCRGDP,SOPLO	-7.540D-07	-0.3328289
PCRGDP,DV73	-1.060D-08	-0.0648785
SOPLO,SOPLO	10.090096	1.0000000
SOPLO,DV73	0.4746116	0.6522870
DV73,DV73	0.0524691	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure H.17.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Less Developed Oil Exporters

Less Developed Oil Exporters
Percentage Soymeal Equivalent Imported as Soymeal

SMPL 1964 - 1981
18 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-1.7159429	0.5441202	-3.1536098	0.008
MARGIN	-0.1732714	0.0921575	-1.8801656	0.083
SPROLO	0.0008557	0.0003393	2.5221424	0.026
YEAR	0.0226261	0.0101036	2.2394099	0.043
DV73	0.2272024	0.0937063	2.4246238	0.031

R-squared	0.928506	Mean of dependent var	0.470418
Adjusted R-squared	0.906507	S.D. of dependent var	0.275666
S.E. of regression	0.084289	Sum of squared resid	0.092361
Durbin-Watson stat	1.892235	F-statistic	42.20816
Log likelihood	21.91095	TPE = 6/17	

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.00170	0.13587	0.13417
	1965	-0.04618	0.04451	0.09069
	1966	0.05095	0.21846	0.16751
	1967	-0.10358	0.08822	0.19181
	1968	-0.06385	0.11514	0.17899
	1969	-0.08786	0.14481	0.23267
	1970	0.17215	0.52788	0.35573
	1971	0.09466	0.51083	0.41616
	1972	0.06600	0.39071	0.32471
	1973	1.3D-16	0.67197	0.67197
	1974	-0.00864	0.56837	0.57702
	1975	-0.03964	0.52006	0.55970
	1976	0.08492	0.74057	0.65565
	1977	-0.00401	0.71269	0.71669
	1978	-0.06575	0.75612	0.82187
	1979	0.01133	0.82133	0.81000
	1980	-0.08979	0.75165	0.84144
	1981	0.02758	0.74832	0.72075

INDEPENDENT VARIABLES

MARGIN = Soybean Crush Margin
(SMP*XRLO/CPILO)*.795 + (SOP*XRLO/CPILO)*.175 -
(SP*XRLO/CPILO)

SPROLO = Soybean Production (1000 MT)

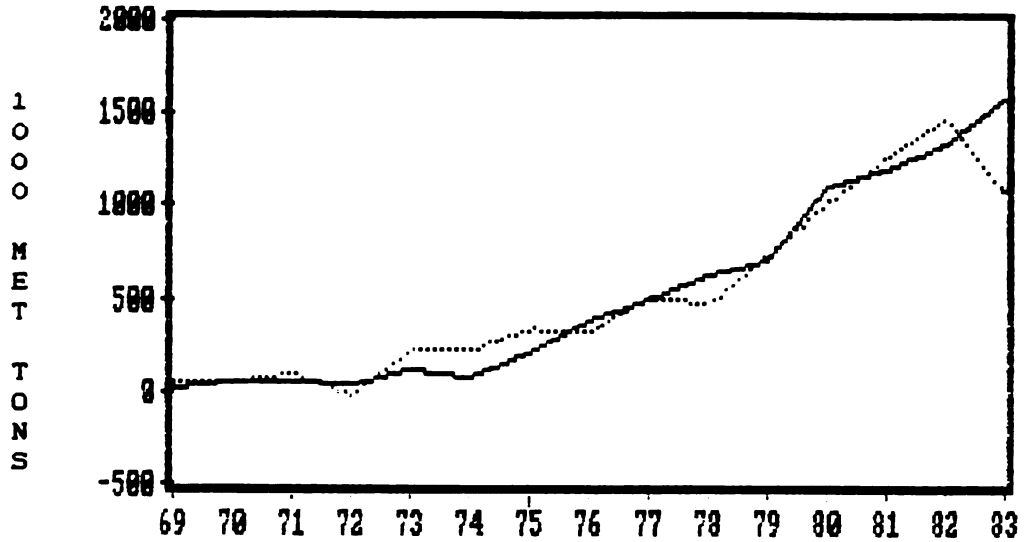
YEAR = 1960=60, 1961=61, ...

DV73 = 1 If(YEAR .EQ. 73)
0 Otherwise

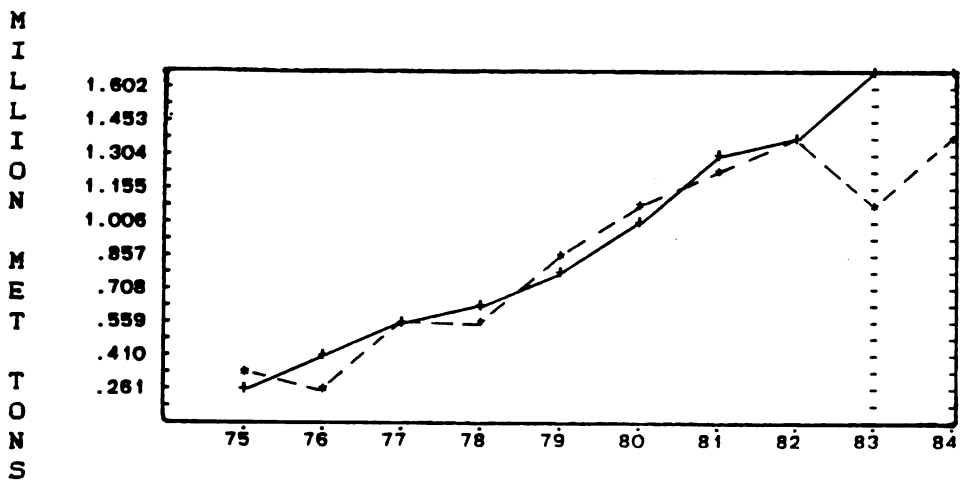
SMFL 1964 - 1981
18 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.4704184	0.2756659	0.8213338	0.0445137
MARGIN	0.0016094	0.2429226	0.6371825	-0.2615480
SPROLO	623.61111	158.16713	889.00000	397.00000
YEAR	72.500000	5.3385391	81.000000	64.000000
DV73	0.0555556	0.2357023	1.0000000	0.0000000

	Covariance	Correlation
PMEAL, PMEAL	0.0717699	1.0000000
PMEAL, MARGIN	-0.0138939	-0.2196837
PMEAL, SPROLO	38.181124	0.9271992
PMEAL, YEAR	1.2823920	0.9226542
PMEAL, DV73	0.0111974	0.1824711
MARGIN, MARGIN	0.0557330	1.0000000
MARGIN, SPROLO	-4.4504186	-0.1226423
MARGIN, YEAR	-0.2140979	-0.1748018
MARGIN, DV73	0.0194339	0.3593792
SPROLO, SPROLO	23627.015	1.0000000
SPROLO, YEAR	736.19444	0.9231610
SPROLO. DV73	2.3549383	0.0668841
YEAR, YEAR	26.916667	1.0000000
YEAR, DV73	0.0277778	0.0233741
DV73, DV73	0.0524691	1.0000000



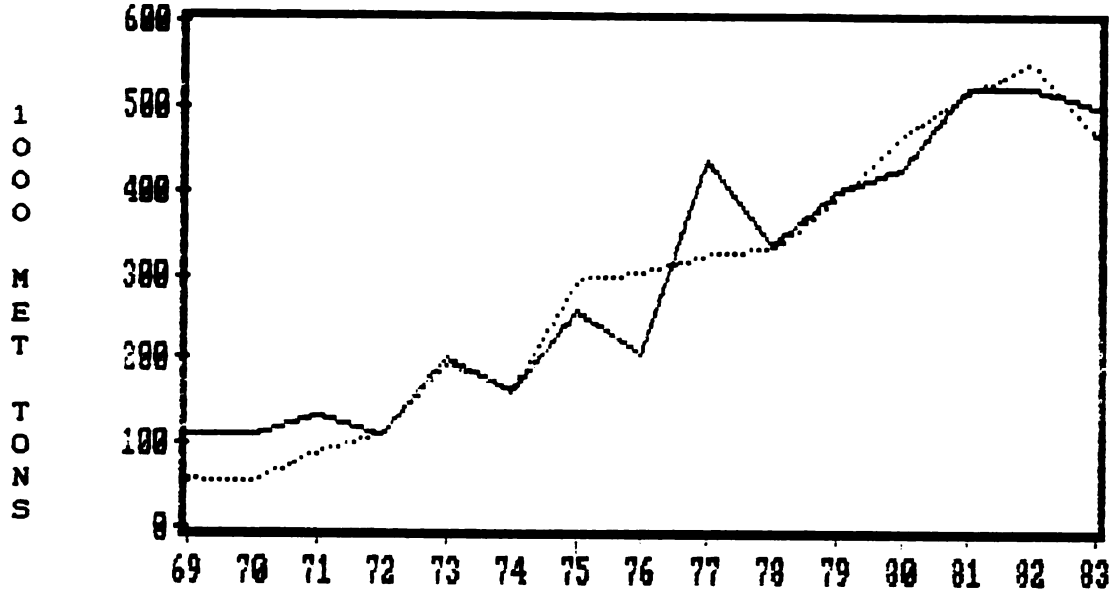
REGIONAL MODEL SIMULATION



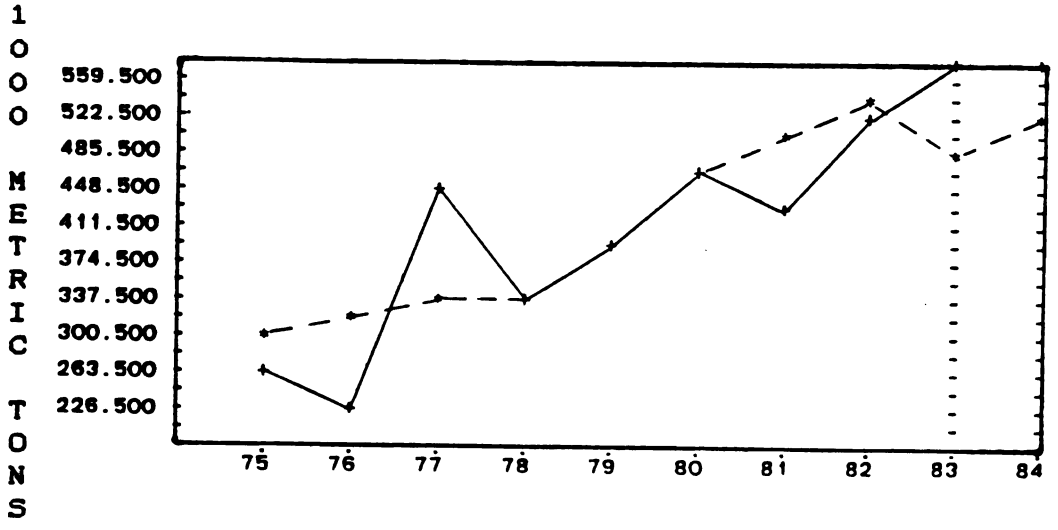
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure H.18.a & b. Soymeal Net Imports - Less Developed Oil Exporters



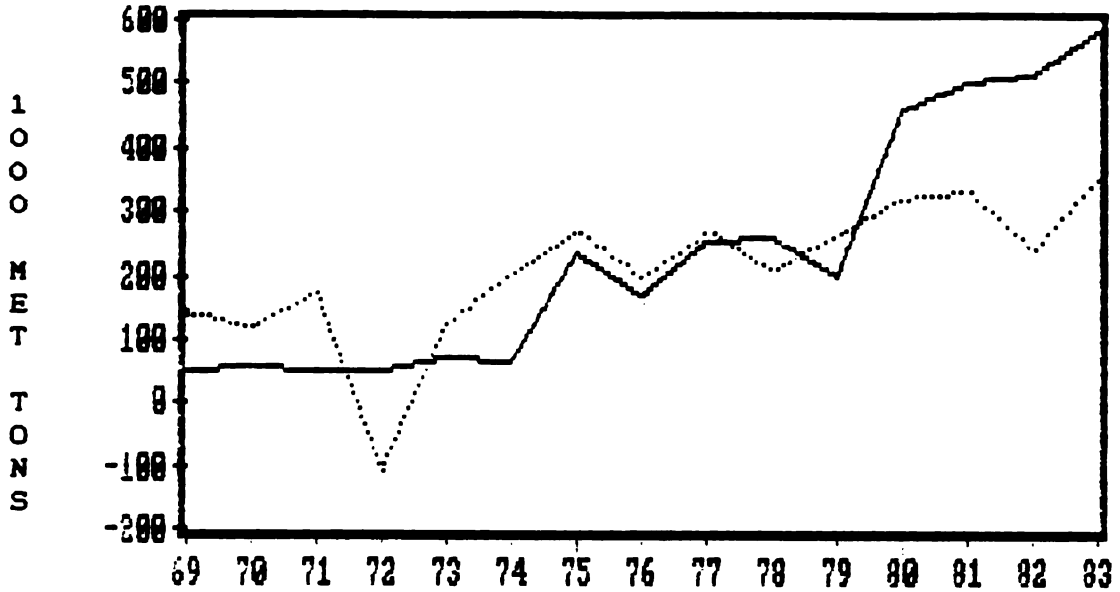
REGIONAL MODEL SIMULATION



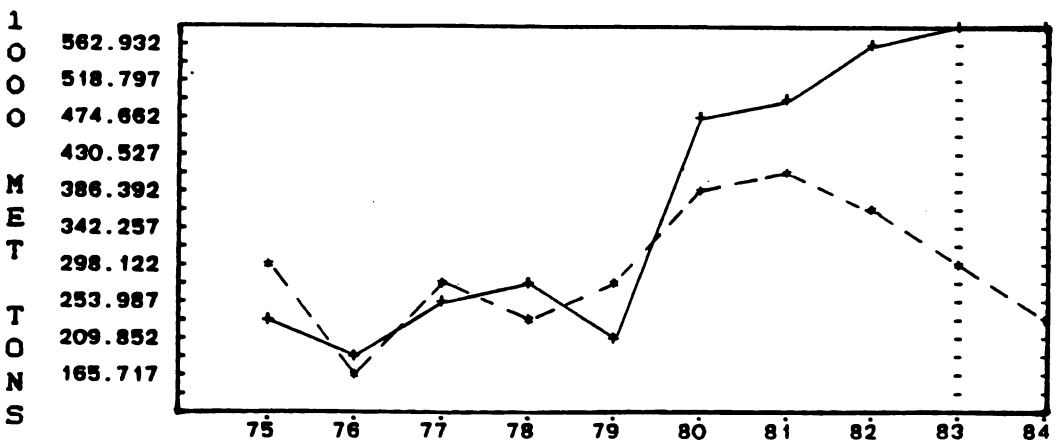
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.19.a & b. Soyoil Net Imports - Less Developed Oil Exporters



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure H.20.a & b. Soybean Net Imports - Less Developed Oil Exporters

APPENDIX I

EQUATION STATISTICS - NEWLY INDUSTRIALIZED COUNTRIES

Wheat

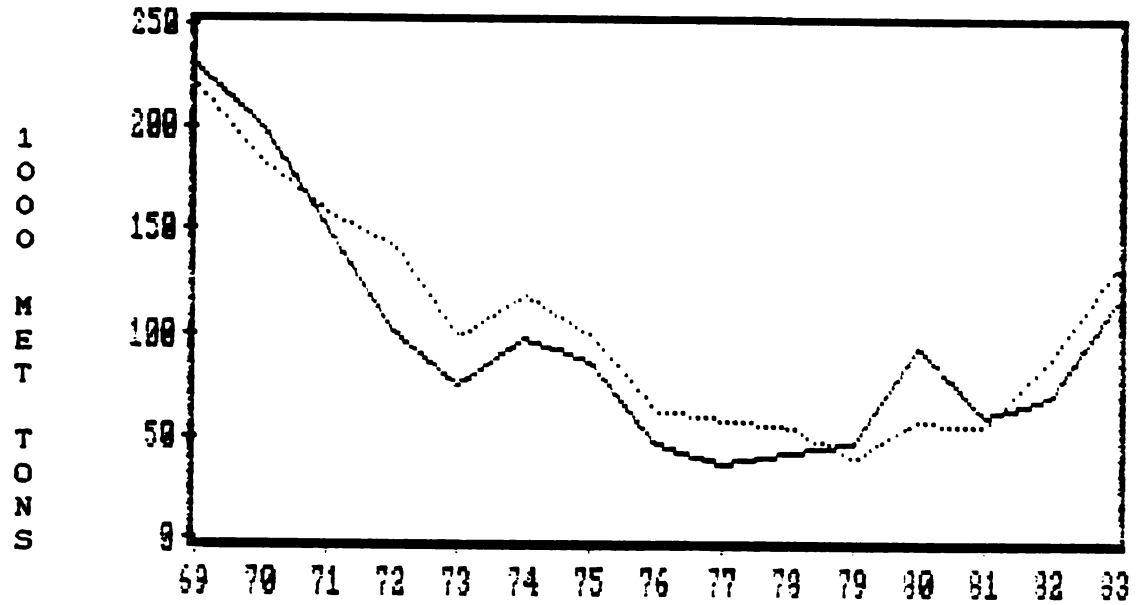
WPRONI.....Production
WHANI.....Harvested Area
WYNI.....Yield
WCONNI.....Total Consumption
WNINI.....Net Imports
WESNI.....Ending Stocks

Coarse Grain

FPRONI.....Production
FHANI.....Harvested Area
FYNI.....Yield
FCONNI.....Total Consumption
FNINI.....Net Imports
FESNI.....Ending Stocks

Soybean Complex

SPRONI.....Production
SHANI.....Harvested Area
SYNI.....Yield
SMCONI.....Soymeal Equiv. Consumption
SOCONI.....Soyoil Equiv. Consumption
SMEINI.....Soymeal Equiv. Net Imports
SOEINI.....Soyoil Equiv. Net Imports
PMELNI.....% SMEINI Imported as SMNINI
SMNINI.....Soymeal Net Imports
SONINI.....Soyoil Net Imports
SNINI.....Soybean Net Imports
SMESNI.....Soymeal Ending Stocks
SOESNI.....Soyoil Ending Stocks
SESNI.....Soybean Ending Stocks

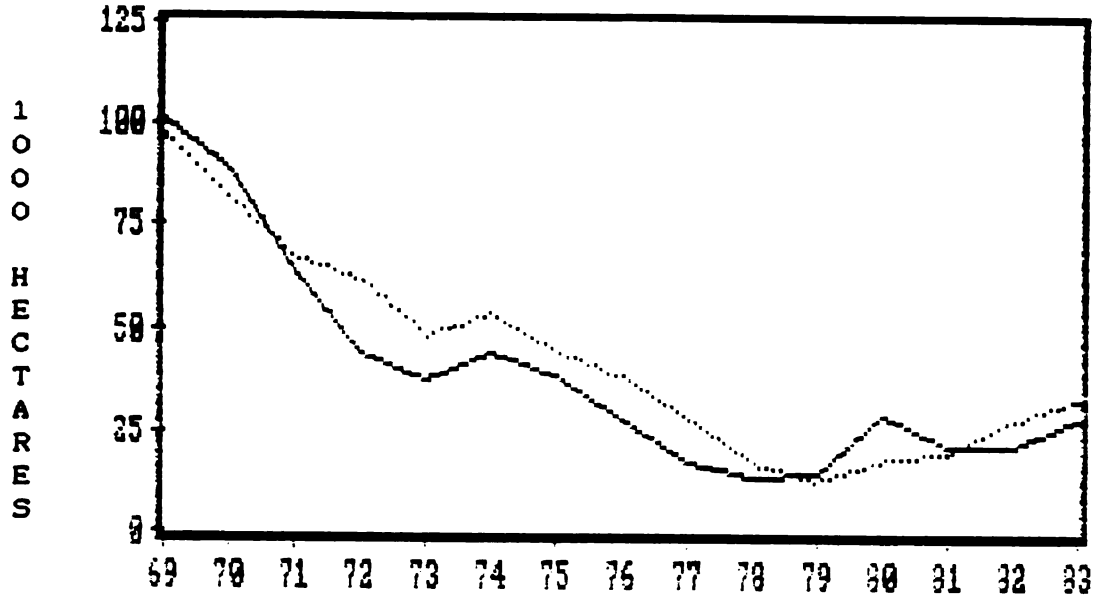


REGIONAL MODEL SIMULATION

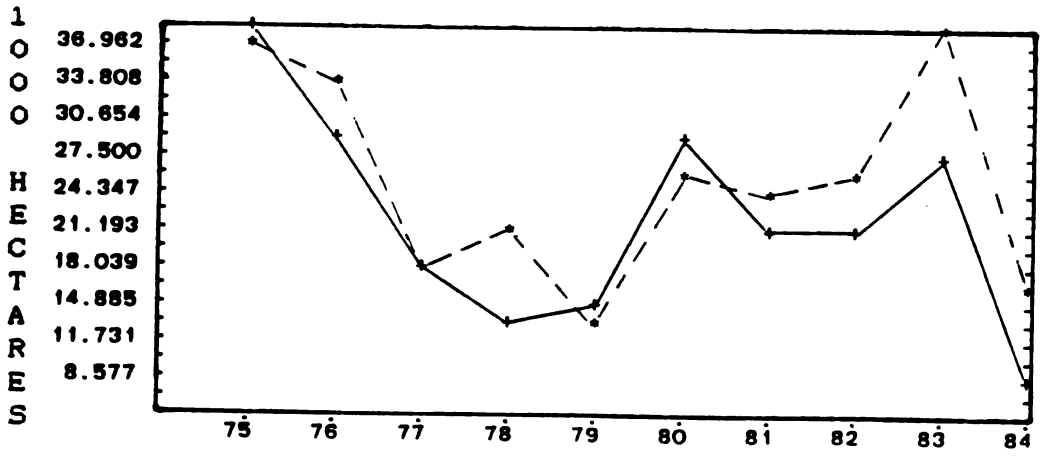
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.1.a & b. Wheat Production - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.2.a & b. Wheat Harvested Area - Newly Industrialized Countries

Newly Industrialized Countries
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is WHANI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	8.5468681	9.7336987	0.8780699	0.393
WHANI(-1)	0.8952379	0.0535763	16.709598	0.000
WRNI4(-1)	10.884223	2.6771921	4.0655369	0.001
FRNI4(-1)	-16.587397	4.2640336	-3.8900719	0.001

R-squared	0.969212	Mean of dependent var	55.60000
Adjusted R-squared	0.963439	S.D. of dependent var	36.99417
S.E. of regression	7.073662	Sum of squared resid	800.5872
Durbin-Watson stat	1.722375	F-statistic	167.8915
Log likelihood	-65.27490	TPE	3/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-0.23724	100.000	100.237
	1965	2.17021	104.000	101.830
	1966	9.03743	109.000	99.9626
	1967	2.86967	109.000	106.130
	1968	-4.76458	102.000	106.765
	1969	4.40458	101.000	96.5954
	1970	4.16318	89.0000	84.8368
	1971	-10.0483	64.0000	74.0483
	1972	-14.7551	44.0000	58.7551
	1973	4.74896	37.0000	32.2510
	1974	0.66105	44.0000	43.3389
	1975	2.02583	38.0000	35.9742
	1976	-3.91025	28.0000	31.9103
	1977	-1.57245	17.0000	18.5724
	1978	5.31694	13.0000	7.68306
	1979	5.01470	14.0000	8.98530
	1980	9.99895	29.0000	19.0011
	1981	-8.26800	21.0000	29.2680
	1982	-7.76854	21.0000	28.7685
	1983	0.91296	28.0000	27.0870

INDEPENDENT VARIABLES

WHANI = Wheat Harvested Area (1000 HA)

WRNI4 = Wheat Revenue Per Hectare
(WYNI(-3)+WYNI(-2)+WYNI(-1)+WYNI)/4*WP*XRNI/CPINI

FRNI4 = Coarse Grain Revenue Per Hectare
(FYNI(-3)+FYNI(-2)+FYNI(-1)+FYNI)/4*FP*XRNI/CPINI

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
WHANI	55.600000	36.994167	109.00000	13.000000
WHANI(-1)	59.100000	37.552630	109.00000	13.000000
WRNI4(-1)	4.2444914	1.2197987	8.0167590	2.9730370
FRNI4(-1)	3.1381305	0.8414422	5.1598160	2.0275510

	Covariance	Correlation
WHANI,WHANI	1300.1400	1.0000000
WHANI,WHANI(-1)	1276.6900	0.9673603
WHANI,WRNI4(-1)	-16.031010	-0.3739520
WHANI,FRNI4(-1)	-17.582898	-0.5945787
WHANI(-1),WHANI(-1)	1339.6900	1.0000000
WHANI(-1),WRNI4(-1)	-19.462341	-0.4472424
WHANI(-1),FRNI4(-1)	-17.433794	-0.5807693
WRNI4(-1),WRNI4(-1)	1.4135133	1.0000000
WRNI4(-1),FRNI4(-1)	0.8435669	0.8651343
FRNI4(-1),FRNI4(-1)	0.6726237	1.0000000

Newly Industrialized Countries
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is WYNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-15.453617	3.8334281	-4.0312787	0.001
LOGT	4.1881128	0.8985823	4.6608003	0.000

R-squared	0.496833	Mean of dependent var	2.408563
Adjusted R-squared	0.473962	S.D. of dependent var	0.591510
S.E. of regression	0.429013	Sum of squared resid	4.049153
Durbin-Watson stat	0.829726	F-statistic	21.72306
Log likelihood	-12.69997		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.33574	2.02970	1.69396
	1961	0.44089	2.20408	1.76319
	1962	0.20832	2.03960	1.83129
	1963	-0.28606	1.61224	1.89830
	1964	0.13575	2.10000	1.96425
	1965	-0.03881	1.99039	2.02919
	1966	-0.05643	2.03670	2.09313
	1967	-0.00015	2.15596	2.15611
	1968	0.14459	2.36275	2.21816
	1969	-0.01197	2.26733	2.27930
	1970	-0.09237	2.24719	2.33956
	1971	-0.03959	2.35938	2.39897
	1972	-0.13936	2.31818	2.45754
	1973	-0.48829	2.02703	2.51531
	1974	-0.36775	2.20455	2.57229
	1975	-0.39167	2.23684	2.62851
	1976	-1.04112	1.64286	2.68398
	1977	-0.62108	2.11765	2.73873
	1978	0.43800	3.23077	2.79277
	1979	0.36816	3.21429	2.84612
	1980	0.34257	3.24138	2.89881
	1981	-0.09369	2.85714	2.95083
	1982	0.23587	3.23810	3.00222
	1983	1.01845	4.07143	3.05298

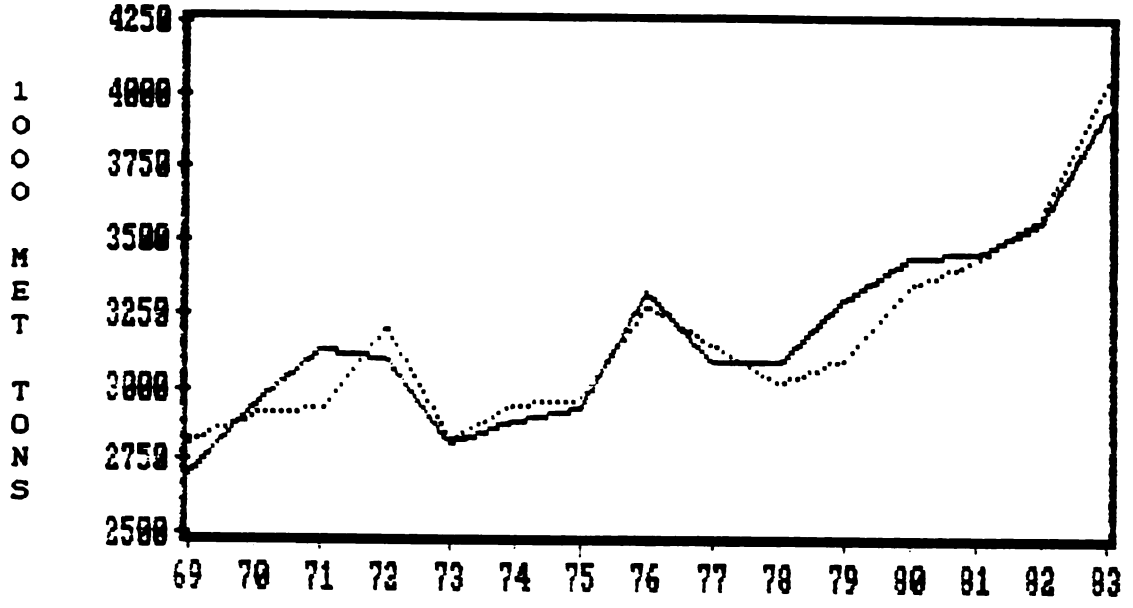
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

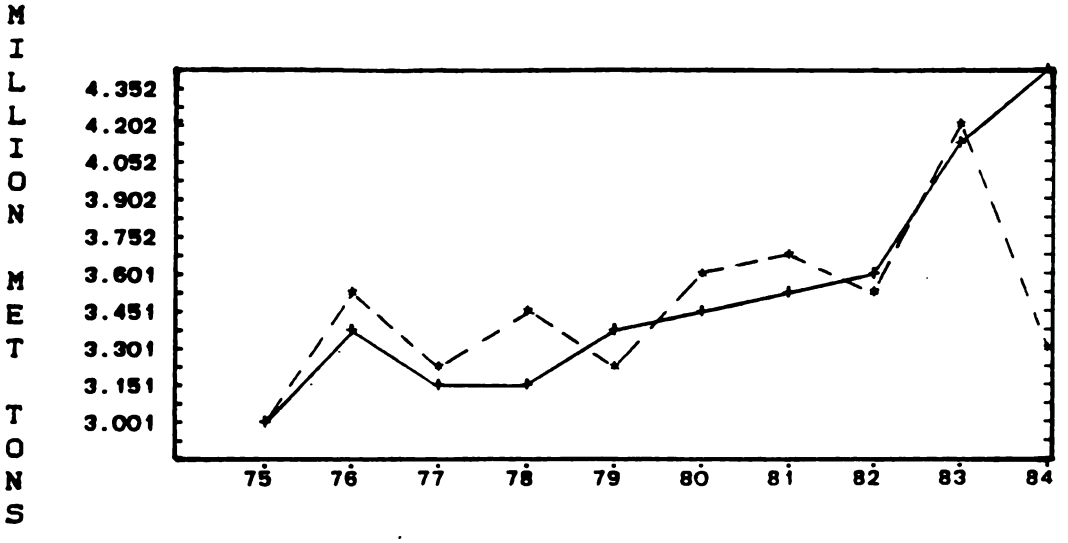
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
WYNI	2.4085633	0.5915101	4.0714290	1.6122450
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
WYNI,WYNI	0.3353056	1.0000000
WYNI,LOGT	0.0397771	0.7048638
LOGT,LOGT	0.0094976	1.0000000



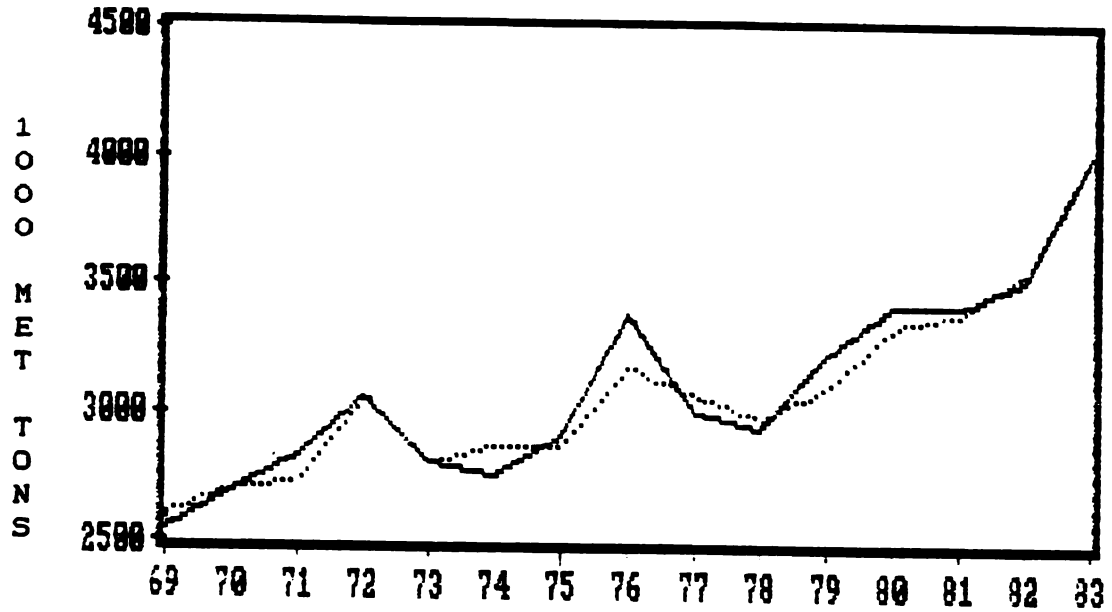
REGIONAL MODEL SIMULATION



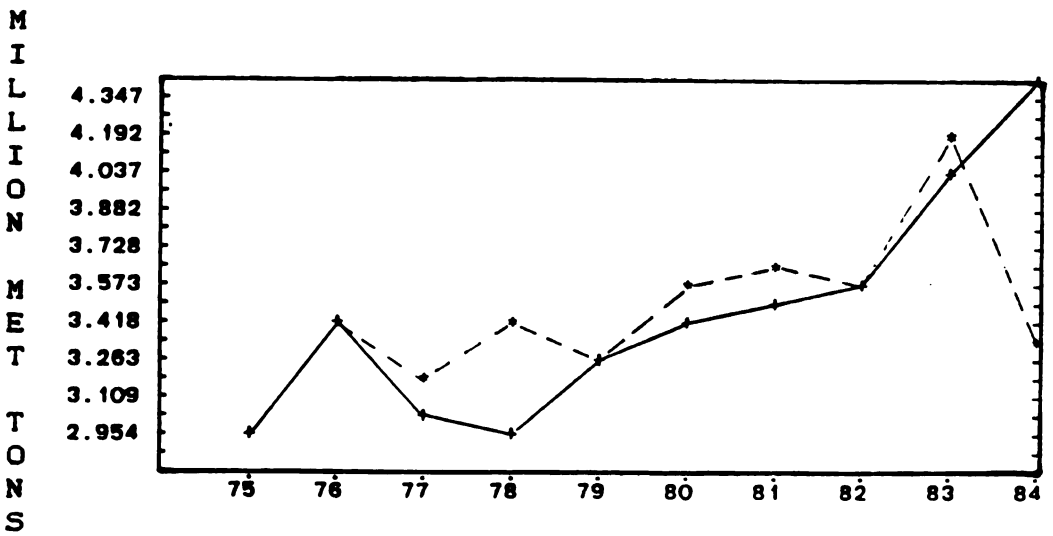
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.3.a & b. Total Wheat Consumption - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.4.a & b. Wheat Net Imports - Newly Industrialized Countries

Newly Industrialized Countries
Per Capita Wheat Net Imports (1000 MT)

SMPL 1969 - 1983
15 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0577425	0.0038995	14.807720	0.000
WPNI	-0.0071137	0.0026502	-2.6842315	0.023
PCDWSU	-1.1423937	0.4749703	-2.4051899	0.037
FPNI	0.0097305	0.0037417	2.6005859	0.026
PCDFSU	-0.1977561	0.0737245	-2.6823648	0.023

R-squared	0.679223	Mean of dependent var	0.043323
Adjusted R-squared	0.550912	S.D. of dependent var	0.002700
S.E. of regression	0.001809	Sum of squared resid	3.27D-05
Durbin-Watson stat	2.214252	F-statistic	5.293576
Log likelihood	76.47848	TPE	3/15

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1969	-0.00178	0.04104	0.04282
*	1970	0.00059	0.04260	0.04201
*	1971	0.00223	0.04387	0.04164
*	1972	-0.00060	0.04636	0.04696
*	1973	0.00073	0.04169	0.04096
*	1974	-0.00144	0.04028	0.04172
*	1975	0.00035	0.04165	0.04131
*	1976	0.00275	0.04751	0.04476
*	1977	-0.00113	0.04127	0.04240
*	1978	-0.00103	0.03985	0.04088
*	1979	0.00106	0.04258	0.04152
*	1980	-0.00102	0.04420	0.04522
*	1981	-0.00099	0.04348	0.04447
*	1982	-0.00187	0.04410	0.04597
*	1983	0.00215	0.04935	0.04720

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPNI/CPINI/POPNI

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESNI(-1) + WPRONI)/POPNI

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(WESNI(-1) + WPRONI)/POPNI

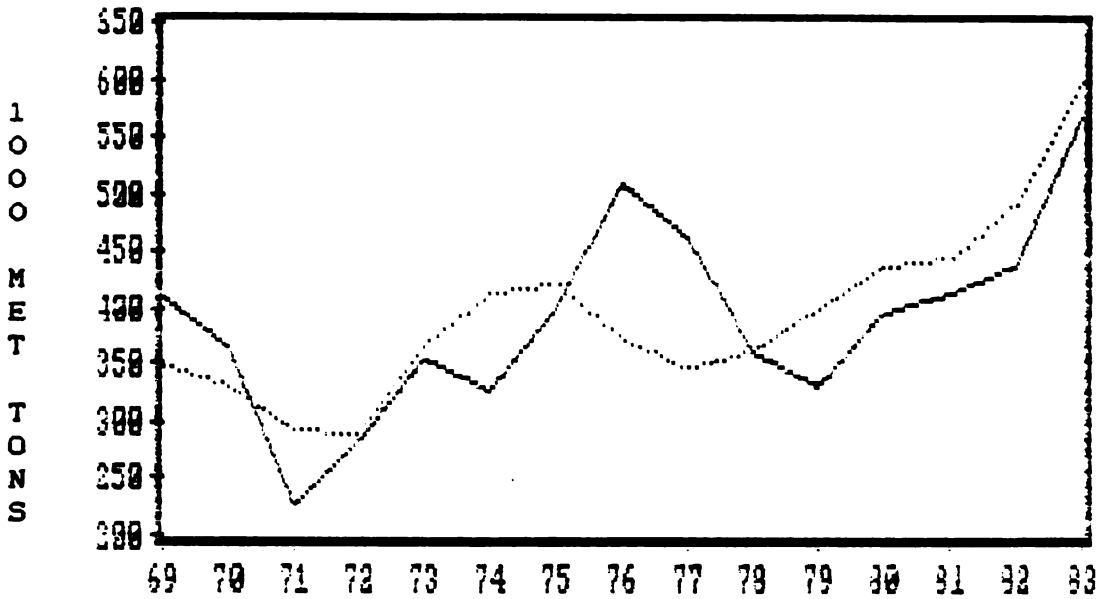
WPNI = Real NIC Wheat Price ($/MT)
WP*XRNI/CPINI

FPNI = Real NIC Coarse Grain Price ($/MT)
FP*XRNI/CPINI

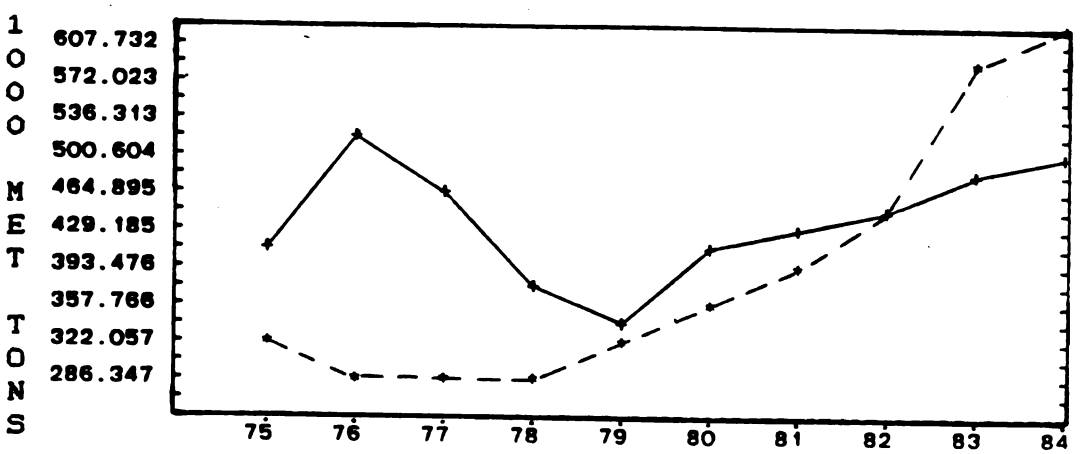
SMPL 1969 - 1983
15 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0433231	0.0027000	0.0493510	0.0398508
PCDWSU	0.0066320	0.0013944	0.0096309	0.0049677
WPNI	1.8612195	0.6165330	3.5821990	1.3478980
PCDFSU	0.0436045	0.0081393	0.0545486	0.0287379
FPNI	1.5436180	0.3986860	2.4763890	1.0624610

	Covariance	Correlation
PCWNI,PCWNI	6.804D-06	1.0000000
PCWNI,PCDWSU	-8.283D-07	-0.2357286
PCWNI,WPNI	-0.0004725	-0.3041197
PCWNI,PCDFSU	-1.299D-05	-0.6332119
PCWNI,FPNI	-0.0002317	-0.2306091
PCDWSU,PCDWSU	1.815D-06	1.0000000
PCDWSU,WPNI	-0.0003831	-0.4774871
PCDWSU,PCDFSU	4.985D-07	0.0470624
PCDWSU,FPNI	-0.0001420	-0.2737409
WPNI,WPNI	0.3547721	1.0000000
WPNI,PCDFSU	0.0022887	0.4886498
WPNI,FPNI	0.2123378	0.9255570
PCDFSU,PCDFSU	6.183D-05	1.0000000
PCDFSU,FPNI	0.0016536	0.5459652
FPNI,FPNI	0.1483538	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.5.a & b. Wheat Ending Stocks - Newly Industrialized Countries

Newly Industrialized Countries
Wheat Ending Stocks Per Capita (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0059883	0.0018137	-3.3017870	0.004
PCDWSU	0.9309252	0.1839565	5.0605730	0.000
PCRGDP	341.60785	64.789707	5.2725635	0.000
WPNI	0.0009570	0.0005113	1.8715085	0.077

R-squared	0.750164	Mean of dependent var	0.004247
Adjusted R-squared	0.710716	S.D. of dependent var	0.002046
S.E. of regression	0.001100	Sum of squared resid	2.30D-05
Durbin-Watson stat	1.594172	F-statistic	19.01659
Log likelihood	126.2379	TPE	12/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00081	0.00125	0.00205
	1962	-0.00104	0.00103	0.00208
	1963	0.00025	0.00114	0.00089
	1964	-0.00083	0.00110	0.00193
	1965	-2.8D-05	0.00166	0.00169
	1966	-0.00102	0.00159	0.00262
	1967	0.00048	0.00288	0.00240
	1968	0.00199	0.00563	0.00364
	1969	0.00086	0.00661	0.00575
	1970	-0.00062	0.00575	0.00637
	1971	-0.00141	0.00349	0.00490
	1972	0.00139	0.00429	0.00290
	1973	0.00017	0.00524	0.00508
	1974	-0.00077	0.00476	0.00553
	1975	0.00103	0.00572	0.00469
	1976	0.00238	0.00713	0.00475
	1977	0.00011	0.00636	0.00624
	1978	-0.00133	0.00488	0.00621
	1979	-0.00097	0.00435	0.00532
	1980	-0.00016	0.00513	0.00528
	1981	2.5D-05	0.00525	0.00523
	1982	-8.8D-05	0.00547	0.00556
	1983	0.00040	0.00697	0.00657

INDEPENDENT VARIABLES

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESNI(-1) + WPRONI)/POPNI

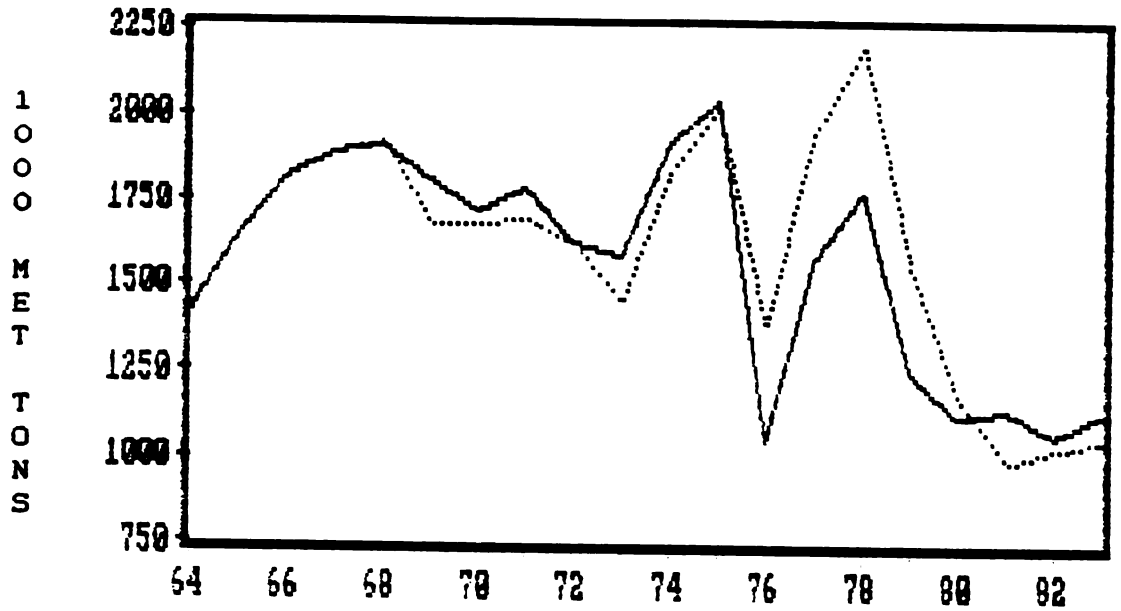
PCRGDP = Real Income Per Capita
GDPNI/CPILNI/POPNI

WPNI = Real NIC Wheat Price ($/MT)
WP*XRNI/CPINI

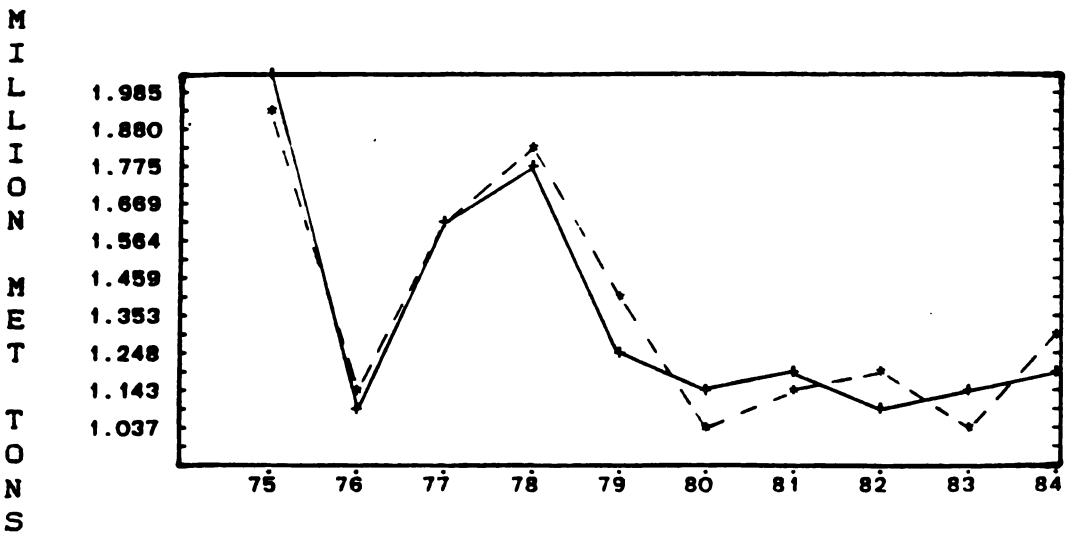
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0042471	0.0020461	0.0071297	0.0010313
PCDWSU	0.0061542	0.0013741	0.0096309	0.0039952
PCRGDP	8.034D-06	3.657D-06	1.430D-05	4.108D-06
WPNI	1.8410548	0.4959479	3.5821990	1.3478980

	Covariance	Correlation
PCWES,PCWES	4.004D-06	1.0000000
PCWES,PCDWSU	1.614D-06	0.6002692
PCWES,PCRGDP	4.602D-09	0.6429493
PCWES,WPNI	-7.394D-05	-0.0761805
PCDWSU,PCDWSU	1.806D-06	1.0000000
PCDWSU,PCRGDP	4.765D-10	0.0991320
PCDWSU,WPNI	-0.0002401	-0.3683044
PCRGDP,PCRGDP	1.279D-11	1.0000000
PCRGDP,WPNI	-2.213D-07	-0.1275626
WPNI,WPNI	0.2352703	1.0000000



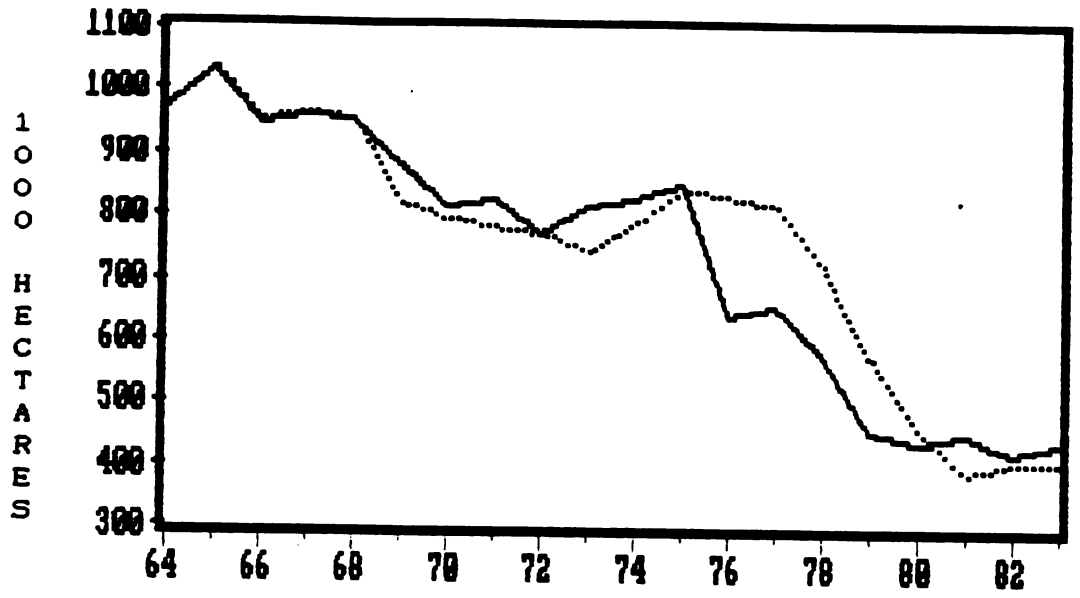
REGIONAL MODEL SIMULATION



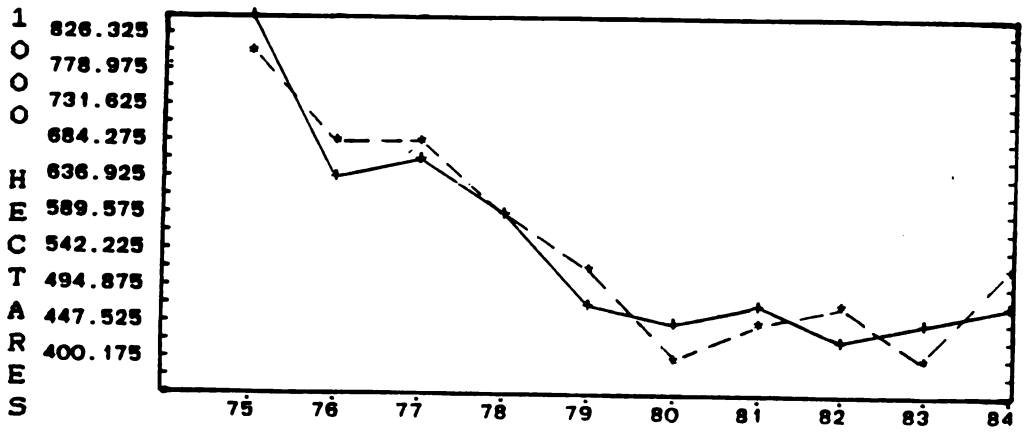
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.6.a & b. Coarse Grain Production - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.7.a & b. Coarse Grain Harvested Area - Newly Industrialized Countries

Newly Industrialized Countries
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is FHANI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2046.0080	737.68077	2.7735684	0.015
FHANI(-1)	0.3201145	0.2036028	1.5722494	0.138
FRNI4(-1)	87.009916	43.262810	2.0111943	0.064
WRNI4(-1)	-18.179686	23.589278	-0.7706758	0.454
FESNI(-1)	-0.0763104	0.0446786	-1.7079836	0.110
YEAR	-22.443233	8.6587829	-2.5919616	0.021

R-squared	0.962513	Mean of dependent var	734.4000
Adjusted R-squared	0.949125	S.D. of dependent var	210.1907
S.E. of regression	47.40977	Sum of squared resid	31467.61
Durbin-Watson stat	2.629524	F-statistic	71.89217
Log likelihood	-101.9886		

TPE 7/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-37.9287	969.000	1006.93
	1965	40.4973	1033.00	992.503
	1966	-49.9053	949.000	998.905
	1967	17.8824	962.000	944.118
	1968	53.5677	951.000	897.432
	1969	-7.11606	880.000	887.116
	1970	-49.0142	813.000	862.014
	1971	-4.62412	823.000	827.624
	1972	20.3888	771.000	750.611
	1973	11.4965	814.000	802.503
	1974	8.62455	824.000	815.375
	1975	62.7668	850.000	787.233
	1976	-85.8330	634.000	719.833
	1977	64.9943	657.000	592.006
	1978	17.8812	576.000	558.119
	1979	-23.3859	455.000	478.386
	1980	-25.0546	432.000	457.055
	1981	-40.3606	448.000	488.361
	1982	-5.36008	415.000	420.360
	1983	30.4830	432.000	401.517

INDEPENDENT VARIABLES

FHANI = Wheat Harvested Area (1000 HA)

FRNI4 = Coarse Grain Revenue Per Hectare
(FYNI(-3)+FYNI(-2)+FYNI(-1)+FYNI)/4*FP*XRNI/CPINI

WRNI4 = Wheat Revenue Per Hectare
(WYNI(-3)+WYNI(-2)+WYNI(-1)+WYNI)/4*WP*XRNI/CPINI

FESNI = Coarse Grain Ending Stocks (1000 MT)

YEAR = 1960=60, 1961=61, ...

SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
FHANI	734.40000	210.19074	1033.0000	415.00000
FHANI(-1)	758.75000	201.33708	1033.0000	415.00000
FRNI4(-1)	3.1381305	0.8414422	5.1598160	2.0275510
WRNI4(-1)	4.2444914	1.2197987	8.0167590	2.9730370
FESNI(-1)	1320.9500	612.30096	2491.0000	138.00000
YEAR	73.500000	5.9160798	83.000000	64.000000

	Covariance	Correlation
FHANI,FHANI	41971.140	1.0000000
FHANI,FHANI(-1)	38050.650	0.9464575
FHANI,FRNI4(-1)	-46.971267	-0.2795573
FHANI,WRNI4(-1)	-44.441760	-0.1824593
FHANI,FESNI(-1)	-81164.880	-0.6638440
FHANI,YEAR	-1127.4000	-0.9543481
FHANI(-1),FHANI(-1)	38509.787	1.0000000
FHANI(-1),FRNI4(-1)	-43.808852	-0.2722013
FHANI(-1),WRNI4(-1)	-51.953679	-0.2226798
FHANI(-1),FESNI(-1)	-63989.512	-0.5463821
FHANI(-1),YEAR	-1056.3250	-0.9335040
FRNI4(-1),FRNI4(-1)	0.6726237	1.0000000
FRNI4(-1),WRNI4(-1)	0.8435669	0.8651343
FRNI4(-1),FESNI(-1)	331.10898	0.6764849
FRNI4(-1),YEAR	2.2665858	0.4792810
WRNI4(-1),WRNI4(-1)	1.4135133	1.0000000
WRNI4(-1),FESNI(-1)	265.33253	0.3739502
WRNI4(-1),YEAR	2.4624110	0.3591822
FESNI(-1),FESNI(-1)	356166.85	1.0000000
FESNI(-1),YEAR	2561.4750	0.7443335
YEAR,YEAR	33.250000	1.0000000

Newly Industrialized Countries
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1983
24 Observations
LS // Dependent Variable is FYNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-16.053201	2.3172969	-6.9275546	0.000
LOGT	4.2501126	0.5431906	7.8243487	0.000

R-squared	0.735642	Mean of dependent var	2.073406
Adjusted R-squared	0.723626	S.D. of dependent var	0.493306
S.E. of regression	0.259337	Sum of squared resid	1.479629
Durbin-Watson stat	1.627327	F-statistic	61.22043
Log likelihood	-0.619379		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.13914	1.48737	1.34823
	1961	0.18295	1.60142	1.41848
	1962	-0.01402	1.47356	1.48758
	1963	-0.55341	1.00218	1.55559
	1964	-0.14884	1.47368	1.62252
	1965	-0.09597	1.59245	1.68842
	1966	0.16029	1.91359	1.75330
	1967	0.13912	1.95634	1.81722
	1968	0.12823	2.00841	1.88018
	1969	0.10663	2.04886	1.94223
	1970	0.10486	2.10824	2.00338
	1971	0.10522	2.16889	2.06367
	1972	-0.01546	2.10765	2.12311
	1973	-0.23211	1.94963	2.18174
	1974	0.08932	2.32888	2.23956
	1975	0.10104	2.39765	2.29661
	1976	-0.69359	1.65931	2.35290
	1977	-0.01576	2.39269	2.40846
	1978	0.60267	3.06597	2.46330
	1979	0.20343	2.72088	2.51745
	1980	0.02169	2.59259	2.57091
	1981	-0.06790	2.55580	2.62370
	1982	-0.13127	2.54458	2.67585
	1983	-0.11626	2.61111	2.72737

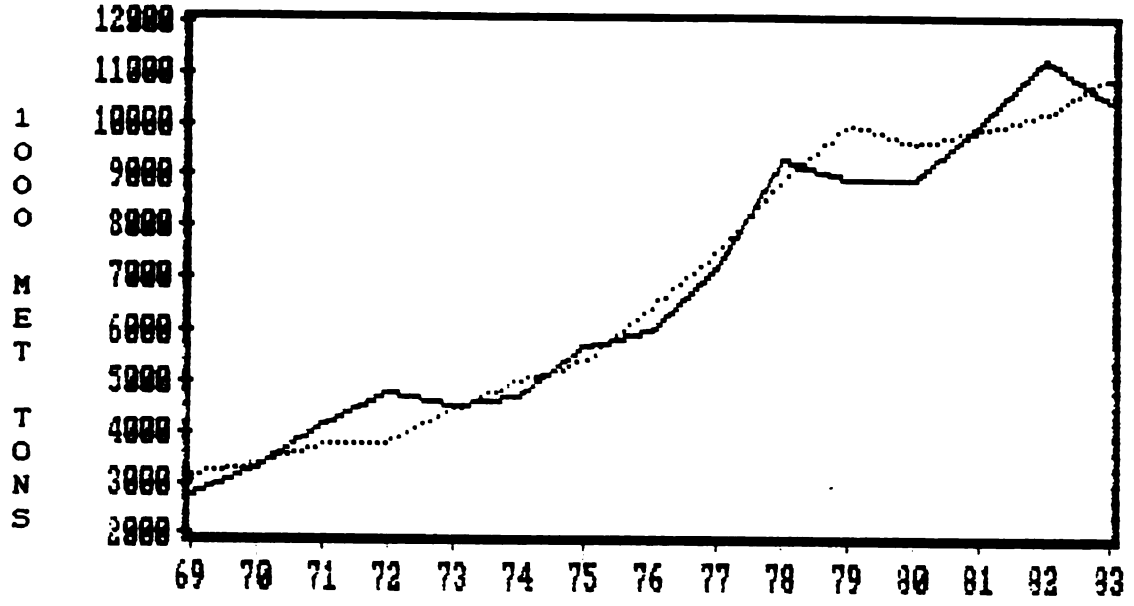
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

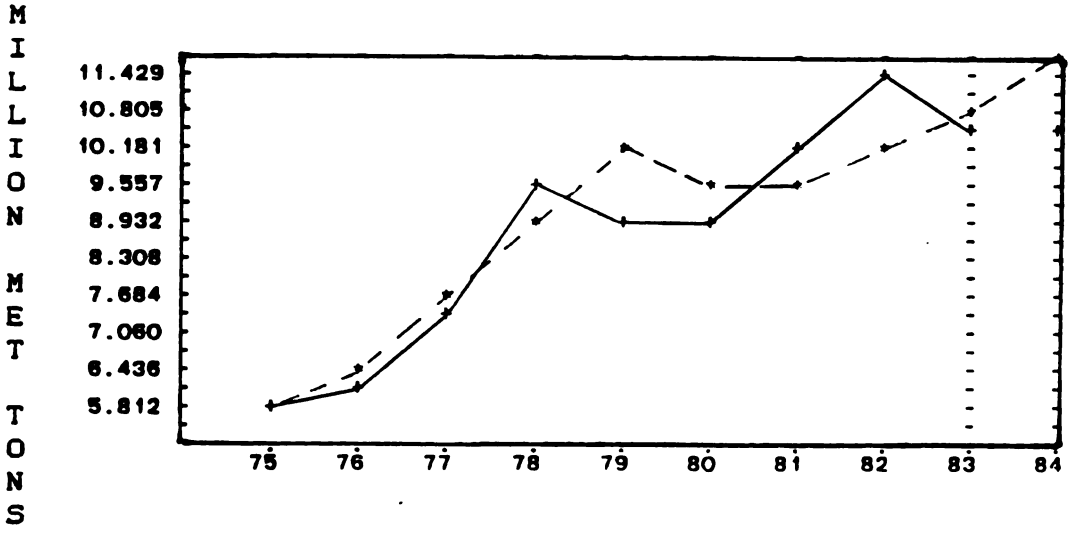
SMPL 1960 - 1983
24 Observations

Series	Mean	S.D.	Maximum	Minimum
FYNI	2.0734065	0.4933058	3.0659720	1.0021760
LOGT	4.2649711	0.0995518	4.4188400	4.0943450

	Covariance	Correlation
FYNI,FYNI	0.2332110	1.0000000
FYNI,LOGT	0.0403659	0.8576957
LOGT,LOGT	0.0094976	1.0000000



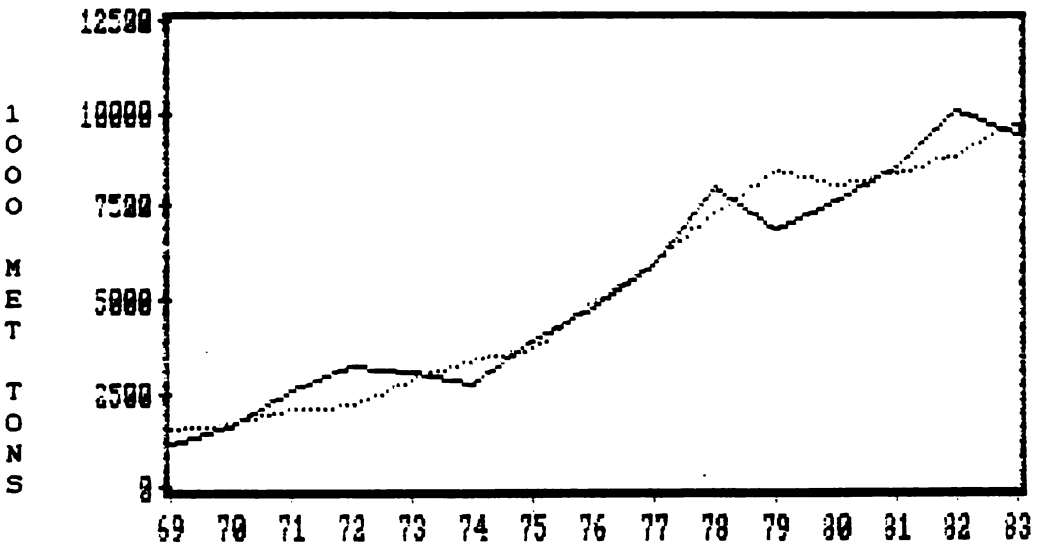
REGIONAL MODEL SIMULATION



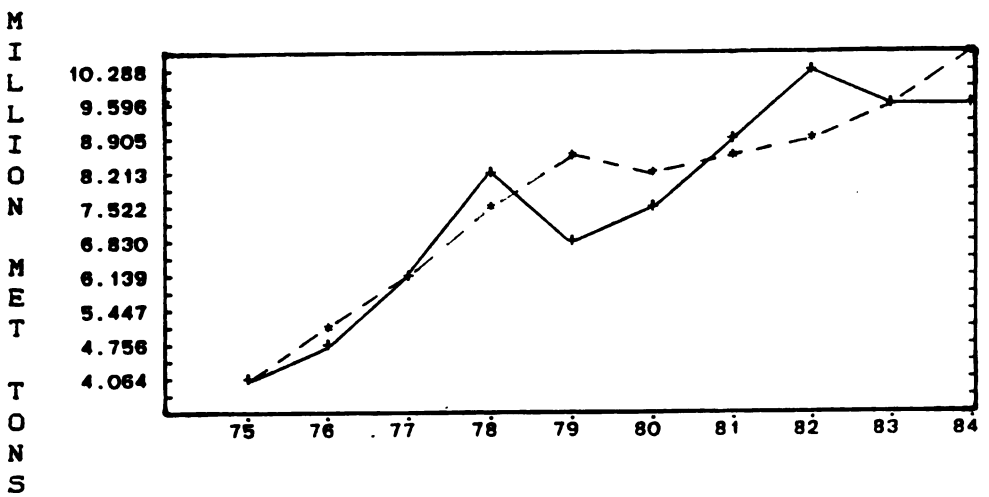
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.8.a & b. Total Coarse Grain Consumption - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.9.a & b. Coarse Grain Net Imports - Newly Industrialized Countries

Newly Industrialized Countries
Coarse Grain Net Imports Per Capita (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0286848	0.0109106	-2.6290743	0.016
PCRGDP	10931.317	519.78800	21.030338	0.000
FPNI	-0.0059975	0.0057616	-1.0409412	0.310

R-squared	0.961147	Mean of dependent var	0.049963
Adjusted R-squared	0.957262	S.D. of dependent var	0.041388
S.E. of regression	0.008556	Sum of squared resid	0.001464
Durbin-Watson stat	1.766198	F-statistic	247.3836
Log likelihood	78.47695	TPE	5/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00410	0.01194	0.00783
	1962	0.00400	0.01245	0.00845
	1963	-0.00087	0.00911	0.00997
	1964	-0.00326	0.00576	0.00902
	1965	-0.00537	0.00413	0.00950
	1966	-0.00760	0.00469	0.01230
	1967	-0.00265	0.01216	0.01481
	1968	-0.00306	0.01508	0.01814
	1969	-0.00540	0.01860	0.02400
	1970	-0.00135	0.02506	0.02641
	1971	0.00896	0.04031	0.03135
	1972	0.01731	0.04940	0.03210
	1973	0.00356	0.04596	0.04239
	1974	-0.00847	0.04061	0.04909
	1975	0.00366	0.05563	0.05198
	1976	-0.00251	0.06628	0.06879
	1977	-0.00106	0.08121	0.08226
	1978	0.00971	0.10832	0.09861
	1979	-0.01989	0.09102	0.11091
	1980	-0.00586	0.09843	0.10428
	1981	0.00321	0.10978	0.10657
	1982	0.01601	0.12674	0.11073
	1983	-0.00319	0.11649	0.11968

INDEPENDENT VARIABLES

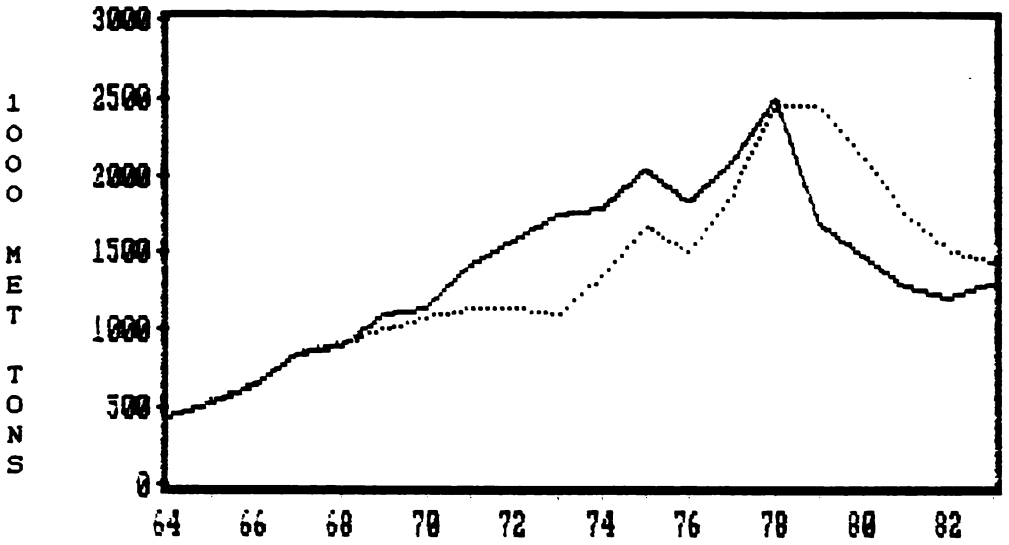
PCRGDP = Real Income Per Capita
GDPNI/CPINI/POPNI

FPNI = Real NIC Coarse Grain Price ($/MT)
FP*XRNI/CPINI

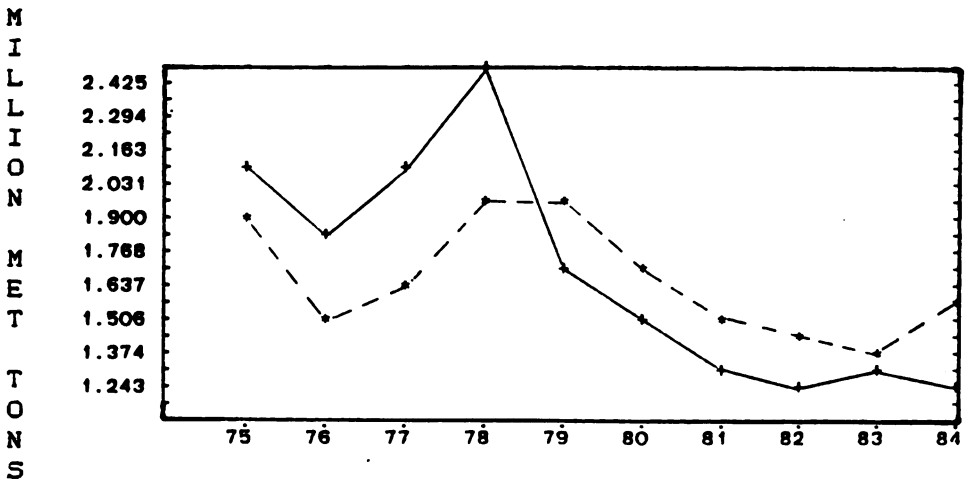
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0499635	0.0413881	0.1267409	0.0041330
PCRGDP	8.034D-06	3.657D-06	1.430D-05	4.108D-06
FPNI	1.5301001	0.3299158	2.4763890	1.0624610

	Covariance	Correlation
PCFNI,PCFNI	0.0016385	1.0000000
PCFNI,PCRGDP	1.418D-07	0.9793072
PCFNI,FPNI	-0.0041708	-0.3193313
PCRGDP,PCRGDP	1.279D-11	1.0000000
PCRGDP,FPNI	-3.244D-07	-0.2811190
FPNI,FPNI	0.1041121	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.10.a & b. Coarse Grain Ending Stocks - Newly Industrialized Countries

Newly Industrialized Countries
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0196557	0.0029842	-6.5866550	0.000
PCDFSU	0.7267653	0.0682993	10.640885	0.000
PCRGDP	1010.9505	171.49554	5.8949084	0.000

R-squared	0.892995	Mean of dependent var	0.017833
Adjusted R-squared	0.882294	S.D. of dependent var	0.008503
S.E. of regression	0.002917	Sum of squared resid	0.000170
Durbin-Watson stat	1.561054	F-statistic	83.45336
Log likelihood	103.2265	TPE	2/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00148	0.00354	0.00501
	1962	0.00060	0.00584	0.00524
	1963	0.00108	0.00261	0.00153
	1964	0.00221	0.00784	0.00563
	1965	-0.00225	0.00952	0.01177
	1966	-0.00360	0.01135	0.01495
	1967	-0.00189	0.01440	0.01629
	1968	-0.00370	0.01495	0.01864
	1969	0.00016	0.01784	0.01768
	1970	-0.00055	0.01808	0.01863
	1971	0.00261	0.02209	0.01949
	1972	0.00334	0.02401	0.02067
	1973	0.00348	0.02601	0.02253
	1974	-0.00169	0.02589	0.02759
	1975	0.00074	0.02923	0.02849
	1976	0.00387	0.02559	0.02172
	1977	0.00320	0.02858	0.02538
	1978	0.00305	0.03367	0.03063
	1979	-0.00747	0.02223	0.02970
	1980	-0.00043	0.01941	0.01983
	1981	-0.00145	0.01643	0.01787
	1982	-7.8D-05	0.01512	0.01520
	1983	0.00025	0.01594	0.01569

INDEPENDENT VARIABLES

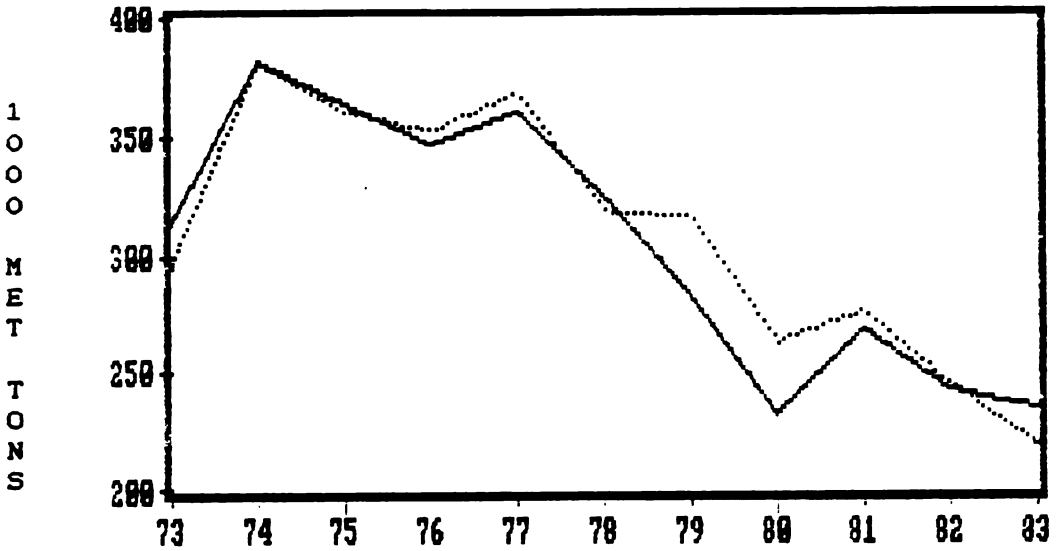
PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESNI(-1) + FPRONI)/POPNI

PCRGDP = Real Income Per Capita
GDPNI/CPINI/POPNI

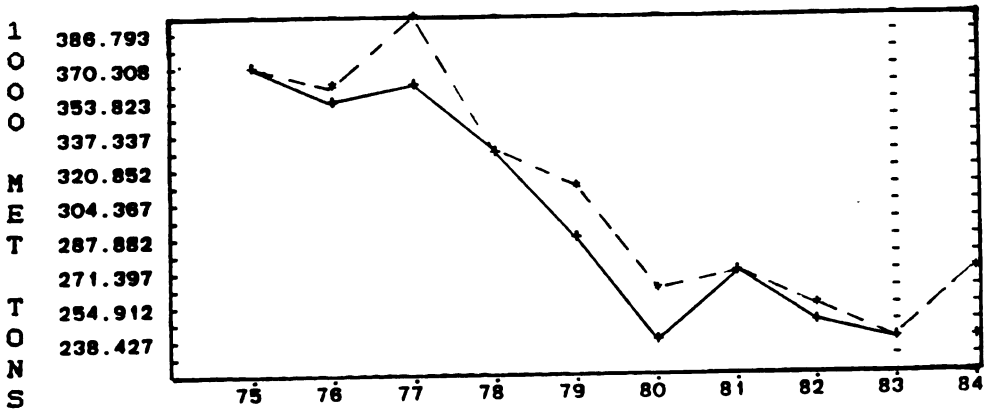
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0178332	0.0085026	0.0336731	0.0026129
PCDFSU	0.0404074	0.0091824	0.0545486	0.0231189
PCRGDP	8.034D-06	3.657D-06	1.430D-05	4.108D-06

	Covariance	Correlation
PCFES,PCFES	6.915D-05	1.0000000
PCFES,PCDFSU	6.280D-05	0.8408766
PCFES,PCRGDP	1.594D-08	0.5359039
PCDFSU,PCDFSU	8.065D-05	1.0000000
PCDFSU,PCRGDP	4.137D-09	0.1288058
PCRGDP,PCRGDP	1.279D-11	1.0000000



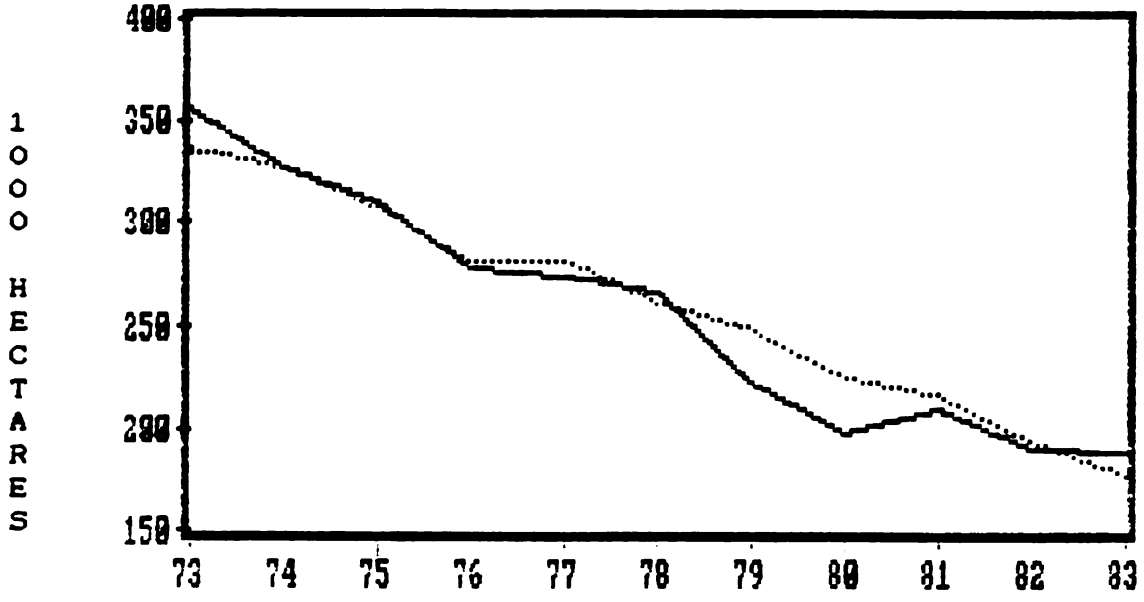
REGIONAL MODEL SIMULATION



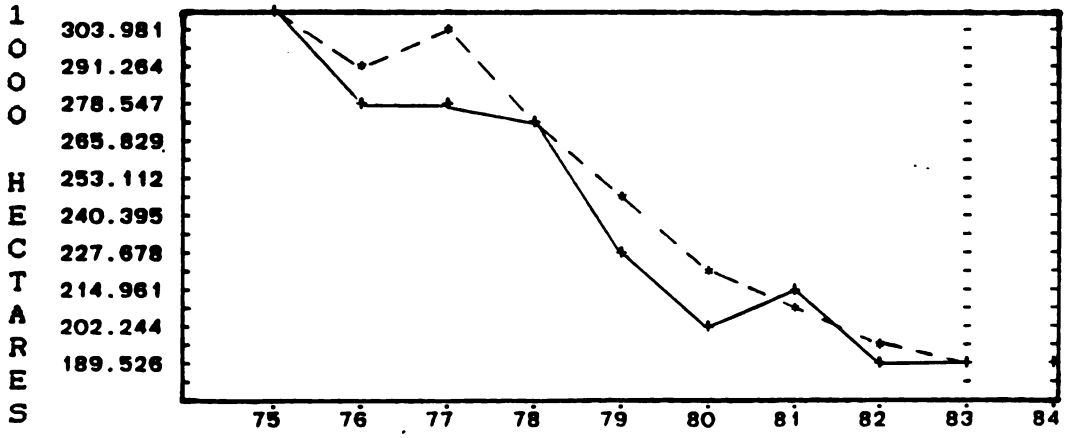
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.11.a & b. Soybean Production - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.12.a & b. Soybean Harvested Area - Newly Industrialized Countries

Newly Industrialized Countries
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SHANI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	2742.0525	639.17375	4.2899955	0.001
SHANI(-1)	0.3604857	0.1648751	2.1864161	0.045
LOGT	-605.95363	140.73900	-4.3055134	0.001
SRNI(-1)	14.576327	5.1825682	2.8125682	0.013

R-squared	0.940487	Mean of dependent var	291.5263
Adjusted R-squared	0.928584	S.D. of dependent var	61.92322
S.E. of regression	16.54819	Sum of squared resid	4107.638
Durbin-Watson stat	1.859052	F-statistic	79.01511
Log likelihood	-78.03339	TPE	3/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-4.27179	359.000	363.272
*	1966	-39.2089	328.000	367.209
	1967	12.8517	360.000	347.148
	1968	12.3306	359.000	346.669
	1969	10.8528	348.000	337.147
	1970	9.88602	335.000	325.114
	1971	-6.05997	311.000	317.060
	1972	14.0549	318.000	303.945
	1973	20.1086	356.000	335.891
	1974	-6.33140	327.000	333.331
	1975	3.54694	310.000	306.453
	1976	-4.83567	277.000	281.836
	1977	-4.71694	275.000	279.717
	1978	8.06241	266.000	257.938
*	1979	-27.0853	222.000	249.085
*	1980	-17.0191	198.000	215.019
	1981	4.31248	210.000	205.688
	1982	0.27625	191.000	190.724
	1983	13.2464	189.000	175.754

INDEPENDENT VARIABLES

SHANI = Soybean Harvested Area (1000 HA)

SRNI4 = Soybean Revenue per Hectare ($/HA)
(Forecast Soybean Yield)*SP/CPINI

LOGT = ln(YEAR)

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SHANI	291.52632	61.923222	360.00000	189.00000
SHANI(-1)	299.15789	57.351996	360.00000	191.00000
LOGT	4.3013124	0.0763372	4.4188400	4.1743880
SRNI(-1)	3.2949009	1.0404044	5.4214150	2.0788910

	Covariance	Correlation
SHANI,SHANI	3632.6704	1.0000000
SHANI,SHANI(-1)	3132.6011	0.9310738
SHANI,LOGT	-4.0863392	-0.9124846
SHANI,SRNI(-1)	-12.960123	-0.2123413
SHANI(-1),SHANI(-1)	3116.1330	1.0000000
SHANI(-1),LOGT	-3.6169647	-0.8720480
SHANI(-1),SRNI(-1)	-12.515707	-0.2214042
LOGT,LOGT	0.0055207	1.0000000
LOGT,SRNI(-1)	0.0386102	0.5131501
SRNI(-1),SRNI(-1)	1.0254707	1.0000000

Newly Industrialized Countries
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1982
19 Observations
LS // Dependent Variable is SYNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-11.084474	1.0166672	-10.902756	0.000
LOGT	2.8214888	0.2370797	11.901012	0.000

R-squared	0.892835	Mean of dependent var	1.013027
Adjusted R-squared	0.886531	S.D. of dependent var	0.231092
S.E. of regression	0.077844	Sum of squared resid	0.103014
Durbin-Watson stat	1.245944	F-statistic	141.6341
Log likelihood	22.60483		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.03586	0.68563	0.64977
	1965	-0.03335	0.66017	0.69351
	1966	-0.01708	0.71951	0.73659
	1967	-0.01791	0.76111	0.77902
	1968	0.04826	0.86908	0.82082
	1969	-0.01718	0.84483	0.86201
	1970	-0.02798	0.87463	0.90261
	1971	-0.01337	0.92926	0.94263
	1972	-0.08587	0.89623	0.98209
	1973	-0.14180	0.87921	1.02101
	1974	0.10574	1.16514	1.05940
	1975	0.07692	1.17419	1.09727
	1976	0.11807	1.25271	1.13464
	1977	0.13757	1.30909	1.17152
	1978	0.01387	1.22180	1.20793
	1979	0.03090	1.27478	1.24388
	1980	-0.10765	1.17172	1.27937
	1981	-0.03346	1.28095	1.31442
	1982	-0.07155	1.27749	1.34903

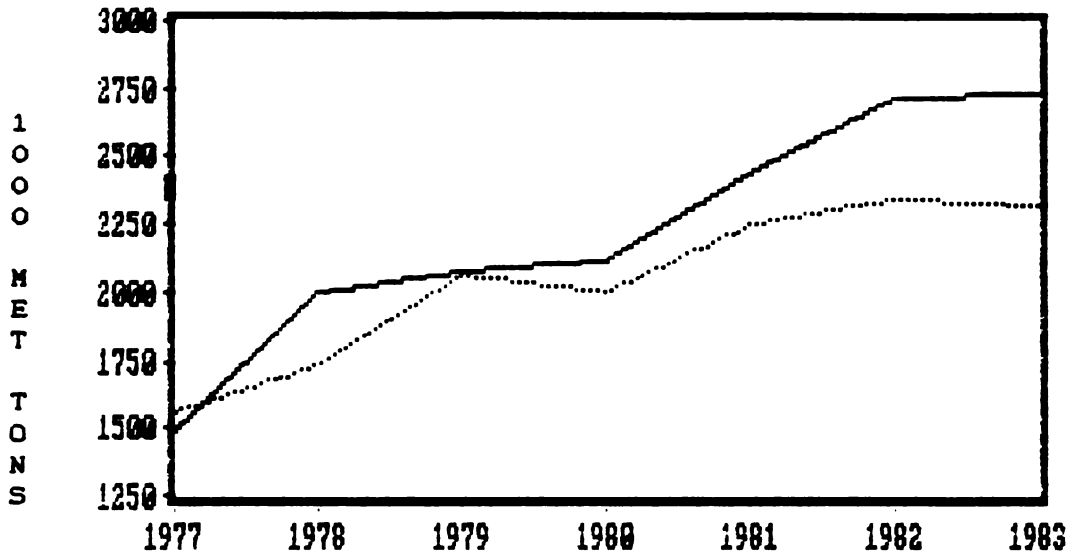
INDEPENDENT VARIABLES

LOGT = Ln(YEAR)

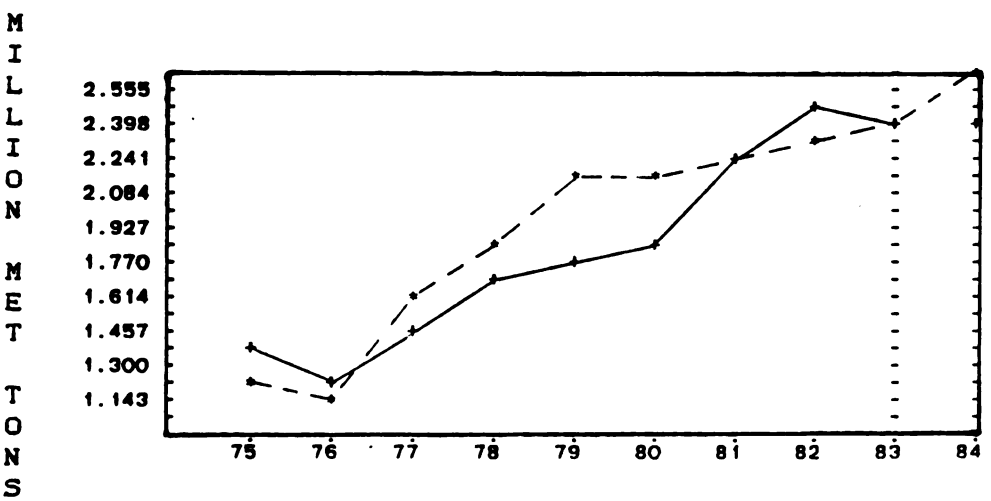
SMPL 1964 - 1982
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SYNI	1.0130275	0.2310919	1.3090910	0.6601672
LOGT	4.2876305	0.0773913	4.4067190	4.1588830

	Covariance	Correlation
SYNI,SYNI	0.0505928	1.0000000
SYNI,LOGT	0.0160096	0.9448995
LOGT,LOGT	0.0056742	1.0000000



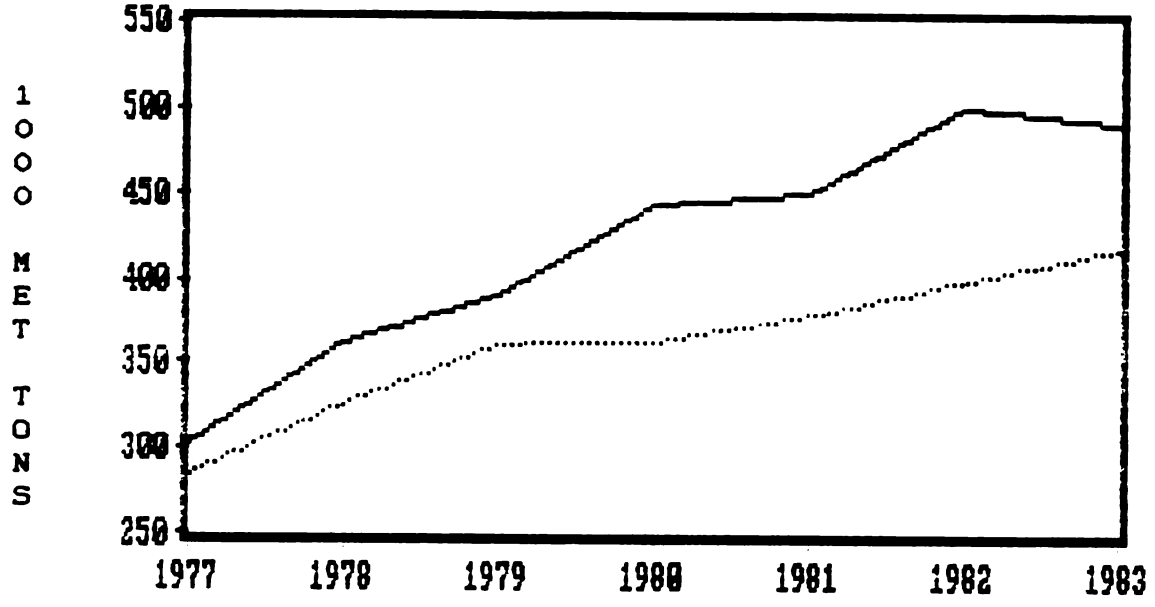
REGIONAL MODEL SIMULATION



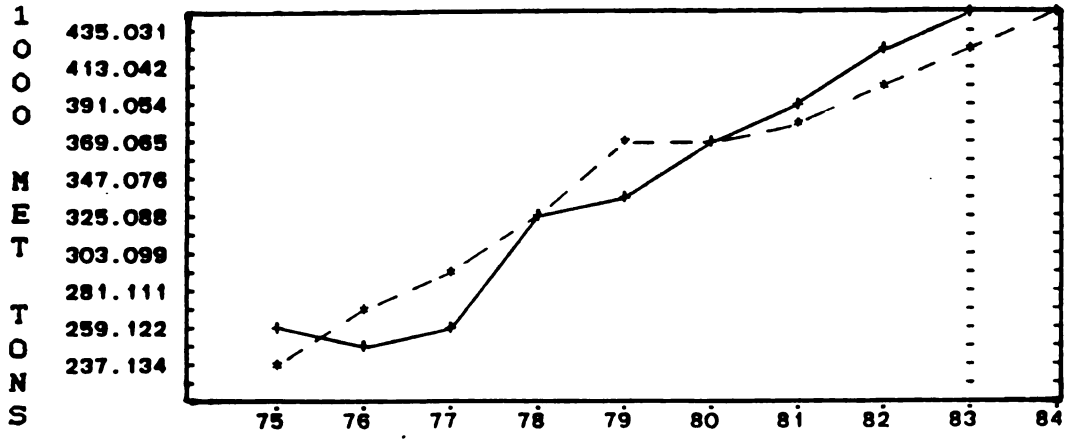
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.13.a & b. Soymeal Equivalent Consumption - Newly Industrialized Countries



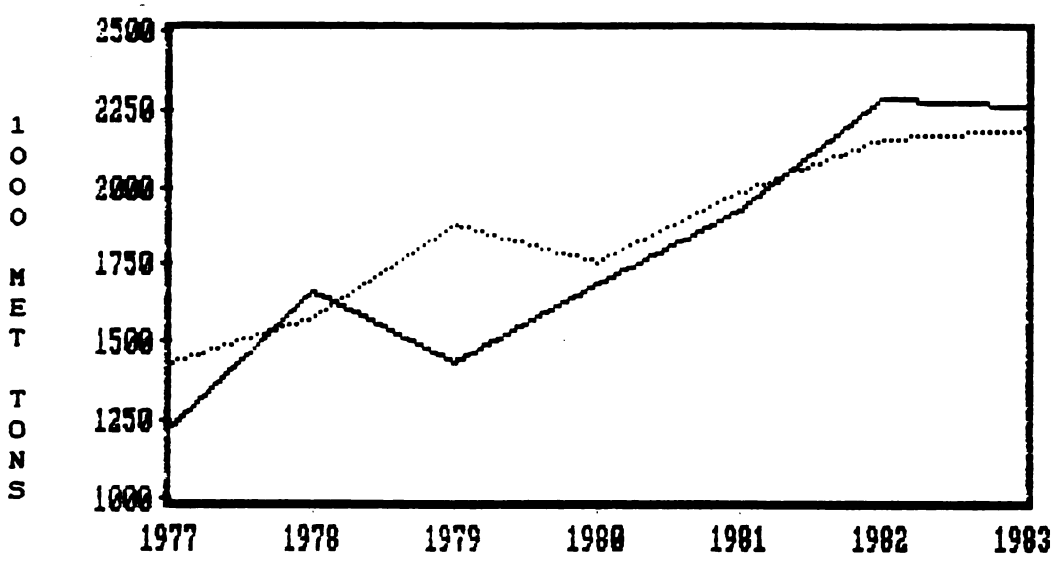
REGIONAL MODEL SIMULATION



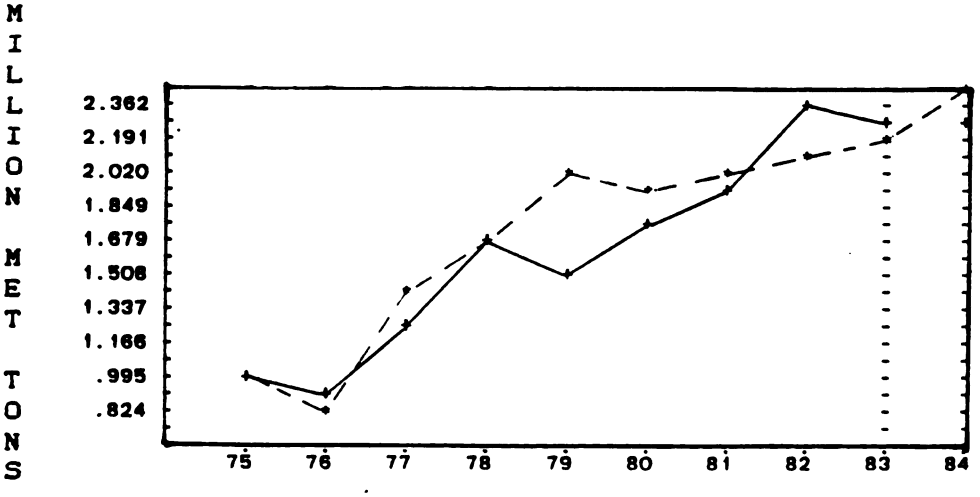
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.14.a & b. Soyoil Equivalent Consumption - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.15.a & b. Soymeal Equivalent Imports - Newly Industrialized Countries

Newly Industrialized Countries
Per Capita Soymeal Equivalent Imports (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PTSMNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0130030	0.0038890	3.3434991	0.005
PCRGDP	1841.8773	128.54899	14.328213	0.000
SPNI	-0.0031068	0.0006556	-4.7386702	0.000
PCSMDS	-0.6223226	0.2248242	-2.7680410	0.015
DV72	0.0055982	0.0022840	2.4510845	0.028

R-squared	0.962299	Mean of dependent var	0.014199
Adjusted R-squared	0.951527	S.D. of dependent var	0.007758
S.E. of regression	0.001708	Sum of squared resid	4.08D-05
Durbin-Watson stat	1.810199	F-statistic	89.33591
Log likelihood	97.01645	TPE	2/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	0.00062	0.00292	0.00230
	1966	0.00011	0.00589	0.00578
	1967	0.00034	0.00587	0.00553
	1968	-0.00067	0.00731	0.00798
	1969	-5.7D-05	0.01015	0.01021
	1970	-0.00044	0.00898	0.00942
	1971	-0.00093	0.01098	0.01191
	1972	2.7D-18	0.00957	0.00957
	1973	-0.00017	0.00832	0.00848
	1974	0.00114	0.01272	0.01158
	1975	0.00186	0.01406	0.01220
	1976	-0.00057	0.01202	0.01260
	1977	-0.00212	0.01689	0.01900
	1978	0.00171	0.02249	0.02078
	1979	-0.00391	0.01899	0.02290
	1980	-0.00135	0.02177	0.02312
	1981	0.00019	0.02447	0.02429
	1982	0.00242	0.02858	0.02615
	1983	0.00183	0.02780	0.02597

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPNI/CPINI/POPNI

SPNI = Real NIC Soybean Price ($/MT)
SP*XRNI/CPINI

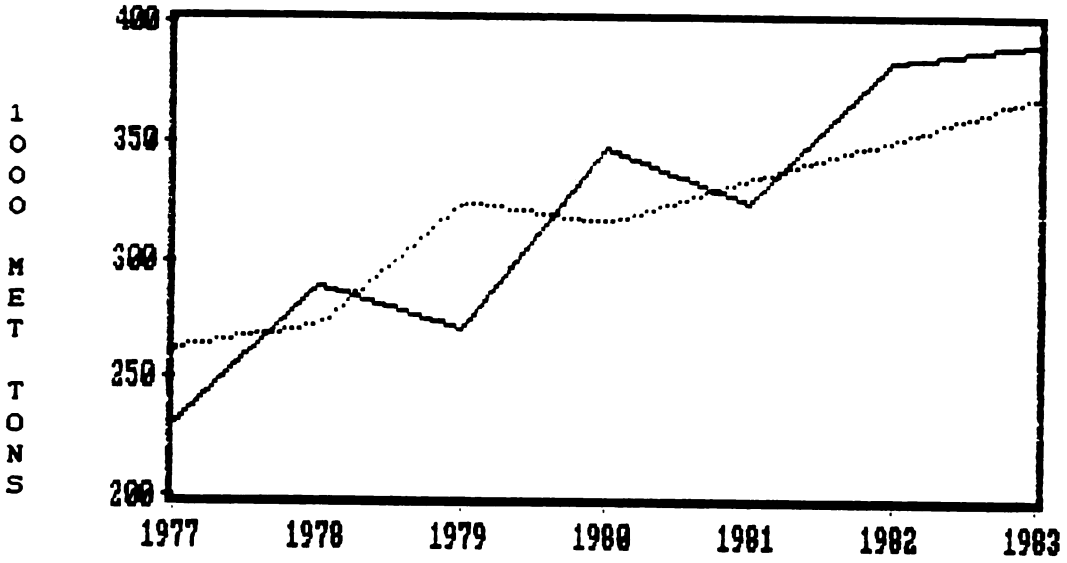
PCSMDS = Per Capita Domestic Soymeal Supply (1000 MT)
((SMESNI(-1) + (SESNI(-1) + SPRONI)*.795)/POPNI

DV72 = 1 If(YEAR .EQ. 72)
0 Otherwise

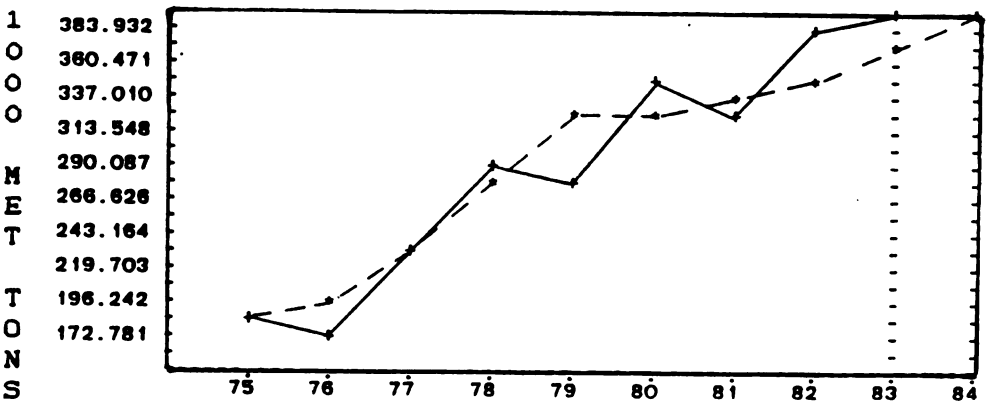
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMNI	0.0141990	0.0077582	0.0285756	0.0029200
PCRGDP	8.830D-06	3.535D-06	1.430D-05	4.437D-06
SPNI	3.2508077	0.8592545	5.5202730	2.1592990
PCSMDS	0.0084574	0.0020670	0.0132947	0.0050469
DV72	0.0526316	0.2294157	1.0000000	0.0000000

	Covariance	Correlation
PTSMNI,PTSMNI	5.702D-05	1.0000000
PTSMNI,PCRGDP	2.461D-08	0.9471828
PTSMNI,SPNI	-0.0024566	-0.3889896
PTSMNI,PCSMDS	-5.258D-06	-0.3461202
PTSMNI,DV72	-0.0002434	-0.1443700
PCRGDP,PCRGDP	1.184D-11	1.0000000
PCRGDP,SPNI	-6.957D-07	-0.2417373
PCRGDP,PCSMDS	-2.075D-09	-0.2997971
PCRGDP,DV72	-1.160D-07	-0.1509989
SPNI,SPNI	0.6994595	1.0000000
SPNI,PCSMDS	-0.0005288	-0.3142742
SPNI,DV72	0.1194456	0.6395965
PCSMDS,PCSMDS	4.047D-06	1.0000000
PCSMDS,DV72	-9.997D-05	-0.2225411
DV72,DV72	0.0498615	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.16.a & b. Soyoil Equivalent Imports - Newly Industrialized Countries

Newly Industrialized Countries
Per Capita Soyoil Equivalent Imports (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PTSONI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0021373	0.0007036	3.0375987	0.008
PCRGDP	323.96767	22.834924	14.187377	0.000
SOPNI	-0.0001333	3.677D-05	-3.6257490	0.002
PCSODS	-0.9938935	0.3909015	-2.5425677	0.023

R-squared	0.940384	Mean of dependent var	0.002720
Adjusted R-squared	0.928461	S.D. of dependent var	0.001233
S.E. of regression	0.000330	Sum of squared resid	1.63D-06
Durbin-Watson stat	1.651614	F-statistic	78.86998
Log likelihood	127.6121	TPE	2/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-0.00014	0.00068	0.00081
	1966	-4.3D-05	0.00144	0.00148
	1967	3.6D-05	0.00141	0.00137
	1968	-5.0D-05	0.00161	0.00166
	1969	0.00040	0.00225	0.00185
	1970	0.00016	0.00196	0.00181
	1971	-0.00012	0.00231	0.00243
	1972	-3.1D-05	0.00210	0.00213
	1973	2.1D-05	0.00173	0.00171
	1974	0.00039	0.00254	0.00215
	1975	2.5D-05	0.00256	0.00254
	1976	-0.00071	0.00226	0.00297
	1977	-0.00044	0.00318	0.00362
	1978	0.00016	0.00390	0.00374
	1979	-0.00050	0.00356	0.00406
	1980	0.00018	0.00449	0.00431
	1981	-2.6D-05	0.00411	0.00414
	1982	0.00034	0.00480	0.00445
	1983	0.00035	0.00480	0.00444

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPNI/CPINI/POPNI

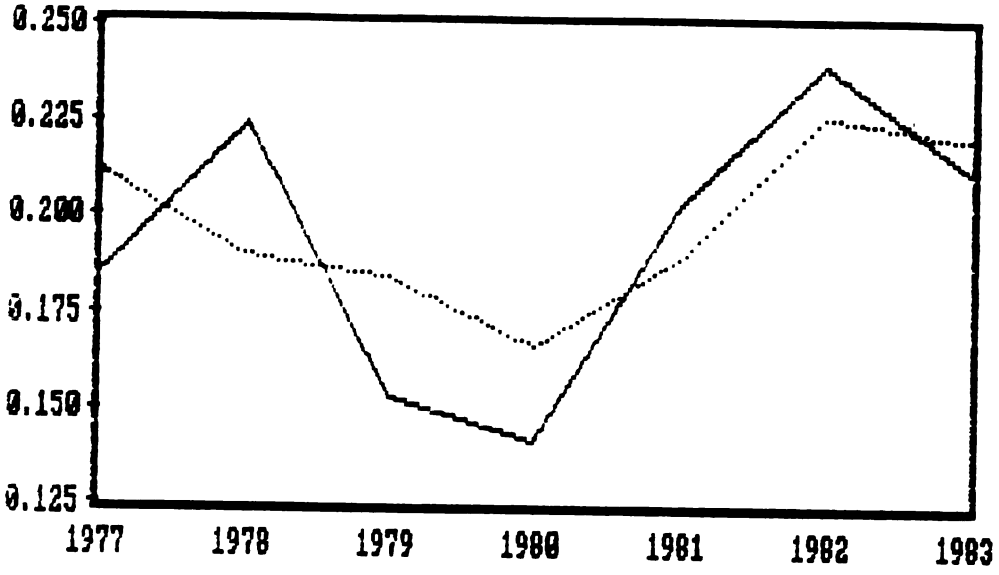
SOPNI = Real Newly Industrialized Countries Soyoil Price ($/MT)
SOP*XRNI/CPINI

PCSODS = Domestic Soyoil Supply Per Capita (1000 MT)
(SOESNI(-1) + (SESNI(-1) + SPRONI)*.175)/POPNI

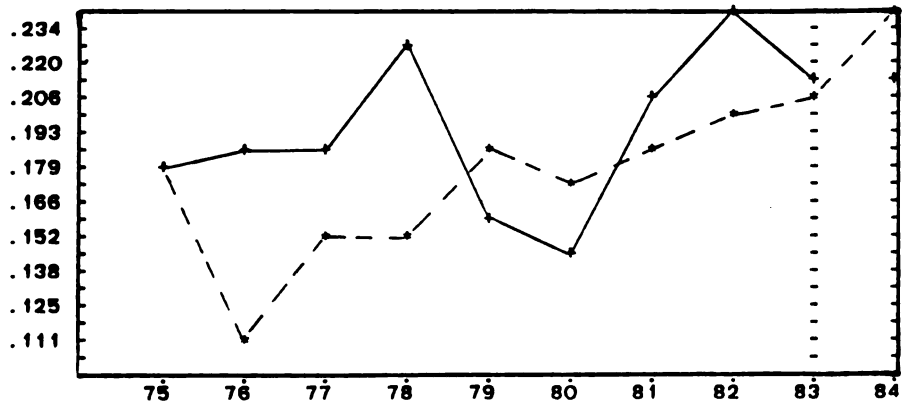
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSONI	0.0027198	0.0012329	0.0047980	0.0006768
PCRGDP	8.830D-06	3.535D-06	1.430D-05	4.437D-06
SOPNI	6.8867185	2.4267067	14.059980	3.8857930
PCSODS	0.0013684	0.0002299	0.0017095	0.0009273

	Covariance	Correlation
PTSONI,PTSONI	1.440D-06	1.0000000
PTSONI,PCRGDP	3.882D-09	0.9402366
PTSONI,SOPNI	-0.0010615	-0.3745076
PTSONI,PCSODS	4.541D-08	0.1691288
PCRGDP,PCRGDP	1.184D-11	1.0000000
PCRGDP,SOPNI	-1.760D-06	-0.2165427
PCRGDP,PCSODS	1.893D-10	0.2458207
SOPNI,SOPNI	5.5789629	1.0000000
SOPNI,PCSODS	-0.0002540	-0.4805661
PCSODS,PCSODS	5.007D-08	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.17.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Newly Industrialized Countries

Newly Industrialized Countries
Percentage Soymeal Equivalent Imported as Soymeal

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0026864	0.0099545	0.2698653	0.791
TSMNI	8.414D-05	1.589D-05	5.2955353	0.000
DV74ON	0.0879363	0.0145777	6.0322323	0.000
SMESNI(-1)	-0.0004289	0.0001216	-3.5285456	0.003

R-squared	0.952499	Mean of dependent var	0.118585
Adjusted R-squared	0.942999	S.D. of dependent var	0.078543
S.E. of regression	0.018752	Sum of squared resid	0.005275
Durbin-Watson stat	2.511412	F-statistic	100.2606
Log likelihood	50.83844	TPE	6/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	0.01422	0.03064	0.01642
	1966	-0.01909	0.01189	0.03098
	1967	-0.01735	0.01445	0.03180
	1968	0.00103	0.04082	0.03979
	1969	0.00782	0.06350	0.05569
	1970	0.02855	0.07910	0.05055
	1971	-0.00625	0.05626	0.06251
	1972	-0.03056	0.02531	0.05587
	1973	0.02164	0.07144	0.04980
	1974	-0.01873	0.14539	0.16412
	1975	0.00359	0.17695	0.17336
	1976	0.01656	0.17941	0.16285
	1977	-0.00888	0.18499	0.19387
	1978	0.01152	0.22415	0.21262
	1979	0.01127	0.15274	0.14147
	1980	-0.02425	0.14094	0.16520
	1981	0.01585	0.20366	0.18781
	1982	0.00767	0.23965	0.23198
	1983	-0.01461	0.21182	0.22643

INDEPENDENT VARIABLES

TSMNI = Soymeal Equivalent Imports (1000 MT)
SNINI*.795 +SMNINI

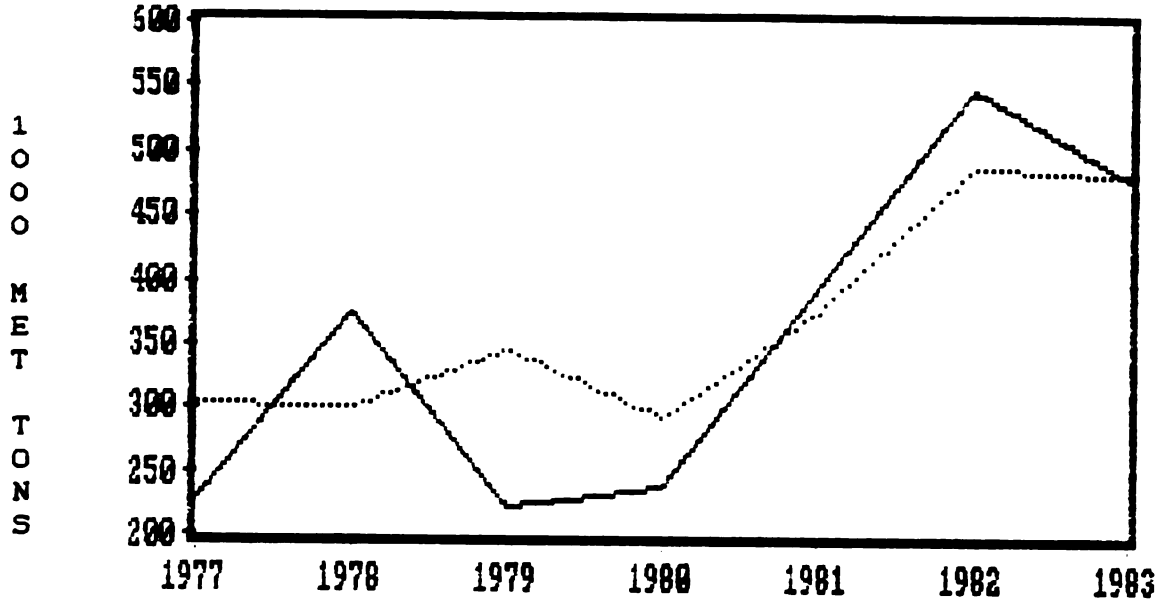
DV74ON = 1 If(YEAR .GE. 74)
0 Otherwise

SMESNI = Soymeal Net Imports (1000 MT)

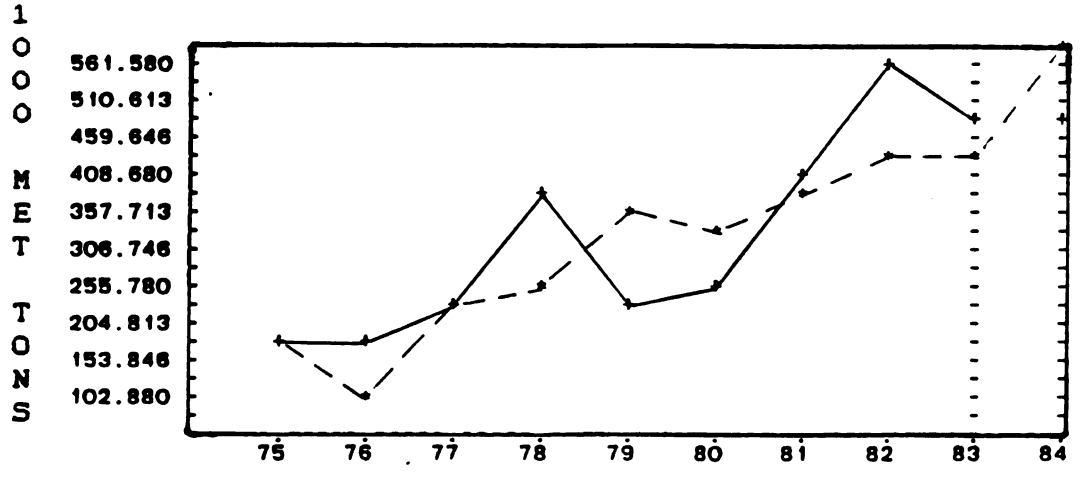
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.1185852	0.0785428	0.2396503	0.0118938
TSMNI	1031.0195	661.94293	2286.6650	163.20500
DV74ON	0.5263158	0.5129892	1.0000000	0.0000000
SMESNI(-1)	39.947368	64.878925	164.00000	0.0000000

	Covariance	Correlation
PMEAL, PMEAL	0.0058443	1.0000000
PMEAL, TSMNI	43.210048	0.8772815
PMEAL, DV74ON	0.0354660	0.9291353
PMEAL, SMESNI(-1)	2.7693313	0.5736488
TSMNI, TSMNI	415106.94	1.0000000
TSMNI, DV74ON	257.41238	0.8001691
TSMNI, SMESNI(-1)	33464.507	0.8225103
DV74ON, DV74ON	0.2493075	1.0000000
DV74ON, SMESNI(-1)	18.922438	0.6001314
SMESNI(-1), SMESNI(-1)	3987.7341	1.0000000



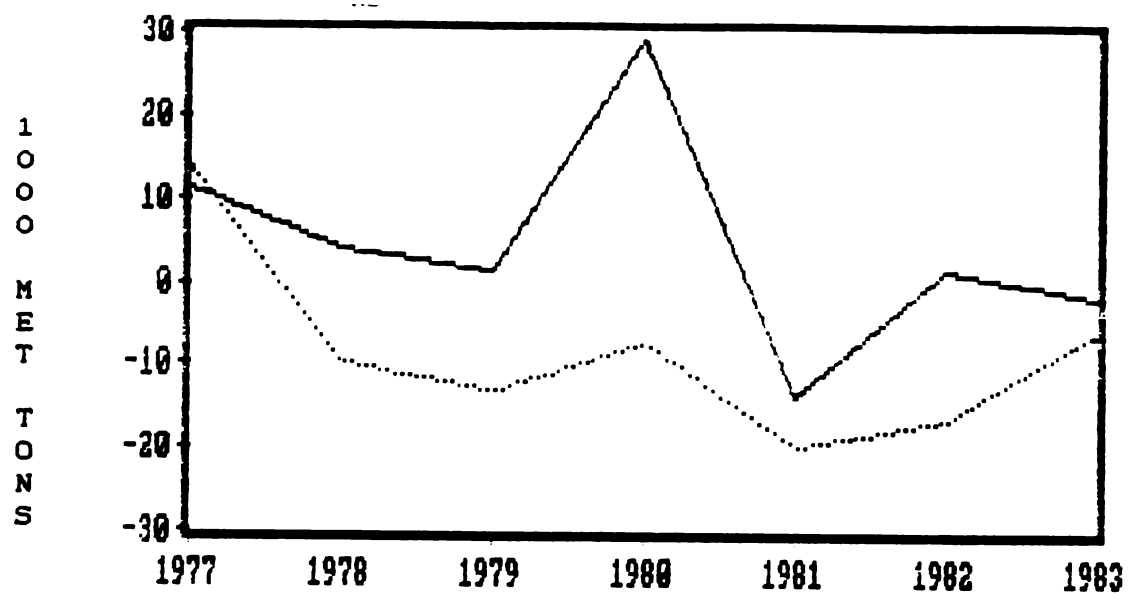
REGIONAL MODEL SIMULATION



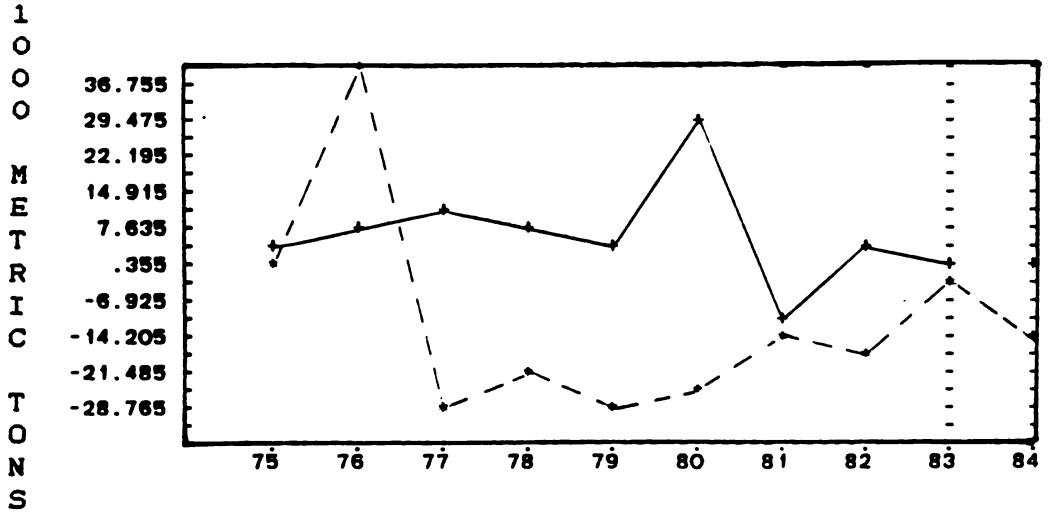
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.18.a & b. Soymeal Net Imports - Newly Industrialized Countries



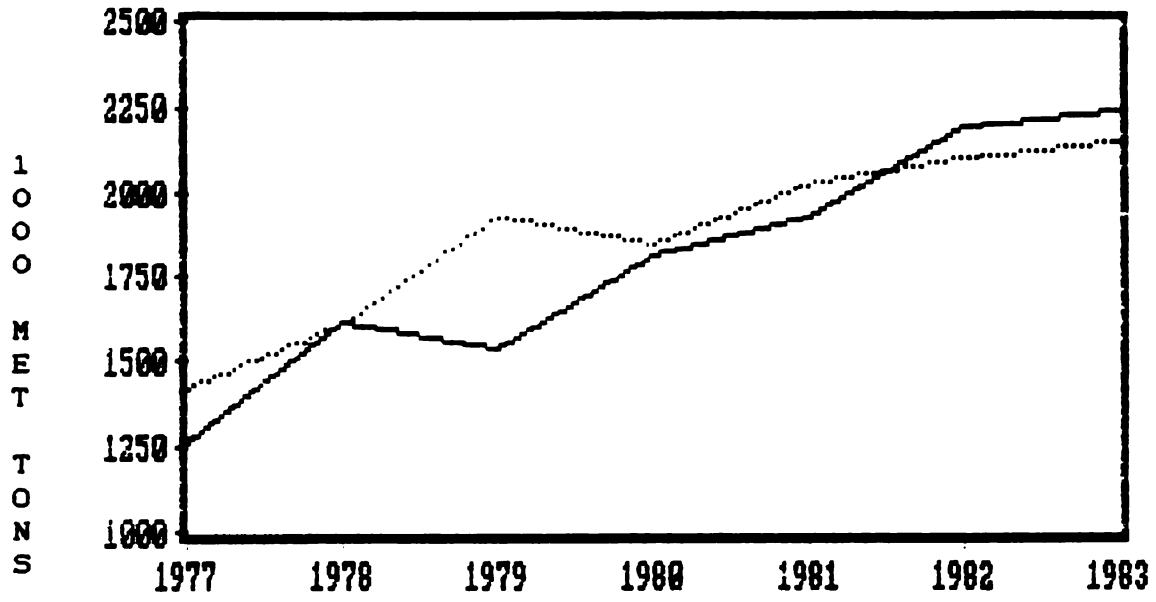
REGIONAL MODEL SIMULATION



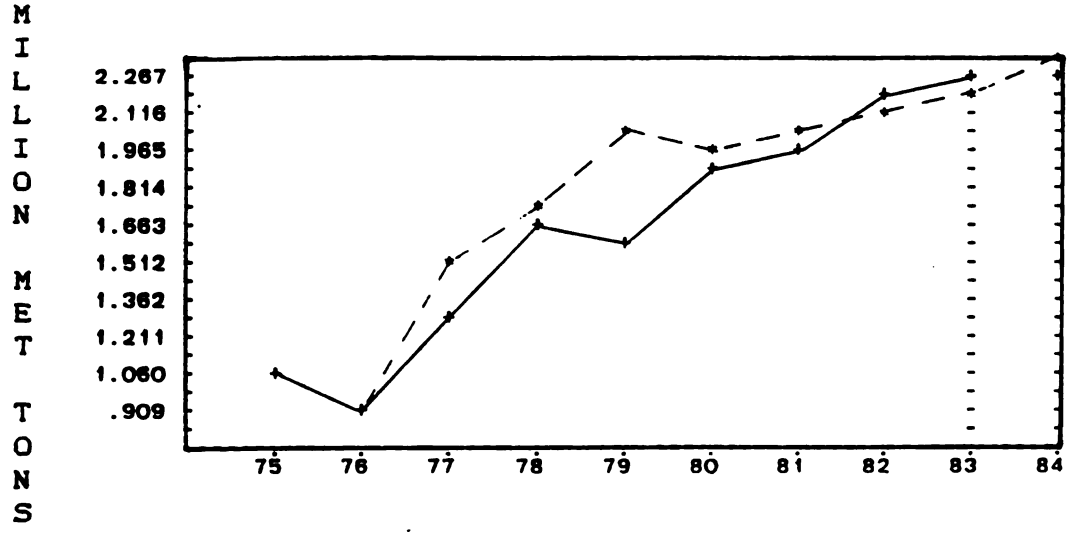
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.19.a & b. Soyoil Net Imports - Newly Industrialized Countries



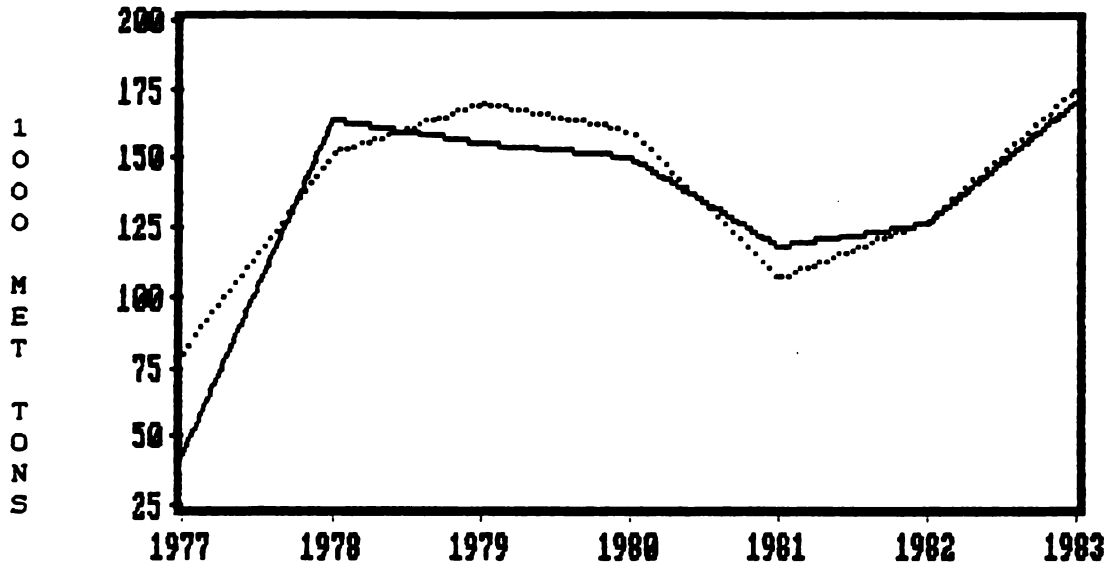
REGIONAL MODEL SIMULATION



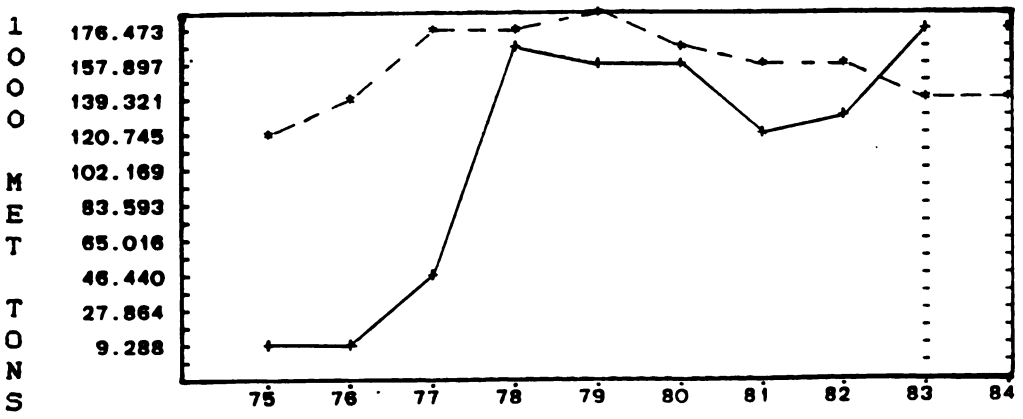
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.20.a & b. Soybean Net Imports - Newly Industrialized Countries



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure I.21.a & b. Soymeal Ending Stocks - Newly Industrialized Countries

Newly Industrialized Countries
Soymeal Ending Stocks (1000 MT)

SMPL 1977 - 1983
7 Observations
LS // Dependent Variable is SMESNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1455.3121	947.25422	1.5363480	0.222
SMSUP	0.0897520	0.0698504	1.2849172	0.289
YEAR	-18.751026	13.574178	-1.3813747	0.261
MARGIN(-1)	370.20506	125.06185	2.9601757	0.060

R-squared	0.843940	Mean of dependent var	132.7143
Adjusted R-squared	0.687880	S.D. of dependent var	44.15018
S.E. of regression	24.66570	Sum of squared resid	1825.190
Durbin-Watson stat	1.279889	F-statistic	5.407788
Log likelihood	-29.40492	TPE	0/7

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
:* :	1977	-22.4762	42.0000	64.4762
: * :	1978	-0.73443	164.000	164.734
: : * :	1979	20.6833	156.000	135.317
: * : :	1980	8.05774	151.000	142.942
: : * :	1981	21.3223	119.000	97.6777
: * : :	1982	-11.0216	127.000	138.022
: * : :	1983	-15.8312	170.000	185.831

INDEPENDENT VARIABLES

SMSUP = Total Soymeal Equivalent Supply (1000 MT)
(SMESNI(-1)+SMNINI+(SESNI(-1)+SPRONI+SNINI)*.795)

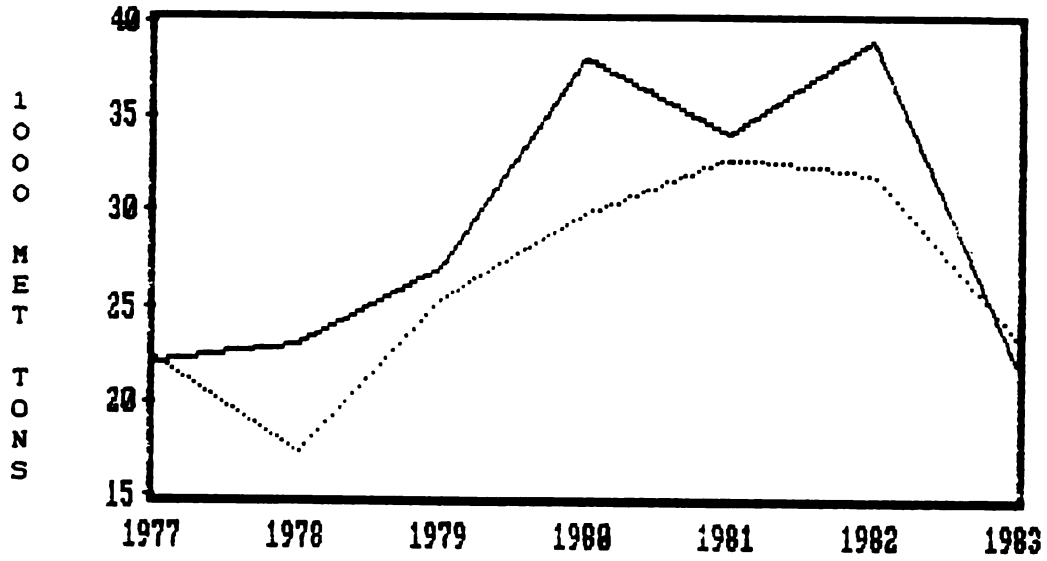
MARGIN = Soybean Crush Margin
(SMP*XRNI/CPINI)*.795 + (SOP*XRNI/CPINI)*.175 -
(SP*XRNI/CPINI)

YEAR = 1960=60, 1961=61,...

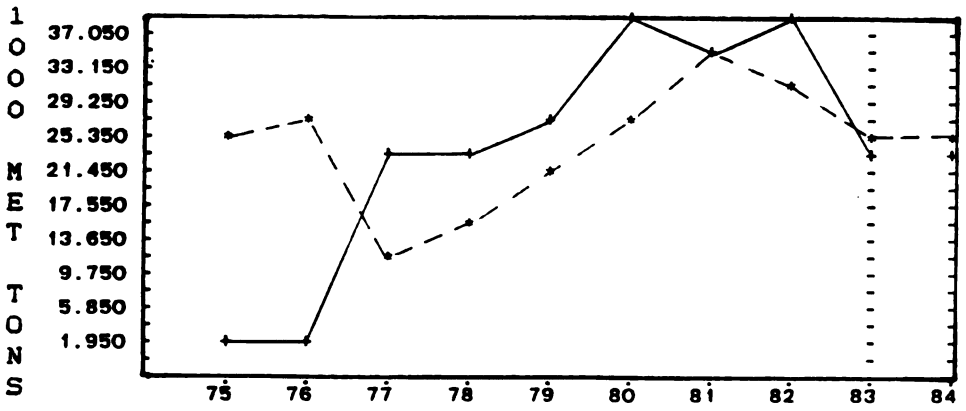
SMPL 1977 - 1983
7 Observations

Series	Mean	S.D.	Maximum	Minimum
SMESNI	132.71429	44.150177	170.00000	42.000000
SMSUP	2312.2028	419.28682	2808.2200	1625.2700
YEAR	80.000000	2.1602469	83.000000	77.000000
MARGIN(-1)	-0.0811458	0.1080726	0.0940312	-0.2508829

	Covariance	Correlation
SMESNI,SMESNI	1670.7755	1.0000000
SMESNI,SMSUP	9308.3288	0.5866443
SMESNI,YEAR	39.000000	0.4770628
SMESNI,MARGIN(-1)	3.5274583	0.8625033
SMSUP,SMSUP	150686.94	1.0000000
SMSUP,YEAR	727.87287	0.9375355
SMSUP,MARGIN(-1)	25.478410	0.6559827
YEAR,YEAR	4.0000000	1.0000000
YEAR,MARGIN(-1)	0.1314840	0.6570538
MARGIN(-1),MARGIN(-1)	0.0100112	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.22.a & b. Soyoil Ending Stocks - Newly Industrialized Countries

Newly Industrialized Countries
Soyoil Ending Stocks (1000 MT)

SMPL 1977 - 1983
7 Observations
LS // Dependent Variable is SOESNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	58.593870	4.1333194	14.175984	0.000
SONINI	0.2455825	0.0761630	3.2244328	0.032
SOPNI	-5.3664481	0.7259313	-7.3925012	0.002

R-squared	0.933818	Mean of dependent var	29.28571
Adjusted R-squared	0.900727	S.D. of dependent var	7.565586
S.E. of regression	2.383731	Sum of squared resid	22.72870
Durbin-Watson stat	2.558119	F-statistic	28.21981
Log likelihood	-14.05458	TPE	1/7

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1977	0.29853	22.0000	21.7015
	1978	2.34503	23.0000	20.6550
*	1979	-1.86660	27.0000	28.8666
*	1980	-0.77619	38.0000	38.7762
*	1981	-0.30281	34.0000	34.3028
*	1982	2.69232	39.0000	36.3077
*	1983	-2.39029	22.0000	24.3903

INDEPENDENT VARIABLES

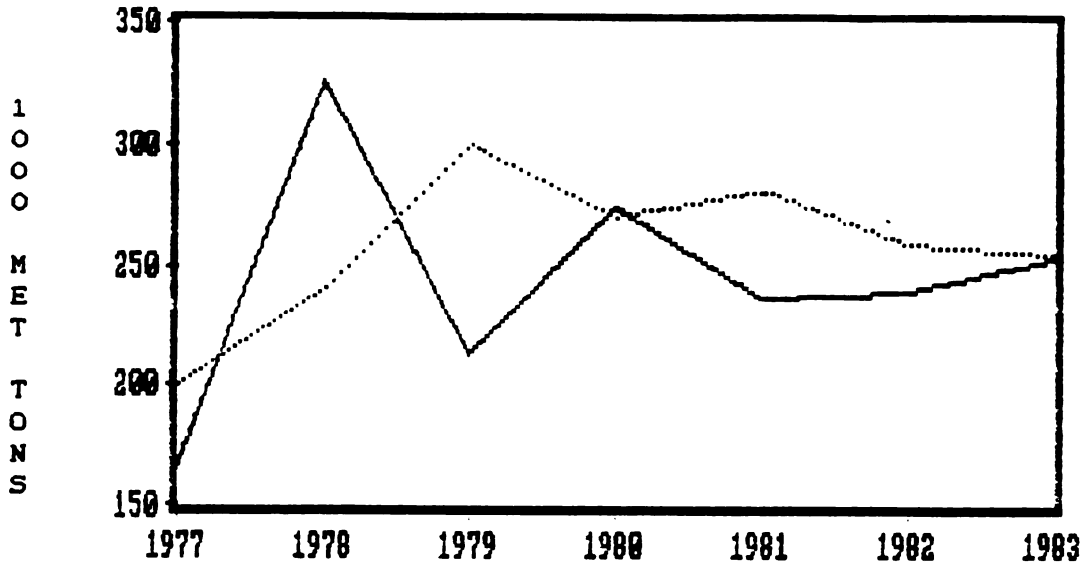
SONINI = Soyoil Net Imports (1000 MT)

SOPNI = Real NIC Soyoil Price ($/MT)
SOP*XRNI/CPINI

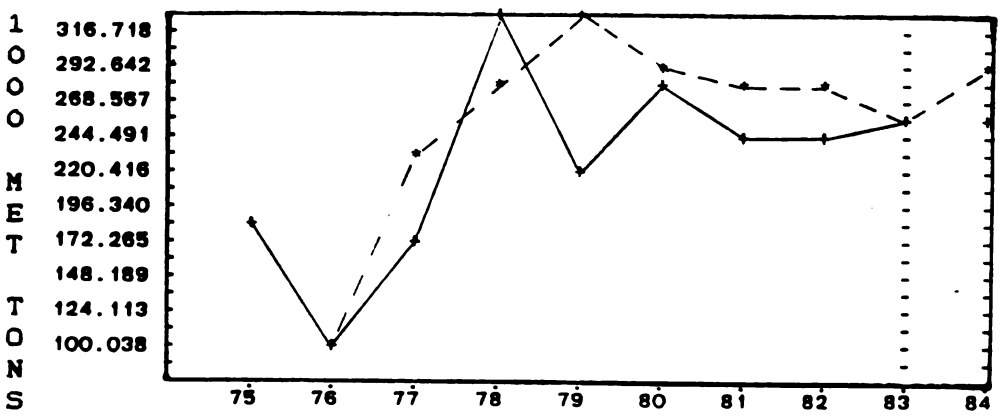
SMPL 1977 - 1983
7 Observations

Series	Mean	S.D.	Maximum	Minimum
SOESNI	29.285714	7.5655862	39.000000	22.000000
SONINI	4.2857143	13.237753	29.000000	-14.000000
SOPNI	5.6574948	1.3888739	7.3780290	3.8857930

	Covariance	Correlation
SOESNI,SOESNI	49.061224	1.0000000
SOESNI,SONINI	14.775510	0.1721204
SOESNI,SOPNI	-7.8610022	-0.8728092
SONINI,SONINI	150.20408	1.0000000
SONINI,SOPNI	4.1204130	0.2614631
SOPNI,SOPNI	1.6534034	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure I.23.a & b. Soybean Ending Stocks - Newly Industrialized Countries

Newly Industrialized Countries
Soybean Ending Stocks (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SESNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	1455.9588	457.79122	3.1803992	0.006
MARGIN	-75.047944	70.164500	-1.0695999	0.302
SBSUP	0.2447551	0.0670509	3.6502890	0.002
YEAR	-22.343939	7.5249010	-2.9693332	0.010

R-squared	0.568361	Mean of dependent var	187.4211
Adjusted R-squared	0.482033	S.D. of dependent var	72.93781
S.E. of regression	52.49327	Sum of squared resid	41333.16
Durbin-Watson stat	1.614327	F-statistic	6.583755
Log likelihood	-99.96715	TPE	5/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	16.1646	190.000	173.835
	1966	79.0297	273.000	193.970
	1967	-10.1386	193.000	203.139
	1968	-37.3079	158.000	195.308
	1969	0.80693	186.000	185.193
	1970	-114.373	54.0000	168.373
	1971	-52.5854	115.000	167.585
	1972	14.5643	113.000	98.4357
	1973	16.0707	84.0000	67.9293
	1974	64.6835	224.000	159.316
	1975	2.03057	179.000	176.969
	1976	-34.2419	88.0000	122.242
	1977	6.49187	165.000	158.508
	1978	90.3087	326.000	235.691
	1979	-5.25360	212.000	217.254
	1980	38.8181	273.000	234.182
	1981	-20.8165	236.000	256.817
	1982	-29.9713	239.000	268.971
	1983	-24.2806	253.000	277.281

INDEPENDENT VARIABLES

SBSUP = Total Soybean Supply (1000 MT)
(SESNI(-1) +SPRONI + SNINI)

MARGIN = Soybean Crush Margin
(SMP*XRNI/CPINI)*.795 + (SOP*XRNI/CPINI)*.175 -
(SP*XRNI/CPINI)

YEAR = 1960 =60, 1961=61,...

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SESNI	187.42105	72.937809	326.00000	54.000000
MARGIN	-0.0010847	0.1854989	0.4843141	-0.2508829
SBSUP	1572.3158	633.02116	2716.0000	745.00000
YEAR	74.000000	5.6273143	83.000000	65.000000

	Covariance	Correlation
SESNI,SESNI	5039.9280	1.0000000
SESNI,MARGIN	-4.1885656	-0.3267777
SESNI,SBSUP	23387.341	0.5346764
SESNI,YEAR	142.05263	0.3653226
MARGIN,MARGIN	0.0325988	1.0000000
MARGIN,SBSUP	-34.433921	-0.3095338
MARGIN,YEAR	-0.2992214	-0.3025737
SBSUP,SBSUP	379625.48	1.0000000
SBSUP,YEAR	3227.3684	0.9563354
YEAR,YEAR	30.000000	1.0000000

APPENDIX J

EQUATION STATISTICS - SOVIET BLOC

Wheat

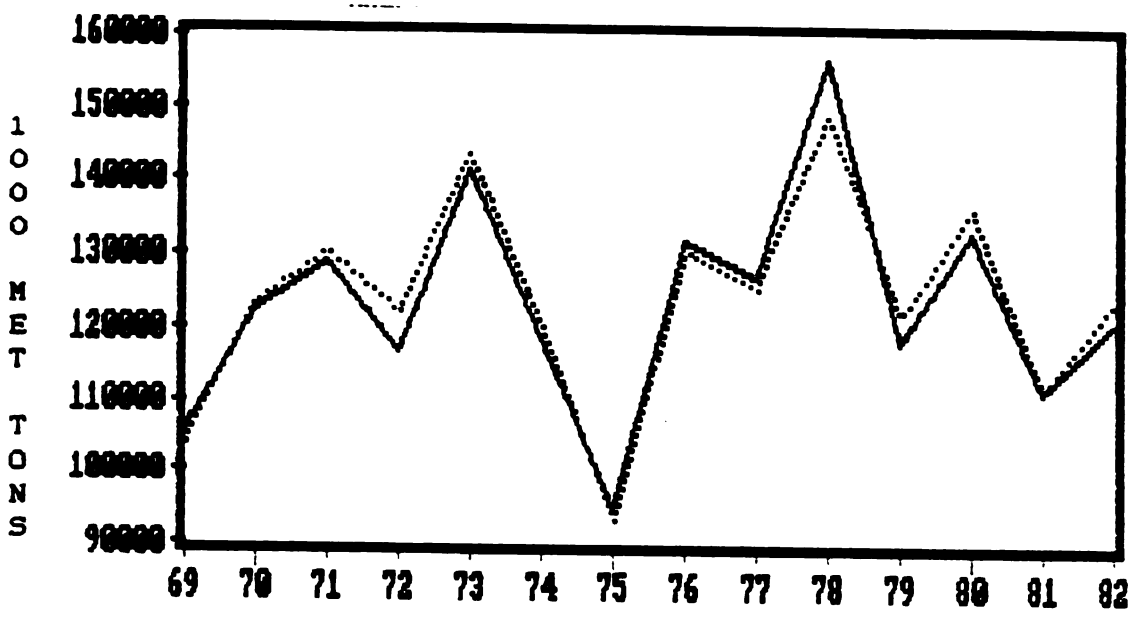
WPROSB.....Production
WHASB.....Harvested Area
WYSB.....Yield
WCONSB.....Total Consumption
WNISB.....Net Imports
WESSB.....Ending Stocks

Coarse Grain

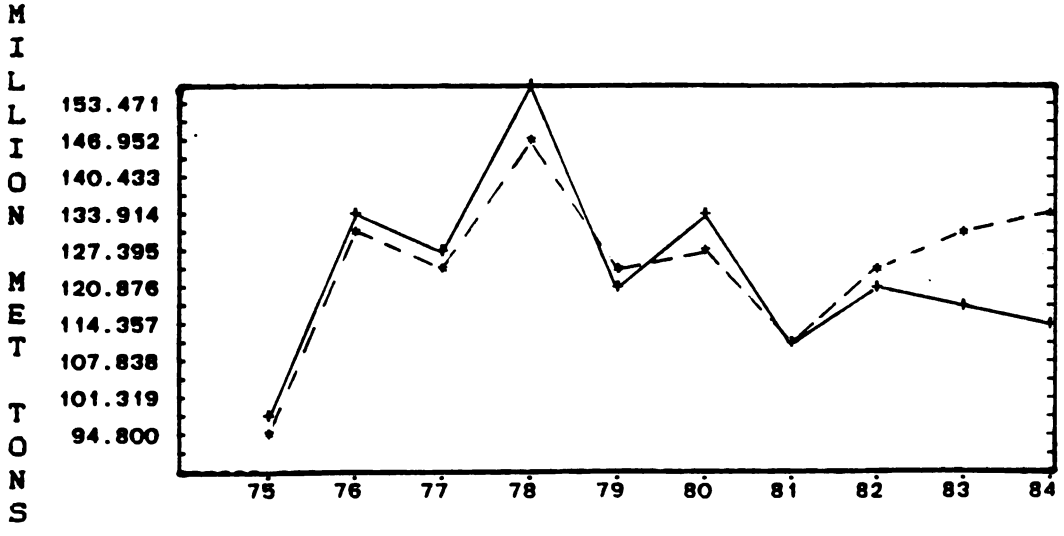
FPROSB.....Production
FHASB.....Harvested Area
FYSB.....Yield
FCONSB.....Total Consumption
FNISB.....Net Imports
FESSB.....Ending Stocks

Soybean Complex

SPROSB.....Production
SHASB.....Harvested Area
SYSB.....Yield
SMCOSB.....Soymeal Equiv. Consumption
SOCOSB.....Soyoil Equiv. Consumption
SMEISB.....Soymeal Equiv. Net Imports
SOEISB.....Soyoil Equiv. Net Imports
PMELSB.....% SMEISB Imported as SMNISB
SMNISB.....Soymeal Net Imports
SONISB.....Soyoil Net Imports
SNISB.....Soybean Net Imports



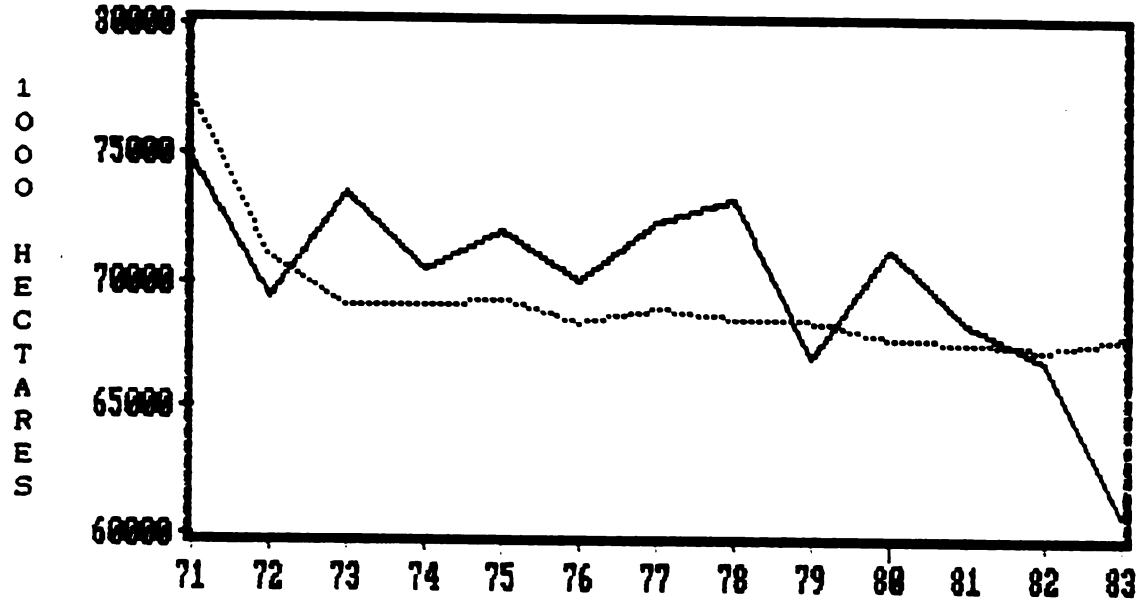
REGIONAL MODEL SIMULATION



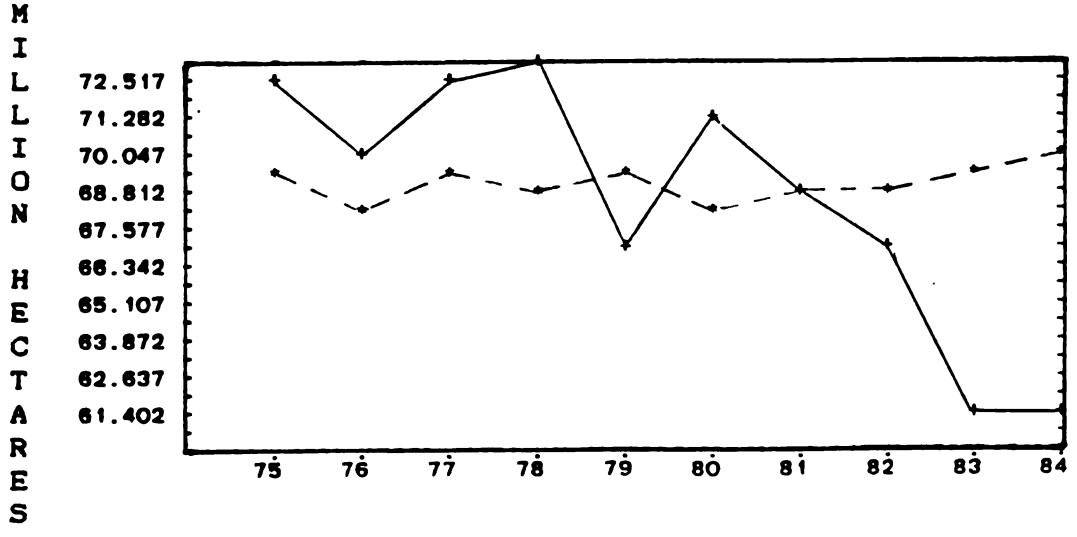
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.1.a & b. Wheat Production - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.2.a & b. Wheat Harvested Area - Soviet Bloc

Soviet Bloc
Wheat Harvested Area (1000 Hectares)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is WHASB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	52686.296	11947.320	4.4098841	0.000
WHASB(-1)	0.2840121	0.1644009	1.7275577	0.103
DV6071	2027.0204	1567.6193	1.2930565	0.214
FNISB(-1)	-0.3210656	0.0898420	-3.5736682	0.003
WNISB(-1)	0.2198336	0.0791620	2.7770113	0.013
DV80	4464.6577	2189.2749	2.0393317	0.058

R-squared	0.846273	Mean of dependent var	73627.27
Adjusted R-squared	0.798233	S.D. of dependent var	4096.656
S.E. of regression	1840.155	Sum of squared resid	54178730
Durbin-Watson stat	2.119098	F-statistic	17.61610
Log likelihood	-193.1010	TPE	5/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-2158.94	72808.0	74966.9
*	1962	1727.70	77555.0	75827.3
*	1963	-2273.85	74615.0	76888.8
*	1964	-640.208	78309.0	78949.2
*	1965	2127.27	80192.0	78064.7
*	1966	91.6952	80195.0	80103.3
*	1967	-557.135	77359.0	77916.1
*	1968	1563.19	77985.0	76421.8
*	1969	1330.88	77277.0	75946.1
*	1970	-427.693	75481.0	75908.7
*	1971	-782.915	74697.0	75479.9
*	1972	-2562.45	69271.0	71833.5
*	1973	55.9125	73490.0	73434.1
*	1974	-1422.69	70318.0	71740.7
*	1975	1259.64	71981.0	70721.4
*	1976	548.709	69863.0	69314.3
*	1977	1502.18	72147.0	70644.8
*	1978	3712.03	73135.0	69423.0
*	1979	-1866.20	66941.0	68807.2
*	1980	-7.9D-12	71192.0	71192.0
*	1981	-198.081	68293.0	68491.1
*	1982	-1029.05	66696.0	67725.0

INDEPENDENT VARIABLES

WHASB = Wheat Harvested Area (1000 HA)

WNISB = Wheat Net Imports (1000 MT)

FNISB = Coarse Grain Net Imports (1000 MT)

DV6071 = 1 If(YEAR .GE. 60 .AND. YEAR .LE. 71)
0 Otherwise

DV80 = 1 If(YEAR .EQ. 80)
0 Otherwise

SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
WHASB	73627.273	4096.6558	80195.000	66696.000
WHASB(-1)	73782.818	3880.1972	80195.000	66941.000
DV6071	0.5000000	0.5117663	1.0000000	0.0000000
FNISB(-1)	8235.0000	10396.873	29683.000	-1528.0000
WNISB(-1)	6428.9091	7849.9713	23531.000	-3509.0000
DV80	0.0454545	0.2132007	1.0000000	0.0000000

	Covariance	Correlation
WHASB,WHASB	16019744.	1.0000000
WHASB,WHASB(-1)	10514120.	0.6929358
WHASB,DV6071	1662.4091	0.8306922
WHASB,FNISB(-1)	-32509357.	-0.7996125
WHASB,WNISB(-1)	-12474082.	-0.4063632
WHASB,DV80	-110.69421	-0.1327731
WHASB(-1),WHASB(-1)	14371570.	1.0000000
WHASB(-1),DV6071	1376.5000	0.7261964
WHASB(-1),FNISB(-1)	-26493973.	-0.6880087
WHASB(-1),WNISB(-1)	-15810153.	-0.5437730
WHASB(-1),DV80	-310.99174	-0.3938309
DV6071,DV6071	0.2500000	1.0000000
DV6071,FNISB(-1)	-4120.5455	-0.8113041
DV6071,WNISB(-1)	-2077.8636	-0.5418520
DV6071,DV80	-0.0227273	-0.2182179
FNISB(-1),FNISB(-1)	103181555	1.0000000
FNISB(-1),WNISB(-1)	58152925.	0.7464559
FNISB(-1),DV80	831.36364	0.3929190
WNISB(-1),WNISB(-1)	58821047.	1.0000000
WNISB(-1),DV80	440.82231	0.2759372
DV80,DV80	0.0433884	1.0000000

Soviet Bloc
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is WYSB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-10.448320	1.8309038	-5.7066461	0.000
LOGT	2.8119180	0.4298584	6.5414986	0.000

R-squared	0.670801	Mean of dependent var	1.525617
Adjusted R-squared	0.655125	S.D. of dependent var	0.329987
S.E. of regression	0.193788	Sum of squared resid	0.788632
Durbin-Watson stat	2.014870	F-statistic	42.79120
Log likelihood	6.153331		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.08773	1.15237	1.06464
	1961	0.03171	1.14283	1.11112
	1962	-0.01970	1.13714	1.15684
	1963	-0.30096	0.90088	1.20184
	1964	-0.06559	1.18053	1.24612
	1965	-0.27202	1.01769	1.28972
	1966	0.20345	1.53609	1.33265
	1967	-0.04480	1.33014	1.37493
	1968	0.10668	1.52327	1.41659
	1969	-0.09297	1.36468	1.45764
	1970	0.12846	1.62655	1.49810
	1971	0.18930	1.72729	1.53799
	1972	0.10671	1.68402	1.57731
	1973	0.30817	1.92428	1.61610
	1974	0.02577	1.68012	1.65436
	1975	-0.37323	1.31888	1.69210
	1976	0.15858	1.88792	1.72935
	1977	-0.00936	1.75675	1.76610
	1978	0.34065	2.14304	1.80239
	1979	-0.07808	1.76013	1.83821
	1980	-0.00854	1.86504	1.87358
	1981	-0.28884	1.61967	1.90851
	1982	-0.13311	1.80990	1.94301

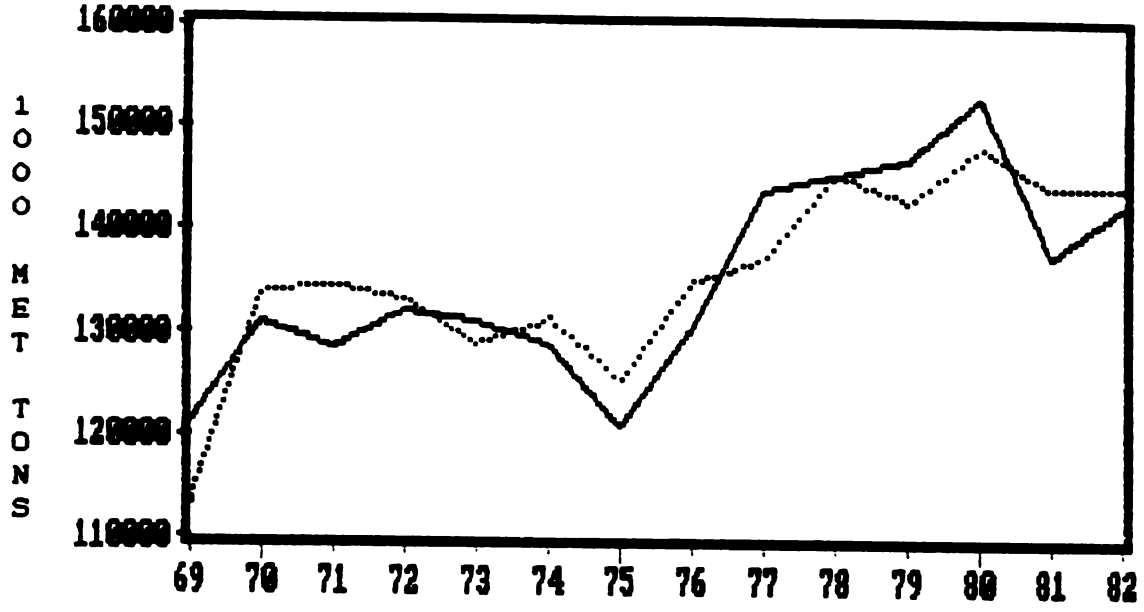
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

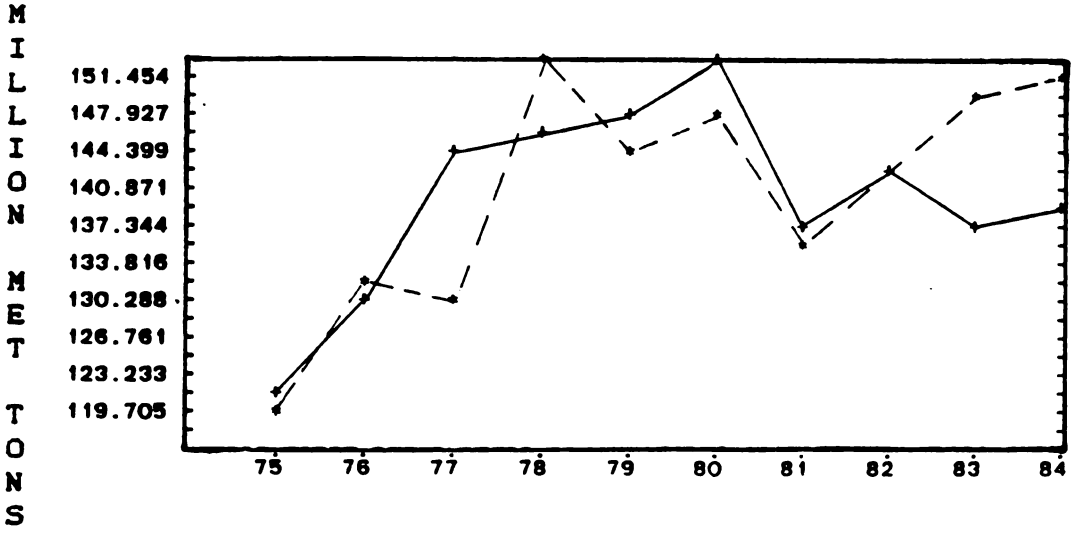
SMPL 1960 - 1982
23 Observations

Series	Mean	S.D.	Maximum	Minimum
WYSB	1.5256174	0.3299869	2.1430370	0.9008778
LOGT	4.2582812	0.0961149	4.4067190	4.0943450

	Covariance	Correlation
WYSB,WYSB	0.1041569	1.0000000
WYSB,LOGT	0.0248473	0.8190244
LOGT,LOGT	0.0088364	1.0000000



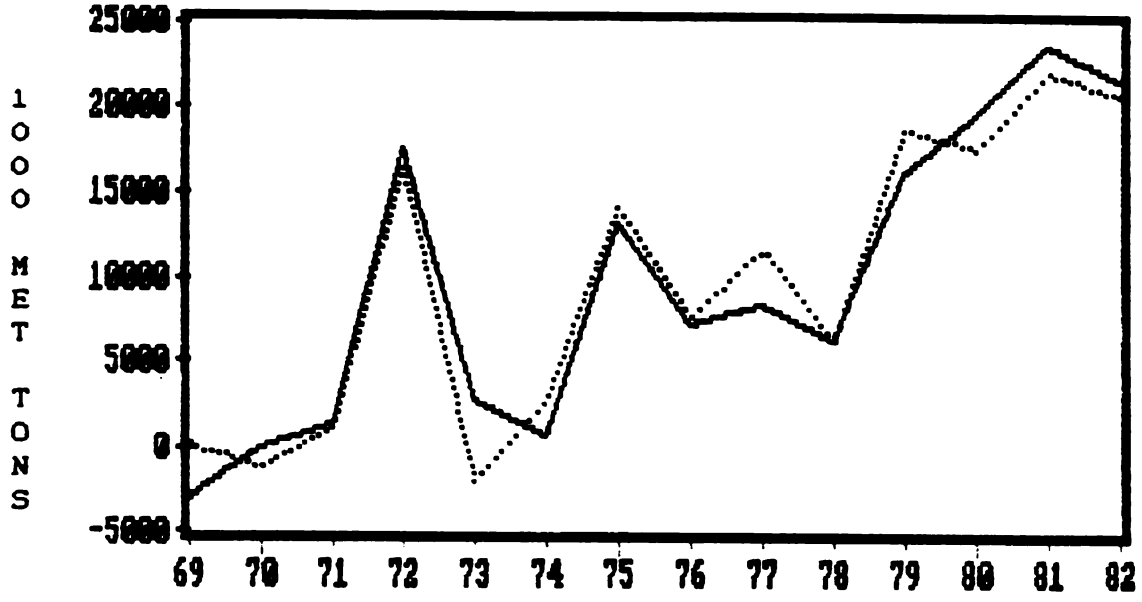
REGIONAL MODEL SIMULATION



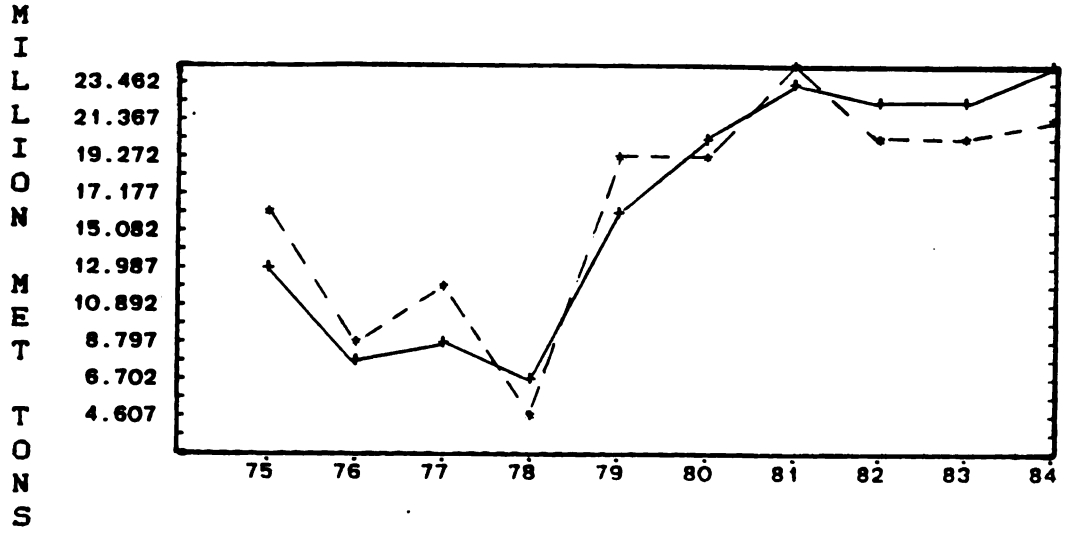
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.3.a & b. Total Wheat Consumption - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.4.a & b. Wheat Net Imports - Soviet Bloc

Soviet Bloc
Per Capita Wheat Net Imports (1000 MT)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0501044	0.0108528	4.6167061	0.000
PCRGDP	288.42114	91.687441	3.1456996	0.006
PCDWSU	-0.2352233	0.0362875	-6.4822152	0.000
PCDFSU	-0.0687625	0.0686525	-1.0016034	0.331
DV72	0.0316434	0.0079720	3.9693035	0.001
DV79ON	0.0153804	0.0065937	2.3325868	0.033

R-squared	0.901321	Mean of dependent var	0.019213
Adjusted R-squared	0.870484	S.D. of dependent var	0.021357
S.E. of regression	0.007686	Sum of squared resid	0.000945
Durbin-Watson stat	1.259821	F-statistic	29.22835
Log likelihood	79.38956	TPE	1/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
*	1961	-0.01389	-0.00074	0.01315
*	1962	-0.01206	0.00158	0.01363
*	1963	0.00883	0.03936	0.03053
*	1964	0.00609	0.01678	0.01069
*	1965	0.01412	0.03119	0.01707
*	1966	0.00718	0.00472	-0.00246
*	1967	-6.3D-05	-0.00252	-0.00245
*	1968	0.00019	-0.00967	-0.00986
*	1969	-0.00603	-0.00827	-0.00223
*	1970	-0.00215	-0.00015	0.00200
*	1971	-0.00280	0.00406	0.00686
*	1972	0.00000	0.04656	0.04656
*	1973	0.00969	0.00734	-0.00235
*	1974	-0.00737	0.00215	0.00952
*	1975	-0.00348	0.03379	0.03727
*	1976	-0.00058	0.01815	0.01874
*	1977	-0.00089	0.02125	0.02214
*	1978	0.00322	0.01603	0.01281
*	1979	-0.00351	0.04053	0.04405
*	1980	0.00265	0.04887	0.04622
*	1981	-2.6D-05	0.05836	0.05839
*	1982	0.00089	0.05332	0.05244

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPSB/CPISB/POPSB

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESSB(-1) + WPROSB)/POPSB

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(WESSB(-1) + WPROSB)/POPSB

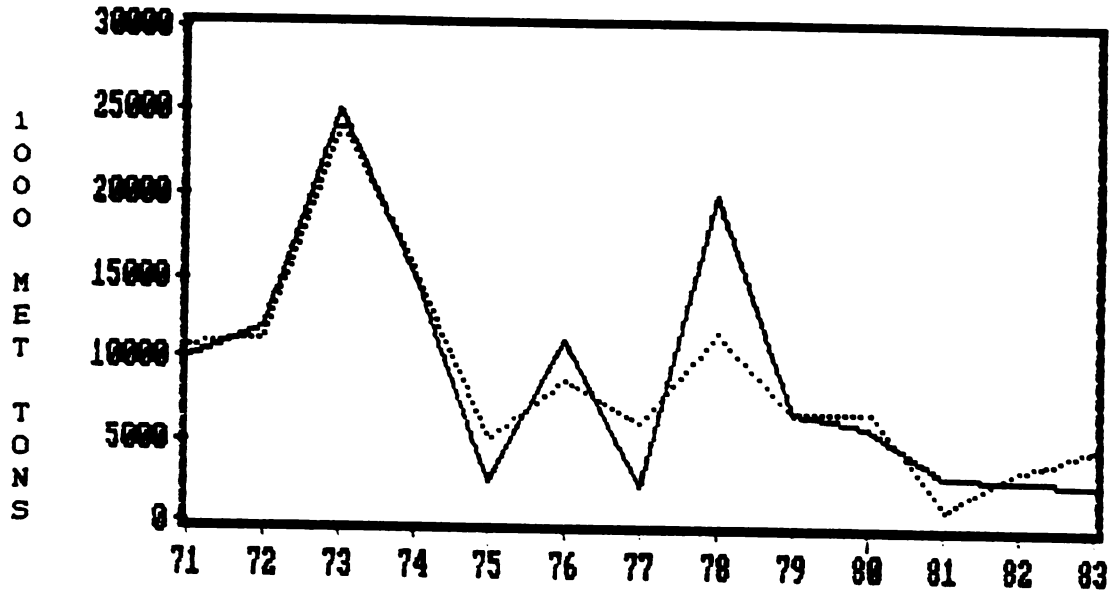
DV72 = 1 If(YEAR .EQ. 72)
0 Otherwise

DV79ON = 1 If(YEAR .GE. 79)
0 Otherwise

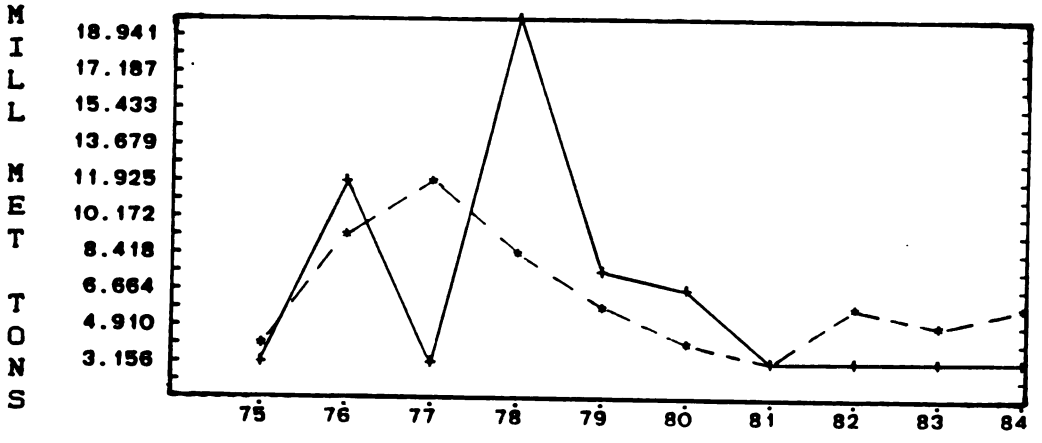
SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0192135	0.0213575	0.0583621	-0.0096725
PCRGDP	0.0002232	5.653D-05	0.0002990	0.0001370
PCDWSU	0.3347830	0.0564975	0.4174320	0.2017439
PCDFSU	0.3017205	0.0637715	0.4060738	0.2030206
DV72	0.0454545	0.2132007	1.0000000	0.0000000
DV790N	0.1818182	0.3947710	1.0000000	0.0000000

	Covariance	Correlation
PCWNI, PCWNI	0.0004354	1.0000000
PCWNI, PCRGDP	5.994D-07	0.5200961
PCWNI, PCDWSU	-0.0005210	-0.4523115
PCWNI, PCDFSU	0.0004243	0.3263350
PCWNI, DV72	0.0012429	0.2859570
PCWNI, DV790N	0.0056470	0.7016642
PCRGDP, PCRGDP	3.051D-09	1.0000000
PCRGDP, PCDWSU	1.152D-06	0.3779773
PCRGDP, PCDFSU	3.109D-06	0.9033815
PCRGDP, DV72	1.507D-07	0.0131021
PCRGDP, DV790N	1.298D-05	0.6091465
PCDWSU, PCDWSU	0.0030469	1.0000000
PCDWSU, PCDFSU	0.0015339	0.4460099
PCDWSU, DV72	0.0001277	0.0111102
PCDWSU, DV790N	-0.0022896	-0.1075438
PCDFSU, PCDFSU	0.0038819	1.0000000
PCDFSU, DV72	0.0002382	0.0183512
PCDFSU, DV790N	0.0096101	0.3999077
DV72, DV72	0.0433884	1.0000000
DV72, DV790N	-0.0082645	-0.1028689
DV790N, DV790N	0.1487603	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.5.a & b. Wheat Ending Stocks - Soviet Bloc

Soviet Bloc
Wheat Ending Stocks Per Capita (1000 MT)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is PCWES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0934793	0.0234276	-3.9901369	0.001
PCDWSU	0.2361464	0.0575377	4.1042057	0.001
WPSB	0.0391789	0.0106200	3.6891813	0.002
DV6669	0.0550945	0.0103530	5.3215944	0.000
WSUR(-1)	-0.0619633	0.0417843	-1.4829329	0.156

R-squared	0.846698	Mean of dependent var	0.033399
Adjusted R-squared	0.810627	S.D. of dependent var	0.029520
S.E. of regression	0.012846	Sum of squared resid	0.002805
Durbin-Watson stat	1.739212	F-statistic	23.47310
Log likelihood	67.42297	TPE	4/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.01515	0.00428	0.01943
	1962	-0.01567	0.00678	0.02245
	1963	0.00970	0.01592	0.00622
	1964	0.02208	0.04287	0.02079
	1965	0.01054	0.01742	0.00688
	1966	0.00012	0.09453	0.09441
	1967	0.01532	0.09093	0.07561
	1968	0.01012	0.09542	0.08530
	1969	-0.02556	0.04410	0.06966
	1970	-0.00559	0.02081	0.02640
	1971	0.00093	0.02696	0.02603
	1972	0.00347	0.03154	0.02808
	1973	-0.00269	0.06595	0.06863
	1974	-0.00288	0.03962	0.04250
	1975	-0.00904	0.00658	0.01562
	1976	0.00492	0.02896	0.02404
	1977	-0.01349	0.00583	0.01932
	1978	0.01552	0.05026	0.03474
	1979	0.00053	0.01719	0.01666
	1980	-0.00629	0.01486	0.02115
	1981	0.00425	0.00713	0.00288
	1982	-0.00114	0.00686	0.00800

INDEPENDENT VARIABLES

PCDWSU = Domestic Wheat Supply Per Capita (1000 MT)
(WESSB(-1) + WPROSB)/POPSB

PCRGDP = Real Income Per Capita
GDPSB/CPILSB/POPSB

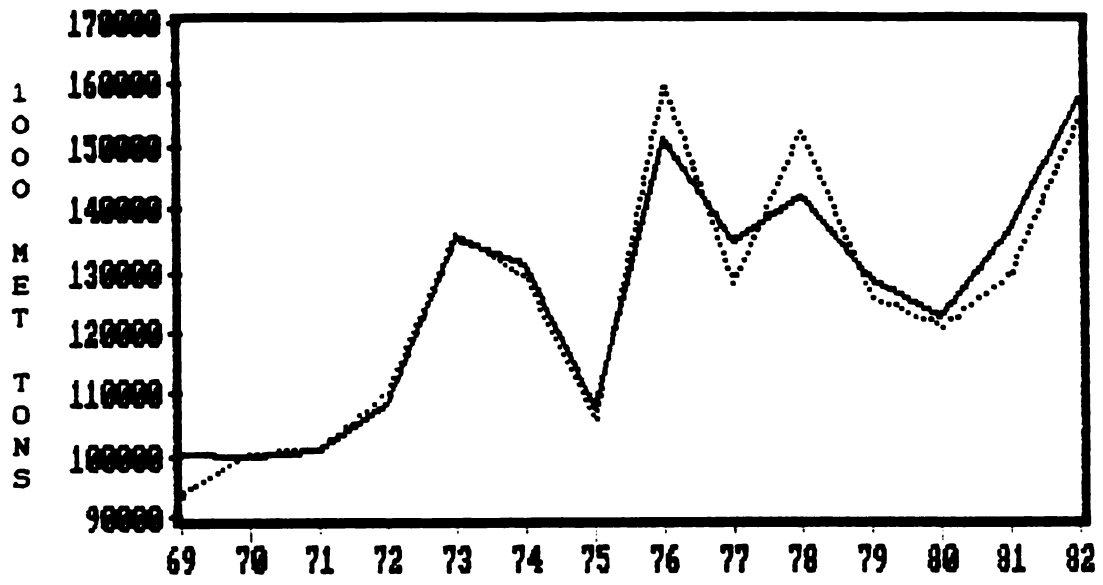
WSUR = Wheat Stock/Utilization Ratio
(WESSB/WCONSB)

DV6669 = 1 If(YEAR .GE. 66 .AND. YEAR .LE. 69)
0 Otherwise

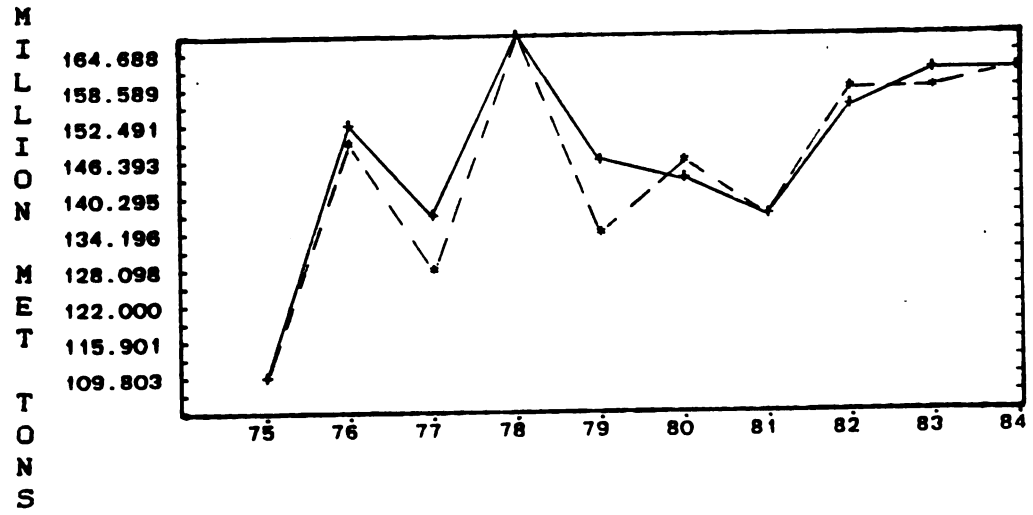
SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWES	0.0333993	0.0295201	0.0954187	0.0042819
PCDWSU	0.3348147	0.0564806	0.4174320	0.2017439
WPSB	1.1370477	0.2692124	1.8344060	0.7787796
DV6669	0.1818182	0.3947710	1.0000000	0.0000000
WSUR(-1)	0.1089705	0.0997223	0.3451586	0.0158264

	Covariance	Correlation
PCWES, PCWES	0.0008318	1.0000000
PCWES, PCDWSU	0.0010048	0.6313355
PCWES, WPSB	0.0021220	0.2797338
PCWES, DV6669	0.0086991	0.7820174
PCWES, WSUR(-1)	0.0015394	0.5478318
PCDWSU, PCDWSU	0.0030451	1.0000000
PCDWSU, WPSB	-0.0019082	-0.1314735
PCDWSU, DV6669	0.0093052	0.4372043
PCDWSU, WSUR(-1)	0.0024562	0.4568606
WPSB, WPSB	0.0691810	1.0000000
WPSB, DV6669	-0.0006588	-0.0064941
WPSB, WSUR(-1)	0.0016377	0.0639085
DV6669, DV6669	0.1487603	1.0000000
DV6669, WSUR(-1)	0.0269245	0.7164970
WSUR(-1), WSUR(-1)	0.0094925	1.0000000



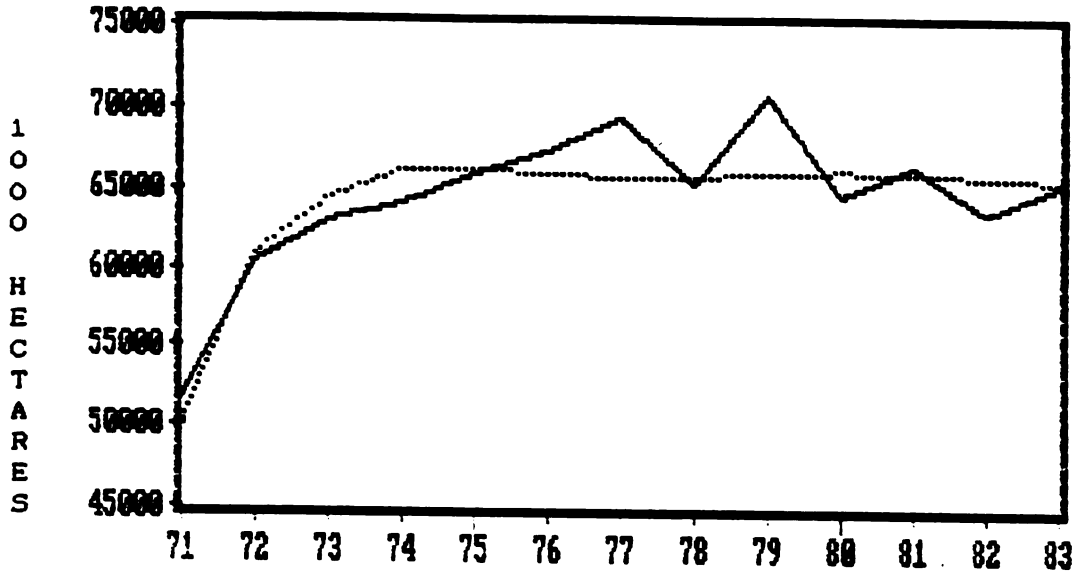
REGIONAL MODEL SIMULATION



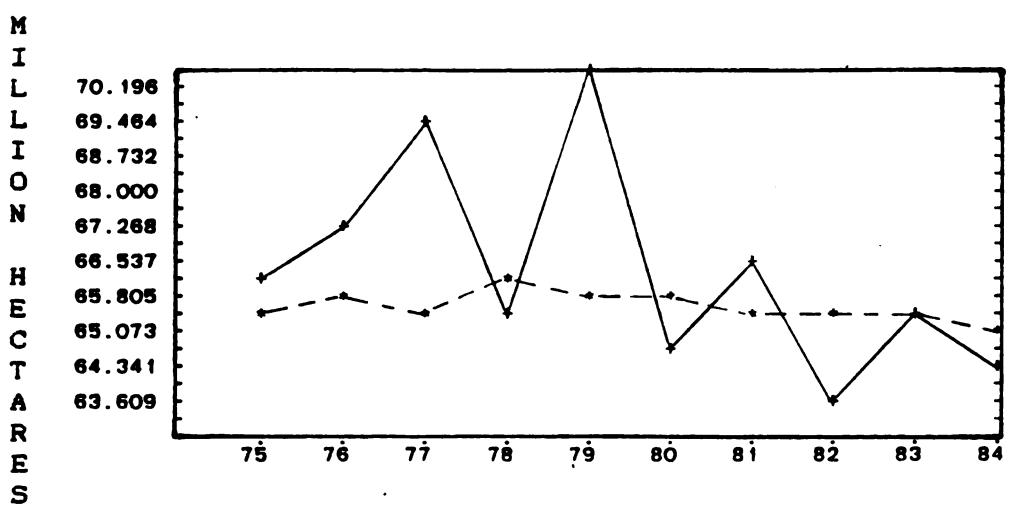
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.6.a & b. Coarse Grain Production - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.7.a & b. Coarse Grain Harvested Area - Soviet Bloc

Soviet Bloc
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is FHASB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	48491.753	9108.6909	5.3236797	0.000
FHASB(-1)	0.1839971	0.1574420	1.1686659	0.259
FNISB(-1)	0.4909400	0.1265433	3.8796192	0.001
DV6071	-7329.0652	2130.4902	-3.4400840	0.003
DV80	-10125.140	2838.3447	-3.5672692	0.002

R-squared	0.946585	Mean of dependent var	59041.68
Adjusted R-squared	0.934017	S.D. of dependent var	9752.057
S.E. of regression	2505.033	Sum of squared resid	1.07D+08
Durbin-Watson stat	2.656496	F-statistic	75.31552
Log likelihood	-200.5538	TPE	11/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	1572.95	51405.0	49832.1
	1962	-502.903	49368.0	49870.9
	1963	2100.36	52299.0	50198.6
	1964	191.690	50882.0	50690.3
	1965	-3485.90	47306.0	50791.9
	1966	-1871.96	47691.0	49563.0
	1967	-216.306	49634.0	49850.3
	1968	-1209.90	49183.0	50392.9
	1969	3608.86	54042.0	50433.1
	1970	-154.304	51085.0	51239.3
	1971	-32.5887	51537.0	51569.6
	1972	-1376.70	60267.0	61643.7
	1973	-994.627	62817.0	63811.6
	1974	344.595	64106.0	63761.4
	1975	2346.14	65869.0	63522.9
	1976	-3624.23	67187.0	70811.2
	1977	3142.32	69241.0	66098.7
	1978	-4665.42	65100.0	69765.4
	1979	856.473	70562.0	69705.5
	1980	1.1D-11	64372.0	64372.0
	1981	3907.31	77564.0	73656.7
	1982	64.1241	77400.0	77335.9

INDEPENDENT VARIABLES

FHASB = Wheat Harvested Area (1000 HA)

FNISB = Coarse Grain Net Imports (1000 MT)

DV6071 = 1 If(YEAR .GE. 60 .AND. YEAR .LE. 71)
0 Otherwise

DV80 = 1 If(YEAR .GE. 80)
0 Otherwise

SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
FHASB	59041.682	9752.0572	77564.000	47306.000
FHASB(-1)	57782.455	9030.5457	77564.000	47306.000
FNISB(-1)	8235.0000	10396.873	29683.000	-1528.0000
DV6071	0.5000000	0.5117663	1.0000000	0.0000000
DV80	0.0454545	0.2132007	1.0000000	0.0000000

	Covariance	Correlation
FHASB,FHASB	90779774.	1.0000000
FHASB,FHASB(-1)	75560750.	0.8988545
FHASB,FNISB(-1)	87228445.	0.9012858
FHASB,DV6071	-4319.3864	-0.9066872
FHASB,DV80	242.28719	0.1220812
FHASB(-1),FHASB(-1)	77843904.	1.0000000
FHASB(-1),FNISB(-1)	80383984.	0.8969251
FHASB(-1),DV6071	-3773.4091	-0.8553652
FHASB(-1),DV80	580.88843	0.3160774
FNISB(-1),FNISB(-1)	103181555	1.0000000
FNISB(-1),DV6071	-4120.5455	-0.8113041
FNISB(-1),DV80	831.36364	0.3929190
DV6071,DV6071	0.2500000	1.0000000
DV6071,DV80	-0.0227273	-0.2182179
DV80,DV80	0.0433884	1.0000000

Soviet Bloc
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1982
23 Observations
LS // Dependent Variable is FYSB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.7860002	0.5019072	-1.5660268	0.133
YEAR	0.0501772	0.0130955	3.8316429	0.001
FHASB	-1.681D-05	9.133D-06	-1.8408459	0.081

R-squared	0.593493	Mean of dependent var	1.790788
Adjusted R-squared	0.552843	S.D. of dependent var	0.265677
S.E. of regression	0.177658	Sum of squared resid	0.631247
Durbin-Watson stat	2.082701	F-statistic	14.59984
Log likelihood	8.713266	TPE	4/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * :	1960	0.06665	1.45576	1.38911
: * :	1961	-0.03423	1.37635	1.41058
: * :	1962	-0.02435	1.47065	1.49500
* : :	1963	-0.21069	1.28521	1.49590
: * :	1964	0.07023	1.64013	1.56990
* : :	1965	-0.26004	1.42016	1.68020
: * :	1966	0.06178	1.78568	1.72390
: * :	1967	-0.05322	1.68820	1.74141
: * :	1968	-0.02992	1.76925	1.79917
: : *	1969	0.09086	1.85852	1.76766
: : *	1970	0.08893	1.95648	1.86755
: * :	1971	0.05068	1.96081	1.91013
: * :	1972	-0.01278	1.80075	1.81353
: : *	1973	0.32665	2.14749	1.82084
: : *	1974	0.19177	2.04112	1.84935
* : :	1975	-0.23839	1.63150	1.86988
: : *	1976	0.35282	2.25072	1.89790
: * :	1977	0.02962	1.94317	1.91355
: : * :	1978	0.14687	2.18021	2.03334
:* : :	1979	-0.16765	1.82404	1.99169
* : :	1980	-0.24517	1.90076	2.14594
* : :	1981	-0.21449	1.75984	1.97433
: * :	1982	0.01408	2.04134	2.02726

INDEPENDENT VARIABLES

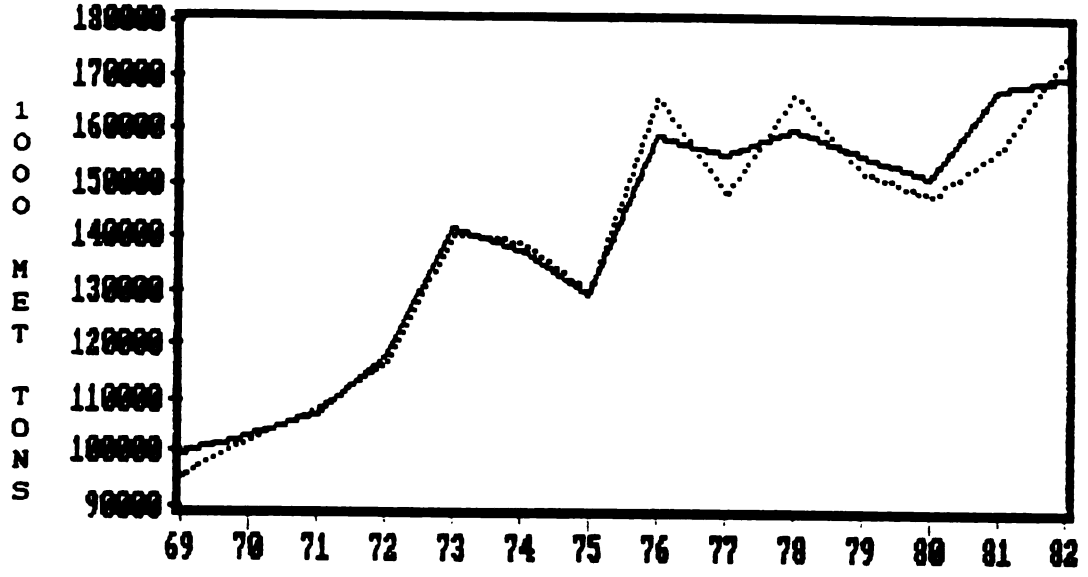
YEAR = 1960=60, 1961=61,...

FHASB = Coarse Grain Harvested Area (1000 HA)

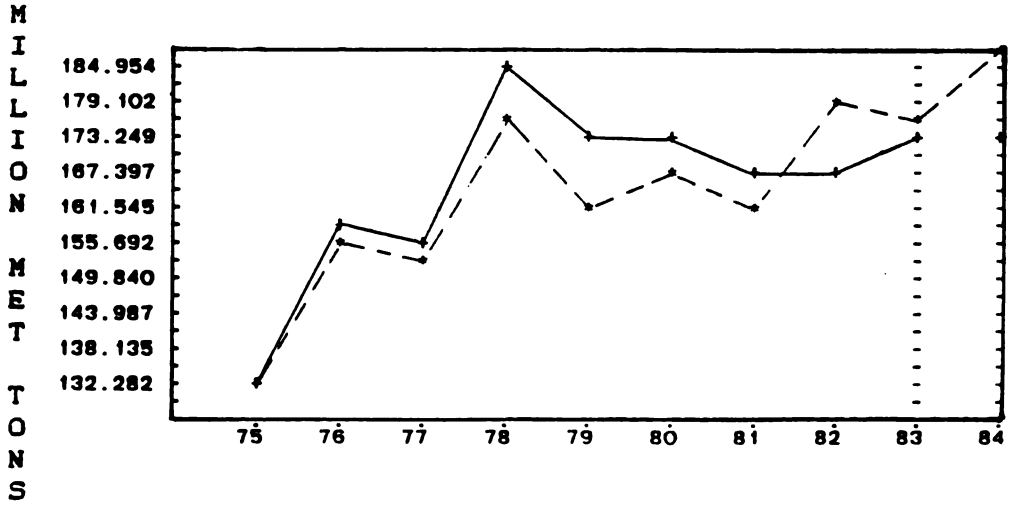
SMPL 1960 - 1982
23 Observations

Series	Mean	S.D.	Maximum	Minimum
FYSB	1.7907884	0.2656773	2.2507180	1.2852060
YEAR	71.000000	6.7823300	82.000000	60.000000
FHASB	58635.391	9725.0413	77564.000	47306.000

	Covariance	Correlation
FYSB, FYSB	0.0675156	1.0000000
FYSB, YEAR	1.2483871	0.7243042
FYSB, FHASB	1342.5053	0.5432193
YEAR, YEAR	44.000000	1.0000000
YEAR, FHASB	57066.087	0.9045090
FHASB, FHASB	90464411.	1.0000000



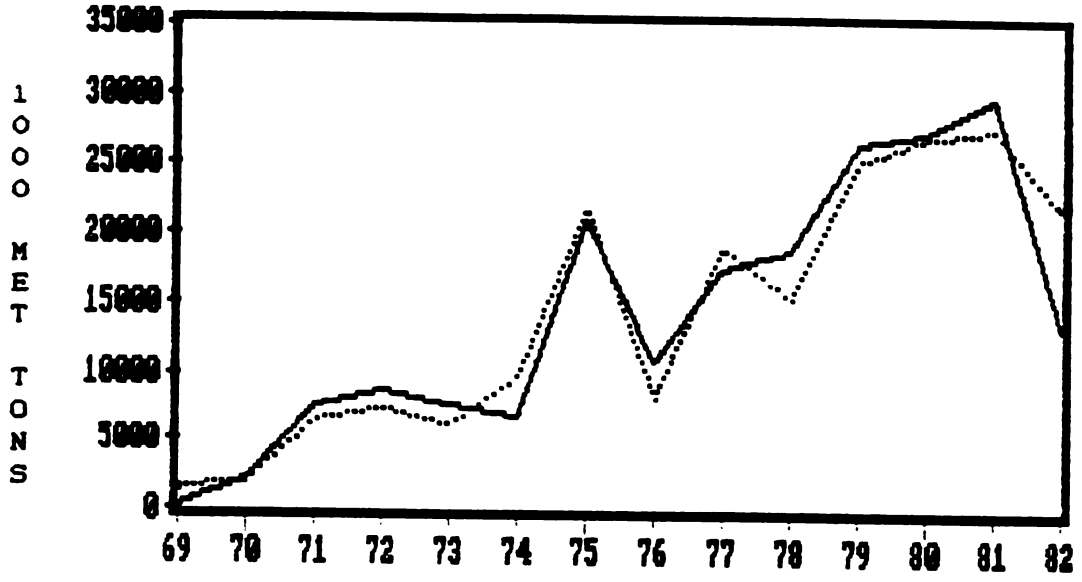
REGIONAL MODEL SIMULATION



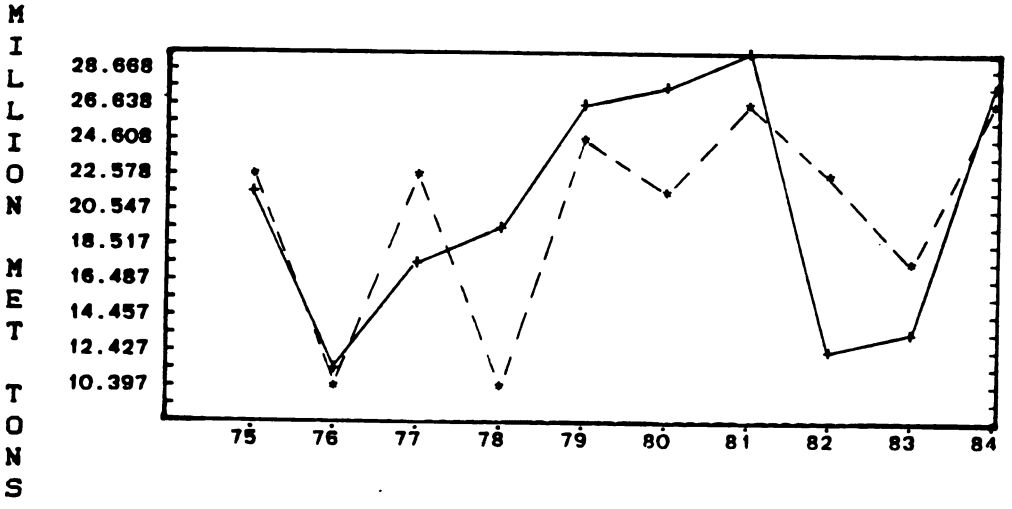
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.8.a & b. Total Coarse Grain Consumption - Soviet Bloc



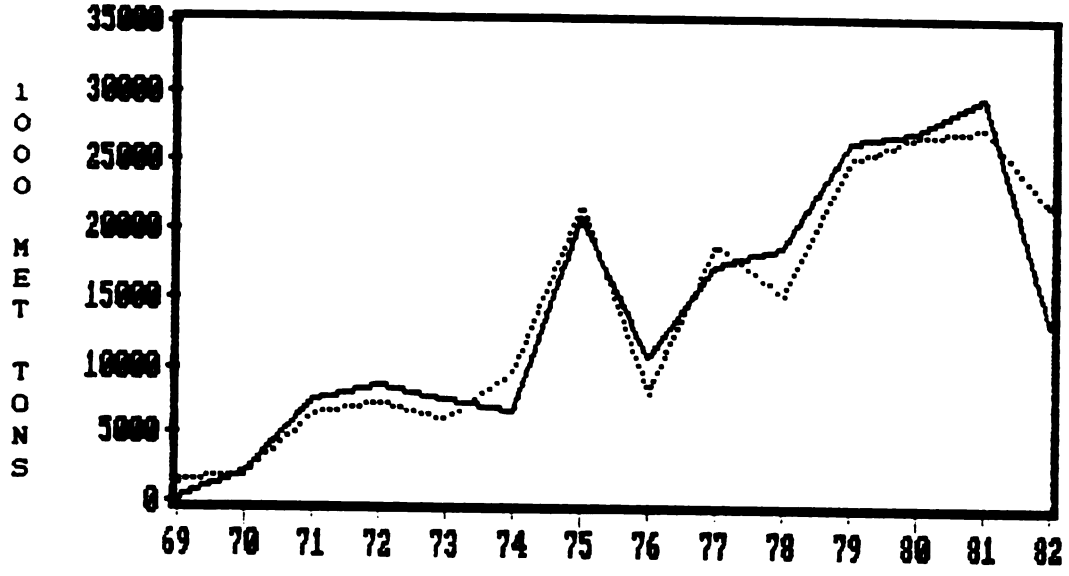
REGIONAL MODEL SIMULATION



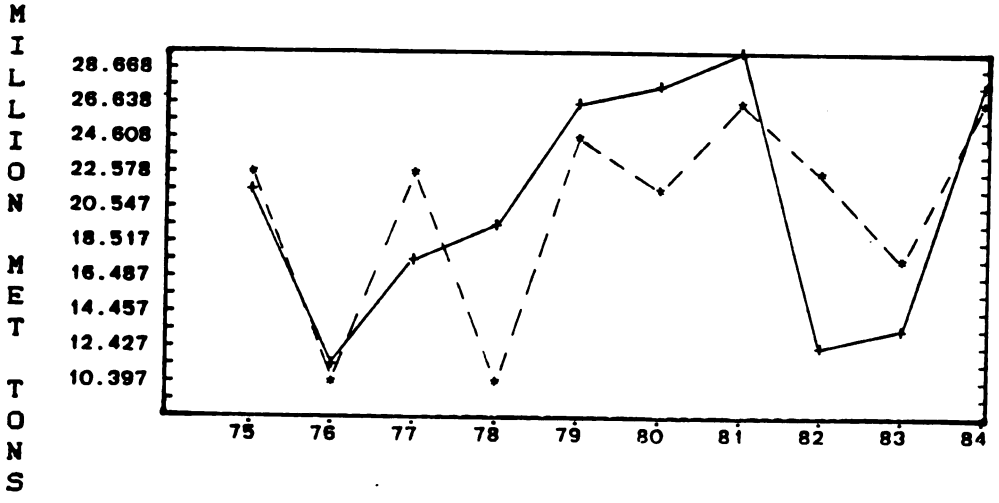
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.9.a & b. Coarse Grain Net Imports - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.9.a & b. Coarse Grain Net Imports - Soviet Bloc

Soviet Bloc
Coarse Grain Net Imports Per Capita (1000 MT)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0265384	0.0211524	-1.2546299	0.228
PCRGDP	692.37197	101.32088	6.8334582	0.000
PCDWSU	-0.0895339	0.0338289	-2.6466715	0.018
PCDFSU	-0.2582038	0.0727024	-3.5515173	0.003
FPSB	-0.0298775	0.0231776	-1.2890694	0.216
WPSB	0.0270429	0.0140541	1.9242030	0.072

R-squared	0.930733	Mean of dependent var	0.022573
Adjusted R-squared	0.909087	S.D. of dependent var	0.025753
S.E. of regression	0.007765	Sum of squared resid	0.000965
Durbin-Watson stat	2.007551	F-statistic	42.99797
Log likelihood	79.16483	TPE	8/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	0.00118	-0.00455	-0.00573
	1962	0.00571	-0.00029	-0.00600
	1963	-0.00699	-0.00056	0.00642
	1964	0.01049	0.00156	-0.00893
	1965	-0.00365	-0.00176	0.00189
	1966	0.00070	-0.00050	-0.00120
	1967	-0.00915	0.00055	0.00971
	1968	-0.00609	0.00124	0.00733
	1969	0.00204	0.00074	-0.00130
	1970	-0.00091	0.00555	0.00647
	1971	0.00158	0.02007	0.01849
	1972	0.00305	0.02296	0.01991
	1973	0.00289	0.02001	0.01712
	1974	-0.00761	0.01729	0.02490
	1975	-0.00160	0.05406	0.05566
	1976	0.00226	0.02756	0.02530
	1977	0.00446	0.04446	0.03999
	1978	0.00452	0.04771	0.04318
	1979	0.00651	0.06667	0.06016
	1980	0.00166	0.06784	0.06618
	1981	0.00860	0.07362	0.06502
	1982	-0.01967	0.03237	0.05204

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPSB/CPISB/POPSB

PCDWSU = Domestic Supply of Wheat Per Capita (1000 MT)
(WESSB(-1) + WPROSB)/POPSB

PCDFSU = Domestic Supply of Coarse Grain Per Capita
(1000 MT)
(FESSB(-1) + FPROSB)/POPSB

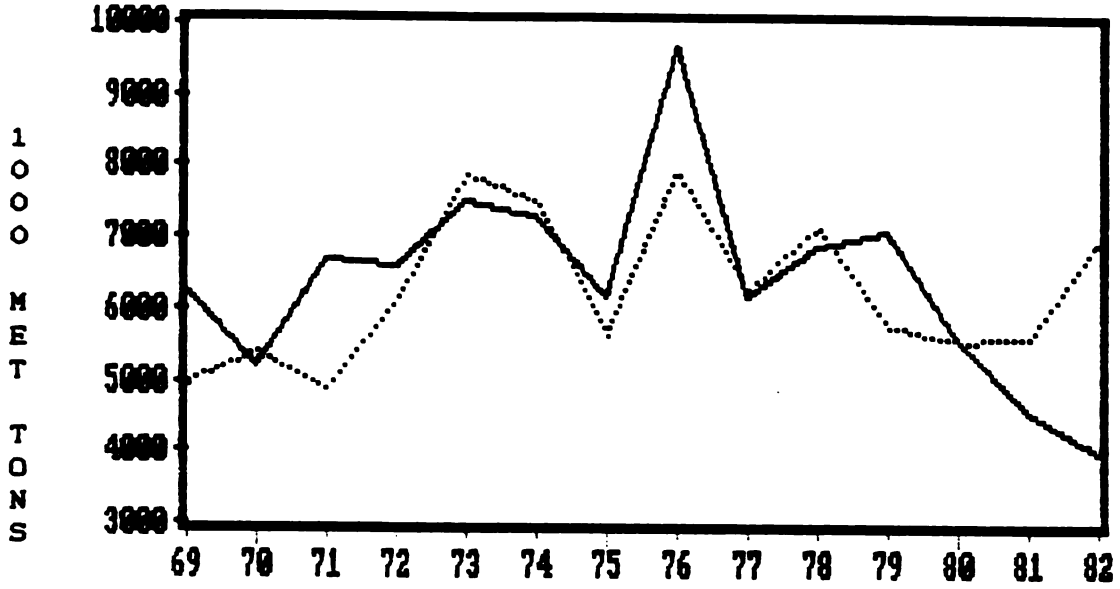
FPSB = Real Soviet Bloc Coarse Grain Price ($/MT)
FP*XRSB/CPISB

WPSB = Real Soviet Bloc Wheat Price ($/MT)
WP*XRSB/CPISB

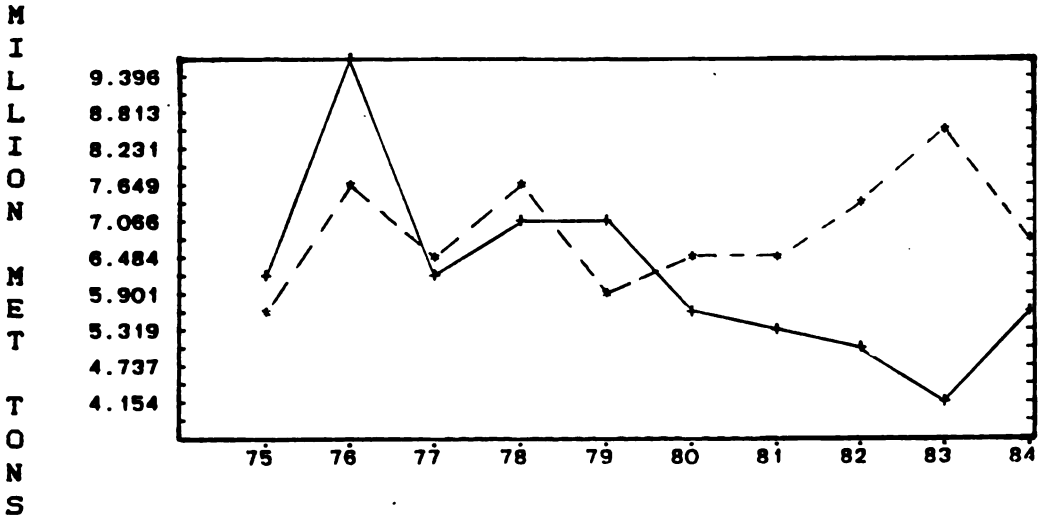
SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0225731	0.0257534	0.0736204	-0.0045499
PCRGDP	0.0002232	5.653D-05	0.0002990	0.0001370
PCDWSU	0.3347830	0.0564975	0.4174320	0.2017439
PCDFSU	0.3017205	0.0637715	0.4060738	0.2030206
FPSB	0.9466009	0.2074780	1.2681330	0.5693728
WPSB	1.1370477	0.2692124	1.8344060	0.7787796

	Covariance	Correlation
PCFNI, PCFNI	0.0006331	1.0000000
PCFNI, PCRGDP	1.229D-06	0.8841002
PCFNI, PCDWSU	0.0001280	0.0921546
PCFNI, PCDFSU	0.0010420	0.6646509
PCFNI, FPSB	-0.0037432	-0.7339055
PCFNI, WPSB	-0.0034318	-0.5185616
PCRGDP, PCRGDP	3.051D-09	1.0000000
PCRGDP, PCDWSU	1.152D-06	0.3779773
PCRGDP, PCDFSU	3.109D-06	0.9033815
PCRGDP, FPSB	-8.070D-06	-0.7208044
PCRGDP, WPSB	-8.091D-06	-0.5569620
PCDWSU, PCDWSU	0.0030469	1.0000000
PCDWSU, PCDFSU	0.0015339	0.4460099
PCDWSU, FPSB	-0.0016823	-0.1503511
PCDWSU, WPSB	-0.0018968	-0.1306507
PCDFSU, PCDFSU	0.0038819	1.0000000
PCDFSU, FPSB	-0.0063725	-0.5045652
PCDFSU, WPSB	-0.0059629	-0.3638630
FPSB, FPSB	0.0410904	1.0000000
FPSB, WPSB	0.0471892	0.8850725
WPSB, WPSB	0.0691810	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.10.a & b. Coarse Grain Ending Stocks - Soviet Bloc

Soviet Bloc
Per Capita Coarse Grain Ending Stocks (1000 MT)

SMPL 1961 - 1982
22 Observations
LS // Dependent Variable is PCFES

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0069608	0.0066437	-1.0477240	0.309
PCDFSU	0.0499222	0.0129056	3.8682538	0.001
FPSB	0.0070929	0.0039891	1.7780805	0.092
DV64	0.0176039	0.0034082	5.1651893	0.000

R-squared	0.685324	Mean of dependent var	0.015616
Adjusted R-squared	0.632879	S.D. of dependent var	0.005352
S.E. of regression	0.003243	Sum of squared resid	0.000189
Durbin-Watson stat	1.040487	F-statistic	13.06726
Log likelihood	97.07823	TPE	7/22

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00374	0.00780	0.01154
	1962	-0.00412	0.00809	0.01221
	1963	-0.00067	0.01059	0.01126
	1964	0.00000	0.03121	0.03121
	1965	0.00022	0.01231	0.01209
	1966	-0.00035	0.01304	0.01339
	1967	0.00203	0.01373	0.01170
	1968	0.00220	0.01449	0.01229
	1969	0.00264	0.01705	0.01441
	1970	-0.00054	0.01411	0.01465
	1971	0.00489	0.01791	0.01303
	1972	0.00125	0.01747	0.01622
	1973	-0.00097	0.01975	0.02072
	1974	-0.00072	0.01909	0.01981
	1975	0.00124	0.01604	0.01480
	1976	0.00567	0.02499	0.01932
	1977	-0.00132	0.01575	0.01707
	1978	0.00065	0.01738	0.01673
	1979	0.00296	0.01774	0.01478
	1980	-0.00032	0.01385	0.01417
	1981	-0.00333	0.01134	0.01466
	1982	-0.00766	0.00982	0.01749

INDEPENDENT VARIABLES

PCDFSU = Domestic Coarse Grain Supply Per Capita (1000 MT)
(FESSB(-1) + FPROSB)/POPSB

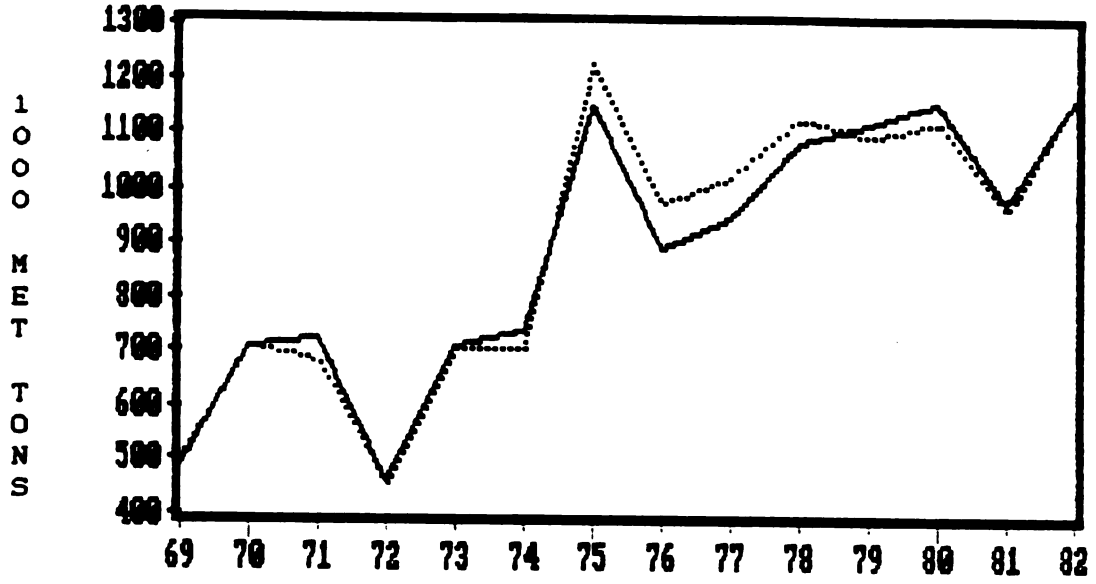
FPSB = Real Soviet Bloc Coarse Grain Price ($/MT)
FP*XRSB/CPISB

DV64 = 1 If(YEAR .EQ. 64)
0 Otherwise

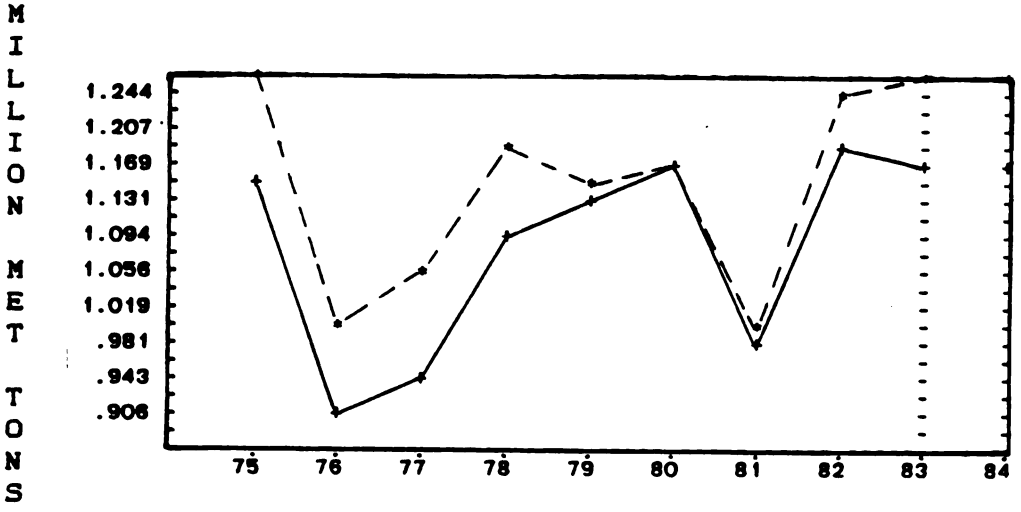
SMPL 1961 - 1982
22 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFES	0.0156161	0.0053524	0.0312111	0.0078016
PCDFSU	0.3017205	0.0637715	0.4060738	0.2030206
FPSB	0.9466009	0.2074780	1.2681330	0.5693728
DV64	0.0454545	0.2132007	1.0000000	0.0000000

	Covariance	Correlation
PCFES, PCFES	2.735D-05	1.0000000
PCFES, PCDFSU	0.0001071	0.3288480
PCFES, FPSB	0.0001287	0.1214352
PCFES, DV64	0.0007089	0.6507774
PCDFSU, PCDFSU	0.0038819	1.0000000
PCDFSU, FPSB	-0.0063725	-0.5045652
PCDFSU, DV64	-0.0023548	-0.1814420
FPSB, FPSB	0.0410904	1.0000000
FPSB, DV64	0.0088280	0.2090754
DV64, DV64	0.0433884	1.0000000



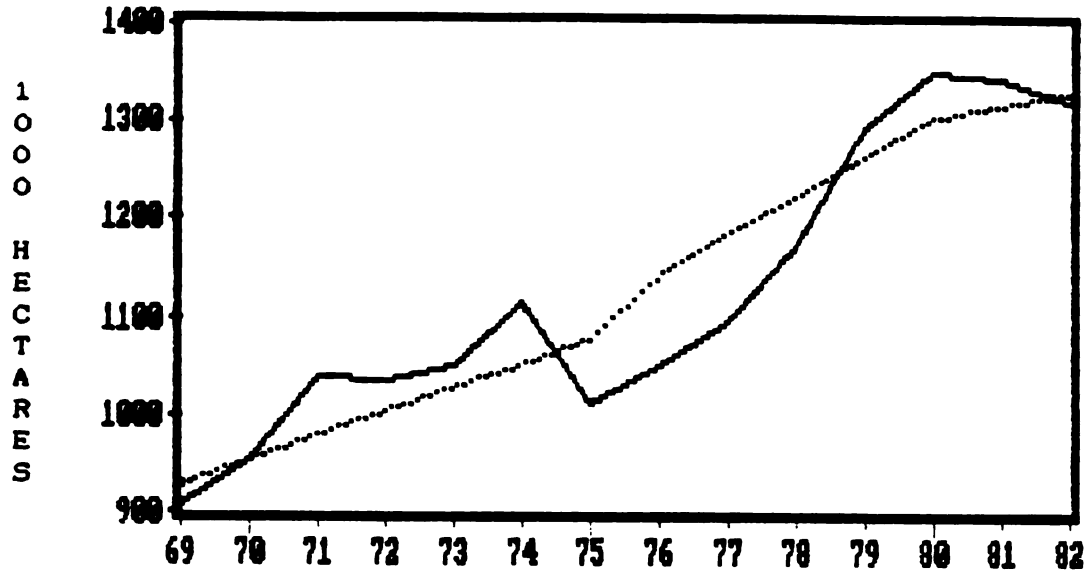
REGIONAL MODEL SIMULATION



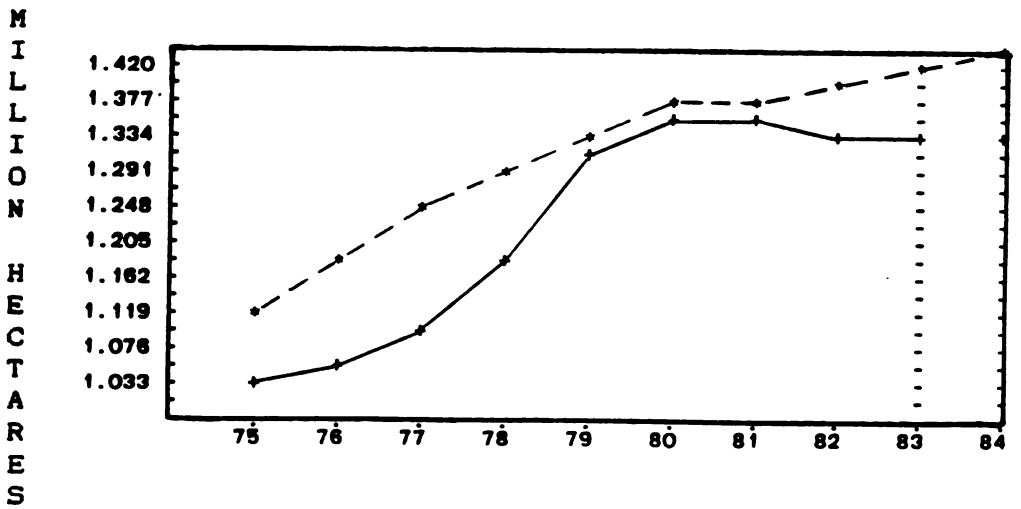
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.11.a & b. Soybean Production - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.12.a & b. Soybean Harvested Area - Soviet Bloc

Soviet Bloc
Soybean Harvested Area (1000 Hectares)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is SHASB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-284.35111	331.13452	-0.8587178	0.404
SHASB(-1)	0.5854709	0.1855723	3.1549472	0.007
YEAR	9.7910777	6.6463184	1.4731581	0.161
SNISB(-1)	0.0250461	0.0232494	1.0772800	0.298

R-squared	0.946522	Mean of dependent var	1086.895
Adjusted R-squared	0.935826	S.D. of dependent var	173.7095
S.E. of regression	44.00496	Sum of squared resid	29046.54
Durbin-Watson stat	1.726123	F-statistic	88.49646
Log likelihood	-96.61588	TPE	6/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-14.9857	867.000	881.986
	1966	5.58312	877.000	871.417
	1967	18.1860	906.000	887.814
	1968	-6.48175	907.000	913.482
	1969	-18.3898	909.000	927.390
	1970	14.7753	952.000	937.225
	1971	63.7820	1037.00	973.218
	1972	-6.30925	1032.00	1038.31
	1973	-6.71737	1049.00	1055.72
	1974	53.4178	1113.00	1059.58
*	1975	-102.280	1011.00	1113.28
*	1976	-57.8046	1047.00	1104.80
	1977	-30.5503	1093.00	1123.55
	1978	14.2566	1172.00	1157.74
	1979	53.8435	1292.00	1238.16
	1980	34.8997	1351.00	1316.10
	1981	-7.61421	1342.00	1349.61
	1982	-33.0609	1321.00	1354.06
	1983	25.4503	1373.00	1347.55

INDEPENDENT VARIABLES

SHASB = Soybean Harvested Area (1000 HA)

SNISB = Soybean Net Imports (1000 MT)

YEAR = 1960=60, 1961=61,...

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SHASB	1086.8947	173.70949	1373.0000	867.00000
SHASB(-1)	1061.7895	164.27605	1351.0000	867.00000
YEAR	74.000000	5.6273143	83.000000	65.000000
SNISB(-1)	1000.5263	921.93229	2509.0000	64.000000

	Covariance	Correlation
SHASB, SHASB	28586.831	1.0000000
SHASB, SHASB(-1)	25906.557	0.9582812
SHASB, YEAR	883.00000	0.9534920
SHASB, SNISB(-1)	129561.53	0.8539542
SHASB(-1), SHASB(-1)	25566.271	1.0000000
SHASB(-1), YEAR	822.84211	0.9395549
SHASB(-1), SNISB(-1)	115057.43	0.8019042
YEAR, YEAR	30.000000	1.0000000
YEAR, SNISB(-1)	4292.7895	0.8734147
SNISB(-1), SNISB(-1)	805224.46	1.0000000

Soviet Bloc
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is SYSB

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-2.1948039	0.5740692	-3.8232394	0.001
YEAR	0.0599722	0.0141509	4.2380370	0.001
SHASB	-0.0013798	0.0004801	-2.8740967	0.011

R-squared	0.645950	Mean of dependent var	0.726612
Adjusted R-squared	0.604297	S.D. of dependent var	0.183895
S.E. of regression	0.115679	Sum of squared resid	0.227488
Durbin-Watson stat	2.031827	F-statistic	15.50790
Log likelihood	16.38512	TPE	6/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-0.06670	0.34040	0.40710
	1965	-0.00651	0.50058	0.50709
	1966	0.15027	0.70353	0.55327
	1967	0.08130	0.65453	0.57322
	1968	0.00545	0.63727	0.63182
	1969	-0.14997	0.53905	0.68903
	1970	0.05298	0.74265	0.68967
	1971	0.06195	0.69431	0.63236
	1972	-0.25058	0.44864	0.69923
	1973	-0.05700	0.67874	0.73574
	1974	-0.04254	0.66487	0.70741
	1975	0.22640	1.13452	0.90812
	1976	-0.07124	0.84718	0.91842
	1977	-0.05490	0.86002	0.91492
	1978	0.05561	0.92150	0.86589
	1979	0.10195	0.86223	0.76028
	1980	0.11756	0.85640	0.73884
	1981	-0.08769	0.72355	0.81124
	1982	-0.02206	0.87812	0.90018
	1983	-0.04427	0.84414	0.88841

INDEPENDENT VARIABLES

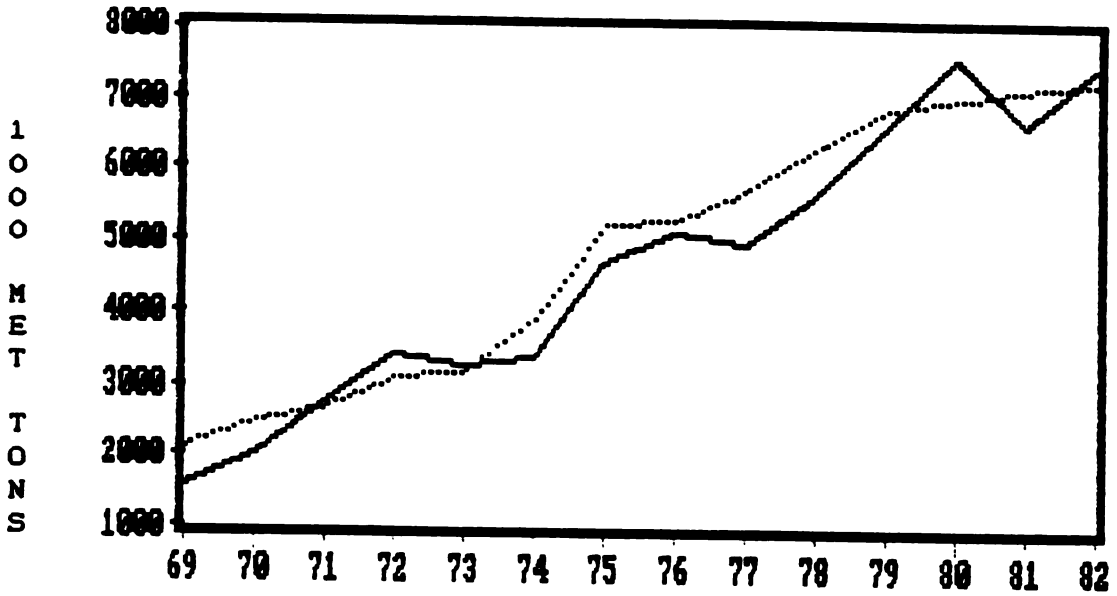
YEAR = 1960=60, 1961=61,...

SHASB = Soybean Harvested Area (1000 HA)

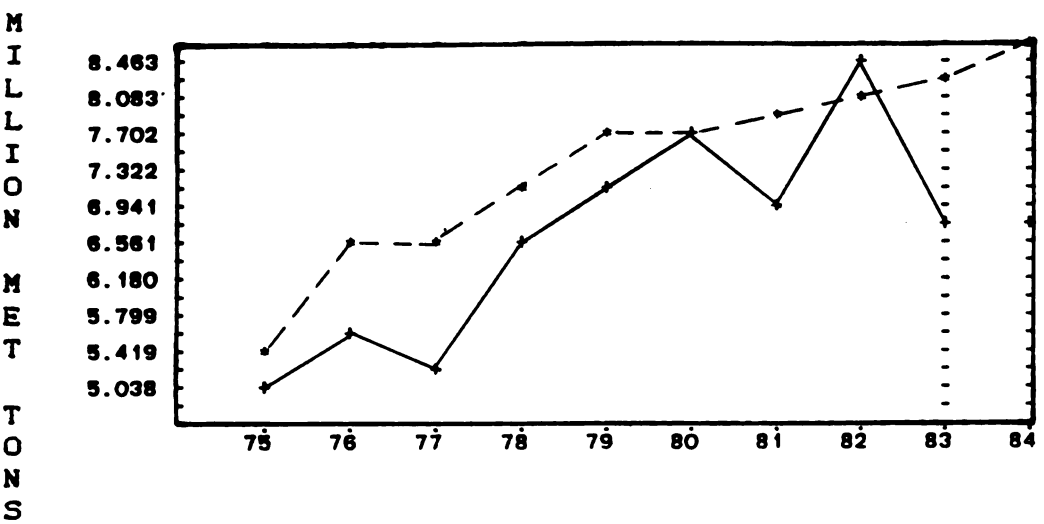
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SYSB	0.7266116	0.1838951	1.1345200	0.3404018
YEAR	73.500000	5.9160798	83.000000	64.000000
SHASB	1077.3500	174.38140	1373.0000	867.00000

	Covariance	Correlation
SYSB, SYSB	0.0321265	1.0000000
SYSB, YEAR	0.7115045	0.6884142
SYSB, SHASB	15.885014	0.5214271
YEAR, YEAR	33.250000	1.0000000
YEAR, SHASB	929.52500	0.9484257
SHASB, SHASB	28888.428	1.0000000



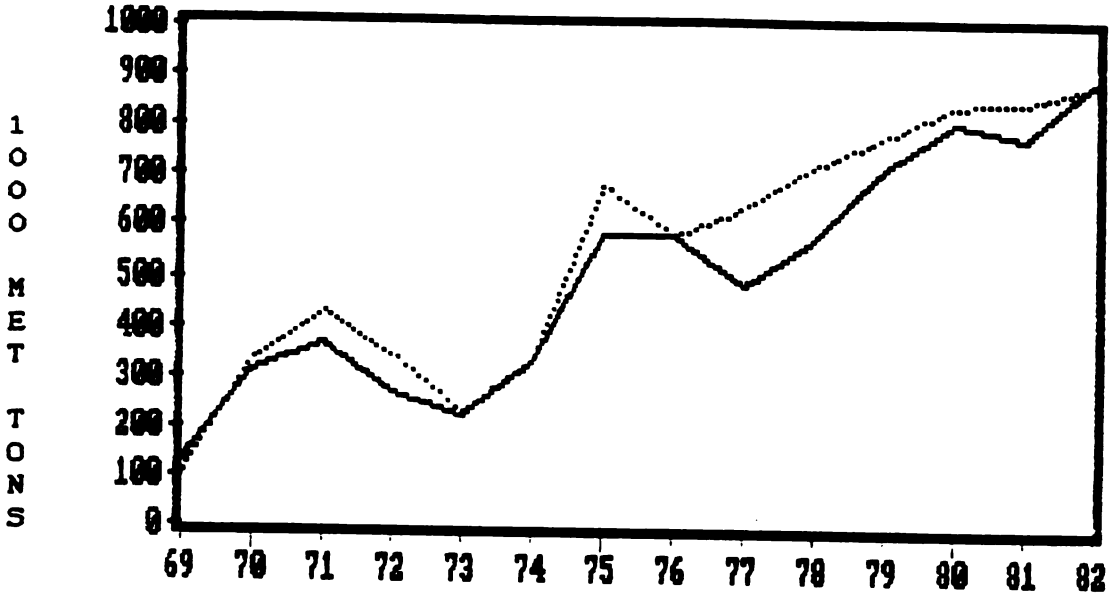
REGIONAL MODEL SIMULATION



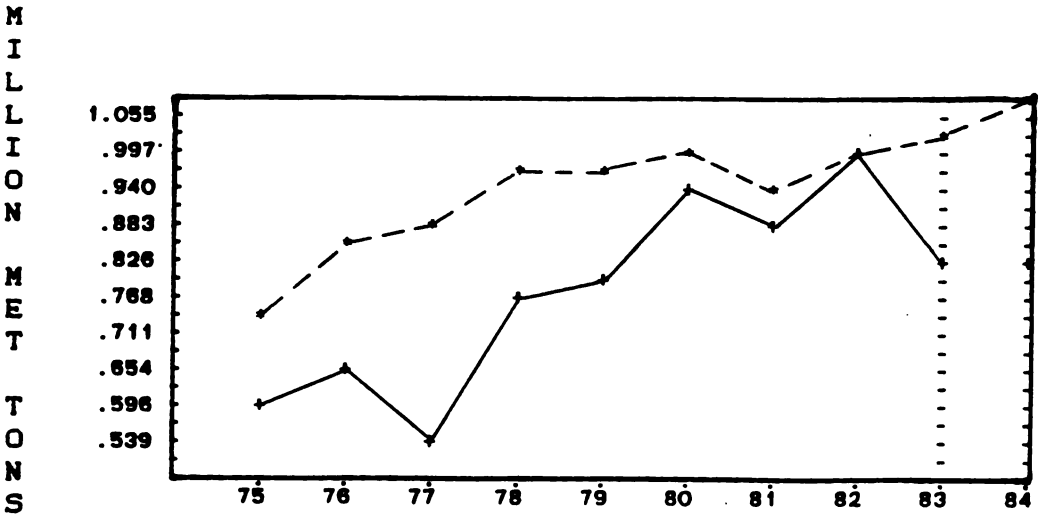
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.13.a & b. Soymeal Equivalent Consumption - Soviet Bloc



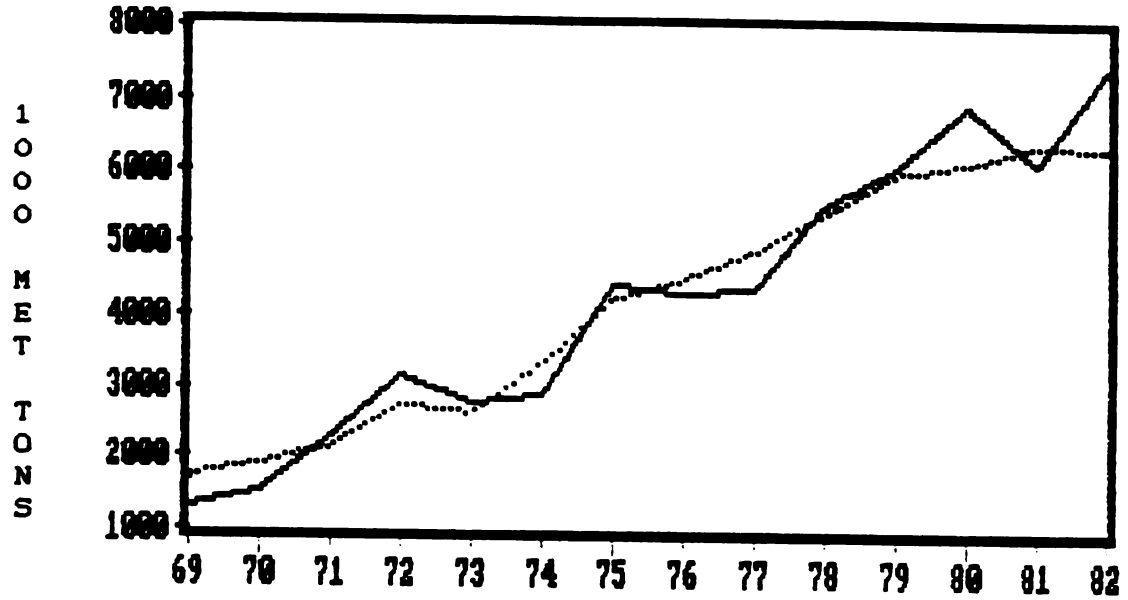
REGIONAL MODEL SIMULATION



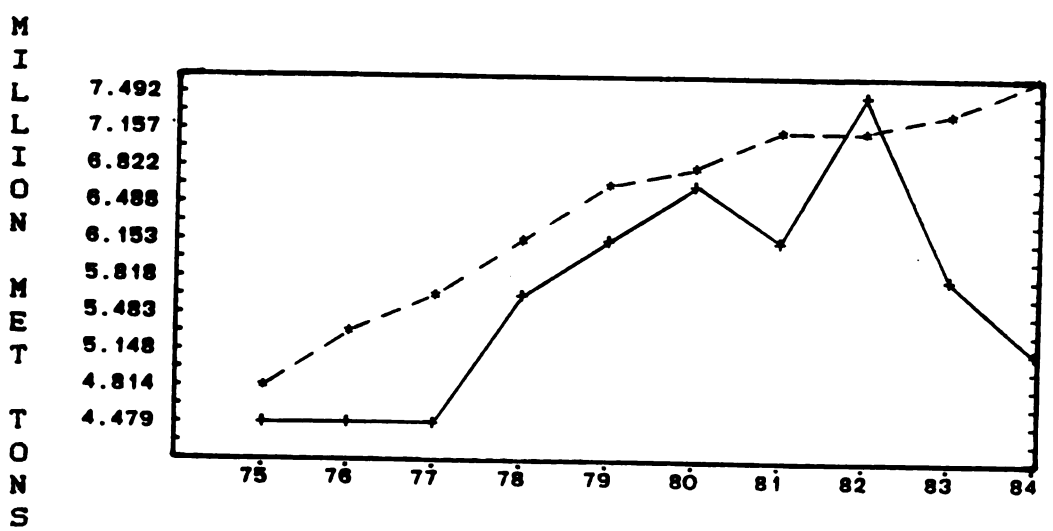
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.14.a & b. Soyoil Equivalent Consumption - Soviet Bloc



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.15.a & b. Soymeal Equivalent Imports - Soviet Bloc

Soviet Bloc
Per Capita Soymeal Equivalent Imports (1000 MT)

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PTSMNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0128015	0.0039120	-3.2723299	0.005
PCRGDP(-1)	110.96395	6.8348545	16.235013	0.000
PCOSSU	-0.4634574	0.3955603	-1.1716479	0.258

R-squared	0.942798	Mean of dependent var	0.009062
Adjusted R-squared	0.935648	S.D. of dependent var	0.005603
S.E. of regression	0.001421	Sum of squared resid	3.23D-05
Durbin-Watson stat	2.170566	F-statistic	131.8564
Log likelihood	99.23823	TPE	6/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: *:	1965	0.00123	0.00127	3.9D-05
: * :	1966	0.00082	0.00195	0.00112
: * :	1967	-0.00049	0.00185	0.00234
: * :	1968	-0.00106	0.00260	0.00366
:* :	1969	-0.00111	0.00356	0.00468
: * :	1970	-0.00102	0.00411	0.00513
: * :	1971	0.00036	0.00607	0.00571
: *:	1972	0.00116	0.00833	0.00717
: * :	1973	0.00050	0.00734	0.00684
:* :	1974	-0.00110	0.00758	0.00868
: * :	1975	0.00053	0.01148	0.01095
: * :	1976	-0.00047	0.01112	0.01160
:* :	1977	-0.00125	0.01123	0.01248
: * :	1978	0.00035	0.01400	0.01365
:* :	1979	0.00024	0.01523	0.01499
: : *	1980	0.00208	0.01734	0.01526
: * :	1981	-0.00061	0.01522	0.01583
: : *	1982	0.00281	0.01840	0.01559
* : :	1983	-0.00296	0.01350	0.01645

INDEPENDENT VARIABLES

PCRGDP = Real GDP Per Capita
GDPSB/CPISB/POPSB

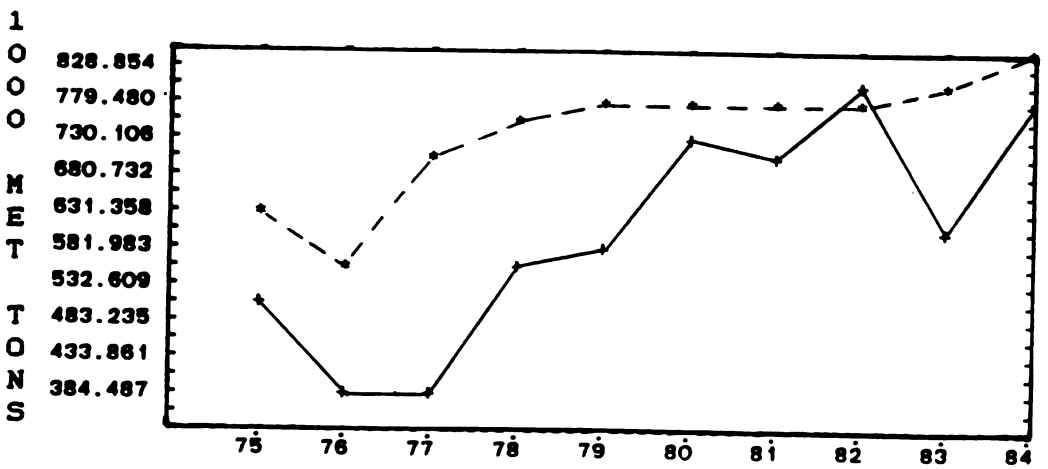
PCOSSU = Per Capita Supply of Sunflower Seed and Rapeseed Meal (1000 MT)
(NPROSB*.441 + RPRORSB*.435)/POPSB

SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSMNI	0.0090618	0.0056034	0.0184021	0.0012688
PCRGDP(-1)	0.0002362	4.924D-05	0.0002990	0.0001521
PCOSSU	0.0093666	0.0008508	0.0118400	0.0084651

	Covariance	Correlation
PTSMNI,PTSMNI	2.975D-05	1.0000000
PTSMNI,PCRGDP(-1)	2.531D-07	0.9684476
PTSMNI,PCOSSU	1.000D-07	0.0221459
PCRGDP(-1),PCRGDP(-1)	2.297D-09	1.0000000
PCRGDP(-1),PCOSSU	3.766D-09	0.0948788
PCOSSU,PCOSSU	6.858D-07	1.0000000

REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.16.a & b. Soyoil Equivalent Imports - Soviet Bloc

Soviet Bloc
Per Capita Soyoil Equivalent Imports (1000 MT)

SMPL 1964 - 1983
20 Observations
LS // Dependent Variable is PTSONI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	9.490D-05	0.0002774	0.3421334	0.737
PCRGDP	6.8072225	0.7840015	8.6826648	0.000
SOPSB	-0.0002009	2.798D-05	-7.1809147	0.000
DV6769	-0.0005316	9.528D-05	-5.5794991	0.000

R-squared	0.960660	Mean of dependent var	0.000831
Adjusted R-squared	0.953284	S.D. of dependent var	0.000600
S.E. of regression	0.000130	Sum of squared resid	2.69D-07
Durbin-Watson stat	1.939431	F-statistic	130.2363
Log likelihood	152.8626	TPE	4/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	0.00018	0.00029	0.00011
	1965	5.7D-05	0.00021	0.00015
	1966	-0.00014	0.00028	0.00042
	1967	-6.2D-05	8.1D-05	0.00014
	1968	-6.9D-05	0.00013	0.00020
	1969	0.00013	0.00018	5.2D-05
	1970	3.0D-06	0.00057	0.00057
	1971	-0.00010	0.00071	0.00081
	1972	-0.00015	0.00054	0.00069
	1973	3.6D-05	0.00031	0.00027
	1974	6.0D-05	0.00060	0.00054
	1975	9.5D-05	0.00129	0.00120
	1976	-5.8D-05	0.00099	0.00105
	1977	-0.00024	0.00092	0.00116
	1978	6.7D-05	0.00138	0.00132
	1979	-2.2D-05	0.00145	0.00148
	1980	4.5D-05	0.00165	0.00161
	1981	-3.6D-05	0.00165	0.00169
	1982	0.00026	0.00193	0.00168
	1983	-5.5D-05	0.00145	0.00150

INDEPENDENT VARIABLES

PCRGDP = **Real GDP Per Capita**
GDPSB/CPISB/POPSB

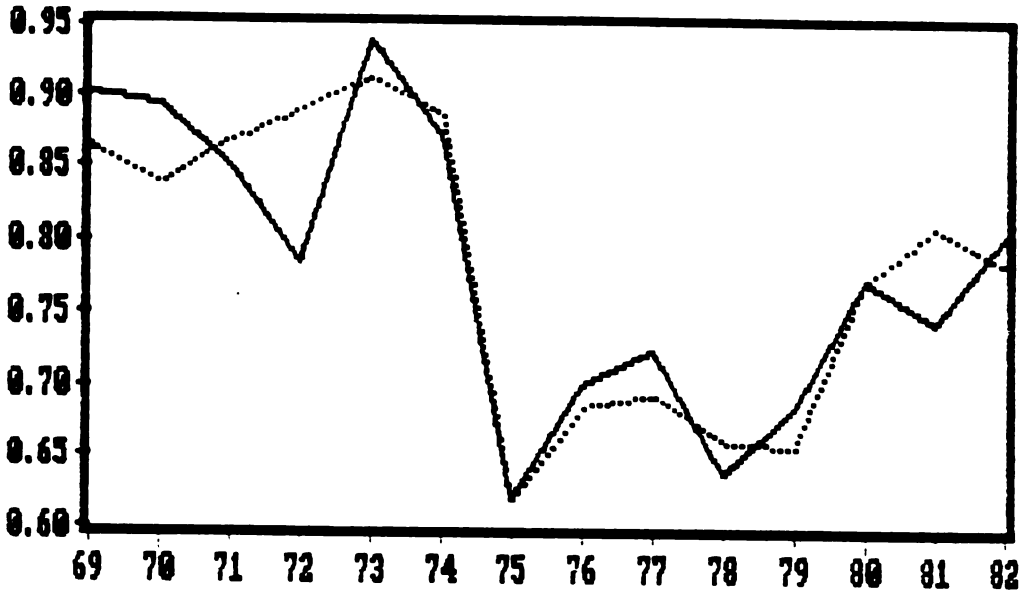
SOPSB = **Real Soviet Bloc Soyoil Price ($/MT)**
SOP*XRSB/CPISB

DV6769 = **1 If(YEAR .GE. 67 .AND. YEAR .LE. 69)**
0 Otherwise

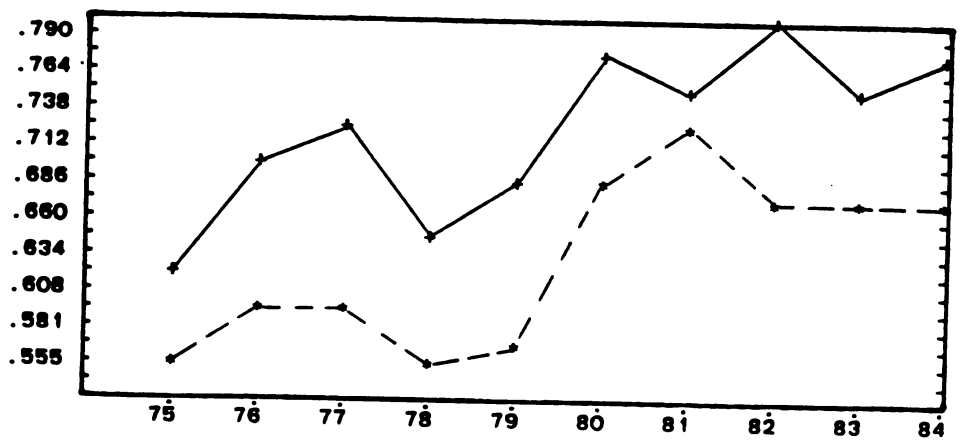
SMPL 1964 - 1983
20 Observations

Series	Mean	S.D.	Maximum	Minimum
PTSONI	0.0008311	0.0005999	0.0019324	8.134D-05
PCRGDP	0.0002394	5.003D-05	0.0003004	0.0001521
SOPSB	4.0486940	1.2934215	7.1999660	2.0823980
DV6769	0.1500000	0.3663475	1.0000000	0.0000000

	Covariance	Correlation
PTSONI,PTSONI	3.419D-07	1.0000000
PTSONI,PCRGDP	2.565D-08	0.8996582
PTSONI,SOPSB	-0.0004879	-0.6618994
PTSONI,DV6769	-0.0001050	-0.5028081
PCRGDP,PCRGDP	2.378D-09	1.0000000
PCRGDP,SOPSB	-2.871D-05	-0.4670379
PCRGDP,DV6769	-6.955D-06	-0.3994272
SOPSB,SOPSB	1.5892922	1.0000000
SOPSB,DV6769	-0.0504682	-0.1121142
DV6769,DV6769	0.1275000	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.17.a & b. Percentage Soymeal Equivalent Exported as Soymeal - Soviet Bloc

Soviet Bloc
Percentage Soymeal Equivalent Imported as Soymeal

SMPL 1965 - 1983
19 Observations
LS // Dependent Variable is PMEAL

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.7602925	0.1059932	7.1730322	0.000
OSMSUP	6.349D-05	3.119D-05	2.0356080	0.060
SPROSB	-0.0001872	4.783D-05	-3.9137112	0.001
DV7579	-0.1331407	0.0269465	-4.9409364	0.000

R-squared	0.823193	Mean of dependent var	0.797344
Adjusted R-squared	0.787831	S.D. of dependent var	0.097135
S.E. of regression	0.044742	Sum of squared resid	0.030028
Durbin-Watson stat	2.371225	F-statistic	23.27940
Log likelihood	34.31590	TPE	7/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-0.01241	0.86128	0.87369
	1966	0.03485	0.87590	0.84105
	1967	0.06703	0.92324	0.85622
	1968	-0.03636	0.82699	0.86335
	1969	0.03658	0.90247	0.86589
	1970	0.05474	0.89486	0.84012
	1971	-0.00971	0.85145	0.86116
	1972	-0.10203	0.78562	0.88765
	1973	0.02909	0.94011	0.91102
	1974	-0.00854	0.87183	0.88037
	1975	-0.01518	0.61792	0.63310
	1976	-0.00036	0.69815	0.69851
	1977	0.01468	0.72191	0.70723
	1978	-0.02874	0.63863	0.66737
	1979	0.02960	0.68181	0.65221
	1980	0.00823	0.77158	0.76335
	1981	-0.06321	0.74213	0.80534
	1982	0.02178	0.80357	0.78179
	1983	-0.02002	0.74011	0.76012

INDEPENDENT VARIABLES

OSMSUP = Supply Rapeseed and Sunflowerseed Meal (1000 MT)
RPROSB*.435 + NPROSB*.441

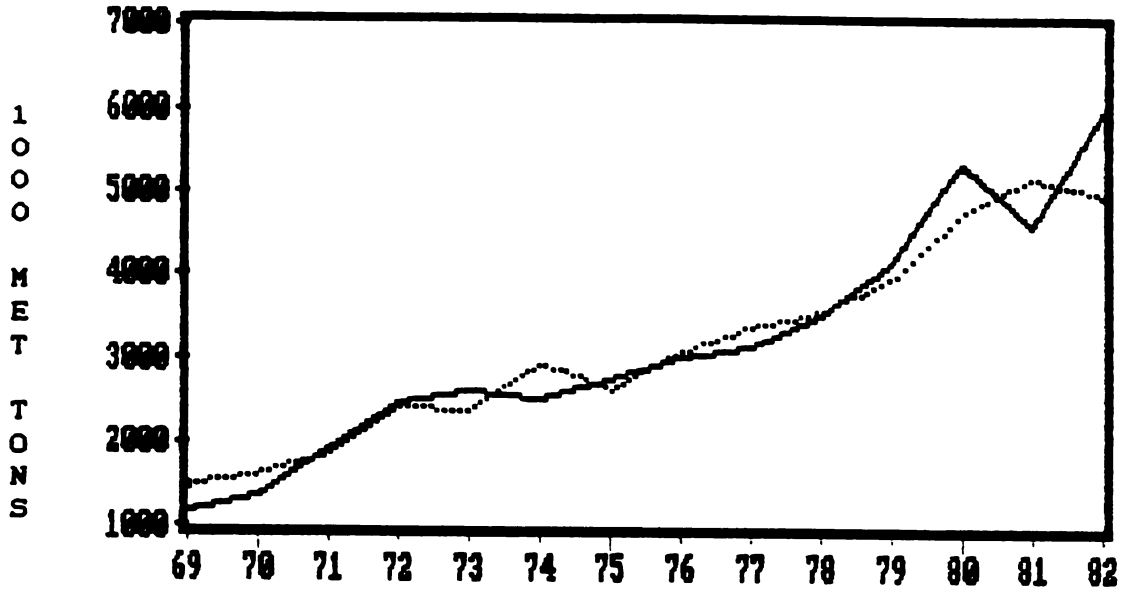
DV7579 = 1 If(YEAR .GE. 75 .AND. YEAR .LE. 79)
0 Otherwise

SPROSB = Soybean Production (1000 MT)

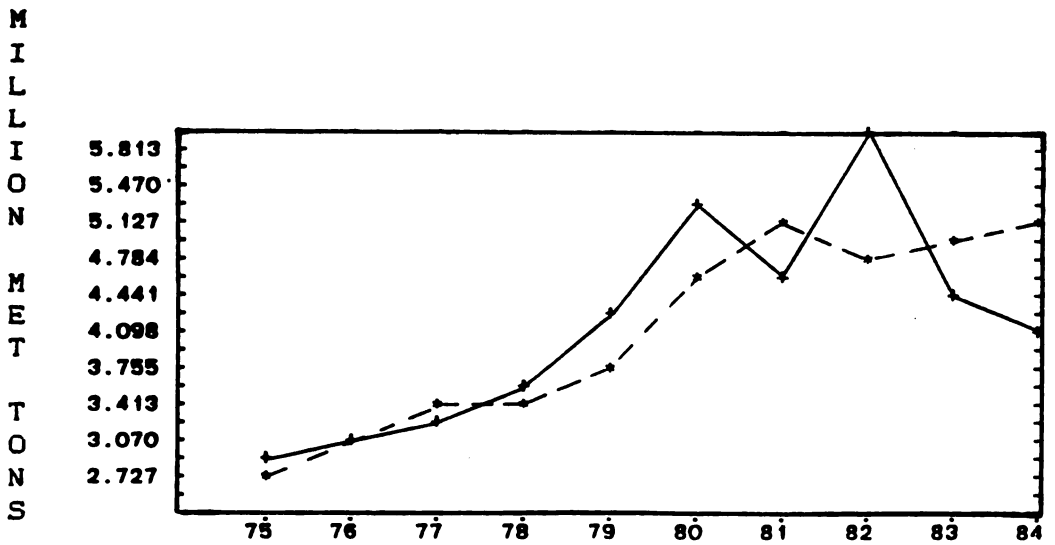
SMPL 1965 - 1983
19 Observations

Series	Mean	S.D.	Maximum	Minimum
PMEAL	0.7973443	0.0971347	0.9401061	0.6179197
OSMSUP	3570.5876	368.35712	4473.3870	3065.7390
SPROSB	825.89474	262.41166	1175.0000	434.00000
DV7579	0.2631579	0.4524139	1.0000000	0.0000000

	Covariance	Correlation
PMEAL, PMEAL	0.0089386	1.0000000
PMEAL, OSMSUP	-4.5001227	-0.1327584
PMEAL, SPROSB	-17.314108	-0.7170077
PMEAL, DV7579	-0.0330688	-0.7943086
OSMSUP, OSMSUP	128545.55	1.0000000
OSMSUP, SPROSB	34255.977	0.3740807
OSMSUP, DV7579	46.933707	0.2972767
SPROSB, SPROSB	65235.673	1.0000000
SPROSB, DV7579	54.659280	0.4859884
DV7579, DV7579	0.1939058	1.0000000



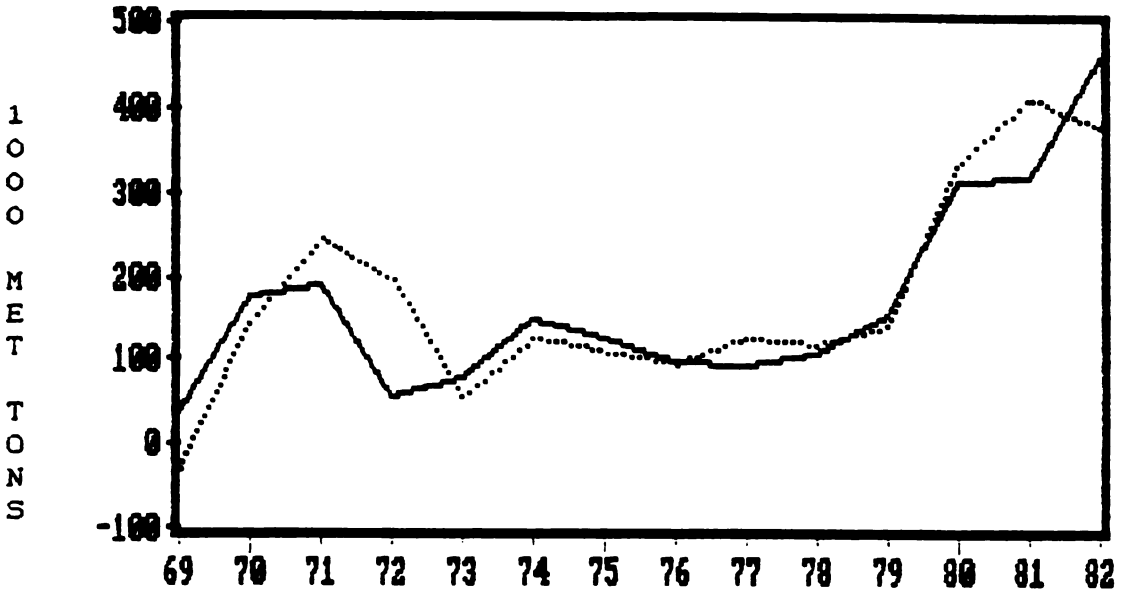
REGIONAL MODEL SIMULATION



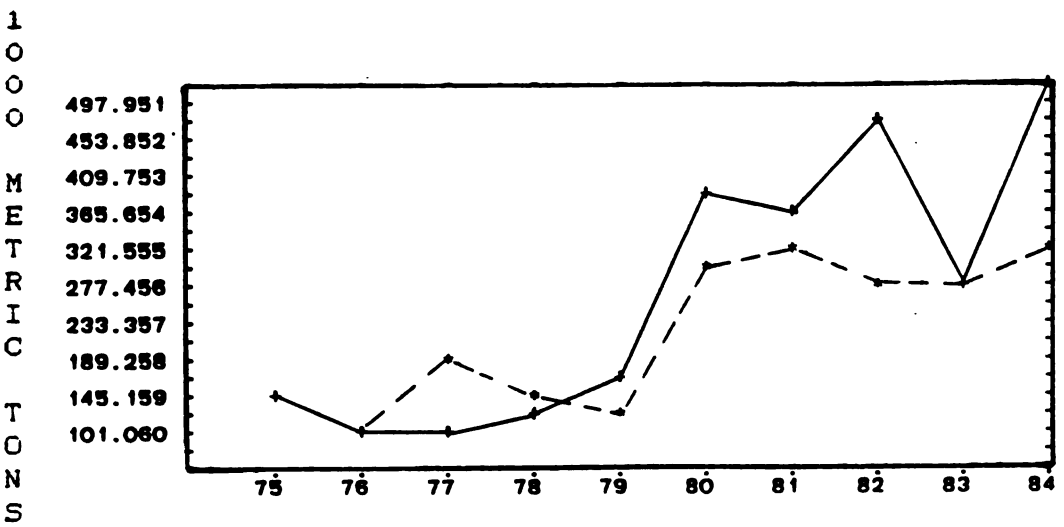
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure J.18.a & b. Soymeal Net Imports - Soviet Bloc



REGIONAL MODEL SIMULATION

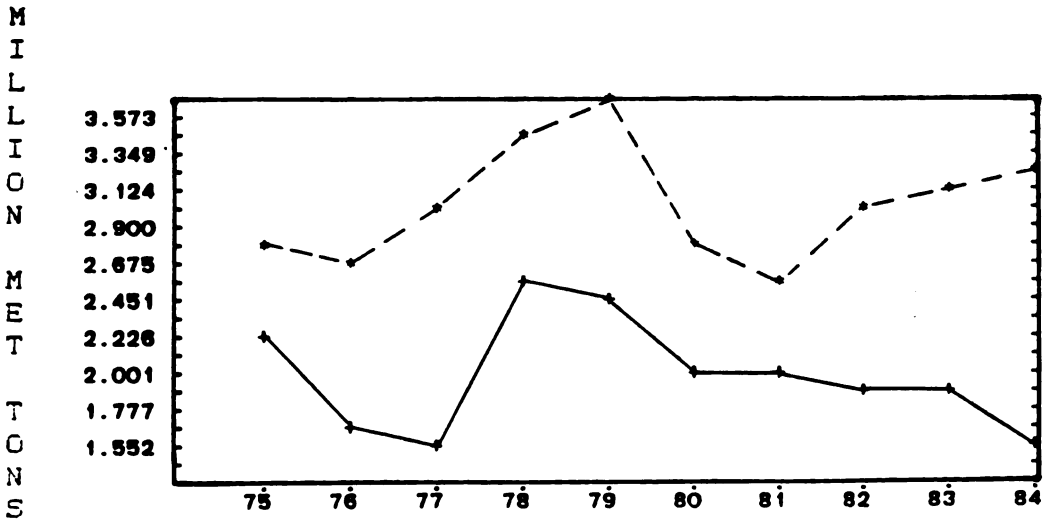


EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.19.a & b. Soyoil Net Imports - Soviet Bloc

REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure J.20.a & b. Soybean Net Imports - Soviet Bloc

APPENDIX K

EQUATION STATISTICS - CHINA

Wheat

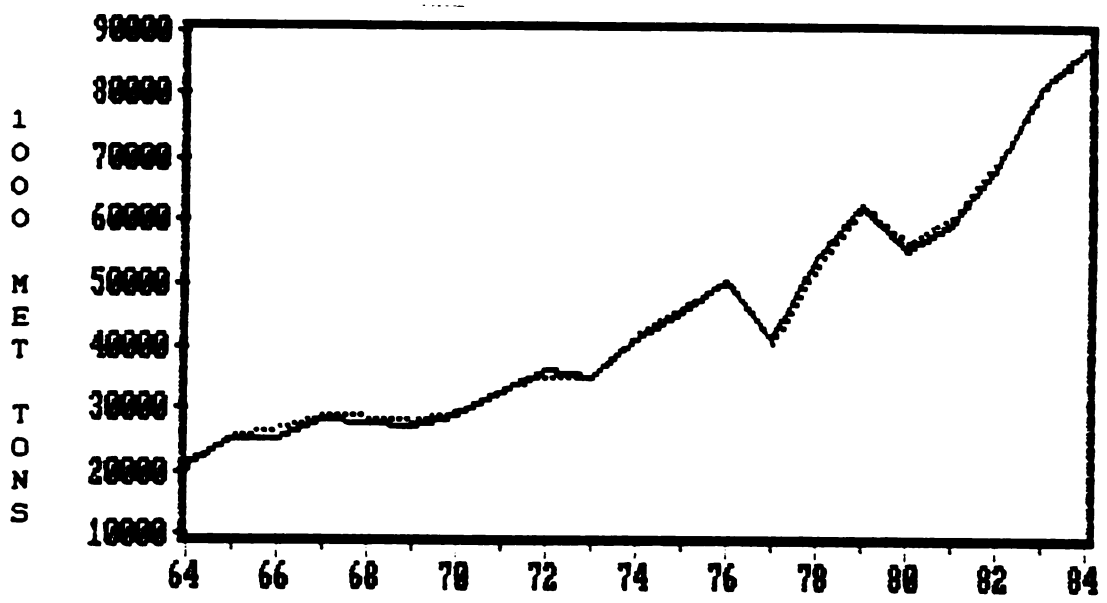
WPROCH.....Production
WHACH.....Harvested Area
WYCH.....Yield
WCONCH.....Total Consumption
WNICH.....Net Imports

Coarse Grain

FPROCH.....Production
FHACH.....Harvested Area
FYCH.....Yield
FCONCH.....Total Consumption
FNICH.....Net Imports

Soybean Complex

SPROCH.....Production
SHACH.....Harvested Area
SYCH.....Yield
SMCOCH.....Soymeal Equiv. Consumption
SOCOCH.....Soyoil Equiv. Consumption
SMEECH.....Soymeal Equiv. Net Exports
SOEECH.....Soyoil Equiv. Net Exports
SMNECH.....Soymeal Net Exports
SONECH.....Soyoil Net Exports
SNECH.....Soybean Net Exports



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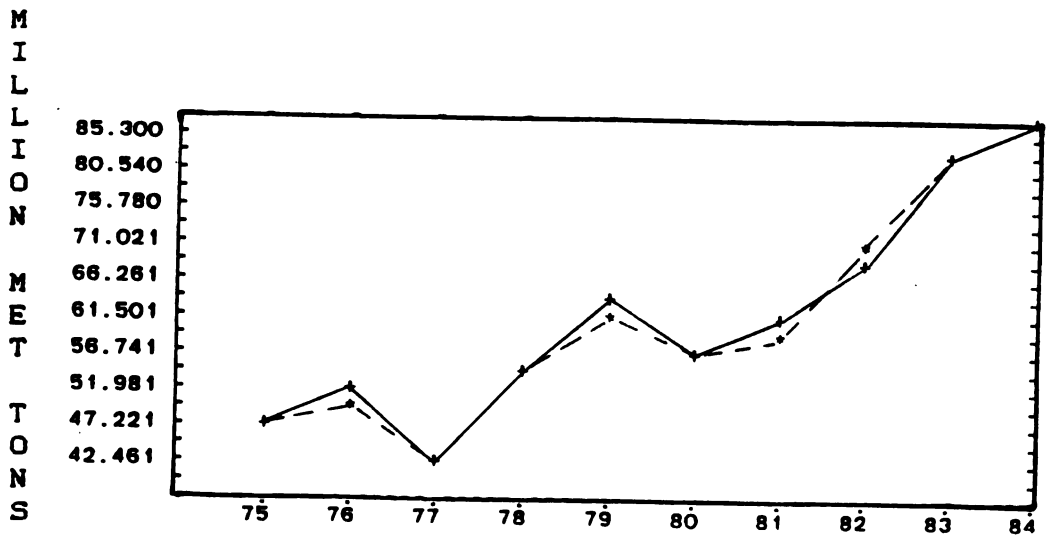
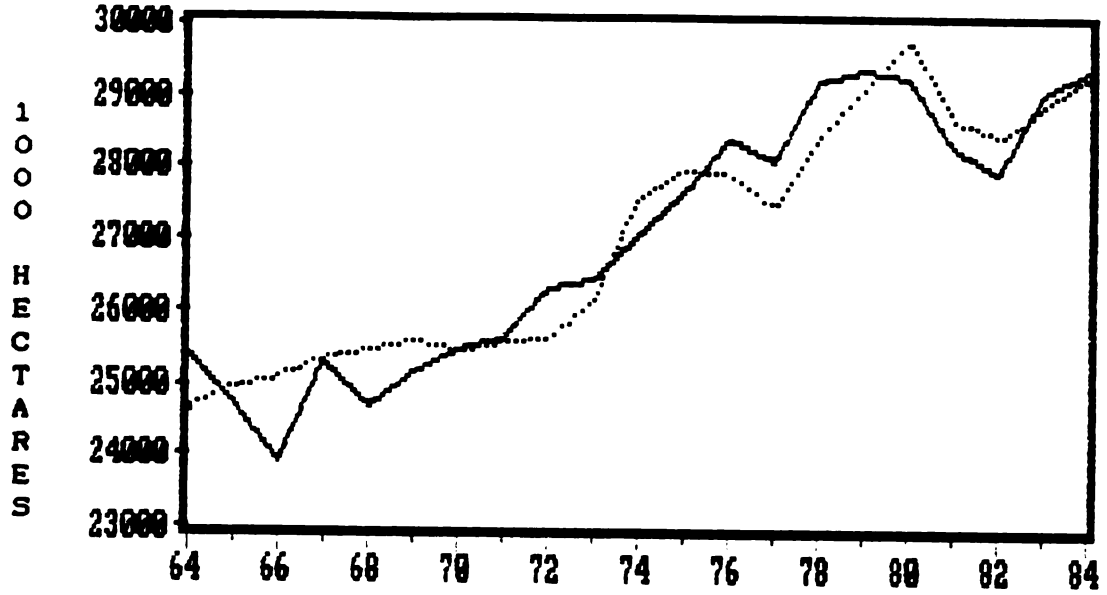


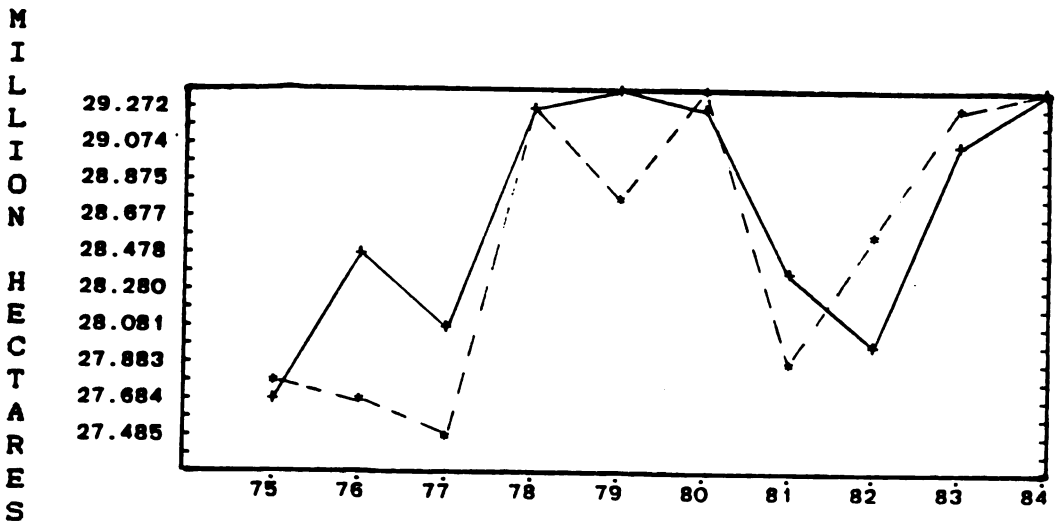
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.1.a & b. Wheat Production - China



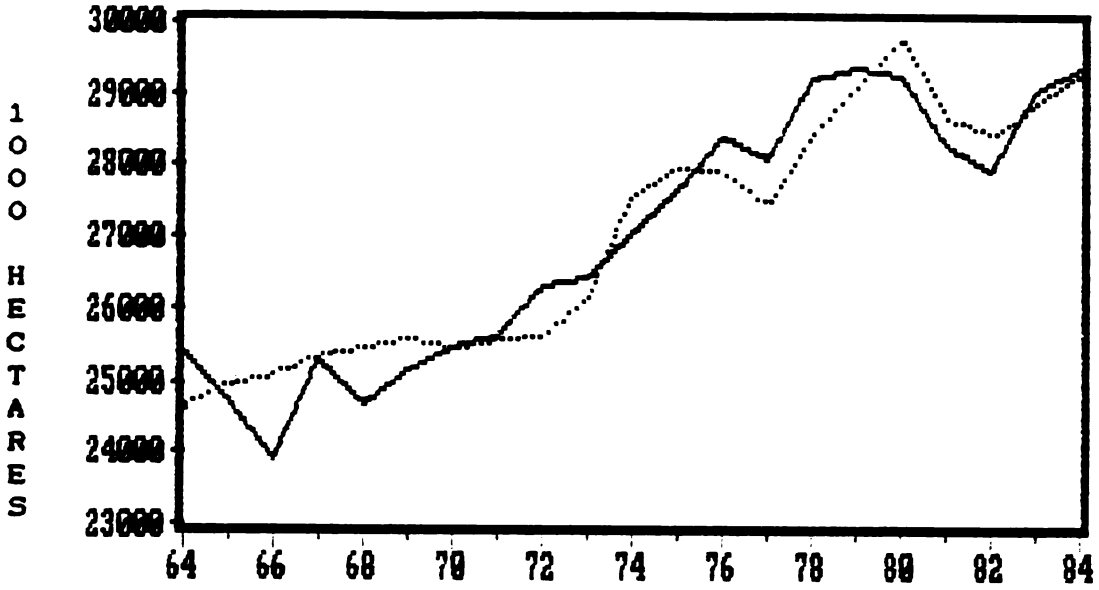
REGIONAL MODEL SIMULATION



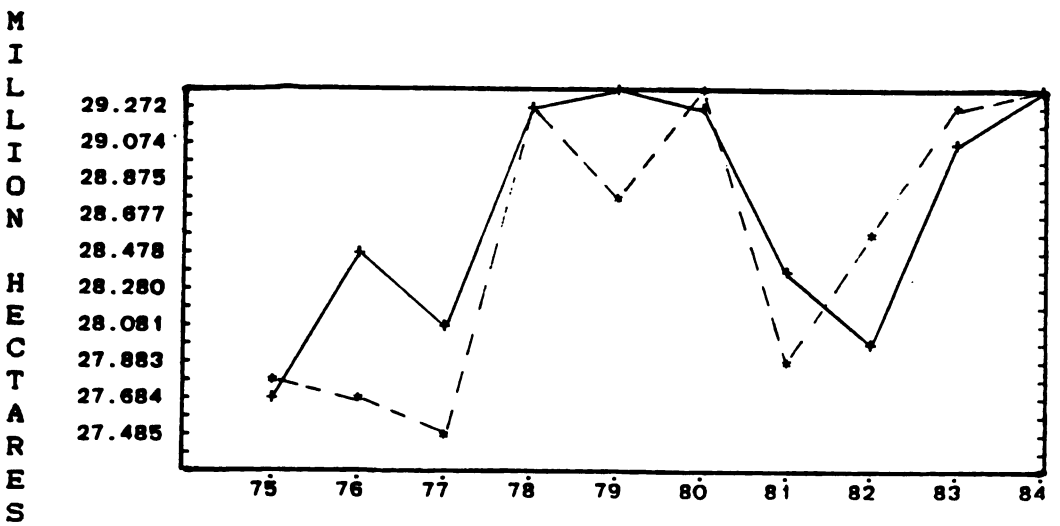
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.2.a & b. Wheat Harvested Area - China



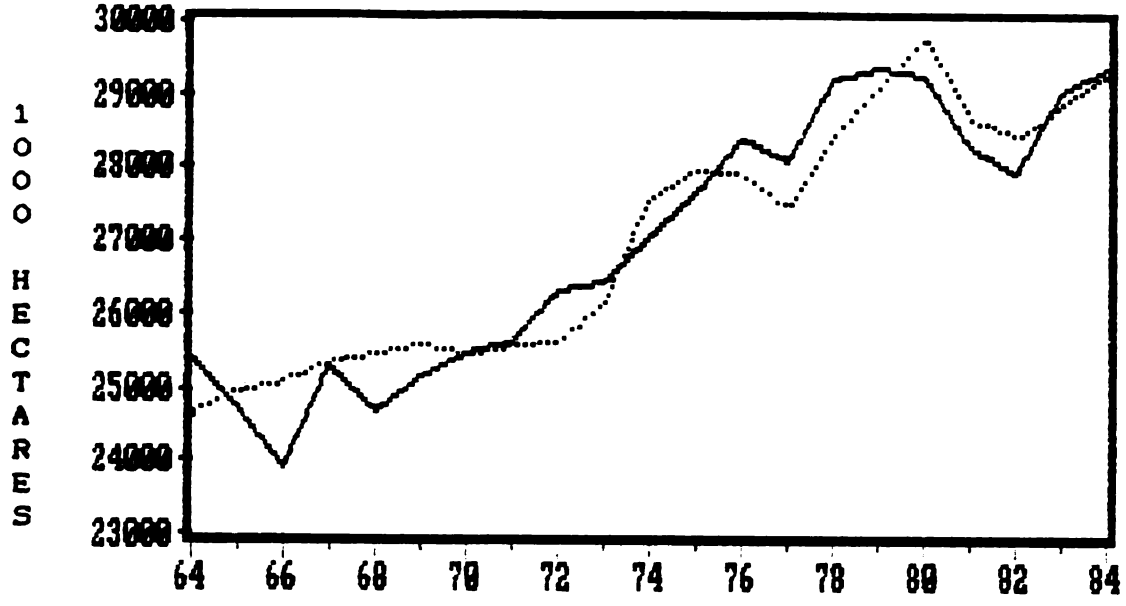
REGIONAL MODEL SIMULATION



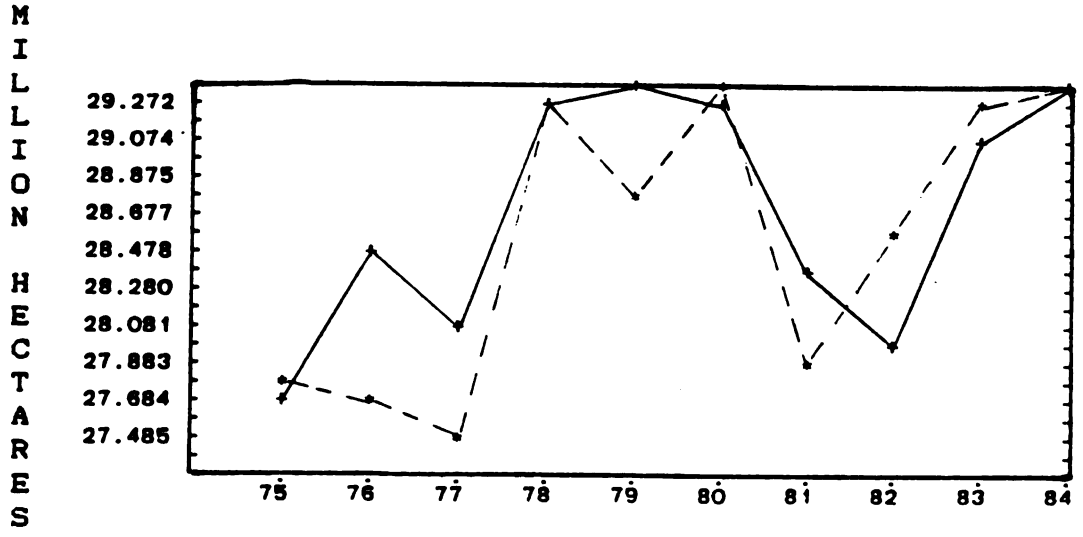
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.2.a & b. Wheat Harvested Area - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.2.a & b. Wheat Harvested Area - China

China
Wheat Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is WHACH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	16163.076	3850.9481	4.1971680	0.001
WHACH(-1)	0.3263169	0.1625698	2.0072412	0.061
WRCH4(-1)	558.14262	152.55533	3.6586241	0.002
DV7880	1183.3307	434.84556	2.7212665	0.015

R-squared	0.920314	Mean of dependent var	26981.52
Adjusted R-squared	0.906252	S.D. of dependent var	1806.124
S.E. of regression	553.0050	Sum of squared resid	5198848.
Durbin-Watson stat	1.772678	F-statistic	65.44580
Log likelihood	-160.2017	TPE	3/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	799.790	25408.0	24608.2
	1965	-465.368	24709.0	25174.4
	1966	-1069.31	23919.0	24988.3
	1967	350.571	25299.0	24948.4
	1968	-769.195	24658.0	25427.2
	1969	-129.526	25162.0	25291.5
	1970	161.524	25458.0	25296.5
	1971	103.748	25639.0	25535.3
	1972	666.493	26302.0	25635.5
	1973	82.4639	26439.0	26356.5
	1974	-617.957	27061.0	27679.0
	1975	-100.751	27661.0	27761.8
	1976	622.982	28417.0	27794.0
	1977	478.901	28065.0	27586.1
	1978	555.015	29183.0	28628.0
	1979	48.2377	29357.0	29308.8
	1980	-603.253	29228.0	29831.3
	1981	-182.687	28307.0	28489.7
	1982	-347.977	27940.0	28288.0
	1983	374.142	29050.0	28675.9
	1984	42.1579	29350.0	29307.8

INDEPENDENT VARIABLES

WHACH = Wheat Harvested Area (1000 HA)

WRCH4 = Wheat Revenue Per Hectare ($/HA)
(WYCH(-3)+WYCH(-2)+WYCH(-1)+WYCH)/4*WP*XRCH/CPICH

DV7880 = 1 If(YEAR .GE. 78 .OR. YEAR .LE. 78)
0 Otherwise

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
WHACH	26981.524	1806.1241	29357.000	23919.000
WHACH(-1)	26715.857	1850.0988	29357.000	23771.000
WRCH4(-1)	3.4607011	1.7722996	6.5668880	1.2331170
DV7880	0.1428571	0.3585686	1.0000000	0.0000000

	Covariance	Correlation
WHACH,WHACH	3106746.8	1.0000000
WHACH,WHACH(-1)	2933249.4	0.9217131
WHACH,WRCH4(-1)	2718.8748	0.8918541
WHACH,DV7880	324.92517	0.5268086
WHACH(-1),WHACH(-1)	3259872.0	1.0000000
WHACH(-1),WRCH4(-1)	2697.5684	0.8638328
WHACH(-1),DV7880	307.49660	0.4867012
WRCH4(-1),WRCH4(-1)	2.9914723	1.0000000
WRCH4(-1),DV7880	0.1427703	0.2358945
DV7880,DV7880	0.1224490	1.0000000

China
Wheat Yield (Metric Tons per Hectare)

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is WYCH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-23.738992	1.9495264	-12.176800	0.000
LOGT	5.9015078	0.4562648	12.934391	0.000

R-squared	0.879137	Mean of dependent var	1.469918
Adjusted R-squared	0.873882	S.D. of dependent var	0.647952
S.E. of regression	0.230107	Sum of squared resid	1.217837
Durbin-Watson stat	0.621585	F-statistic	167.2985
Log likelihood	2.299029		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	0.35827	0.78209	0.42382
	1961	0.03589	0.55725	0.52136
	1962	0.07489	0.69221	0.61732
	1963	0.06546	0.77721	0.71175
	1964	0.01553	0.82021	0.80469
	1965	0.12449	1.02068	0.89619
	1966	0.07061	1.05690	0.98629
	1967	0.05090	1.12593	1.07504
	1968	-0.04904	1.11343	1.16247
	1969	-0.16425	1.08437	1.24862
	1970	-0.18714	1.14640	1.33353
	1971	-0.14672	1.27052	1.41725
	1972	-0.13164	1.36815	1.49979
	1973	-0.24888	1.33231	1.58119
	1974	-0.15137	1.51011	1.66148
	1975	-0.10265	1.63805	1.74070
	1976	-0.04580	1.77306	1.81886
	1977	-0.43244	1.46357	1.89601
	1978	-0.12725	1.84491	1.97216
	1979	0.08946	2.13680	2.04734
	1980	-0.23263	1.88894	2.12157
	1981	-0.08798	2.10690	2.19488
	1982	0.18152	2.44882	2.26730
	1983	0.46290	2.80172	2.33883
	1984	0.57788	2.98739	2.40951

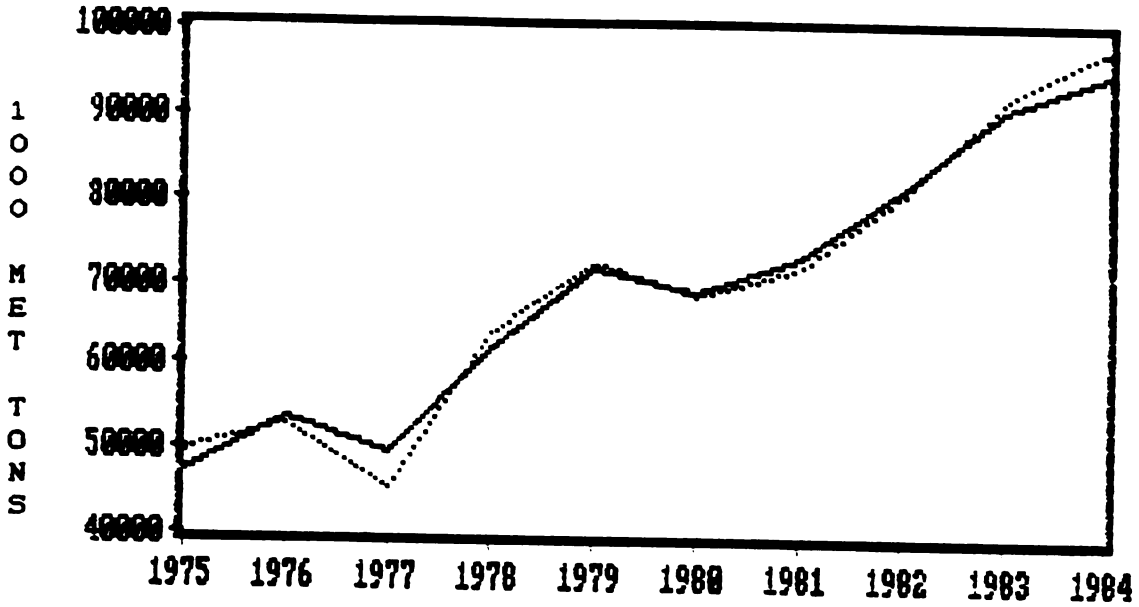
INDEPENDENT VARIABLES

LOGT = Ln(TIME)

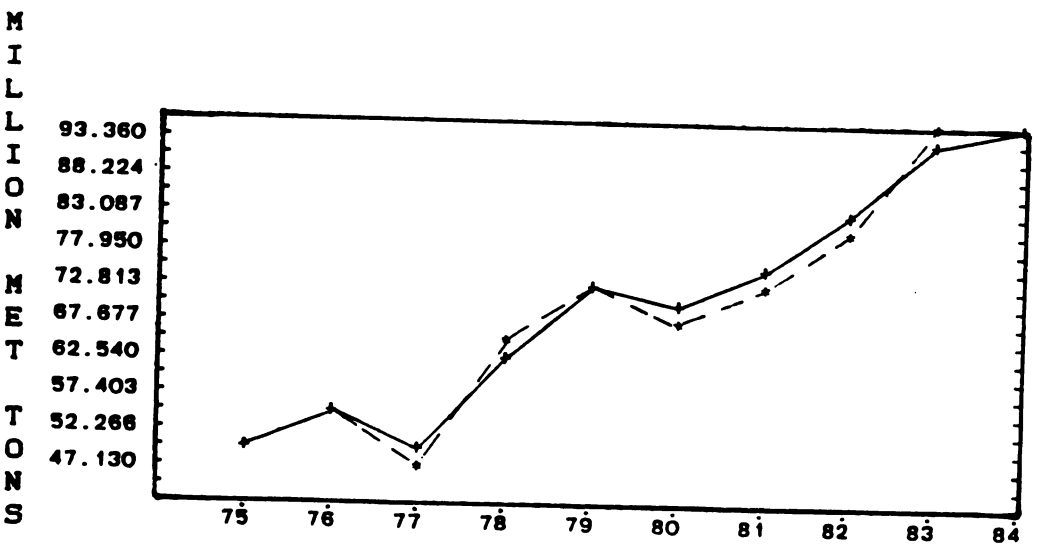
SMPL 1960 - 1984
25 Observations

Series	Mean	S.D.	Maximum	Minimum
WYCH	1.4699175	0.6479518	2.9873940	0.5572501
LOGT	4.2716050	0.1029457	4.4308170	4.0943450

	Covariance	Correlation
WYCH.WYCH	0.4030479	1.0000000
WYCH.LOGT	0.0600413	0.9376232
LOGT.LOGT	0.0101739	1.0000000



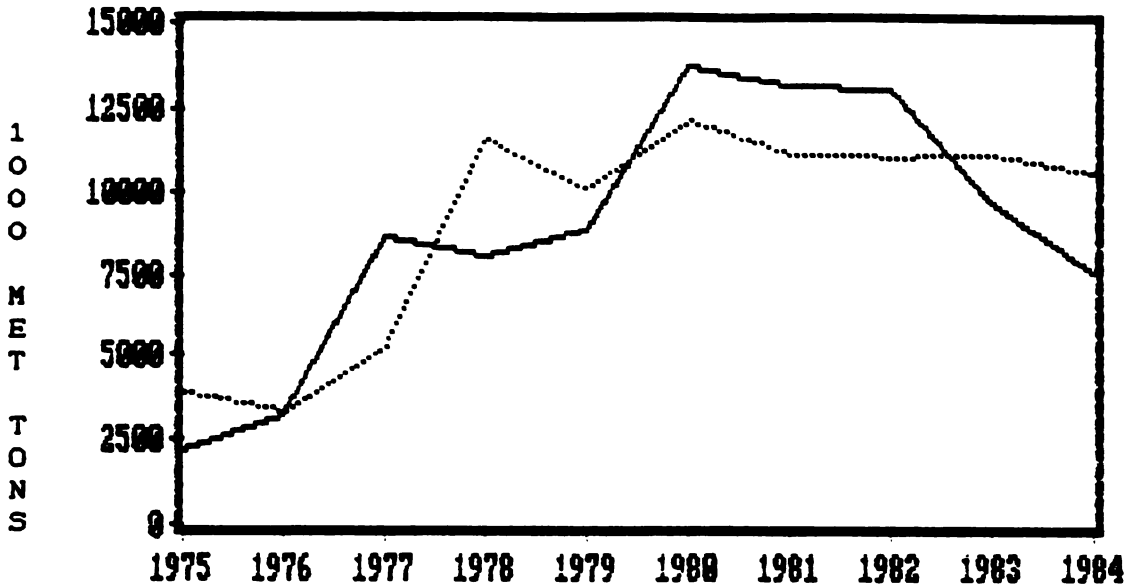
REGIONAL MODEL SIMULATION



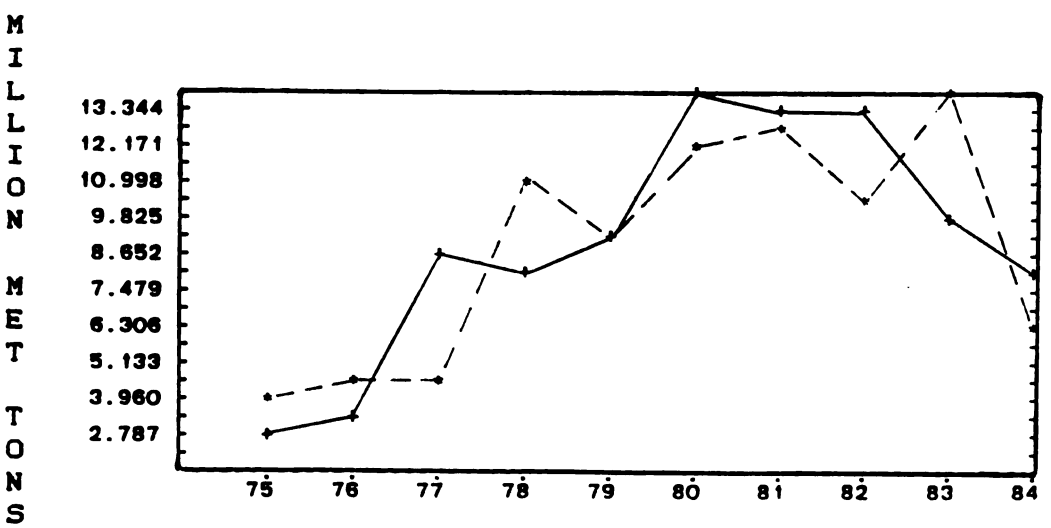
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.3.a & b. Total Wheat Consumption - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.4.a & b. Wheat Net Imports - China

China
Per Capita Wheat Net Imports (1000 MT)

SMPL 1961 - 1983
23 Observations
LS // Dependent Variable is PCWNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0102016	0.0018186	5.6096745	0.000
PCWPRO	-0.2116100	0.0775303	-2.7293834	0.014
S1	2746.8121	542.79949	5.0604544	0.000
WPCH	-0.0011536	0.0016428	-0.7022273	0.492
FPCH	0.0032834	0.0028303	1.1600882	0.261

R-squared	0.721986	Mean of dependent var	0.007327
Adjusted R-squared	0.660205	S.D. of dependent var	0.003028
S.E. of regression	0.001765	Sum of squared resid	5.61D-05
Durbin-Watson stat	2.017488	F-statistic	11.68621
Log likelihood	115.9897	TPE	7/23

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	-0.00064	0.00724	0.00788
	1962	-0.00031	0.00714	0.00744
	1963	4.4D-05	0.00737	0.00732
	1964	3.0D-05	0.00697	0.00694
	1965	0.00252	0.00865	0.00613
	1966	0.00055	0.00670	0.00615
	1967	0.00064	0.00542	0.00478
	1968	-0.00103	0.00450	0.00554
	1969	-0.00015	0.00635	0.00650
	1970	-0.00209	0.00441	0.00650
	1971	-0.00156	0.00348	0.00504
	1972	9.1D-05	0.00606	0.00597
	1973	-4.1D-05	0.00632	0.00636
	1974	0.00020	0.00632	0.00612
	1975	-0.00191	0.00238	0.00429
	1976	0.00011	0.00337	0.00326
	1977	0.00378	0.00906	0.00528
	1978	-0.00328	0.00836	0.01164
	1979	-0.00102	0.00909	0.01011
	1980	0.00155	0.01397	0.01242
	1981	0.00199	0.01319	0.01121
	1982	0.00174	0.01280	0.01107
	1983	-0.00122	0.00937	0.01058

INDEPENDENT VARIABLES

PCWPRO = Wheat Production Per Capita (1000 MT)
WPROCH/POPCH

S1 = Real Income Per Capita After 1977
(GDPCH/CPICH/POPCH)*DV78ON
Where: DV78ON = 1 If(YEAR .GE. 78)
0 Otherwise

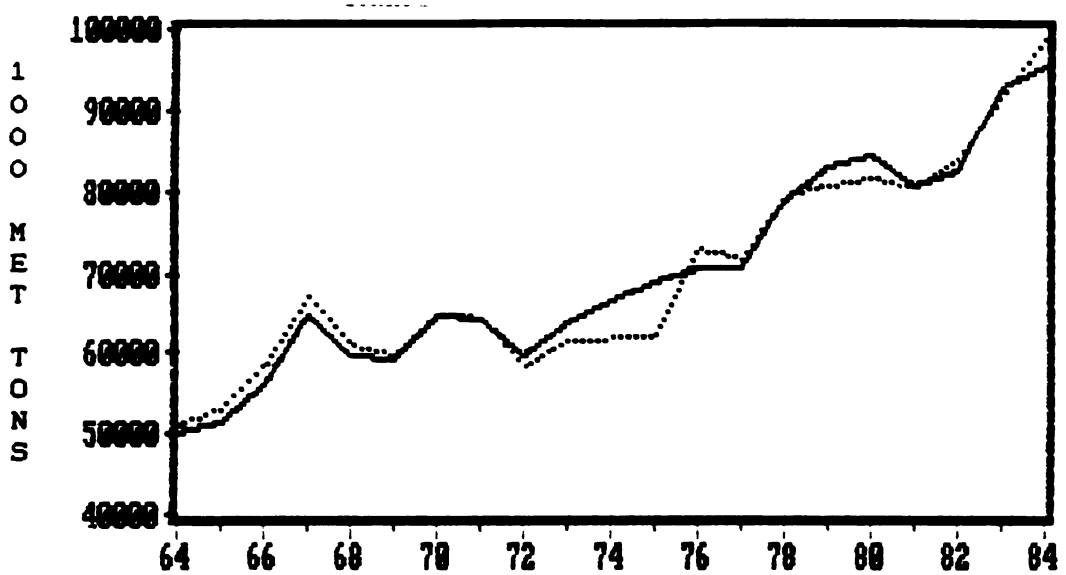
WPCH = Real Chinese Wheat Price ($/MT)
WP*XRCH/CPICH

FPCH = Real Chinese Coarse Grain Price ($/MT)
FP*XRCH/CPICH

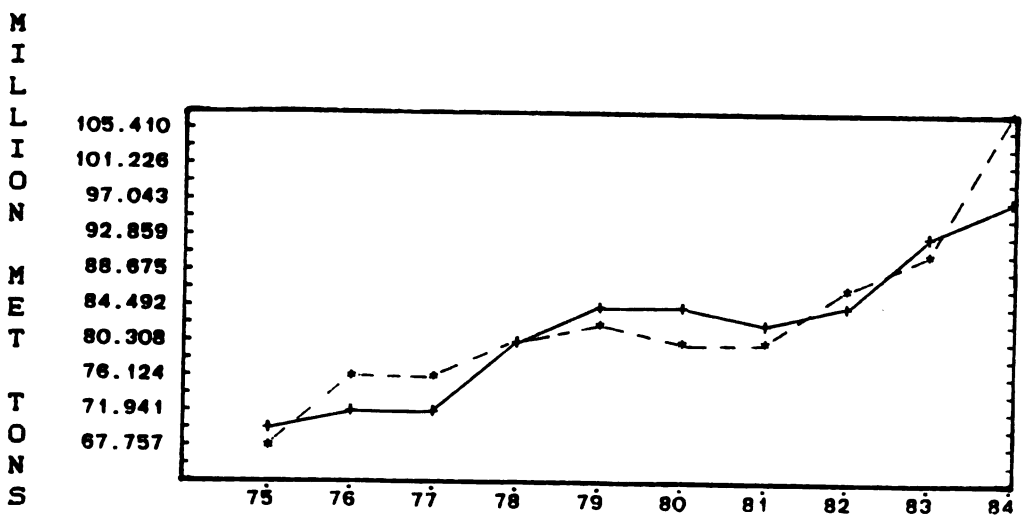
SMPL 1961 - 1983
23 Observations

Series	Mean	S.D.	Maximum	Minimum
PCWNI	0.0073272	0.0030285	0.0139692	0.0023804
PCWPRO	0.0437025	0.0147632	0.0794049	0.0216368
S1	9.946D-07	1.717D-06	4.273D-06	0.0000000
WPCH	2.3235574	0.6976069	4.0464310	1.5086810
FPCH	1.9254033	0.4862615	2.9271310	1.2629830

	Covariance	Correlation
PCWNI,PCWNI	8.773D-06	1.0000000
PCWNI,PCWPRO	2.006D-05	0.4691703
PCWNI,S1	3.802D-09	0.7642138
PCWNI,WPCH	0.0003750	0.1855551
PCWNI,FPCH	0.0001732	0.1229837
PCWPRO,PCWPRO	0.0002085	1.0000000
PCWPRO,S1	2.046D-08	0.8437553
PCWPRO,WPCH	0.0058351	0.5923348
PCWPRO,FPCH	0.0044778	0.6521148
S1,S1	2.821D-12	1.0000000
S1,WPCH	4.209D-07	0.3673083
S1,FPCH	2.644D-07	0.3309556
WPCH,WPCH	0.4654965	1.0000000
WPCH,FPCH	0.3016687	0.9297253
FPCH,FPCH	0.2261698	1.0000000



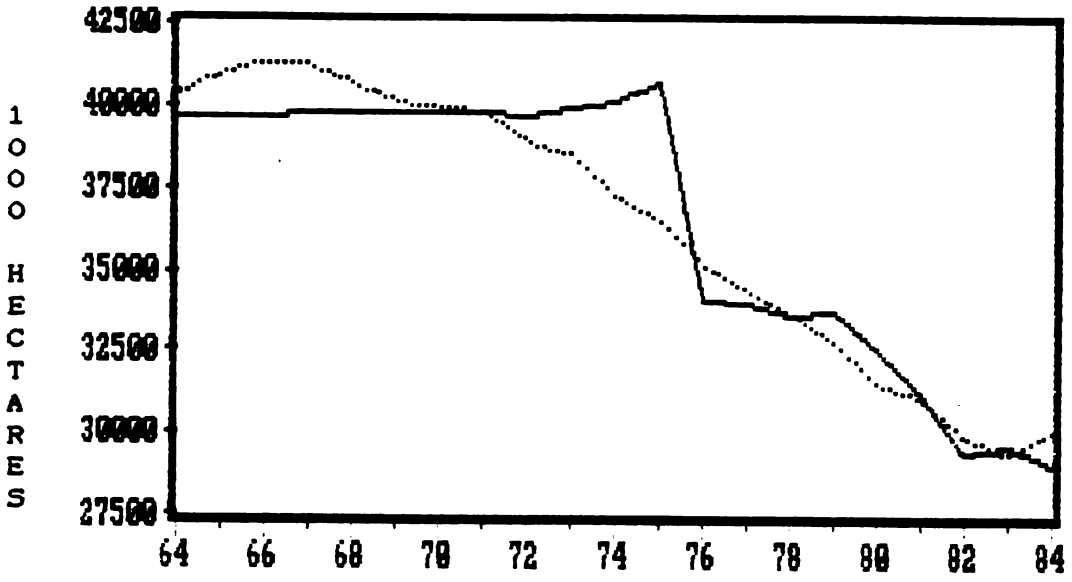
REGIONAL MODEL SIMULATION



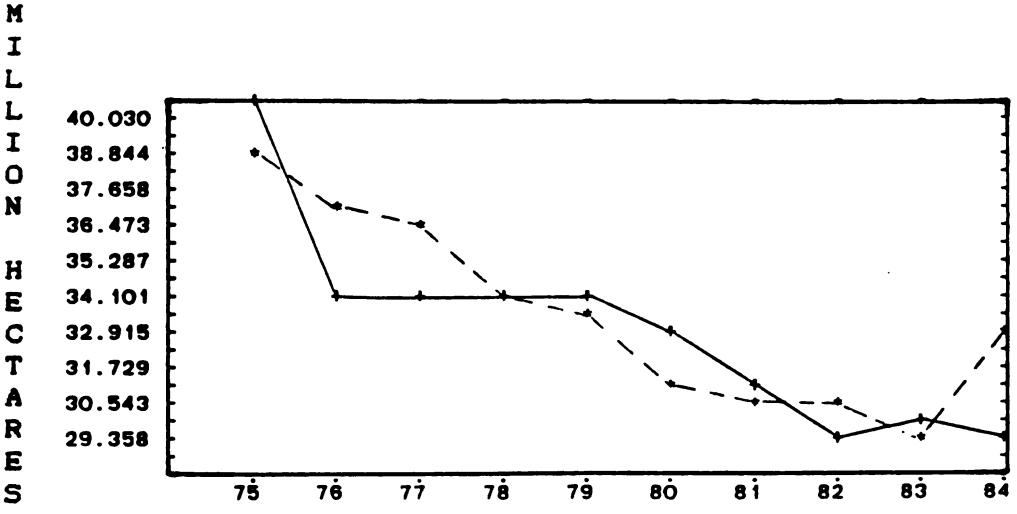
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.5.a & b. Coarse Grain Production - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.6.a & b. Coarse Grain Harvested Area - China

China
Coarse Grain Harvested Area (1000 Hectares)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is FHACH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	24594.239	17080.509	1.4399009	0.169
FHACH(-1)	0.7754420	0.1657832	4.6774476	0.000
WRCH4(-1)	-777.56560	792.77330	-0.9808171	0.341
FRCH4(-1)	1125.9290	900.74561	1.2499967	0.229
YEAR	-245.31287	188.64029	-1.3004267	0.212

R-squared	0.910012	Mean of dependent var	36408.29
Adjusted R-squared	0.887514	S.D. of dependent var	4269.648
S.E. of regression	1431.992	Sum of squared resid	32809596
Durbin-Watson stat	2.176424	F-statistic	40.45016
Log likelihood	-179.5457	TPE	7/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: * : :	1964	-692.209	39641.0	40333.2
: * : :	1965	-698.420	39664.0	40362.4
: * : :	1966	-587.924	39683.0	40270.9
: * : :	1967	-213.264	39711.0	39924.3
: :* :	1968	233.773	39716.0	39482.2
: :* :	1969	371.764	39733.0	39361.2
: * :	1970	110.487	39746.0	39635.5
: :* :	1971	186.927	39756.0	39569.1
: * :	1972	833.258	39673.0	38839.7
: * :	1973	820.360	39892.0	39071.6
: : :*	1974	1777.16	40118.0	38340.8
: : : *	1975	1926.86	40623.0	38696.1
* : : :	1976	-4325.10	33999.0	38324.1
: : * :	1977	444.643	33900.0	33455.4
: :* :	1978	234.950	33519.0	33284.0
: : *:	1979	1065.27	33708.0	32642.7
: :* :	1980	286.901	32518.0	32231.1
: * : :	1981	-638.266	31125.0	31763.3
: * : :	1982	-653.540	29281.0	29934.5
: : * :	1983	718.698	29568.0	28849.3
:* : :	1984	-1202.33	29000.0	30202.3

INDEPENDENT VARIABLES

FHACH = Wheat Harvested Area (1000 HA)

WRCH4 = Wheat Revenue Per Hectare
(WYCH(-3)+WYCH(-2)+WYCH(-1)+WYCH)/4*WP*XRCH/CPICH

FRCH4 = Coarse Grain Revenue Per Hectare
(FYCH(-3)+FYCH(-2)+FYCH(-1)+FYCH)/4*FP*XRCH/CPICH

YEAR = 1960=60, 1961=61,...

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
FHACH	36408.286	4269.6484	40623.000	29000.000
FHACH(-1)	36914.143	3966.5849	40623.000	29281.000
WRCH4(-1)	3.4607011	1.7722996	6.5668880	1.2331170
FRCH4(-1)	3.5822363	1.5656047	7.4536530	1.4854260
YEAR	74.000000	6.2048368	84.000000	64.000000

	Covariance	Correlation
FHACH,FHACH	17361807.	1.0000000
FHACH,FHACH(-1)	15072717.	0.9344842
FHACH,WRCH4(-1)	-5622.7733	-0.7802084
FHACH,FRCH4(-1)	-5076.6214	-0.7974250
FHACH,YEAR	-22238.000	-0.8813787
FHACH(-1),FHACH(-1)	14984568.	1.0000000
FHACH(-1),WRCH4(-1)	-4885.5083	-0.7297014
FHACH(-1),FRCH4(-1)	-4640.2584	-0.7845716
FHACH(-1),YEAR	-19888.286	-0.8484759
WRCH4(-1),WRCH4(-1)	2.9914723	1.0000000
WRCH4(-1),FRCH4(-1)	2.5538444	0.9664168
WRCH4(-1),YEAR	9.7170874	0.9278076
FRCH4(-1),FRCH4(-1)	2.3343980	1.0000000
FRCH4(-1),YEAR	8.6459182	0.9345186
YEAR,YEAR	36.666667	1.0000000

China
Coarse Grain Yield (Metric Tons per Hectare)

SMPL 1960 - 1984
25 Observations
LS // Dependent Variable is FYCH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.1407784	0.9017302	0.1561203	0.877
YEAR	0.0573252	0.0067992	8.4311755	0.000
FHACH	-6.614D-05	1.236D-05	-5.3493649	0.000

R-squared	0.959661	Mean of dependent var	1.829897
Adjusted R-squared	0.955994	S.D. of dependent var	0.672760
S.E. of regression	0.141129	Sum of squared resid	0.438186
Durbin-Watson stat	0.740411	F-statistic	261.6878
Log likelihood	15.07640	TPE	3/25

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1960	-0.25280	0.79519	1.04799
	1961	-0.08163	0.94233	1.02396
	1962	0.05650	1.13236	1.07586
	1963	0.06537	1.19683	1.13146
	1964	0.07440	1.26200	1.18760
	1965	0.04830	1.29170	1.24340
	1966	0.11625	1.41572	1.29947
	1967	0.27188	1.62683	1.35495
	1968	0.08927	1.50121	1.41194
	1969	0.01800	1.48615	1.46814
	1970	0.09928	1.62389	1.52461
	1971	0.03698	1.61825	1.58127
	1972	-0.14402	1.50006	1.64408
	1973	-0.08994	1.59699	1.68692
	1974	-0.07339	1.65592	1.72930
	1975	-0.05628	1.69694	1.75322
	1976	-0.17392	2.07477	2.24868
	1977	-0.22701	2.08555	2.31256
	1978	-0.03732	2.35777	2.39508
	1979	0.02494	2.46484	2.43991
	1980	0.01401	2.58995	2.57594
	1981	-0.12942	2.59598	2.72541
	1982	-0.09042	2.81428	2.90470
	1983	0.19041	3.13346	2.94304
	1984	0.25055	3.28848	3.03794

INDEPENDENT VARIABLES

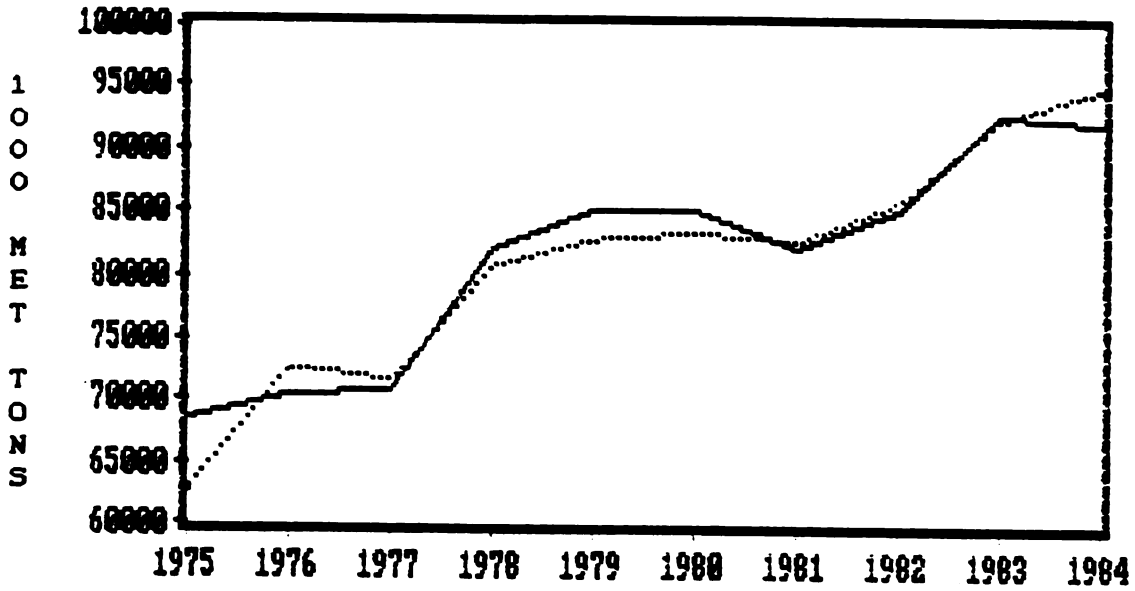
YEAR = 1960=60, 1961=61,...

FHACH = Coarse Grain Harvested Area (1000 HA)

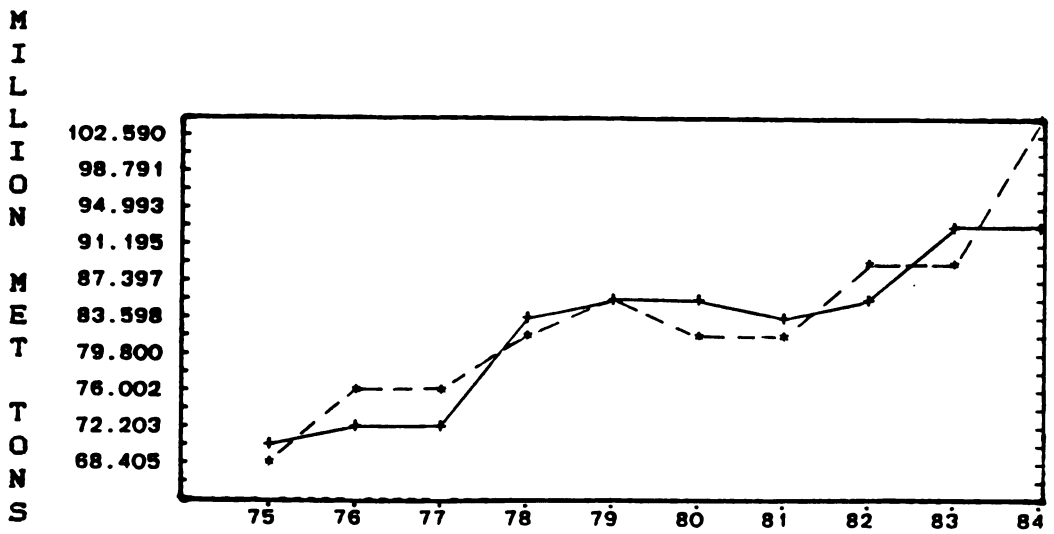
SMPL 1960 - 1984
25 Observations

Series	Mean	S.D.	Maximum	Minimum
FYCH	1.8298974	0.6727596	3.2884830	0.7951939
YEAR	72.000000	7.3598007	84.000000	60.000000
FHACH	36863.760	4047.0542	40623.000	29000.000

	Covariance	Correlation
FYCH, FYCH	0.4345012	1.0000000
FYCH, YEAR	4.5273761	0.9524658
FYCH, FHACH	-2380.2973	-0.9106701
YEAR, YEAR	52.000000	1.0000000
YEAR, FHACH	-23380.480	-0.8176682
FHACH, FHACH	15723502.	1.0000000



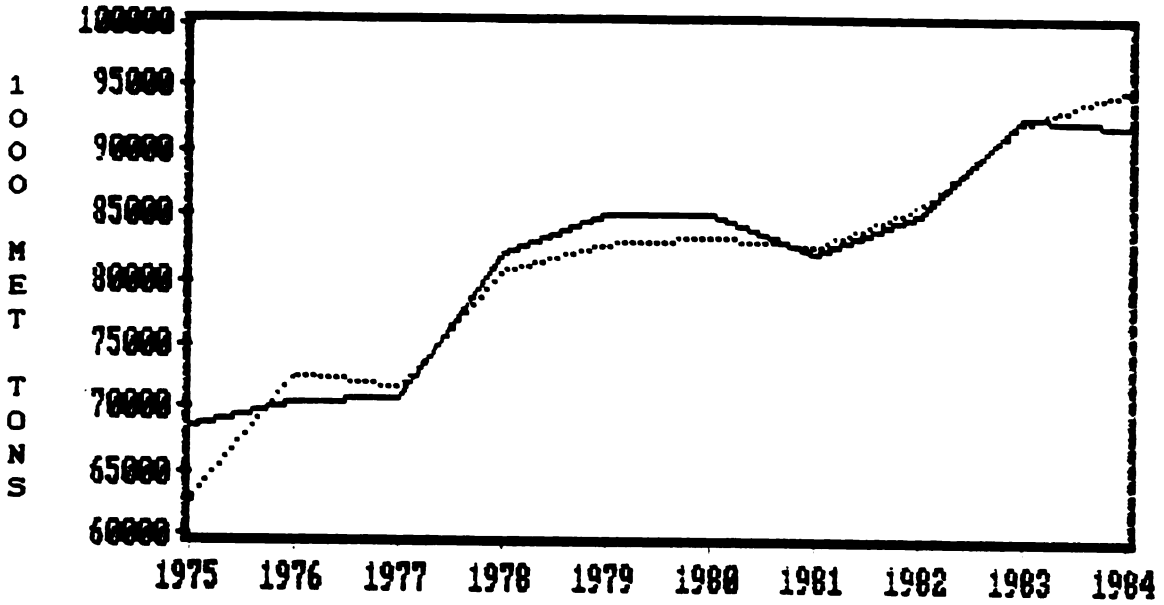
REGIONAL MODEL SIMULATION



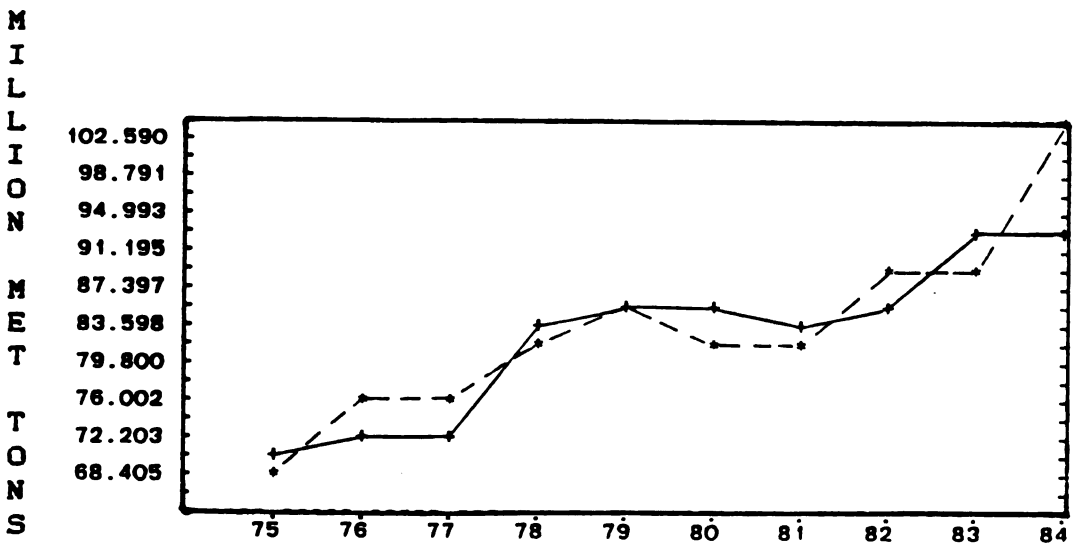
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.7.a & b. Total Coarse Grain Consumption - China



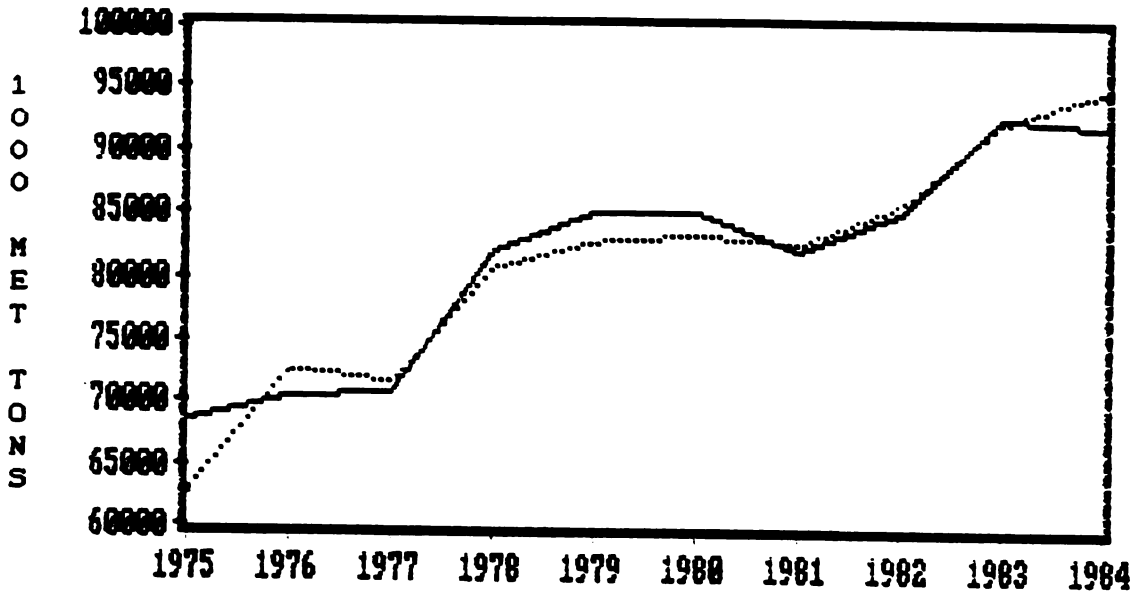
REGIONAL MODEL SIMULATION



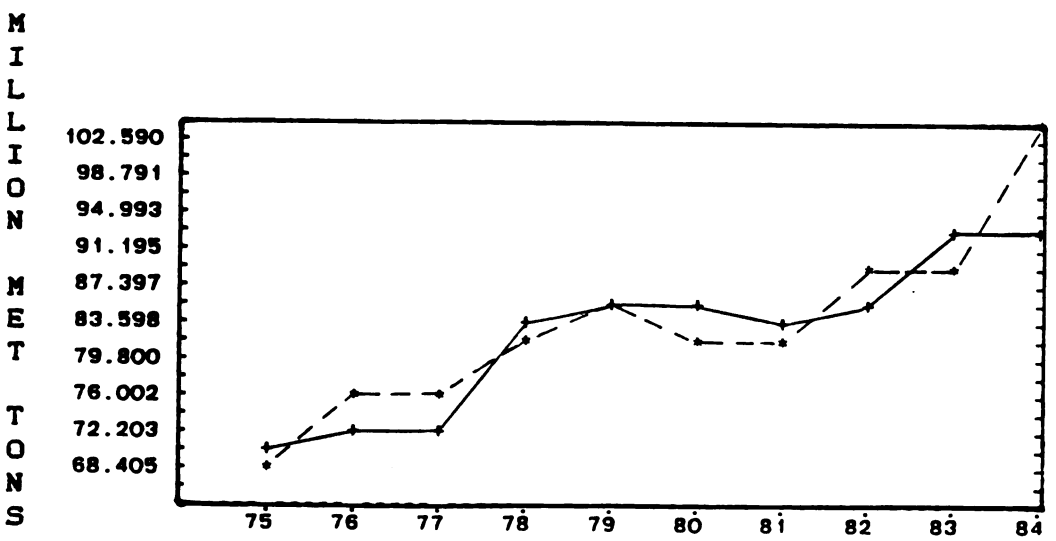
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.7.a & b. Total Coarse Grain Consumption - China



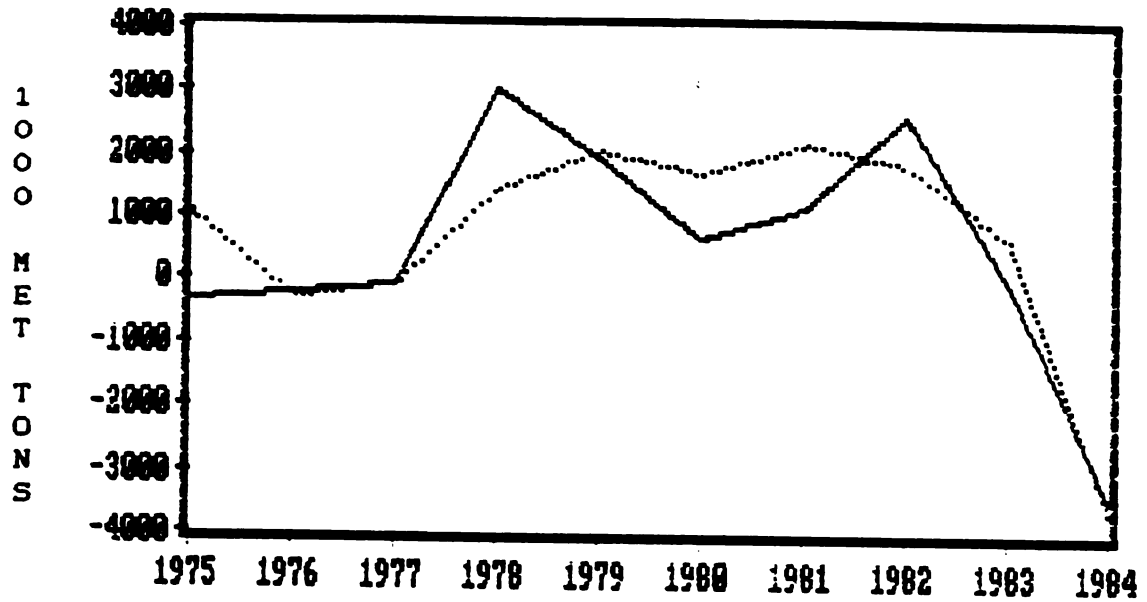
REGIONAL MODEL SIMULATION



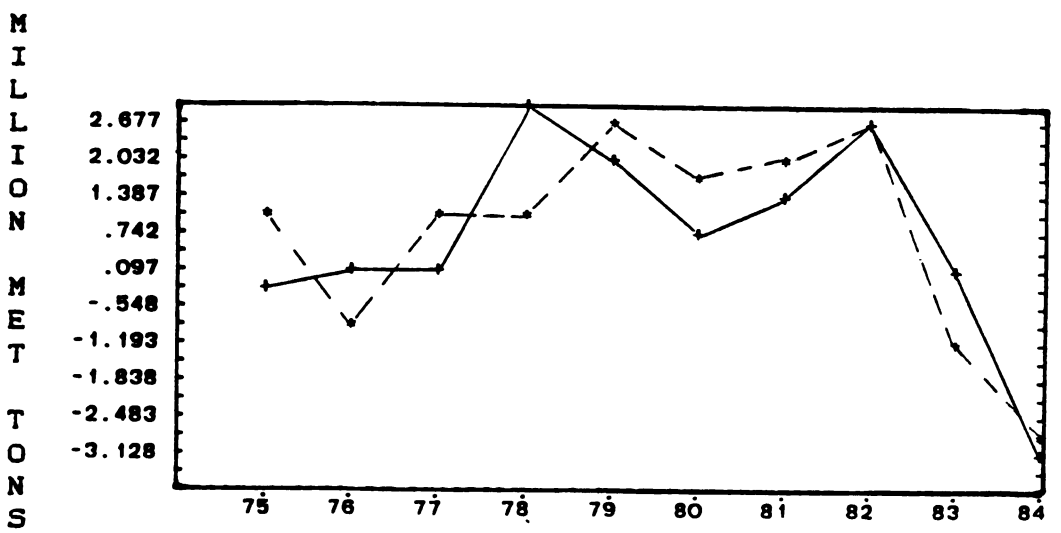
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.7.a & b. Total Coarse Grain Consumption - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.8.a & b. Coarse Grain Net Imports - China

China
Per Capita Coarse Grain Net Imports (1000 MT)

SMPL 1961 - 1984
24 Observations
LS // Dependent Variable is PCFNI

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0060350	0.0019836	3.0424673	0.007
S1	495.11823	121.31399	4.0812955	0.001
PCFPRO	-0.0766560	0.0278073	-2.7566815	0.013
FPCH	-0.0018517	0.0008057	-2.2982987	0.034
WPCH	0.0014951	0.0005641	2.6504847	0.016
DV84ON	-0.0048029	0.0007543	-6.3669185	0.000

R-squared	0.789240	Mean of dependent var	0.000477
Adjusted R-squared	0.730696	S.D. of dependent var	0.001269
S.E. of regression	0.000658	Sum of squared resid	7.80D-06
Durbin-Watson stat	1.978955	F-statistic	13.48107
Log likelihood	145.2120	TPE	7/24

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1961	6.0D-06	0.00180	0.00179
	1962	-0.00041	0.00048	0.00089
	1963	0.00030	0.00100	0.00070
	1964	-0.00038	5.7D-05	0.00044
	1965	-0.00040	-0.00024	0.00016
	1966	-0.00019	-7.9D-05	0.00011
	1967	0.00044	0.00011	-0.00033
	1968	-0.00024	-4.5D-05	0.00019
	1969	0.00025	0.00000	-0.00025
	1970	0.00056	-3.7D-05	-0.00060
	1971	-5.0D-06	4.5D-05	5.0D-05
	1972	0.00052	0.00078	0.00026
	1973	0.00060	0.00203	0.00143
	1974	-0.00024	0.00019	0.00042
	1975	-0.00088	-0.00038	0.00050
	1976	-8.6D-05	-0.00024	-0.00015
	1977	-2.6D-05	-6.9D-05	-4.4D-05
	1978	0.00166	0.00312	0.00146
	1979	0.00012	0.00198	0.00186
	1980	-0.00079	0.00066	0.00145
	1981	-0.00096	0.00112	0.00208
	1982	0.00070	0.00256	0.00186
	1983	-0.00056	-4.9D-05	0.00051
	1984	0.00000	-0.00333	-0.00333

INDEPENDENT VARIABLES

PCFPRO = Coarse Grain Production Per Capita (1000 MT)
FPROCH/POPCH

S1 = Real Income Per Capita After 1977
(GDPCH/CPICH/POPCH)*DV78ON
Where: DV78ON = 1 If(YEAR .GE. 78)
0 Otherwise

WPCH = Real Chinese Wheat Price ($/MT)
WP*XRCH/CPICH

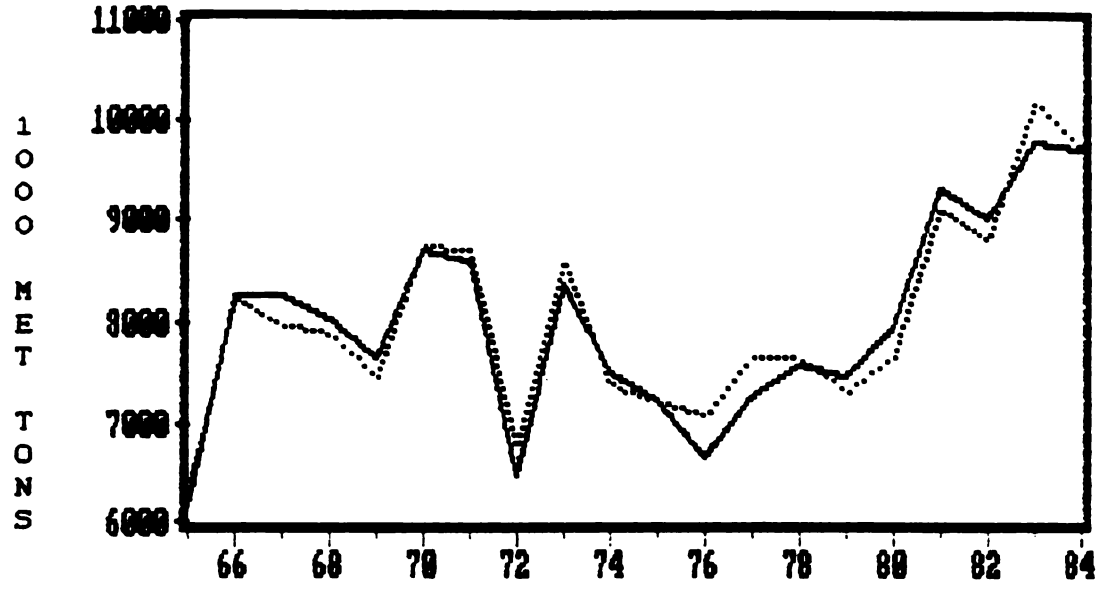
FPCH = Real Chinese Coarse Grain Price ($/MT)
FP*XRCH/CPICH

DV40ON = 1 If(YEAR .GE. 84)
0 Otherwise

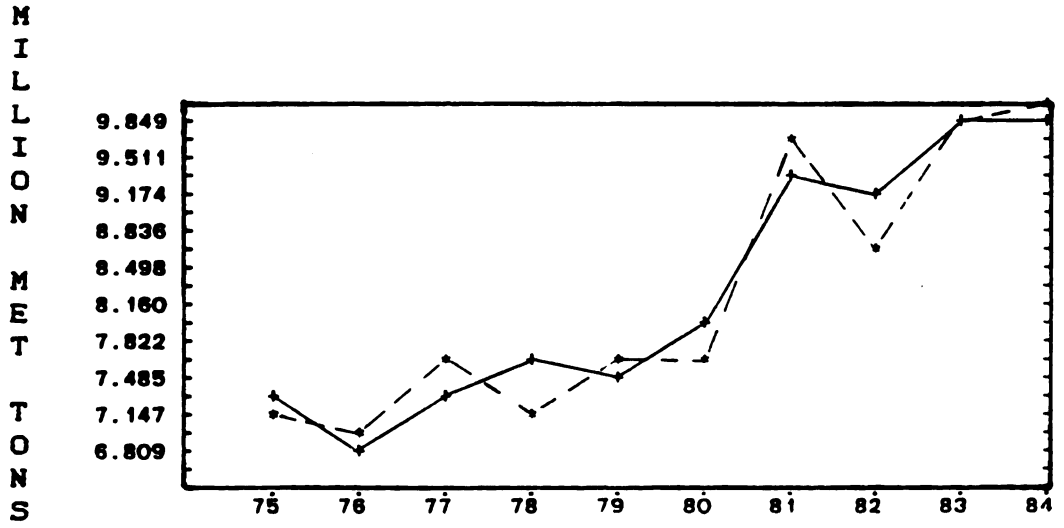
SMPL 1961 - 1984
24 Observations

Series	Mean	S.D.	Maximum	Minimum
PCFNI	0.0004774	0.0012689	0.0031155	-0.0033333
S1	1.154D-06	1.853D-06	4.831D-06	0.0000000
PCFPRO	0.0762404	0.0080207	0.0921411	0.0565381
FPCH	1.9499650	0.4898698	2.9261280	1.2731470
WPCH	2.3584564	0.7027887	4.0450370	1.5093750
DV84ON	0.0416667	0.2041241	1.0000000	0.0000000

	Covariance	Correlation
PCFNI,PCFNI	1.543D-06	1.0000000
PCFNI,S1	2.234D-10	0.0991782
PCFNI,PCFPRO	-2.311D-06	-0.2368999
PCFNI,FPCH	-1.965D-05	-0.0329859
PCFNI,WPCH	8.763D-05	0.1025426
PCFNI,DV84ON	-0.0001588	-0.6396892
S1,S1	3.289D-12	1.0000000
S1,PCFPRO	1.086D-08	0.7625389
S1,FPCH	3.411D-07	0.3922363
S1,WPCH	5.316D-07	0.4260313
S1,DV84ON	1.532D-07	0.4227333
PCFPRO,PCFPRO	6.165D-05	1.0000000
PCFPRO,FPCH	0.0015349	0.4076293
PCFPRO,WPCH	0.0020489	0.3792827
PCFPRO,DV84ON	0.0006625	0.4222599
FPCH,FPCH	0.2299735	1.0000000
FPCH,WPCH	0.3079058	0.9332453
FPCH,DV84ON	0.0219449	0.2290031
WPCH,WPCH	0.4733323	1.0000000
WPCH,DV84ON	0.0324868	0.2363039
DV84ON,DV84ON	0.0399306	1.0000000



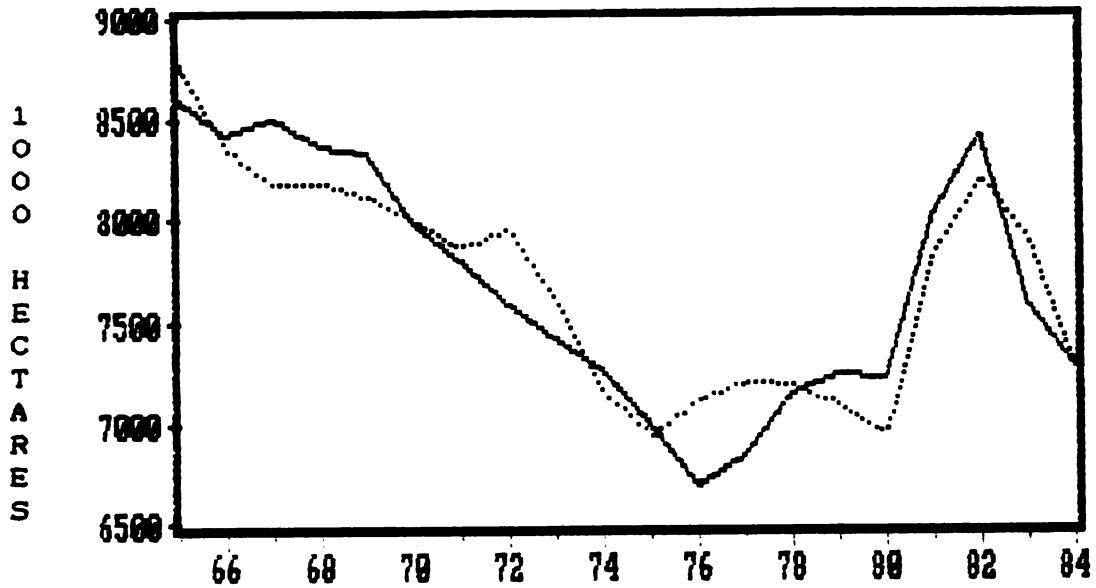
REGIONAL MODEL SIMULATION



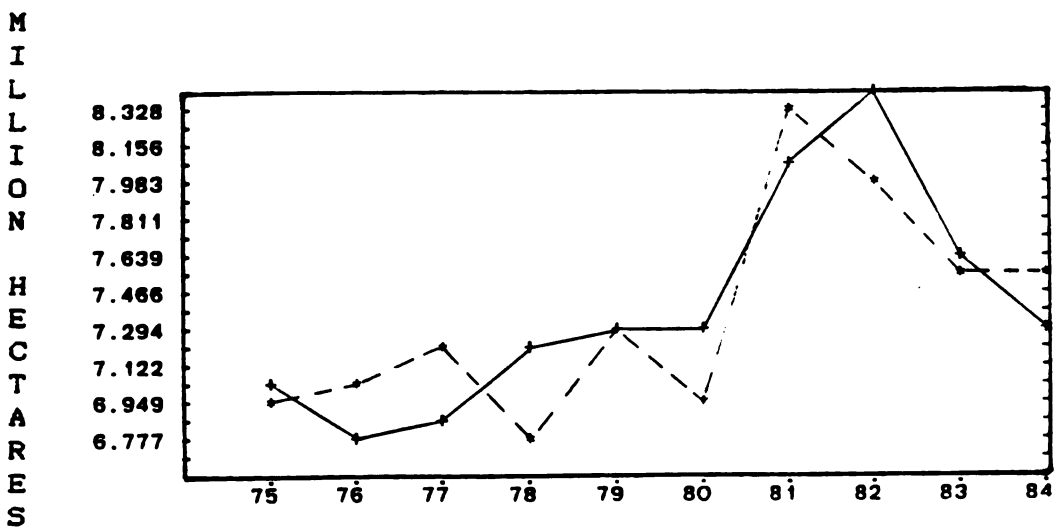
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.9.a & b. Soybean Production - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.10.a & b. Soybean Harvested Area - China

China
Soybean Harvested Area (1000 Hectares)

```
3MFL    1965  -  1984
20 Observations
LS // Dependent Variable is SHACH
```

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	6532.9452	963.04008	6.7836690	0.000
SHACH(-1)	0.2832281	0.0996621	2.8418837	0.012
DV81ON	1098.5126	230.54968	4.7647544	0.000
FRCH4(-1)	-347.68926	72.634341	-4.7868440	0.000

R-squared	0.876080	Mean of dependent var	7686.200
Adjusted R-squared	0.852845	S.D. of dependent var	605.0406
S.E. of regression	232.0985	Sum of squared resid	861915.4
Durbin-Watson stat	1.562296	F-statistic	37.70513
Log likelihood	-135.0906	TPE	4/20

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1965	-164.089	8593.00	8757.09
	1966	129.040	8425.00	8295.96
	1967	312.520	8503.00	8190.48
	1968	95.2126	8363.00	8267.79
	1969	169.679	8329.00	8159.32
	1970	-76.9356	7985.00	8061.94
	1971	-60.2131	7791.00	7851.21
	1972	-347.406	7583.00	7930.41
	1973	-79.1415	7408.00	7487.14
	1974	170.737	7261.00	7090.26
	1975	30.0266	6999.00	6968.97
	1976	-434.176	6691.00	7125.18
	1977	-225.072	6850.00	7075.07
	1978	59.0187	7144.00	7084.98
	1979	183.621	7247.00	7063.38
	1980	237.180	7226.00	6988.82
	1981	108.892	8024.00	7915.11
	1982	164.996	8419.00	8254.00
	1983	-368.302	7597.00	7965.30
	1984	94.4134	7286.00	7191.59

INDEPENDENT VARIABLES

SHACH = Soybean Harvested Area (1000 HA)

FRCH4 = Coarse Grain Revenue Per Hectare
(FYCH(-3)+FYCH(-2)+FYCH(-1)+FYCH)/4*FP*XRCH/CPICH

DV81ON = 1 If (YEAR .GE. 81)
0 Otherwise

SMPL 1965 - 1984
20 Observations

Series	Mean	S.D.	Maximum	Minimum
SHACH	7686.2000	605.04063	8593.0000	6691.0000
SHACH(-1)	7822.3500	788.73358	10009.000	6691.0000
DV81ON	0.2000000	0.4103913	1.0000000	0.0000000
FRCH4(-1)	3.6870768	1.5287751	7.4536530	1.7564140

	Covariance	Correlation
SHACH,SHACH	347770.46	1.0000000
SHACH,SHACH(-1)	374573.98	0.8262265
SHACH,DV81ON	29.060000	0.1231939
SHACH,FRCH4(-1)	-479.34192	-0.5454986
SHACH(-1),SHACH(-1)	590995.63	1.0000000
SHACH(-1),DV81ON	-1.1700000	-0.0038048
SHACH(-1),FRCH4(-1)	-599.59480	-0.5234321
DV81ON,DV81ON	0.1600000	1.0000000
DV81ON,FRCH4(-1)	0.4209812	0.7063132
FRCH4(-1),FRCH4(-1)	2.2202957	1.0000000

China
Soybean Yield (Metric Tons per Hectare)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is SYCH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-4.7044982	1.0608597	-4.4346092	0.000
LOGT	1.3337444	0.2466265	5.4079521	0.000

R-squared	0.606185	Mean of dependent var	1.031532
Adjusted R-squared	0.585457	S.D. of dependent var	0.144315
S.E. of regression	0.092917	Sum of squared resid	0.164038
Durbin-Watson stat	1.955389	F-statistic	29.24595
Log likelihood	21.15016		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
. *	1964	-0.05610	0.78629	0.84239
*	1965	-0.14853	0.71454	0.86307
:*	1966	0.09817	0.98160	0.88343
* :	1967	0.06911	0.97260	0.90349
* :	1968	0.03813	0.96138	0.92325
* :	1969	-0.02664	0.91608	0.94272
: *	1970	0.12889	1.09080	0.96191
: *	1971	0.12429	1.10512	0.98083
* :	1972	-0.14889	0.85059	0.99948
: *	1973	0.11198	1.12986	1.01788
* :	1974	-0.00724	1.02878	1.03602
* :	1975	-0.01949	1.03443	1.05393
*:	1976	-0.07921	0.99238	1.07159
* :	1977	-0.02917	1.05985	1.08903
* :	1978	-0.04731	1.05893	1.10624
* :	1979	-0.09384	1.02939	1.12323
* :	1980	-0.04120	1.09881	1.14001
*:	1981	0.00557	1.16214	1.15657
*:	1982	-0.10036	1.07257	1.17294
:*	1983	0.09561	1.28472	1.18910
: *	1984	0.12624	1.33132	1.20508

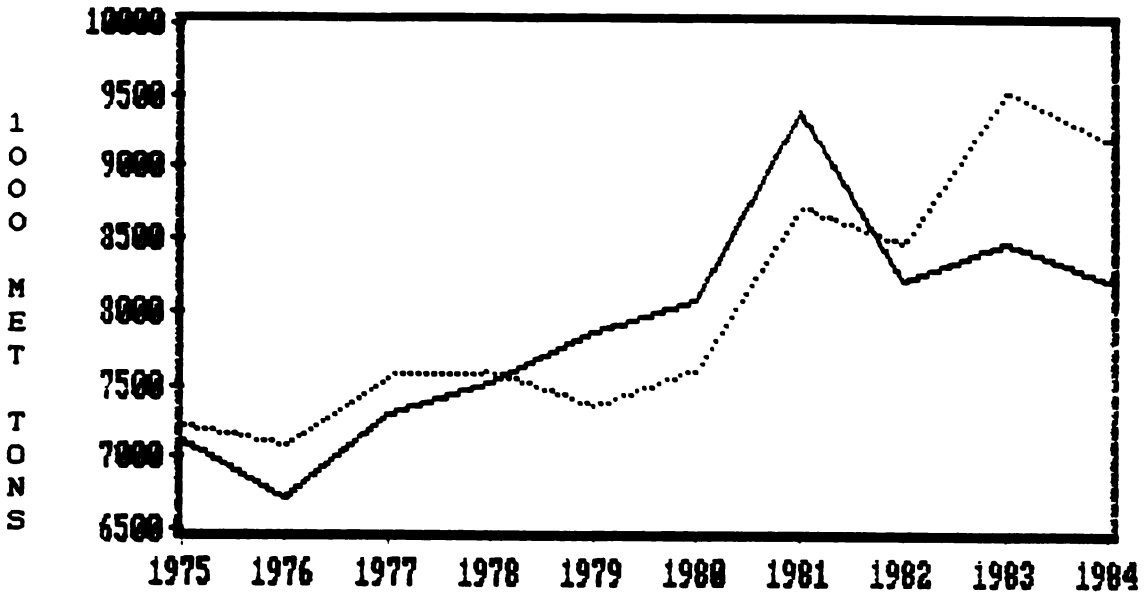
INDEPENDENT VARIABLES

LOGT = ln(YEAR)

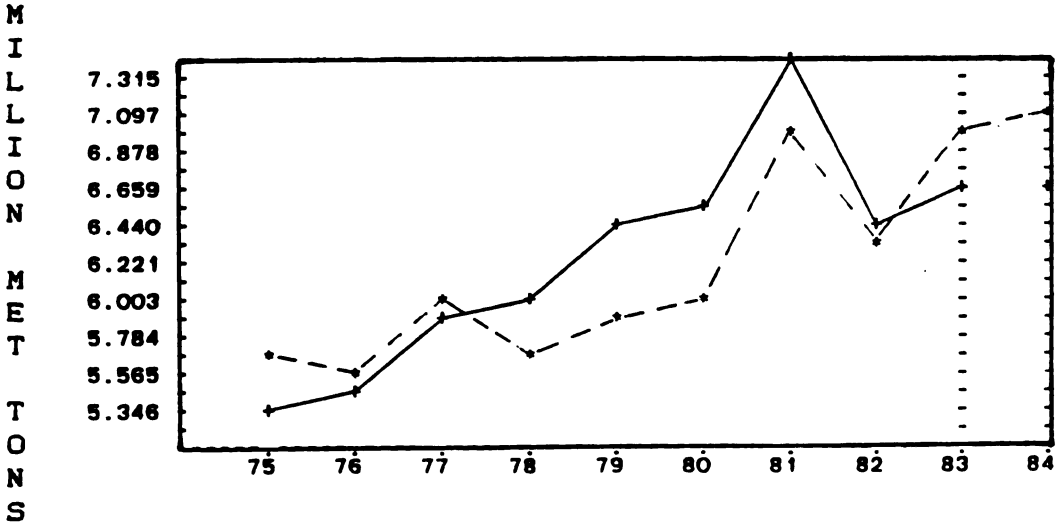
SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SYCH	1.0315323	0.1443149	1.3313200	0.7145351
LOGT	4.3006970	0.0842444	4.4308170	4.1588830

	Covariance	Correlation
SYCH,SYCH	0.0198350	1.0000000
SYCH,LOGT	0.0090150	0.7785785
LOGT,LOGT	0.0067592	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.11.a & b. Soymeal Equivalent Consumption - China

China
Per Capita Soymeal Equivalent Consumption* (1000 MT)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is PCSMEC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0044710	0.0039279	-1.1382602	0.272
PCSPRO	0.6350321	0.0846771	7.4994557	0.000
PCOMSU	-0.1185414	0.1137327	-1.0422807	0.313
PCRGDP	-692.55394	478.32685	-1.4478676	0.167
YEAR	0.0001099	6.075D-05	1.8090516	0.089

R-squared	0.861256	Mean of dependent var	0.006860
Adjusted R-squared	0.826570	S.D. of dependent var	0.000865
S.E. of regression	0.000360	Sum of squared resid	2.07D-06
Durbin-Watson stat	1.371357	F-statistic	24.83008
Log likelihood	139.5713		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	-7.7D-05	0.00822	0.00830
	1965	-0.00035	0.00613	0.00648
	1966	0.00015	0.00822	0.00807
	1967	-0.00012	0.00801	0.00814
	1968	-0.00035	0.00765	0.00799
	1969	-5.7D-05	0.00716	0.00722
	1970	0.00018	0.00790	0.00772
	1971	0.00019	0.00769	0.00750
	1972	9.7D-05	0.00583	0.00573
	1973	0.00076	0.00771	0.00695
	1974	-6.5D-05	0.00628	0.00634
	1975	-3.0D-05	0.00610	0.00613
	1976	-0.00024	0.00572	0.00596
	1977	-0.00020	0.00613	0.00633
	1978	-6.5D-05	0.00620	0.00627
	1979	0.00050	0.00650	0.00601
	1980	0.00030	0.00654	0.00624
	1981	0.00049	0.00747	0.00697
	1982	-0.00027	0.00627	0.00654
	1983	-0.00051	0.00633	0.00684
	1984	-0.00033	0.00602	0.00635

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPCH/CPICH/POPCH

PCSPRO = Soymeal Production Per Capita (1000 MT)
SPROCH/POPCH

PCOMSU = Per Capita Supply of Cottonseed, Peanut, Rapeseed and Sunflower Seed Meals (1000 MT)
(CPROCH*.38 + PPROCH*.46 + RPROCH*.44 + NPROCH*.44)/POPCH

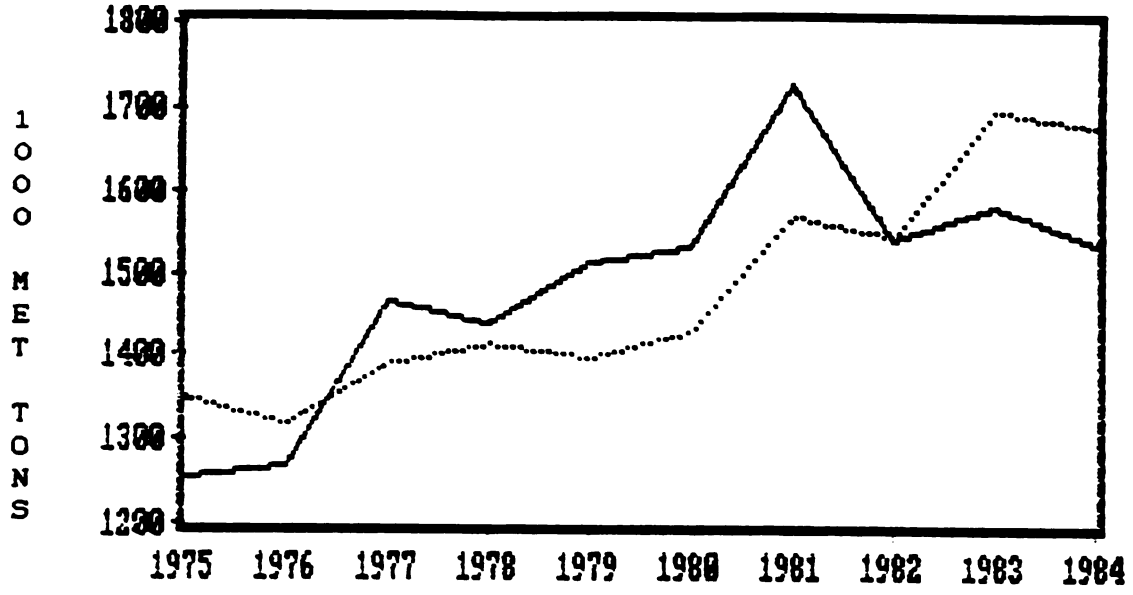
---

* Soymeal Equivalent Consumption =
(SPROCH - SNECH)*.795 - SMNECH

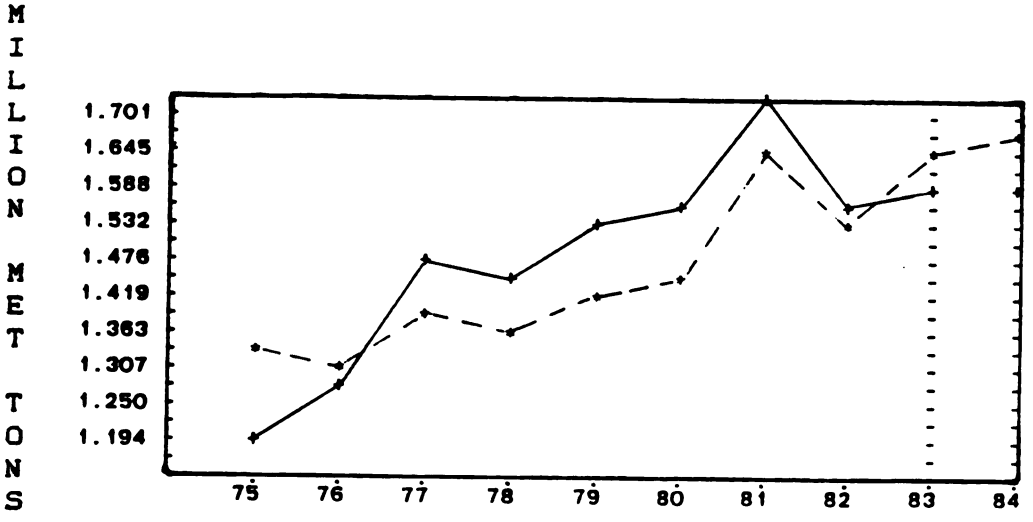
SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSMEC	0.0068610	0.0008644	0.0082200	0.0057200
PCSPRO	0.0090508	0.0012765	0.0111631	0.0070849
PCOMSU	0.0036517	0.0024329	0.0085716	0.0005059
PCRGDP	3.056D-06	7.735D-07	4.831D-06	1.863D-06
YEAR	74.000000	6.2048368	84.000000	64.000000

	Covariance	Correlation
PCSMEC, PCSMEC	7.116D-07	1.0000000
PCSMEC, PCSPRO	9.318D-07	0.8867613
PCSMEC, PCOMSU	-1.041D-06	-0.5197832
PCSMEC, PCRGDP	-3.276D-10	-0.5145054
PCSMEC, YEAR	-0.0029929	-0.5859162
PCSPRO, PCSPRO	1.552D-06	1.0000000
PCSPRO, PCOMSU	-1.064D-06	-0.3596779
PCSPRO, PCRGDP	-3.364D-10	-0.3577512
PCSPRO, YEAR	-0.0037566	-0.4980191
PCOMSU, PCOMSU	5.637D-06	1.0000000
PCOMSU, PCRGDP	1.706D-09	0.9520927
PCOMSU, YEAR	0.0134911	0.9383972
PCRGDP, PCRGDP	5.698D-13	1.0000000
PCRGDP, YEAR	4.390D-06	0.9604662
YEAR, YEAR	36.666667	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.12.a & b. Soyoil Equivalent Consumption - China

China
Per Capita Soyoil Equivalent Consumption* (1000 MT)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is PCSOEC

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0004063	0.0002621	1.5501828	0.140
PCRGDP	91.801528	82.866201	1.1078284	0.283
PCSPRO	0.1087358	0.0165466	6.5714856	0.000
PCOOSU	-0.0585921	0.0533446	-1.0983684	0.287

R-squared	0.739794	Mean of dependent var	0.001570
Adjusted R-squared	0.693875	S.D. of dependent var	0.000156
S.E. of regression	8.64D-05	Sum of squared resid	1.27D-07
Durbin-Watson stat	1.421171	F-statistic	16.11091
Log likelihood	168.9086		

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	4.0D-05	0.00181	0.00177
*	1965	-0.00016	0.00134	0.00150
*	1966	-8.3D-06	0.00180	0.00181
*	1967	-5.4D-06	0.00176	0.00176
*	1968	-7.1D-06	0.00168	0.00169
*	1969	-1.4D-05	0.00157	0.00159
*	1970	9.8D-06	0.00174	0.00173
*	1971	8.4D-06	0.00170	0.00170
*	1972	-2.2D-05	0.00135	0.00137
*	1973	9.8D-05	0.00170	0.00160
*	1974	-7.7D-05	0.00139	0.00147
*	1975	-8.3D-05	0.00136	0.00144
*	1976	-1.1D-05	0.00135	0.00136
*	1977	0.00011	0.00155	0.00144
*	1978	1.9D-05	0.00149	0.00147
*	1979	9.1D-05	0.00155	0.00146
*	1980	7.5D-05	0.00155	0.00148
*	1981	0.00015	0.00173	0.00157
*	1982	9.1D-06	0.00152	0.00151
*	1983	-7.5D-05	0.00154	0.00162
*	1984	-0.00015	0.00148	0.00163

INDEPENDENT VARIABLES

PCRGDP = Real Income Per Capita
GDPCH/CPICH/POPCH

PCSPRO = Soymeal Production Per Capita (1000 MT)
SPROCH/POPCH

PCOOSU = Per Capita Supply of Cottonseed, Peanut, Rapeseed and Sunflower Seed Oils (1000 MT)
(CPROCH*.115 + PPROCH*.159 + RPROCH*.346 + NPROCH*.40)/POPCH

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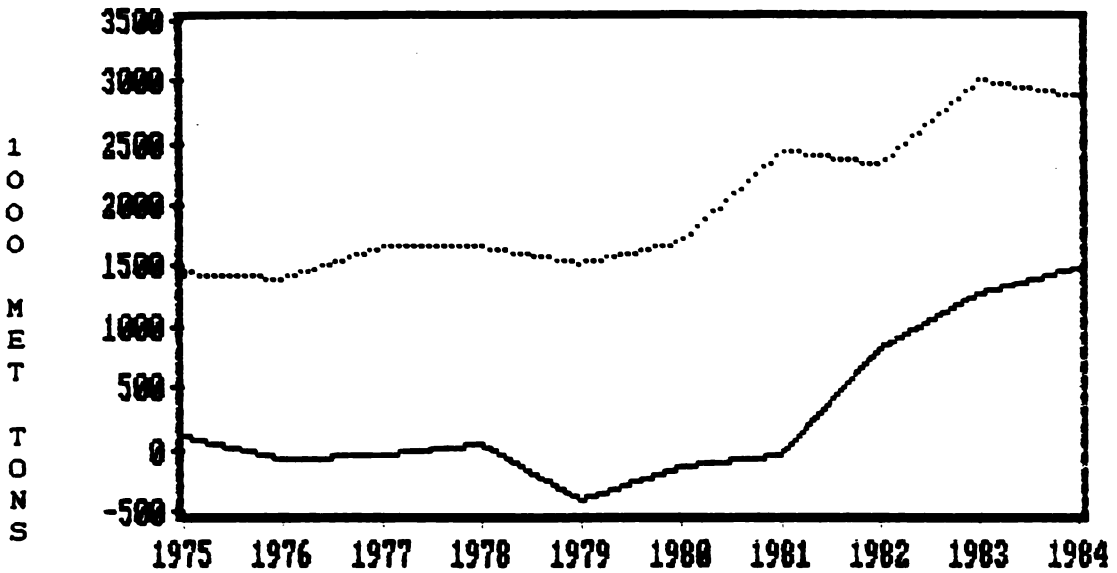
* Soyoil Equivalent Consumption =
(SPROCH - SNECH)*.195 - SMOECH

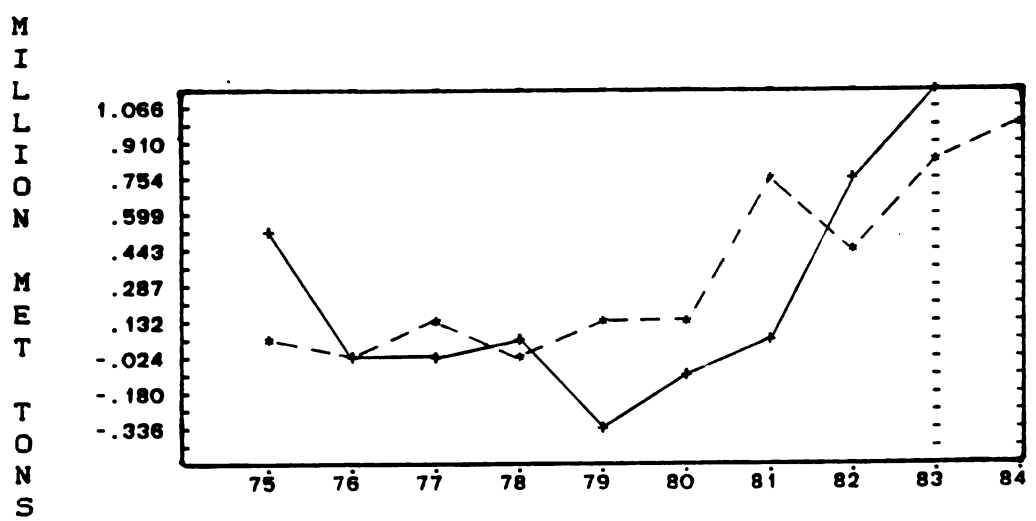
SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
PCSOEC	0.0015697	0.0001562	0.0018061	0.0013431
PCRGDP	3.056D-06	7.735D-07	4.831D-06	1.863D-06
PCSPRO	0.0090508	0.0012765	0.0111631	0.0070849
PCOOSU	0.0017279	0.0011687	0.0040725	0.0004185

	Covariance	Correlation
PCSOEC, PCSOEC	2.322D-08	1.0000000
PCSOEC, PCRGDP	-3.212D-11	-0.2792690
PCSOEC, PCSPRO	1.612D-07	0.8489072
PCSOEC, PCOOSU	-4.448D-08	-0.2559202
PCRGDP, PCRGDP	5.698D-13	1.0000000
PCRGDP, PCSPRO	-3.364D-10	-0.3577512
PCRGDP, PCOOSU	8.167D-10	0.9486375
PCSPRO, PCSPRO	1.552D-06	1.0000000
PCSPRO, PCOOSU	-3.976D-07	-0.2798673
PCOOSU, PCOOSU	1.301D-06	1.0000000



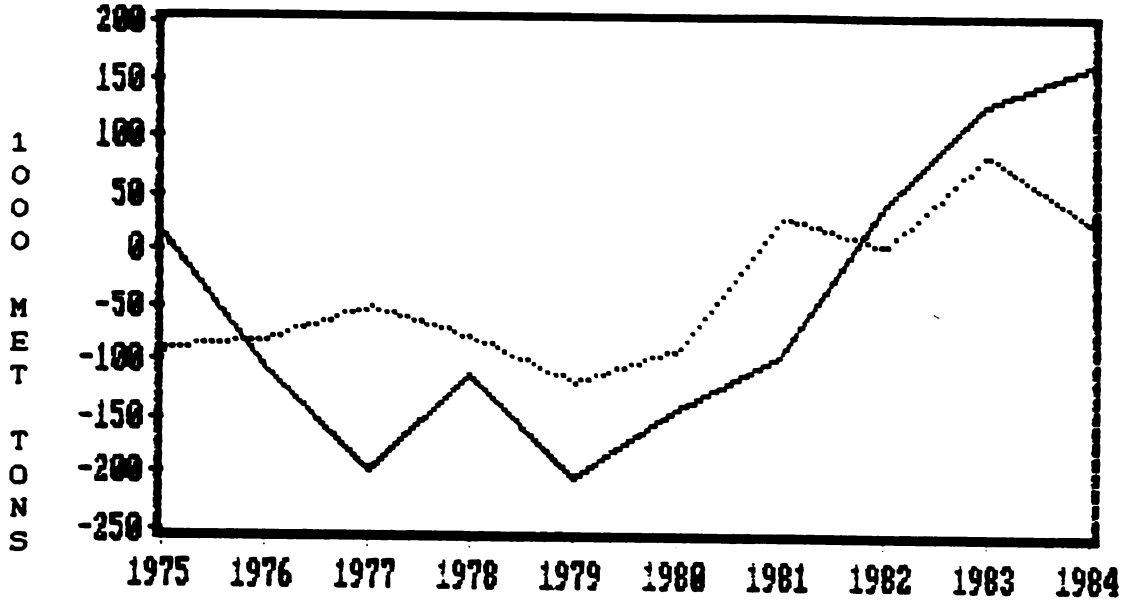
REGIONAL MODEL SIMULATION



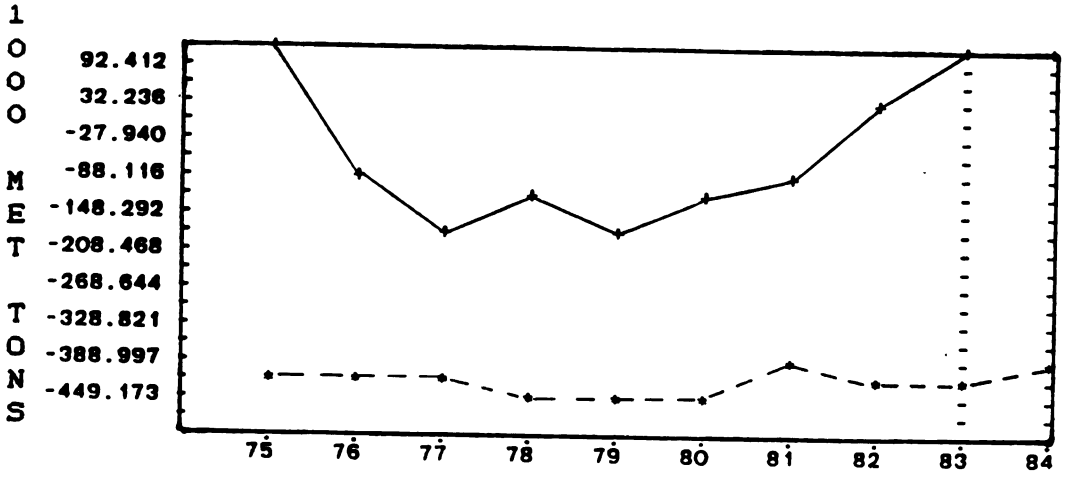
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.13.a & b. Soymeal Equivalent Exports - China



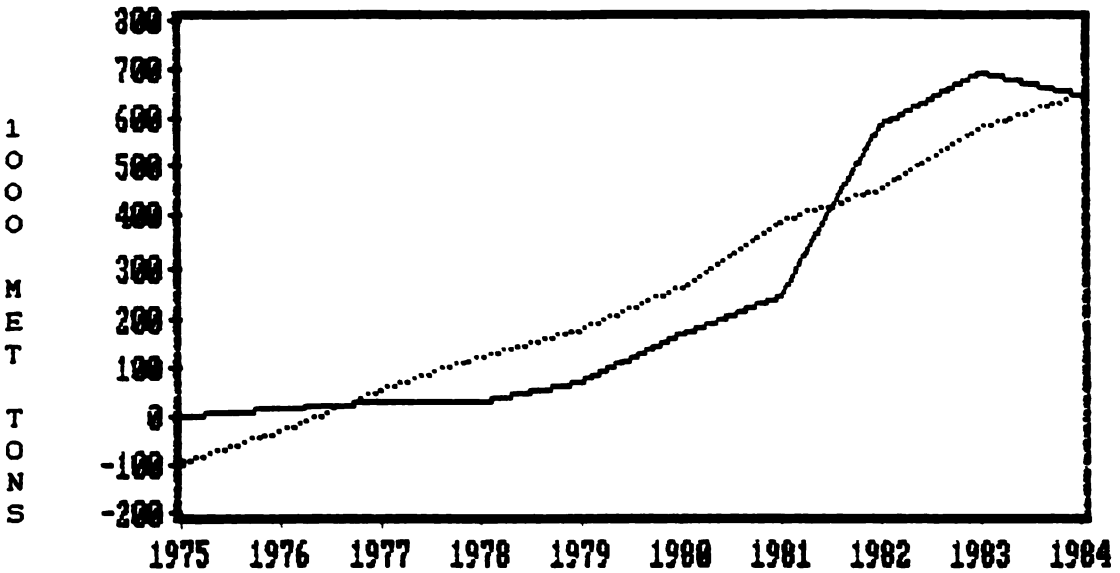
REGIONAL MODEL SIMULATION



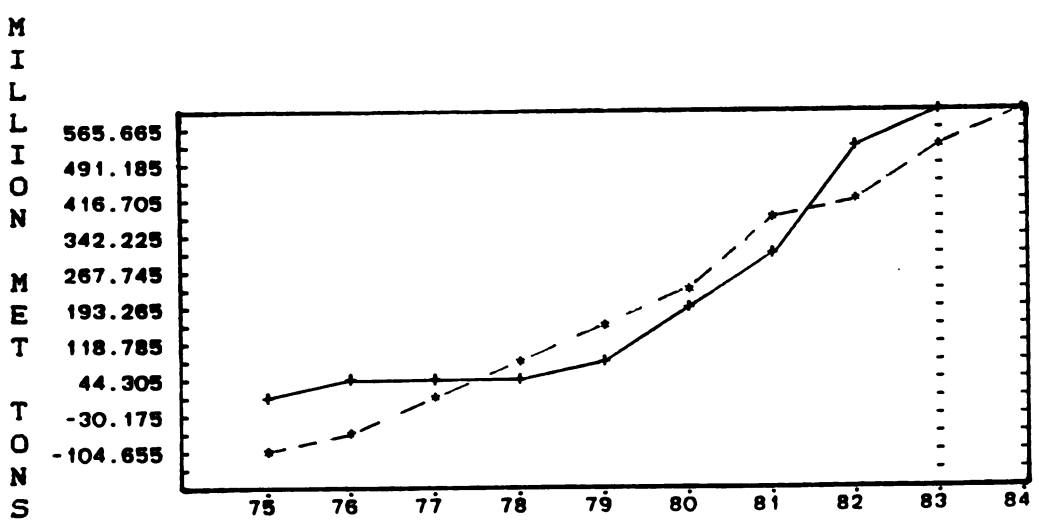
EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.14.a & b. Soyoil Equivalent Exports - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.15.a & b. Soymeal Net Exports - China

China
Soymeal Net Exports (1000 MT)

SMPL 1976 - 1983
8 Observations
LS // Dependent Variable is SMNECH

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-4808.6001	1646.0543	-2.9212888	0.043
SPROCH	0.1707557	0.0669178	2.5517243	0.063
SMECO	-0.2549704	0.0598612	-4.2593611	0.013
YEAR	65.981012	26.036295	2.5341936	0.064

R-squared	0.971430	Mean of dependent var	205.7500
Adjusted R-squared	0.950002	S.D. of dependent var	223.8263
S.E. of regression	50.04804	Sum of squared resid	10019.22
Durbin-Watson stat	1.893859	F-statistic	45.33528
Log likelihood	-39.88279	TPE	2/8

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
: : : *: :	1976	44.7740	17.0000	-27.7740
: : * : :	1977	1.45860	29.0000	27.5414
* : : : :	1978	-78.4950	29.0000	107.495
: : :* : :	1979	5.81608	66.0000	60.1839
: : * : :	1980	-9.10439	170.000	179.104
: : : * : :	1981	21.5907	245.000	223.409
: : : * : :	1982	31.1729	540.000	508.827
: : * : : :	1983	-17.2129	550.000	567.213

INDEPENDENT VARIABLES

SPROCH = Soybean Production (1000 MT)

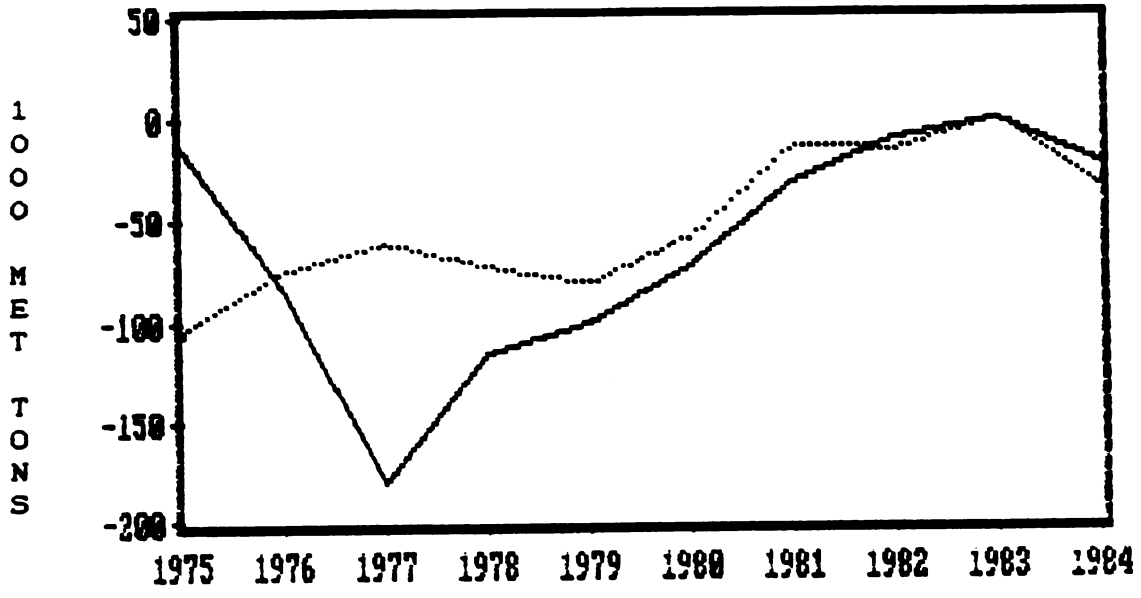
SMECO = Soymeal Equivalent Consumption (1000 MT)
(SPROCH - SNECH)*.795 -SMNECH

YEAR = 1960=60, 1961=61,...

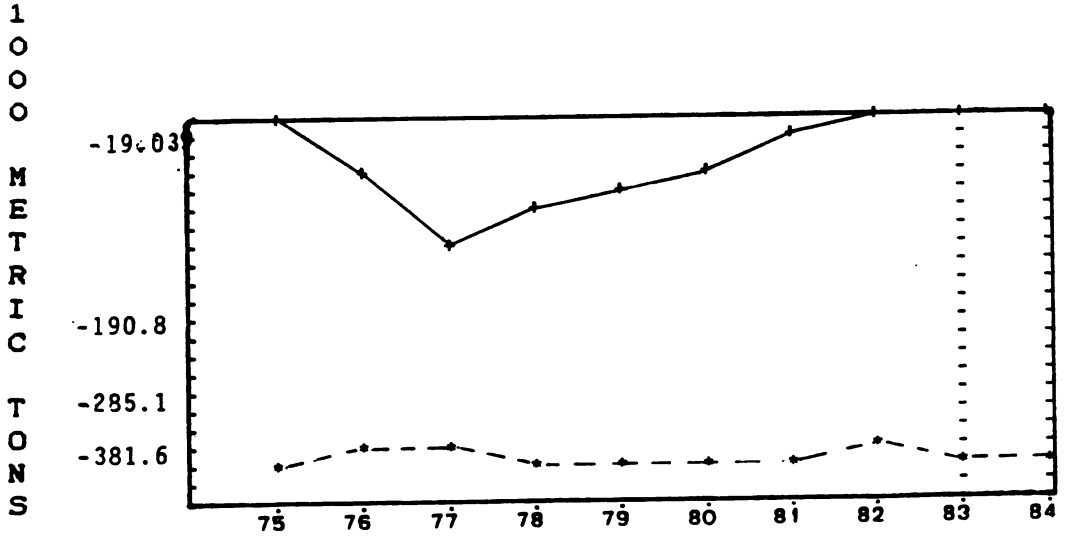
SMPL 1976 - 1983
8 Observations

Series	Mean	S.D.	Maximum	Minimum
SMNECH	205.75000	223.82630	550.00000	17.000000
SPROCH	8122.5000	1113.2770	9760.0000	6640.0000
SMECO	6346.2425	655.31650	7470.4750	5363.5600
YEAR	79.500000	2.4494897	83.000000	76.000000

	Covariance	Correlation
SMNECH, SMNECH	43835.938	1.0000000
SMNECH, SPROCH	193019.38	0.8852756
SMNECH, SMECO	76083.463	0.5928161
SMNECH, YEAR	439.87500	0.9169264
SPROCH, SPROCH	1084462.5	1.0000000
SPROCH, SMECO	558777.90	0.8753401
SPROCH, YEAR	2278.1250	0.9547521
SMECO, SMECO	375759.76	1.0000000
SMECO, YEAR	1159.0689	0.8252290
YEAR, YEAR	5.2500000	1.0000000



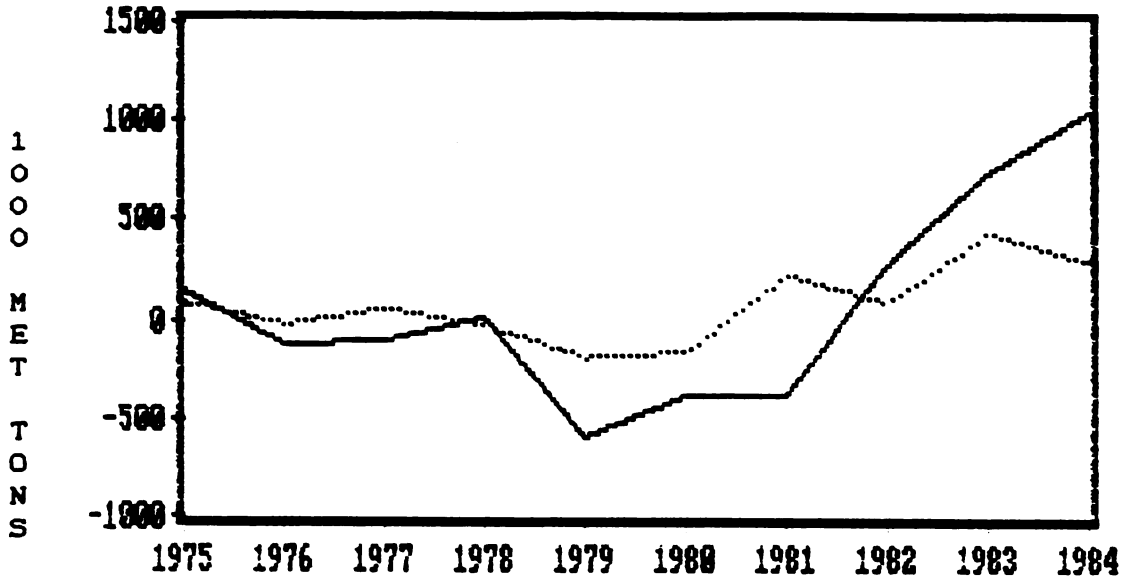
REGIONAL MODEL SIMULATION



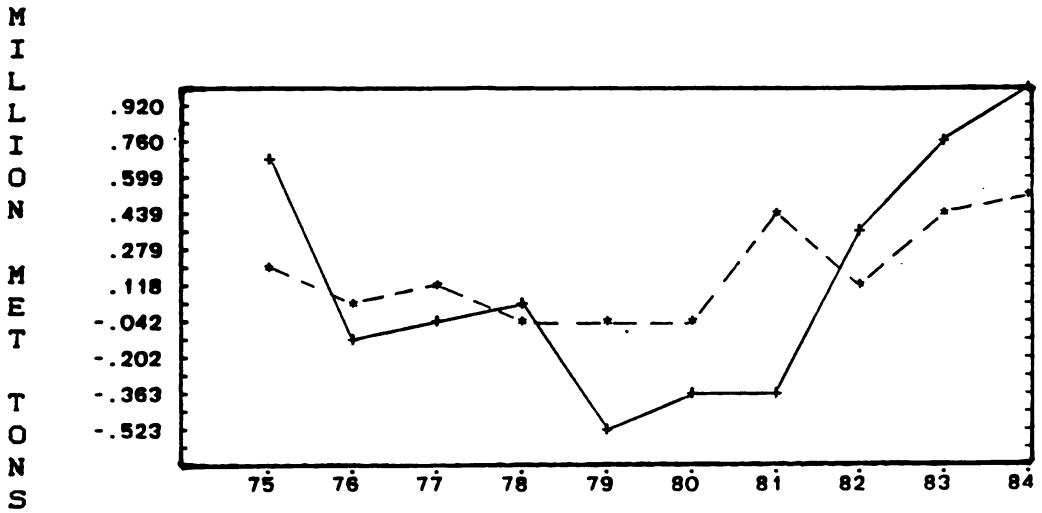
EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure K.16.a & b. Soyoil Net Exports - China



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure K.17.a & b. Soybean Net Exports - China

APPENDIX L

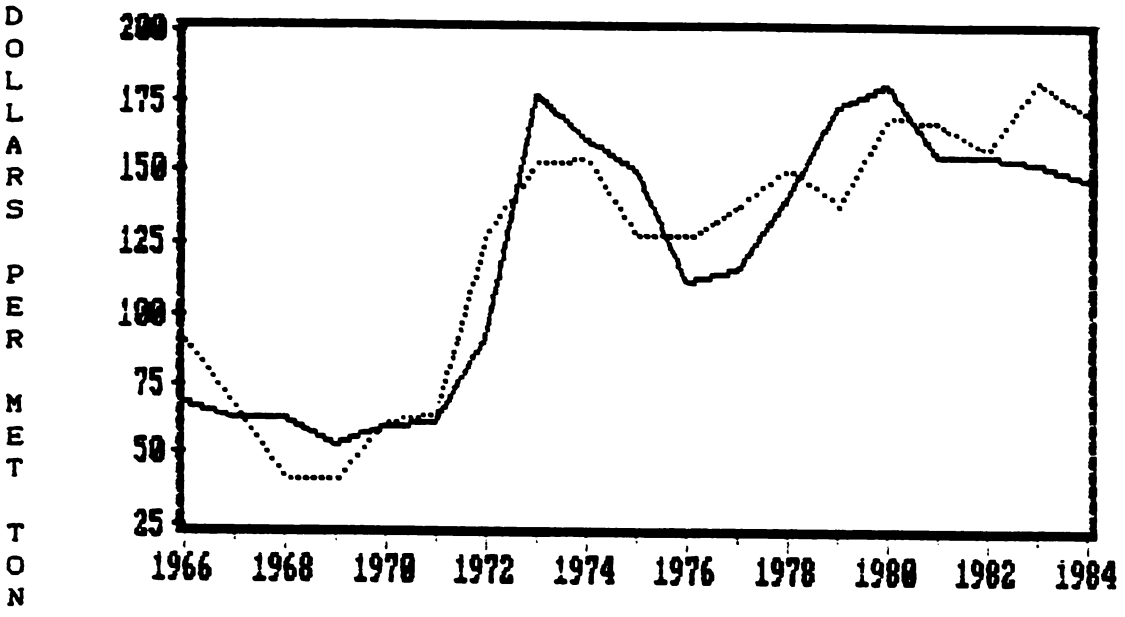
PRICE EQUATION STATISTICS

WP.....Wheat Price

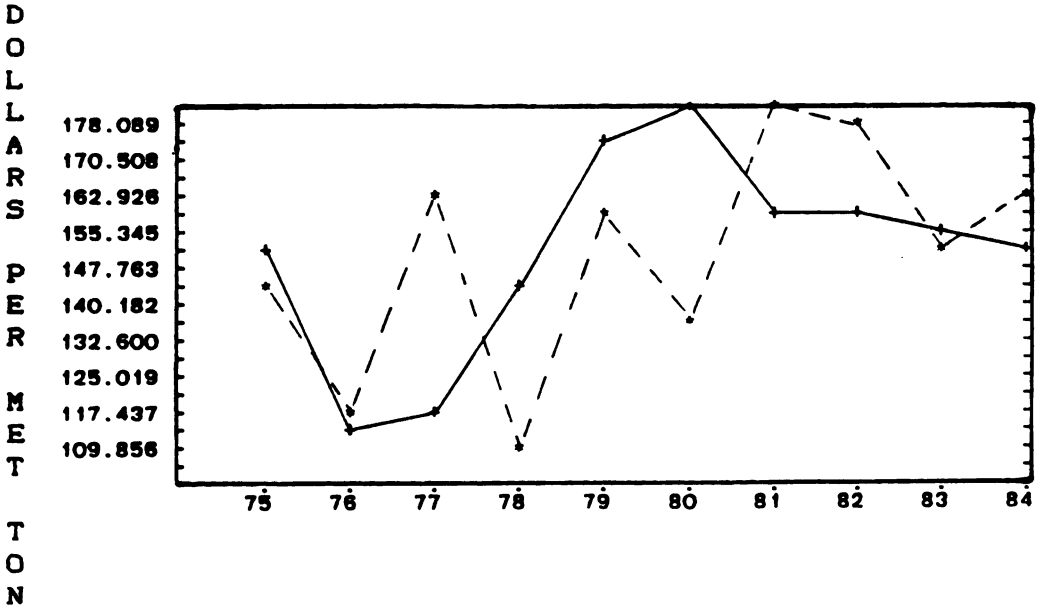
FP.....Coarse Grain Price

SMP.....Soymeal Price

SP.....Soybean Price



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure L.1.a & b. Wheat Price - U.S. Gulf

United States
Wheat Price/Loan Rate Ratio (\$/MT)
SMPL 1966 - 1984
19 Observations
LS // Dependent Variable is WPLRMT

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.1082633	0.2768339	-0.3910767	0.701
WUSR	0.8891656	0.1155336	7.6961650	0.000
WSPL	-0.0046350	0.0008178	-5.6679084	0.000

R-squared	0.805160	Mean of dependent var	1.730448
Adjusted R-squared	0.780805	S.D. of dependent var	0.772029
S.E. of regression	0.361450	Sum of squared resid	2.090343
Durbin-Watson stat	1.913666	F-statistic	33.05936
Log likelihood	-5.992281	TPE	4/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1966	-0.50197	1.46398	1.96595
	1967	-0.06278	1.36796	1.43075
	1968	0.48651	1.36796	0.88146
	1969	0.28999	1.16004	0.87005
	1970	0.00348	1.31201	1.30852
	1971	-0.06172	1.32006	1.38178
	1972	-0.77717	2.00002	2.77719
	1973	0.54503	3.85590	3.31087
	1974	0.15396	3.21163	3.05767
	1975	0.47828	3.00007	2.52179
	1976	-0.17535	1.35558	1.53093
	1977	-0.25726	1.40444	1.66170
	1978	-0.12121	1.63398	1.75519
	1979	0.37714	1.87994	1.50280
	1980	0.11995	1.64999	1.53004
	1981	-0.09238	1.32812	1.42050
	1982	-0.00672	1.20040	1.20712
	1983	-0.21244	1.14380	1.35624
	1984	-0.18533	1.22264	1.40797

INDEPENDENT VARIABLES

WUSR = Wheat Utilization/Stock Ratio for Major Exporters

$$\frac{WNEAR+WCONAR}{WESAR} + \frac{WNEAU+WCONAU}{WESAU} + \frac{WNECA+WCONCA}{WESCA} +$$

$$\frac{(WCONDM-WNIDM)^*}{WESDM} + \frac{WNEUS+WCONUS}{WESUS - \alpha*WCCC - \beta*WFOR}$$

WSPL = Slope Shifter
(WSUR*YEAR*(YEAR .GE.79))

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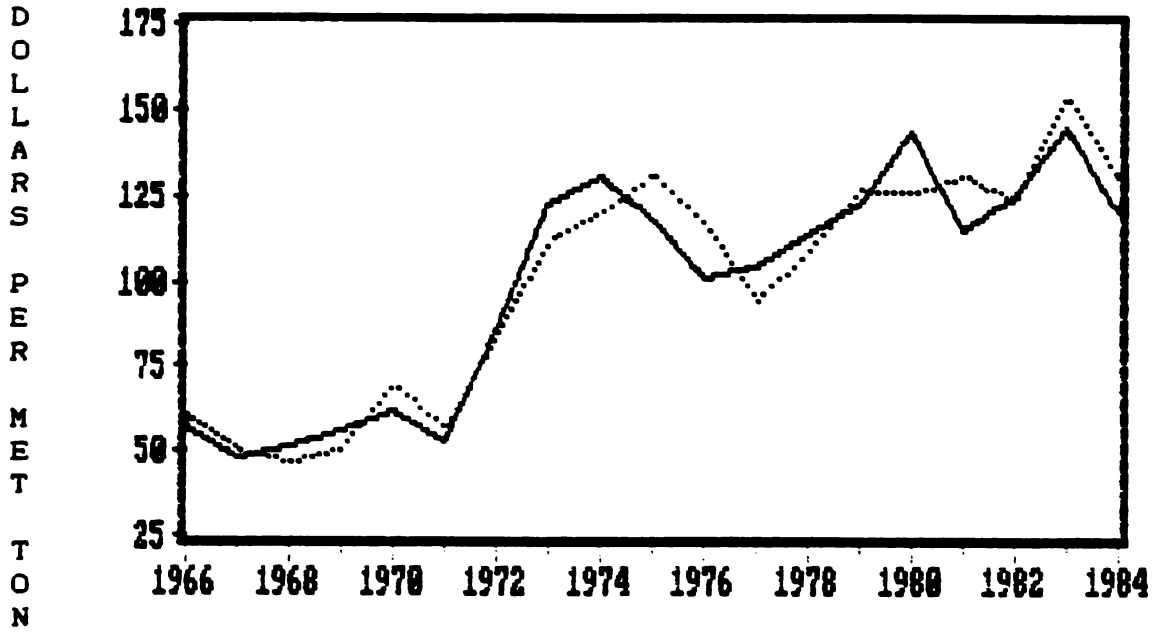
* Wheat Utilization for the Developed Markets are included only for those periods when the Developed Markets are exporters.

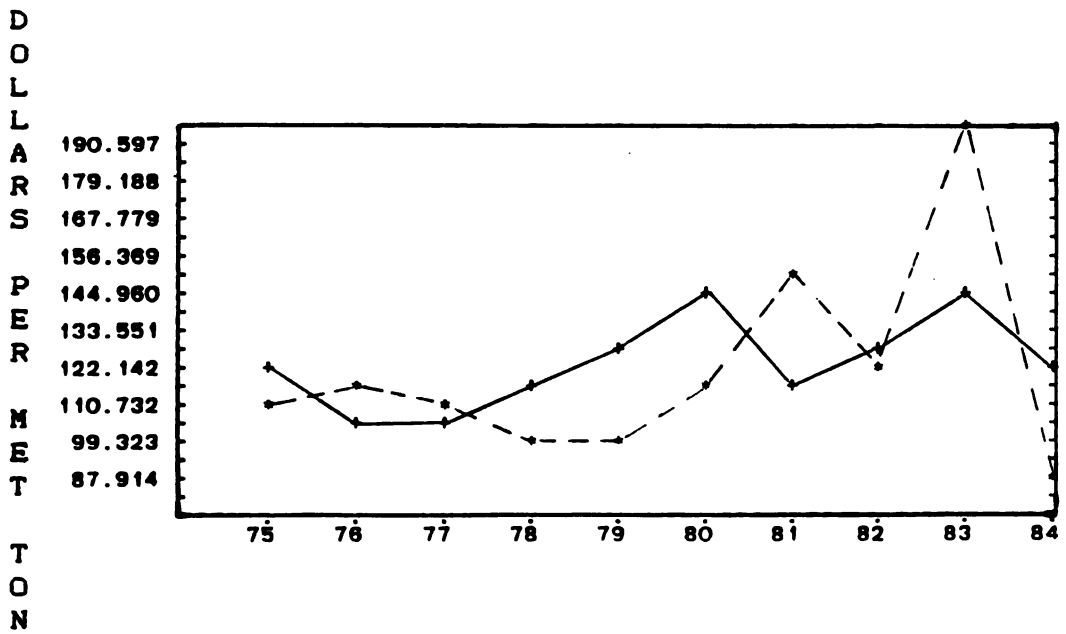
SMPL 1966 - 1984
19 Observations

Series	Mean	S.D.	Maximum	Minimum
WPLRMT	1.7304477	0.7720291	3.8559000	1.1437990
WUSR	2.4643185	0.8160440	3.8453240	1.1002570
WSPL	76.046390	115.29047	254.81680	0.0000000

	Covariance	Correlation
WPLRMT, WPLRMT	0.5646589	1.0000000
WPLRMT, WUSR	0.3840106	0.6433941
WPLRMT, WSPL	-24.421028	-0.2896130
WUSR, WUSR	0.6308790	1.0000000
WUSR, WSPL	38.175766	0.4283136
WSPL, WSPL	12592.319	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure L.2.a & b. Coarse Grain Price - U.S. Gulf

United States
Corn Price/Loan Rate Ratio ($/MT)

SMPL 1966 - 1984
19 Observations
LS // Dependent Variable is FPLRMT

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	0.0715042	0.1524405	0.4690629	0.645
FUSR	0.3125092	0.0251563	12.422688	0.000
FSPL	-0.0013706	0.0001640	-8.3596491	0.000

R-squared	0.921713	Mean of dependent var	1.644284
Adjusted R-squared	0.911928	S.D. of dependent var	0.598303
S.E. of regression	0.177558	Sum of squared resid	0.504431
Durbin-Watson stat	1.903503	F-statistic	94.18856
Log likelihood	7.513413	TPE	4/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1966	-0.05983	1.38086	1.44070
	1967	-0.02553	1.17137	1.19690
	1968	0.12244	1.23813	1.11569
	1969	0.14013	1.35232	1.21219
	1970	-0.18872	1.48562	1.67434
	1971	-0.07547	1.27611	1.35158
	1972	0.03395	2.06670	2.03275
	1973	0.29001	2.96180	2.67179
	1974	0.27708	3.01814	2.74107
	1975	-0.30120	2.70917	3.01037
	1976	-0.25507	1.70663	1.96170
	1977	0.12837	1.31503	1.18666
	1978	0.07236	1.44000	1.36764
	1979	-0.04275	1.48090	1.52365
	1980	0.20182	1.60886	1.40704
	1981	-0.16639	1.20836	1.37476
	1982	0.01694	1.23998	1.22305
	1983	-0.07814	1.38605	1.46419
	1984	-0.08999	1.19536	1.28535

INDEPENDENT VARIABLES

FUSR = Coarse Grain Utilization/Stock Ratio for Major Exporters

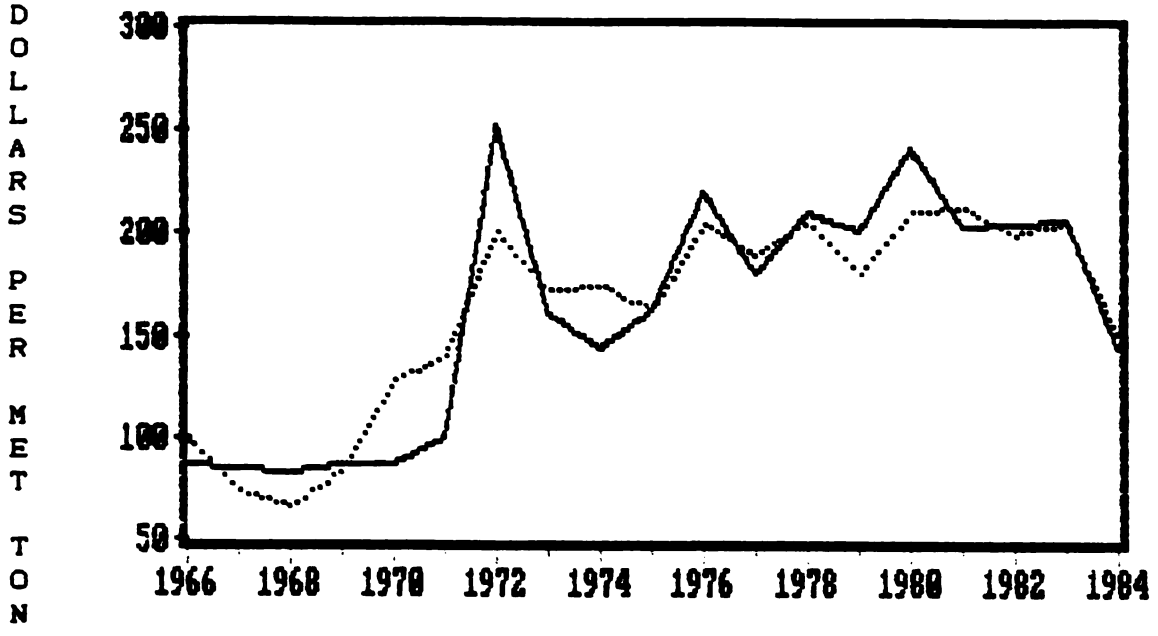
$$\frac{FNEAR+FCONAR}{FESAR} + \frac{FNEAU+FCONAU}{FESAU} + \frac{FNECA+FCONCA}{FESCA} + \frac{FNEUS+FCONUS}{FESUS - \alpha*CCCC - \beta*CFOR}$$

FSPL = Slope Shifter
(FSUR*YEAR*(YEAR .GE.79))

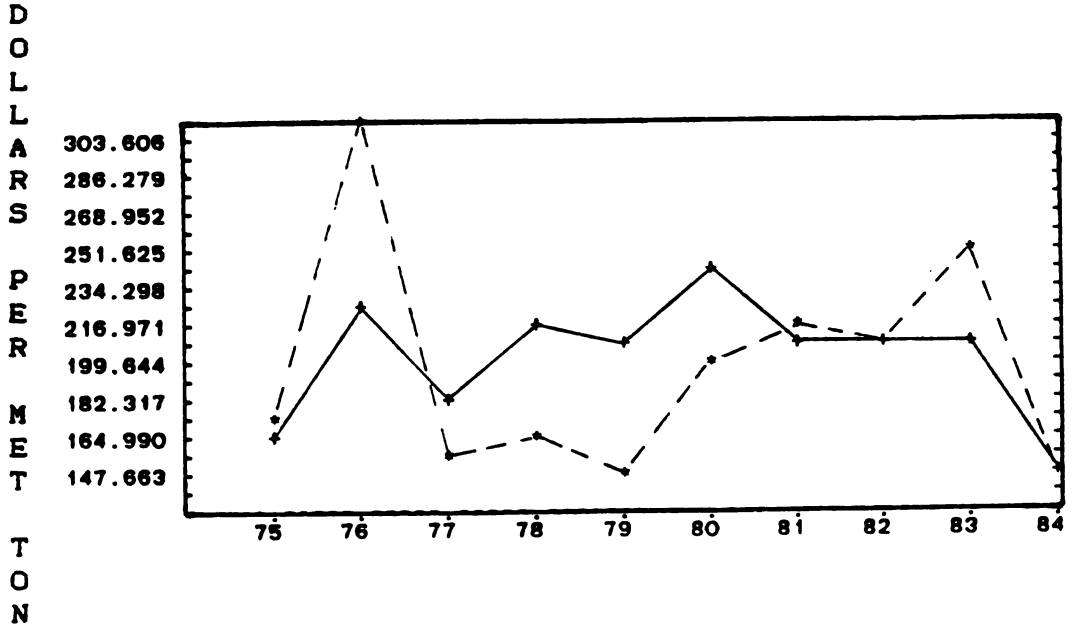
SMPL 1966 - 1984
19 Observations

Series	Mean	S.D.	Maximum	Minimum
FPLRMT	1.6442841	0.5983026	3.0181410	1.1713650
FUSR	5.9766254	1.7031151	9.4040810	3.3413070
FSPL	215.20892	261.31314	581.60710	0.0000000

	Covariance	Correlation
FPLRMT, FPLRMT	0.3391257	1.0000000
FPLRMT, FUSR	0.7350464	0.7614316
FPLRMT, FSPL	-60.460076	-0.4081949
FUSR, FUSR	2.7479380	1.0000000
FUSR, FSPL	90.257803	0.2140724
FSPL, FSPL	64690.631	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL - - - ESTIMATED

Figure L.3.a & b. Soymeal Price - 44% Decatur

United States
Real Soymeal Price ($/MT)

SMPL 1966 - 1984
19 Observations
LS // Dependent Variable is SMPUS

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-0.0816298	0.5205106	-0.1568264	0.877
FPUS	1.0436159	0.3217379	3.2436831	0.005
SMUSR	0.1178358	0.0275061	4.2839812	0.001
SPLSS	-0.0007741	0.0005653	-1.3694249	0.191

R-squared	0.709577	Mean of dependent var	2.330702
Adjusted R-squared	0.651492	S.D. of dependent var	0.798287
S.E. of regression	0.471265	Sum of squared resid	3.331361
Durbin-Watson stat	2.112791	F-statistic	12.21627
Log likelihood	-10.41978	TPE	1/19

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1966	-0.29866	2.20508	2.50374
	1967	0.31254	2.09358	1.78104
	1968	0.41760	1.93602	1.51842
	1969	0.09826	1.94337	1.84511
	1970	-0.85504	1.83737	2.69241
	1971	-0.78385	2.02505	2.80890
	1972	1.04877	4.96890	3.92012
	1973	-0.16914	2.99295	3.16209
	1974	-0.48601	2.41221	2.89821
	1975	0.02458	2.49449	2.46991
	1976	0.24260	3.18726	2.94467
	1977	-0.11196	2.44959	2.56155
	1978	0.06364	2.64520	2.58156
	1979	0.24143	2.27605	2.03462
	1980	0.31845	2.40400	2.08555
	1981	-0.08921	1.82971	1.91892
	1982	0.05151	1.76772	1.71621
	1983	0.02915	1.72043	1.69128
	1984	-0.05468	1.09437	1.14905

INDEPENDENT VARIABLES

FPUS = Real Coarse Grain Price ($/MT)
FP/CPIUS

SMUSR = Soymeal Equivalent Utilization/Stock Ratio

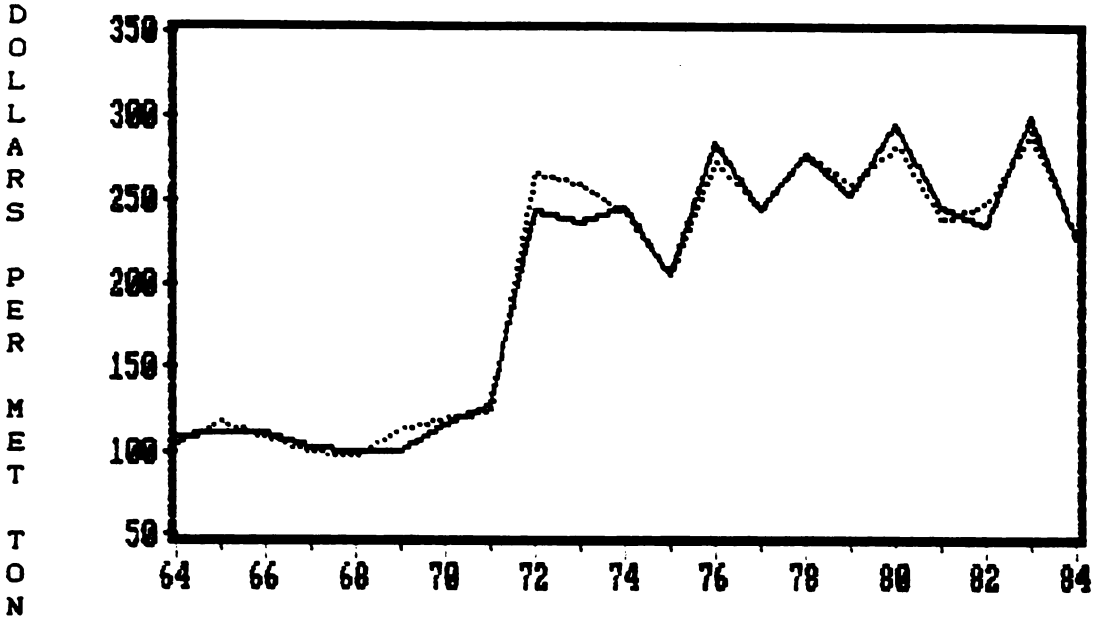
$$\frac{\text{SNEUS}*.795 + \text{SMCOUS} + \text{SMNEUS}}{\text{SESUS}*.795 + \text{SMESUS}}$$

FSPL = Slope Shifter
(FSUR*YEAR*(YEAR .GE.79))

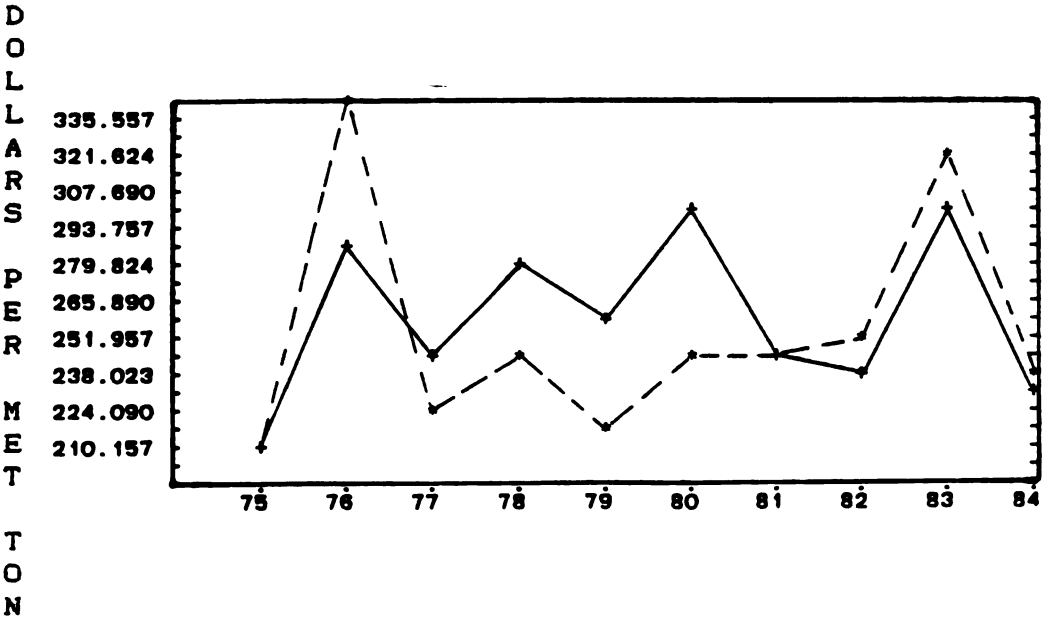
SMPL 1966 - 1984
19 Observations

Series	Mean	S.D.	Maximum	Minimum
SMPUS	2.3307024	0.7982872	4.9688980	1.0943700
FPUS	1.4088308	0.3606902	2.2714290	0.9199048
SMUSR	8.4226601	4.0449586	19.066470	2.8375040
SPLSS	65.153767	205.02053	807.41750	0.0000000

	Covariance	Correlation
SMPUS, SMPUS	0.6037223	1.0000000
SMPUS, FPUS	0.1533221	0.5620725
SMPUS, SMUSR	1.9231558	0.6286694
SMPUS, SPLSS	-53.946879	-0.3479292
FPUS, FPUS	0.1232502	1.0000000
FPUS, SMUSR	0.0783187	0.0566628
FPUS, SPLSS	-19.980677	-0.2852066
SMUSR, SMUSR	15.500549	1.0000000
SMUSR, SPLSS	-19.249650	-0.0245015
SPLSS, SPLSS	39821.132	1.0000000



REGIONAL MODEL SIMULATION



EX - POST FORECAST
1975 -1984

——— ACTUAL — — — ESTIMATED

Figure L.4.a & b. Soybean Price - U.S. GULF

United States
Soybean Price ($/MT)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is SP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.3800194	6.6300280	-0.5098047	0.616
SMP	0.7869375	0.0499336	15.759672	0.000
SOP	0.1903434	0.0170404	11.170148	0.000

R-squared	0.983022	Mean of dependent var	198.1467
Adjusted R-squared	0.981136	S.D. of dependent var	74.43737
S.E. of regression	10.22369	Sum of squared resid	1881.427
Durbin-Watson stat	1.932017	F-statistic	521.1113
Log likelihood	-76.99798	TPE	2/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	4.92057	109.860	104.939
	1965	-5.17879	111.700	116.879
	1966	3.46149	110.960	107.499
	1967	3.83214	102.510	98.6779
	1968	3.69378	99.9400	96.2462
	1969	-10.9083	100.680	111.588
	1970	-1.39207	117.210	118.602
	1971	4.60210	126.760	122.158
	1972	-21.4606	242.870	264.331
	1973	-19.9884	235.890	255.878
	1974	4.68992	243.610	238.920
	1975	1.59362	203.190	201.596
	1976	13.9286	284.030	270.101
	1977	1.39100	243.240	241.349
	1978	1.51953	277.780	276.260
	1979	-4.04122	252.430	256.471
	1980	14.4486	295.420	280.971
	1981	8.66475	244.000	235.335
	1982	-11.9320	234.000	245.932
	1983	10.5959	299.000	288.404
	1984	-2.94058	226.000	228.941

INDEPENDENT VARIABLES

SMP = Soymeal Pric ($/MT)

SOP = Soyoil Price ($/MT)

United States
Soybean Price ($/MT)

SMPL 1964 - 1984
21 Observations
LS // Dependent Variable is SP

VARIABLE	COEFFICIENT	STD. ERROR	T-STAT.	2-TAIL SIG.
C	-3.3800194	6.6300280	-0.5098047	0.616
SMP	0.7869375	0.0499336	15.759672	0.000
SOP	0.1903434	0.0170404	11.170148	0.000

R-squared	0.983022	Mean of dependent var	198.1467
Adjusted R-squared	0.981136	S.D. of dependent var	74.43737
S.E. of regression	10.22369	Sum of squared resid	1881.427
Durbin-Watson stat	1.932017	F-statistic	521.1113
Log likelihood	-76.99798	TPE	2/21

Residual Plot	obs	RESIDUAL	ACTUAL	FITTED
	1964	4.92057	109.860	104.939
	1965	-5.17879	111.700	116.879
	1966	3.46149	110.960	107.499
	1967	3.83214	102.510	98.6779
	1968	3.69378	99.9400	96.2462
	1969	-10.9083	100.680	111.588
	1970	-1.39207	117.210	118.602
	1971	4.60210	126.760	122.158
	1972	-21.4606	242.870	264.331
	1973	-19.9884	235.890	255.878
	1974	4.68992	243.610	238.920
	1975	1.59362	203.190	201.596
	1976	13.9286	284.030	270.101
	1977	1.39100	243.240	241.349
	1978	1.51953	277.780	276.260
	1979	-4.04122	252.430	256.471
	1980	14.4486	295.420	280.971
	1981	8.66475	244.000	235.335
	1982	-11.9320	234.000	245.932
	1983	10.5959	299.000	288.404
	1984	-2.94058	226.000	228.941

INDEPENDENT VARIABLES

SMP = Soymeal Pric ($/MT)

SOP = Soyoil Price ($/MT)

SMPL 1964 - 1984
21 Observations

Series	Mean	S.D.	Maximum	Minimum
SP	198.14667	74.437368	299.00000	99.940000
SMP	153.32524	60.241159	252.42000	77.390000
SOP	424.86000	176.52548	695.11000	185.63000

	Covariance	Correlation
SP,SP	5277.0683	1.0000000
SP,SMP	3972.7185	0.9302352
SP,SOP	10828.823	0.8653109
SMP,SMP	3456.1879	1.0000000
SMP,SOP	6582.3903	0.6499384
SOP,SOP	29677.376	1.0000000