



BALANCE-OF-PAYMENTS

FINANCE

The study investigated the balance-of-payments position on the periphery of the countries studied. From 20 to 35 years of small size and openness faced by external economic success in achieving it appears to have had the years investigated, led by economic stagnation than the OECD average. Country followed an economic policy at the external policy were the variations with respect to the balance of payments to be asymmetrical. Surpluses and deficits. The surpluses were usual

ABSTRACT

BALANCE-OF-PAYMENTS ADJUSTMENT POLICIES IN FINLAND, DENMARK AND NORWAY

By

William C. Kleiner

The study investigates the use of monetary and fiscal policy to adjust balance-of-payments disequilibria in three small open countries situated on the periphery of the major western trading nations. Together the countries studied account for approximately 6 per cent of OECD trade. From 20 to 35 per cent of their GNP is traded. Because of their small size and openness, each of the economies is strongly influenced by external economic factors, and each has had a different degree of success in achieving internal stability and external balance. Finland appears to have had the least success in achieving its goals. In the years investigated, 1950 - 1969, it has at various times been troubled by economic stagnation, prices which have risen considerably faster than the OECD average, and chronic balance-of-payments deficits. The country followed an economic strategy which usually directed monetary policy at the external situation. The discount rate and the money supply were the variables which consistently moved in an adjusting direction with respect to external disequilibria. Moreover, there appeared to be asymmetrical behavior with respect to balance-of-payments surpluses and deficits. The domestic liquidity effects of a balance-of-payments surplus were usually offset, while the reduction of liquidity

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brought about by an external deficit was usually not offset. The net result of Finland's balance-of-payments policy with respect to the money supply was, therefore, to impart a deflationary bias to the economy. The adjustment of the economy to external deficits, however, was not complete, and the country twice devalued its currency during the period of the study. The 1967 devaluation achieved its success partly because a small country can change the par value of its currency by a large amount without causing serious foreign repercussions (a 26 per cent effective devaluation, in Finland's case), partly because the country adopted a strict incomes policy to reduce its rate of price inflation, and partly because increased foreign demand boosted the country's exports during the devaluation period.

Denmark, on the other hand, was a degree more successful in its pursuit of internal stability and external balance. The Danish model of reaction to external disturbances was similar to the Finnish. The discount rate and the money supply consistently moved in an adjusting direction with respect to the balance-of-payments. Again, however, there was asymmetrical behavior with respect to balance-of-payments surpluses and deficits. As with Finland, the liquidity effects of a balance-of-payments surplus were offset, while a balance-of-payments deficit was allowed to reduce domestic liquidity. The net effect of Denmark's balance-of-payments policy, with respect to the money supply, was to impart a deflationary bias on the economy. Denmark's adjustment to the external situation was sufficient to prevent undue pressure on the country's exchange rate. The country devalued once in the period under study. The devaluation occurred in 1967 and was to maintain parity with the pound sterling which had just been devalued by the United Kingdom. The Danish devaluation was a modest 8 per cent.

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Of the three countries, Norway was the most successful in achieving its internal and external goals. At the heart of the Norwegian strategy is the role played by the government as leader and arbitrator in a pervasive and on-going program of incomes policy. Along with incomes policy to control inflation, Norway directed monetary policy toward the growth and production variables, while fiscal policy responded to the external situation. The adjustment of the external situation, moreover, did not appear to impart a deflationary bias to the Norwegian economy. Much of the credit for this fact must go to the country's successful control of inflation. Norway's competitive international position did not deteriorate during the period of investigation, and as a consequence, the country did not face any serious balance-of-payments deficits. As a surplus country, Norway did not inflate its economy or revalue its currency, but allowed its international reserves to increase, generally at a faster rate than the value of its imports.

Finally, the lags involved in the trade of these three small, open economies appear to be rather short. Judging from Denmark and Finland, offsetting policy usually occurs within one or two quarters for an increase in the level of international reserves, while a reduction in liquidity due to a net loss of reserves begins to be felt almost immediately. If, in addition, it is fair to generalize from the Finnish experience, it can be said that a reduction in the volume of imports will follow very quickly behind a change in their price, with, in Finland's case, approximately 88 per cent of the total change occurring in two quarters. The domestic effects of the Finnish devaluation also occurred with very little lag. In this case, 97 per cent of the total effect of devaluation on domestic import prices had occurred within two quarters.

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**BALANCE-OF-PAYMENTS ADJUSTMENT POLICIES IN
FINLAND, DENMARK AND NORWAY**

By

William C. Kleiner

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INTROD

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Chapter 1

INTRODUCTION AND METHOD OF ANALYSIS

Introduction

Under the Bretton Woods "adjustable peg" system of fixed exchange rates, countries were for the most part expected to adjust disequilibria in their balance-of-payments without resorting to exchange rate changes.¹ Under this system the adjustment of balance-of-payments disequilibria necessarily received much study, most of which was directed toward the adjustment process itself, i.e., the theoretical means by which adjustment could be achieved. The general thrust of the theory was that a country, if it had an appropriate number of policy tools and used them correctly,² could simultaneously achieve both its domestic and external economic goals. The evidence from the international financial experiences of the 1960s and early 1970s suggests, however, that the attainment of external balance has been very elusive for many countries. The question then becomes why many countries failed to achieve external balance.

¹Under the articles of the IMF, a country was allowed to devalue its currency once up to 10 percent. Further devaluation needed IMF approval and would be allowed only if the country was suffering from a chronic payments imbalance.

²For a discussion of the relation between the number of policy goals and the number of policy tools, see Jan Tinbergen, Economic Policy: Principles and Design (Amsterdam: North-Holland Publishing Company, 1956), Chapter 4.

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³ Roger Nurkse, *International
Finance*, 2nd ed., New York, 1959.

A partial answer to the question may be that policy-makers have for the most part ignored theoretical guidelines in their formulation of economic policy. An alternative possibility is that the theory on which they based their actions was faulty. Either way, the issue cannot be decided unless we understand exactly how policy responded to external disequilibria. Since we know that many economic policy decisions are made in a complex political-economic environment, and that policy-makers normally have wide discretionary latitude in the implementation of policy action, it is not at all clear, on a priori grounds, that policy-makers will react consistently one way or the other to imbalances in their balance-of-payments. The result is that the actual response of economic policy, in various countries, to balance-of-payments disequilibria is an empirical question open to investigation. This paper is such an investigation. Its primary purpose is to examine how economic policy reacted to balance-of-payments disequilibria in three Scandinavian countries for the years 1950 to 1970.

The present paper has three major predecessors. The first is the Nurkse study which examined balance-of-payments policies for the period between the world wars.³ The second is the Bloomfield study which examined central bank behavior during the so-called "golden age of the gold standard."⁴ The third is the more recent Michaely study which investigated the balance-of-payments adjustment policies of the Group of Ten with the objective of assessing the implications their aggregate

³Ragnar Nurkse, International Currency Experience (Montreal, 1944).

⁴Arthur I. Bloomfield, Monetary Policy Under the Gold Standard: 1880-1914 (New York, 1959).

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behavior, with respect to payments' disequilibria, had for the functioning of the international financial system.⁵

The present investigation extends the Michaely study, with a number of modifications and additions, to the countries of Finland, Norway, and Denmark. The thesis focuses mainly on the process of real adjustment to payments' disequilibria through changes in income, prices, and interest rates. The investigation of changes in commercial policy and the means for financing a deficit will be of only supplemental nature, chiefly to determine whether such compensatory policy actions can explain an apparent lack of real adjustment--should the study reveal such a model of behavior--in the countries examined. The use of exchange rate adjustment is examined in Chapter 4.

Historical Background

It is commonly thought that during the so-called golden age of the gold standard, roughly the period from 1870 to 1914, international finance functioned smoothly with the participating nations maintaining a reasonable balance in their accounts with the rest of the world without recourse to undue restrictive trade policy or major adjustment in exchange rates. The disruption of international trade with World War I brought to an end the golden age of the gold standard. Immediately after the war and until approximately 1923 exchange rates were allowed to float. Subsequent national efforts to reinstate fixed exchange rates, often at pre-war parities, met with failures.

⁵Michael Michaely, The Responsiveness of Demand Policies to Balance-of-Payments: Postwar Patterns (New York: NBER, 1971).

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The devaluation cycle of the 1930s further weakened faith in the existing international financial system and raised the question as to why the system had functioned well prior to World War I and so poorly thereafter. One answer recognized that the war had destroyed the old parities, and therefore any action by nations, especially unilateral action, to restore fixed exchange rates without regarding changes in parity was necessarily going to fail. Another suggested that nations were no longer willing to follow the "rules of the game" of the gold standard, which were presumed to have been followed by the monetary authorities during the period of the gold standard. The traditional definition of the rules called for the central bank to conduct domestic monetary policy according to the dictates of the external situation, expanding domestic assets in response to a balance-of-payments surplus and contracting them in response to a deficit. Along with the demand for the parallel movement of central bank domestic and foreign assets, the rules called for an increase in the discount rate, to attract short-term foreign capital during balance-of-payments deficits and a decrease of the discount rate during balance-of-payments surpluses. Bloomfield, using this model of the rules, found, however, that the central banks did not in fact follow the rules as so defined during the classic period; and the Nurske study concluded, as had been maintained, that these rules were not followed in the period between World War I and II.

The conclusion of the Bloomfield study, as Michael points out, raises a question concerning the legitimacy of the traditional definition of the rules of the game. The rules, he notes, were not an ex ante guide formulated and used by central bankers during the

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classical period, but rather were an ex post hypothesis formulated later to explain what was thought to be apparent central bank behavior during the classical period. As such the definition's historical legitimacy must rest upon empirical verification. The Bloomfield study, however, concludes that central bank behavior during the classical period did not conform to the traditional definition of the rules. The traditional definition of the rules of the game would therefore appear unfounded, and Michaely, as a consequence, argues for a slightly different definition.

Michaely, in his study of the post World War II period, finds the criterion, which requires that central bank domestic and foreign assets move in parallel, too restrictive an interpretation of the rules. Instead of considering the domestic assets of the central bank to be the crucial variable, he suggests that the money supply be considered the crucial variable. In this version, the rules of the game would require the money supply, or the rate of change of the money supply, to increase during balance-of-payments surpluses and to decrease during balance-of-payments deficits. Discount rate policy remains unchanged from the previous definition. The argument for this version is based on the fact that the strength of the automatic effects of the specie-flow mechanism will vary from country to country, depending upon whether fluctuations in the level of international reserves are substantial or not in relation to the country's money supply. For some countries, he argues, the automatic effects may be of sufficient magnitude to cause too drastic a change in the money supply. He reasons that there is a "proper change," i.e., the change which will bring about equilibrating adjustment in the balance-of-payments in a reasonable time without more

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than the necessary disruption of the domestic economy. The achievement of this proper change, moreover, may require some central banks to reinforce the automatic effects of the specie-flow mechanism and other banks to partially offset them. It then no longer matters whether, as far as the rules of the game go, central bank assets increase or decrease with balance-of-payments disequilibria as long as the money supply, as the crucial variable, moves in an adjusting direction with respect to the disequilibria. In his use of the definition, however, Michaely makes no attempt to determine what the "proper change" in the money supply is for the countries investigated, but rather simply examines the direction of the change, or rate of change, in the money supply, disregarding the intensity of the change. The nature of his study, in a sense, justifies this approach since the analysis explicitly sets out to investigate only qualitative aspects of balance-of-payments adjustment policies and avoids quantitative estimates of either the trade-offs attached by policy-makers to alternative economic targets or the effectiveness of given adjustment policies. But it does, as a consequence, leave a relatively weak definition of the rules of the game, which has now passed from a definition requiring a "proper change" in the money supply to one requiring only that the money supply change in an adjusting direction. Previously Michaely had noted that during the classical period of the gold standard, countries were able to maintain approximate equilibrium in their external accounts over time without recourse to restrictive trade policy or major exchange rate adjustments. This is a paraphrase of Nurske's definition of equilibrium in the balance-of-payments; and it suggests a rather simple test which will be added in this study to Michaely's definition of the rules of the game. If, in fact,

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the discount rate and the money supply respond to balance-of-payments disequilibria in an adjusting direction, and the country under investigation is free from restrictive trade policies and major exchange rate changes in the period of analysis, then the country will be considered in this study to have followed the rules of the game.

If, on the other hand, the country has adjusted its exchange rate or unilaterally engaged in restrictive trade policies to mitigate a payments' deficit, even though the money supply and discount rate were manipulated in an adjusting direction, the country will not be said to have followed the rules of the game.

It is generally conceded that most modern nations will not subject their domestic economies completely to the dictates of the external situation. They recognize that externally they must be good citizens--that the unilateral imposition of restrictive trade barriers or frequent devaluations will cause foreign repercussions which might lead to retaliation and the deleterious reduction of international trade. Determining policy trade-offs between domestic well-being and external balance, recognizing that the two need not be mutually exclusive, is one of the purposes of this thesis.

The Design of the Study

Objectives of the Study

The purpose of the study is to identify balance-of-payments policies in the countries of Finland, Norway, and Denmark for the period from 1950 to 1969. The questions which it will seek to answer are: (1) which monetary and fiscal policy instruments were used for balance-of-payments adjustment, (2) which monetary and fiscal policy instruments

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were not used for balance-of-payments adjustment, (3) was the policy reaction to periods of balance-of-payments surpluses and deficits symmetrical, (4) did the pattern of policy reaction change over time, (5) did the countries follow the rules of the game, and (6) can regression analysis be used to quantify the authorities' reaction functions.

General Approach

The analysis will proceed on two levels. At the first level the behavior of each individual policy instrument will be examined with respect to disturbances in the balance-of-payments. If the instrument moves in such a direction so as to have an adjusting influence on the balance-of-payments disequilibria, such an instrument will be considered to have been used as an instrument of adjustment, providing that its movement cannot be explained by another policy target. At the second level, a crucial variable, usually the money supply, standing as a proxy for aggregate monetary policy, will be examined to determine if overall monetary policy was responsive to balance-of-payments disequilibria. Commercial policy will then be examined with two purposes in mind. The first is to determine whether commercial policy was actively used to avoid or postpone real balance-of-payments adjustment. The second is to determine, if monetary policy did respond in an adjusting direction, whether the real adjustment was sufficient to avoid the need for restrictive trade policies. Finally, the country's exchange rate policy will be examined, again to determine whether real adjustment to balance-of-payments disequilibria was sufficient to avoid the need for either devaluation or revaluation of the country's currency. Chronic pressure, in either direction, on the exchange rate, even if the rate

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The Analytical Method

The study uses a combination of statistical indicators, reference cycle analysis, and regression analysis to deduce the responsiveness of demand policies to external disequilibria. Following Michaely, the procedure used will be to divide the period under investigation, 1950 to 1969, into subperiods of disturbances in the balance-of-payments according to whether the balance-of-payments is in balance, surplus or deficit and to observe the behavior of the selected policy variables during these subperiods. The subperiods, because of the nature of balance-of-payments disturbances, are expected to be of sufficient length to justify the assumption that movements of the policy variables are in response to movements of the target variables within the same subperiod. Each policy variable will be examined vis-à-vis each target variable. If, over time, a uniform pattern of behavior emerges for a policy variable, it will be considered a causal relationship between the independent variable, the disturbance, and the dependent variable, the policy instrument, as long as no other target variable can explain the pattern. There is the possibility, of course, that the causal relationship may be in the other direction, that we may in fact be observing the effects that policy actions have on the disturbances. Again, however, following Michaely, we assume that the effects of policy actions will lag long enough behind the actual action itself to minimize this problem, and the causal relationship will be interpreted as moving

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in only the aforementioned direction. If a uniform pattern appears in which the money supply rises with balance-of-payments surpluses and falls with balance-of-payments deficits, it will be considered prima facie evidence that the behavior is official reaction to the external situation. Corroborating evidence will, however, be sought in the examination of alternative policy objectives to determine whether or not their achievement might explain the movements in the policy instruments. The other economic targets which will be examined are the rather universally accepted goals of full employment, a stable price level, and a high and steady rate of economic growth. The most informative subperiod, from the point of view of this study, is the one where an inconsistent situation exists, i.e., a situation where the domestic goals and the external goal call for different policy remedies. Unfortunately for policy-makers, there are often conflicts among the domestic goals themselves. With this in mind, few truly clear cases of inconsistent situations are likely to appear, since at least one of the domestic goals will usually call for the same remedy as the external situation. Again the consistency of behavior will supply the evidence as to which objective policy-makers are reacting. If, for example, in one subperiod where there is a high rate of unemployment and a balance-of-payments surplus, the money supply expands; and in the next subperiod, which denotes a balance-of-payments deficit, the rate of unemployment remains high but the money supply contracts, the money supply will then be assumed to have reacted in both periods to the external situation. The fact that the money supply moved in an adjusting direction with respect to the high rate of unemployment in the first subperiod will be considered, because this behavior was not

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In addition to the analytical method just outlined, reference cycle analysis will be used whenever a statistical series displays cyclical behavior.⁶ This technique of analysis is similar to the one outlined and should give like results. The first step in reference cycle analysis is to identify the peaks and troughs in the statistical series representing the independent variable, in this case the balance-of-payments variable. The reference cycle is then measured from trough to trough and includes, obviously, both an expansionary and contractionary phase of the cycle. The major difference between this type of analysis and the previous method is that each phase of the reference cycle is likely to contain brief periods of deviation from the trend which were identified in the previous analysis as distinct subperiods of disturbances. The result is to reduce the number of observations of payments' disturbances. Concomitantly, the method of averaging used in reference cycle analysis tends to smooth out the data, making it less sensitive to short-run fluctuations. The end result is to make the two methods of analysis complementary. Relationships which do not appear to respond to short-run disturbances in the balance-of-payments because of briefly erratic fluctuations in the data may be revealed to respond to the longer run balance-of-payments cycle. In addition, those responses which may be obscured because of the lags

⁶Arthur F. Burns and Wesley C. Mitchell, Measuring Business Cycles (New York: NBER, 1947), Chapter 2.

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involved should be clearer with reference cycle analysis because the reference cycle typically is a much longer period, and response of policy instruments can therefore safely be attributed to the position of the independent variable in the same period. Furthermore, reference cycle analysis can be used to measure lags, and in countries where the money supply appears to respond in an adjusting direction to balance-of-payments disequilibria, an appendix will be added in which the method is used to estimate the length of time the change in the money supply lags behind the payments' disturbance.

Finally, multiple regression analysis will be used to corroborate the findings of the first two analytical methods. The Michaely study experimented with regression analysis but obtained meager results.⁷ Although Michaely did not use a distributed lag regression model, he suggested its use might give improved results. Such a model has been used by Rueber,⁸ and Dewald and Johnson⁹ to measure statistically the weight which the monetary authorities attach to alternative economic objectives. The procedure, known as reaction function analysis, is to regress a distributed lag function typically of the form $M_t = b + b_1 M_{t-1} + b_2 U_t + b_3 Y_t + b_4 P_t + b_5 B_t + e_t$, where M is the money supply or some other indicator of monetary policy, U the unemployment variable, Y the growth variable, usually the rate of change of industrial production,

⁷Michaely, op. cit., pp. 281-87.

⁸G. L. Reuber, "The Objectives of Canadian Monetary Policy, 1949-61: Empirical 'Trade-Offs' and the Reaction Function of the Authorities," The Journal of Political Economy, LXXII (April, 1964), 109-132.

⁹William G. Dewald and Harry G. Johnson, "An Objective Analysis of American Monetary Policy, 1952-61," in Banking and Monetary Studies, Dean Carson (ed.) (Homewood, Illinois, 1963), pp. 171-89.

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p the price level variable, B the balance-of-payments variable, and e the disturbance. The resultant equation is then solved for the equilibrium condition, $M_t = M_{t-1}$, and the resultant regression coefficients are read as the weights which the monetary authorities attach to the respective target variables. The major difficulties associated with this method, other than choosing the right proxies for the economic targets and monetary policy, is that the regression coefficients are likely to measure not only the subjective trade-offs attached by the policy-makers to the alternative goals, but also, in part, their assessment of the structural trade-offs actually existing in the economy and even, in part, endogenous changes among the independent and dependent variables. Moreover, the partial adjustment model cited assigns exponentially decreasing weight to the lagged explanatory variables. To explain the variation in the dependent variable in time t, the greatest weight will be assigned to the values of the target variables in time t, the next greatest weight in time t-1, and so on. The hypothesized existence of a recognition, action, and impact lag in monetary and fiscal policy suggests that the earliest periods should not necessarily receive the greatest weight. A regression model which allowed more flexibility in the estimation of the weights was therefore desired. For this reason, and for economy and ease of estimation, a polynomial model was used to estimate the policy reaction functions.

Policy Variables

The selection of policy variables for examination will depend on the structure of the monetary and fiscal systems in the countries under investigation. All variables which the authorities consider policy

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instruments, provided that they have been used often enough to indicate a pattern of behavior, will be investigated. The examination will generally include those variables which the monetary authorities have directly under their control such as the discount rate, open market operations, reserve ratio requirements, central bank lending to the banking system, central bank lending to the government, central bank lending (in some cases) to the private nonbanking sector, and central bank total domestic claims (the summation of the foregoing central bank domestic lending). In addition, the study will examine policy variables which are a step removed from the direct control of the monetary authorities such as commercial bank lending to the public, short- and long-run interest rates, and the money supply. With respect to fiscal policy, aggregate government tax revenue and aggregate government expenditure along with the overall budgetary surplus or deficit will be examined. The examination of changes in individual tax rates or separate categories of expenditure is considered beyond the scope of this study.

Models of Reaction

Each individual statistical series will suggest the reaction model applicable in its case. Where possible prior information in the nature of the statements and practices of policy-makers and economic analysts as to the appropriate model of reaction will be used. In other cases several models of reaction may be experimented with. For example, if absolute changes in the direction or level of a variable do not yield meaningful results, the rate of change of the variable or its deviation from the trend will be tried. In the case of the money supply, where

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one would expect a secular increase over time, the rate of change of the variable is probably a more meaningful measure than considering increases and decreases in its absolute size. Here the money supply, if it responded in an adjusting direction to balance-of-payments disequilibria, would be expected to increase at a decreasing rate during downward disturbances in the balance-of-payments and to increase at an increasing rate during upward external disturbances rather than fall and rise in the absolute sense. With a variable such as the discount rate, however, only the absolute change can be considered meaningful. Here an adjusting reaction requires that the discount rate falls during upward payments' disturbances and rises during downward disturbances, since it is extremely unlikely that any country has exhibited either a monotonic increase or decrease of the discount rate over the period in question. The choice of such reaction models will be further discussed and defended in the analyses of the individual countries.

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CHAPTER 2

BALANCE OF PAYMENTS THEORY

Introduction

Balance of payments theory is the examination of the adjustment mechanisms, set in motion both deliberately through policy action and automatically through inherent economic processes, which act to correct or mitigate an imbalance in the goods and payment flows constituting a country's external accounts. The body of payments theory is normally divided into (1) classical thought with its emphasis on relative price adjustment with fixed exchange rates, (2) income-multiplier theory, (3) exchange rate adjustment models, (4) the use of policy mixes to achieve simultaneous internal and external balance.¹

Balance of Payments

A country's economic transactions with the rest of the world are recorded in an accounting statement known as the balance of payments. The statement itself is based on a system of double-entry bookkeeping where each debit is matched by an equal credit. In this special sense, the balance of payments must always balance, since by definition the sum of all entries in the statement is zero. Imbalance in the balance

¹Anne O. Krueger, "Balance-of-Payments Theory," Journal of Economic Literature, Vol. 7: No. 1 (March 1969), 1-2.

of payments can only occur when certain categories of items in the statement are separately grouped and totaled, and the essential meaning of such an imbalance is that a country's transfer payments and expenditures abroad on goods, services, and investments are not matched by similar foreign expenditures in domestic markets. The goods and payment flows which give rise, when netted, to this type of balance or imbalance, arise from so-called "autonomous entries" and are the aggregate result of private market and governmental decisions to spend, lend, and invest abroad. In theory, the autonomous entries in the external accounts are totaled to compute a country's balance of payments position, and the residual entries are called the "balancing" or "accommodating" entries, e.g., they arise because the autonomous items do not balance. In practice, it is not always possible to distinguish between autonomous and accommodating entries, and several alternative measures of a country's external position are in use. These measures differ in their disposition of the short-term capital account.²

The present practice is to divide U.S. private short-term capital into liquid and nonliquid categories. Readily marketable U.S. short-term claims on foreigners, such as demand deposits, time deposits, and negotiable securities, are considered to be liquid claims, while not so marketable claims on foreigners, such as trade credits and cash items in the process of collection, are classified as nonliquid. All U.S. nonbanking liabilities to foreigners are also classified as nonliquid capital.³

²A bond or bank acceptance with a maturity at the date of issue of less than 12 months enters the balance of payments in the short-term capital account.

³John Pippenger, "Balance-of-Payments Deficits: Measurement and Interpretation," Review: The Federal Reserve Bank of St. Louis, Vol. 55: No. 11 (November 1973), 7-10.

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The "balance on current account and long-term capital" treats all short-term capital (liquid and nonliquid, private and official) along with allocations of special drawing rights and errors and omissions as accommodating entries. The "net liquidity balance" treats liquid private capital, U.S. and foreign, foreign official liquid and nonliquid dollar holdings in the U.S., and U.S. official reserve assets as accommodating entries. In this case, nonliquid short-term private capital, allocations of special drawing rights, and errors and omissions are considered "autonomous" entries and are placed above the line. The "official reserve transactions balance" definition treats only foreign official liquid and nonliquid dollar holdings in the U.S. and U.S. official reserve assets as accommodating. All other short-term capital along with allocations of special drawing rights and errors and omissions are placed above the line.⁴ The theoretical purpose of each measure is to determine the magnitude of any transfer problem the country may have with respect to its external account. The rationale behind the official settlement balance is that if a country is able to easily finance a basic balance deficit through the private foreign acquisition of its liabilities, then such acquisition may be thought of as autonomous. If private foreigners are unwilling to hold the deficit country's short-term liabilities, they will turn them over to their central bank, at which time they are treated as accommodating flows.

If imbalance occurs under the official settlement definition it will normally entail a change in the level of international reserves held by the country's monetary authority. A country with an official

⁴U.S. Department of Commerce, John Hein, "Measuring the U.S. Balance of Payments," Conference Board Record (September 1971), p. 36.

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settlements deficit can finance the deficit by reducing its official short-term claims on foreigners or by exchanging gold for foreign exchange or its own outstanding liabilities. All three transactions reduce the net level of international reserves available to the monetary authority of the deficit country. In the opposite vein, a country with an official settlements surplus will increase its official short-term claims on foreigners, reduce its outstanding official liabilities to foreigners, or import gold in exchange for foreign exchange or its own liabilities. Again, all three transactions will work to increase the net level of official international reserves available to a surplus country. It is in this sense that the level of official international reserves is often used as a proxy for the external situation in balance of payments studies.⁵

The Target Variable

To define imbalance in a country's balance of payments does not imply that the country's external economic target variable has been identified. The nature of the external constraint is undoubtedly viewed differently by different countries. For a single country, it is often not accurate to equate an imbalance in the balance of payments with external disequilibrium, especially if the country is a surplus country, for it may view the accumulation of international liquidity as desirable. At the same time, a deficit country may consider itself to be in external equilibrium for as long as the deficit is easily financed.

⁵Michael Michaely, Balance-of-Payments Adjustment Policies: Japan, Germany, and the Netherlands, National Bureau of Economic Research, (New York: Columbia University Press, 1968), p. 26.

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Additional problems appear when the international financial system as a whole is considered. If the parochial view of external equilibrium by individual countries is the accumulation of international reserves, and all countries do act to achieve this target, then the system as a whole will not have an equilibrium solution unless newly created reserves are sufficient to satisfy the growing aggregate demand for international liquidity.⁶ In such a system, all participants cannot simultaneously achieve balance, and the actions of one country to gain external equilibrium will frustrate those of another. Implicitly, in most academic discussions, balance-of-payment adjustment is directed toward the achievement of balance, in the sense of zero change in the level of reserves, in the country's balance-of-payments. The simultaneous achievement of equilibrium by all countries in the system is therefore assumed possible. The adoption of the alternative view that the international financial system is a disequilibrium system, however, does not alter the explanatory power of payments theory. In such a system, countries can use their policy tools in an effort to achieve external balance, but the goal will be an elusive one.

The classical theory of payments adjustment evolved against the background of the gold standard and domestic price flexibility--both in the inflationary and deflationary sense. In this paradigm exchange rates were fixed between the gold import and export points by gold arbitrage. Say's Law, coupled with changes in the real interest rate, insured that the real output of the economy would, in the long-run, be maintained at the full-employment level and, in the short-run, gravitate

⁶John Patrick, "The Optimum Policy Mix: Convergence and Consistency," The Open Economy, eds. Peter B. Kenen and Roger Lawrence (New York: 1968), p. 280.

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¹ J. C. Pigou, "The
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² Gerard Nunkse, "The
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toward that level. As Pigou later formally demonstrated, wage and price flexibility assured that nominal aggregate demand would always be sufficient to purchase the nominal full-employment output of the economy.⁷ The role of the government in this model, other than to maintain the competitive conditions necessary to assure wage and price flexibility, was minimal. The economy would reach and maintain full-employment output on its own, without government policy intervention.

Parallel to the classical belief that the domestic economy would automatically seek full-employment equilibrium was their belief that a disturbance in the country's external accounts would also be self-correcting, providing the country's monetary authority did not neutralize the monetary effects of the balance of payments disturbance. In the classical paradigm, moreover, no rationale existed for such central bank neutralization, since the size of the domestic money supply did not affect the level of output but only the absolute price level of the economy. On the contrary, the classical scheme called for central bank reinforcement of the monetary effects of balance of payments imbalances, since the domestic consequences of such action on the employment variable were believed minimal. This special mode of central bank behavior, which required discretionary monetary policy to respond to the requirements of the balance of payments, later became known as the "rules of the game of the gold standard."⁸

⁷A. C. Pigou, "The Classical Stationary State," Economic Journal, 53: 343-51, 1943.

⁸Ragnar Nurkse, International Currency Experience (League of Nations: 1944), Chap. IV.

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The classical explanation of balance-of-payments adjustment was based on the equation of exchange, $MV = PO$, where M was the nominal money supply, V the income velocity of money, P the general price level, and O real output. In the classical paradigm, the demand for money was for transactions balances and was thought to be a stable function of money income, especially in the short-run, since it was based on the payment habits of the economy which do not normally change greatly in the short-run. In the equation of exchange, M and P are left to vary, and the conclusion is that there is a direct relationship between the size of the money supply and the absolute price level of the economy. Deficit countries would then experience a reduction in the general price level which would make their exports relatively less expensive in foreign markets, while at the same time, relative costs of imports would increase in their own markets. The physical volume of exports would rise and the physical volume of imports would fall, and, providing the external market were stable, the deficit would grow smaller.⁹ The adjustment of prices would continue until the monetary contraction ended, i.e., until balance was restored in the balance-of-payments. Moreover, in view of the increased demand, the domestic price of exports and import substitutes would fall at a slower rate than nontraded goods, thus facilitating the necessary transfer of resources to the traded goods sector of the economy away from the home goods sector.

Classical economists thus thought that balance in the balance-of-payments would be restored through the semi-automatic operation of the

⁹The classical price-specie flow analysis implicitly assumes that the foreign exchange market is stable. For a discussion of this point, see Leland B. Yeager, International Monetary Relations (New York: Harper and Row, 1966), pp. 146-51.

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price-specie flow mechanism. Since, in the face of this theory, chronic long-run disequilibrium in the balance of payments was not likely to occur, the fixed parities which existed among currencies on the gold standard were regarded with confidence. This confidence engendered another payments adjustment mechanism: flows of stabilizing speculative capital. When the value of a currency weakened and approached the gold export point, speculators, assuming its value would not go much lower, would buy it, thus increasing its value. Conversely, when the value of a currency increased and approached the gold import point, speculators would assume it would go no higher and would sell, thus increasing its supply and holding down its price.

Taussig was the first to recognize that payments adjustment occurred too rapidly to be explained by relative price changes only.¹⁰ He hypothesized that changes in income were also an important factor in the adjustment process. Although the "pure income" effect was subsequently incorporated in the transfer problem debate stemming from the reparations levied on Germany after World War I, it was not until the General Theory and advent of multiplier analysis that the theoretical basis of the income adjustment mechanism was convincingly delineated.

Income-Adjustment Mechanism

Consider the following simple Keynesian model of an open economy using only the goods market and assuming no feedback from foreign markets:¹¹

¹⁰F. W. Taussig, International Trade (New York: Macmillan, 1927), pp. 239-44.

¹¹For a graphical exposition of this model, see an intermediate level textbook, such as Mordechai E. Kreinin, International Economics: A Policy Approach (New York: Harcourt Brace Jovanovich, 1971), pp. 56-64.

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$$(1) \quad Y = C + I + G + X$$

$$(2) \quad Y = C + S + T + M$$

$$(3) \quad B = X - M$$

$$(4) \quad B = 0$$

where Y is net national income, C is consumption, I is net investment, G is government spending, T is the tax revenue, X is exports and M is imports. Equation 4 represents equilibrium in the balance-of-payments. The behavior assumptions are:

$$C = C(Y), \quad 0 < C_y < 1, \quad \text{where } C_y = \frac{dC}{dY}$$

$$I = \bar{I}$$

$$G = \bar{G}, \quad \text{where } G \text{ is determined exogenously}$$

$$X = \bar{X}$$

$$T = \bar{T}$$

$$M = M(Y) \quad M_y > 0, \quad \text{where } M_y = \frac{dM}{dY}$$

To solve the system for its multipliers, we begin by taking the total differentials of equations 1 and 3:

$$(5) \quad dY = C_y dY + dI + dG + dX$$

$$(6) \quad dB = dX - M_y dY$$

Rewriting equations 5 and 6, we have:

$$(7) \quad dY(1 - C_y) = dI + dG + dX$$

$$(8) \quad M_y dY + dB = dX$$

Putting equations 7 and 8 in matrix form, we have:

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$Y + S_y + M$

$$\begin{bmatrix} (1-C_y) & 0 \\ M_y & 1 \end{bmatrix} \begin{bmatrix} dY \\ dB \end{bmatrix} = \begin{bmatrix} dI + dG + dX \\ dX \end{bmatrix}$$

The determinant of the system is $1-C_y$. Using Cramer's Rule and solving for dY , we have:

$$(9) \quad dY = \frac{(dI + dG + dX)}{1-C_y}$$

and the income multipliers for the system are:

$$(a) \quad \frac{dY}{dI} = \frac{1}{1-C_y}$$

$$(b) \quad \frac{dY}{dG} = \frac{1}{1-C_y}$$

$$(c) \quad \frac{dY}{dX} = \frac{1}{1-C_y}$$

Additionally, solving for dB , we can identify the balance of payments effect of a change in any of the exogenous variables:

$$(10) \quad dB = \frac{(1-C_y)dX - (dI + dG + dX) M_y}{1-C_y}$$

Isolating the effect in an exogenous change in the level of exports, we have:

$$(11) \quad \frac{dB}{dX} = \frac{(1-C_y) - M_y}{1-C_y} = 1 - \frac{1}{1 + \frac{S_y}{M_y}} > 0^{12}$$

Isolating the effect of an exogenous change in the level of investment or government spending, we have:

$$(12) \quad \frac{dB}{dG} = \frac{-M_y}{1-C_y} < 0$$

and $(13) \quad \frac{dB}{dI} = \frac{-M_y}{1-C_y} < 0$

¹² $C_y + S_y + M_y = 1.$

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A question which may now be asked is if there is an exogenous increase in exports, will equilibrium be restored in the balance of payments. To answer this question, consider equation (11):

$$\frac{dB}{dX} = \frac{(1-Cy) - My}{1-Cy} = 1 - \frac{1}{1 + \frac{Sy}{My}}$$

when $dX = K$, the change in the balance of payments is equal to

$$K \left[1 - \frac{1}{1 + \frac{Sy}{My}} \right] = K - K \frac{1}{1 + \frac{Sy}{My}}$$

Equilibrium requires that $dB = 0$, which requires

$$K - K \frac{1}{1 + \frac{Sy}{My}} = 0$$

$$K = K \frac{1}{1 + \frac{Sy}{My}}$$

Dividing both sides by K , we have:

$$1 = \frac{1}{1 + \frac{Sy}{My}}$$

which can be rewritten:

$$1 + \frac{Sy}{My} = 1$$

Now, multiplying both sides by My , we have:

$$My + Sy = My$$

which yields $Sy = 0$.

The conclusion is that if an exogenous increase in exports occurs, equilibrium will be restored in the balance of payments only if the country is unstable in isolation, i.e., it does not have a positive Sy . In general, considering equation (11), the country will move closer to restoring balance in the balance of payments the larger is My and the smaller the Sy .

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The effect of an exogenous increase in government spending or investment on the balance of payments can also be examined on the basis of equations (12) and (13). Both multipliers, it can be seen, are negative. An increase in spending will cause the balance of payments to deteriorate. A zero marginal propensity to save when G or I is increased will not restore equilibrium in the balance of payments. If $S_y = 0$, equation (12) reduces to $\frac{dB}{dG} = -1$ and the balance of payments will deteriorate by the amount of government spending. If $S_y > 0$, then $\frac{dB}{dG} = -\frac{1}{1 + \frac{S_y}{M_y}}$ and the balance of payments will deteriorate by some fraction, $\frac{1}{1 + \frac{S_y}{M_y}}$, of the dG , i.e., $dB < dG$. In general, the balance of payments will deteriorate least from an increase in government spending the larger the marginal propensity to save and the smaller the marginal propensity to import. The lower the marginal propensity to import, ceteris paribus, the less of a constraint is the balance of payments in the use of fiscal policy to achieve internal economic objectives. Conversely, the less effective is the use of fiscal policy to achieve external equilibrium.

The foregoing equation system is the most elementary formulation of the Keynesian model. Adding the money market to the system and making international short-term capital flows a function of the interest rate will not drastically alter its conclusions. Consider the following model which is the basis of simple Keynesian IS - LM analysis.¹³ Again, exchange rates are to remain fixed.

¹³For similar treatment, see John F. Helliwell, "Monetary and Fiscal Policies for an Open Economy," Oxford Economic Papers, Vol. XXI-1 (March 1969), pp. 35-55, and Marina Von Newman Whitman, Policies for Internal and External Balance (Princeton: International Finance Section, Princeton University Press, 1970), pp. 14-17.

$$(1) \quad Y = C + I + G + X$$

$$(2) \quad Y = C + S + T + M$$

$$(3) \quad I + G + X = S + T + M$$

$$(4) \quad M_d = L + T$$

$$(5) \quad M_s = M_d$$

$$(6) \quad B = X - M - K$$

$$(7) \quad B = 0$$

and

$$C = C(Y); \quad 0 < C_Y < 1$$

$$I = I(i); \quad I_i < 0$$

$$G = \bar{G}$$

$$X = \bar{X}$$

$$L = L(i); \quad L_i < 0$$

$$T = T(Y); \quad T_Y > 0$$

$$M = M(Y); \quad M_Y > 0$$

$$K = K(i); \quad K_i < 0$$

$$C_Y + S_Y + M_Y = 1$$

where L is the liquidity demand for money, T the transactions demand for money, M_s the money supply, and K the net capital outflow. The remaining variables are defined as in the first model.

To solve the system for its multipliers, we first totally differentiate equations (1), (4) and (6).

$$dY = C_Y dY + I_i di + dG + dX$$

$$dM_s = T_Y dY + L_i di$$

$$dB = M_Y dY - K_i di + dX$$

Rewriting in matrix form, we have:

$$(1 - C_y)$$

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$$T_y = \frac{(T_y + dx) L_y + M_y}{(1 - C_y) L_y + M_y}$$

Multipliers

(8)

(9)

Solving for T_y , we have

$$(1 - C_y)$$

T_y

$$T_y = \frac{M_y}{\det.}$$

$$T_y = \frac{(1 - C_y) L_y + M_y}{L_y}$$

Multipliers

(10)

$$\begin{bmatrix} (1 - Cy) & -Ii & 0 \\ Ty & Li & 0 \\ My & +Ki & 1 \end{bmatrix} \begin{bmatrix} dY \\ di \\ dB \end{bmatrix} = \begin{bmatrix} dG + dX \\ dMs \\ dX \end{bmatrix}$$

The determinant of the system is:

$$\begin{aligned} \det. &= (1 - Cy) (Li - 0) + Ii (Ty - 0) + 0 \\ &= Li(1 - Cy) + IiTy < 0: \text{The determinant is negative.} \end{aligned}$$

Using Cramer's Rule, the system can now be solved for the multipliers. Solving for dY , we have:

$$dY = \frac{\begin{bmatrix} dG + dX & -Li & 0 \\ dMs & Li & 0 \\ dX & +Ki & 1 \end{bmatrix}}{\text{determinant}} = \frac{(dG + dX)(Li - 0) + Ii (dMs - 0)}{\text{determinant}}$$

$$dY = \frac{(dG + dX) Li + Ii dMs}{Li(1 - Cy) + IiTy}$$

and the multipliers are:

$$(8) \quad \frac{dY}{dG} = \frac{dY}{dX} = \frac{Li}{\det.} > 0$$

$$(9) \quad \frac{dY}{dMs} = \frac{Ii}{\det.} > 0$$

Solving for dB , we have:

$$dB = \frac{\begin{bmatrix} (1 - Cy) & -Li & dG + dX \\ Ty & Li & dMs \\ My & +Ki & dX \end{bmatrix}}{\text{determinant}} = \frac{(1 - Cy) LidX - dMsKi + Ii TydX - dMsMy + (dG + dX + TyKi - LiMy)}{\text{determinant}}$$

$$dB = \frac{(1 - Cy) LidX - dMsKi + Ii TydX - dMsMy + (dG + dX + TyKi - LiMy)}{\text{determinant}}$$

And the multipliers are:

$$(10) \quad \frac{dB}{dG} = \frac{TyKi - LiMy}{\det.} \leq 0$$

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$$(11) \quad \frac{dB}{dM_s} = \frac{-K_i(1-C_y) - M_y I_i}{\det.} < 0$$

$$(12) \quad \begin{aligned} \frac{dB}{dX} &= \frac{L_i(1-C_y) = I_i T_y + T_y K_i - L_i M_y}{\det.} \\ &= \frac{L_i S_y + I_i T_y + T_y K_i}{\det.} > 0 \end{aligned}$$

$$(13) \quad \frac{dB}{dX} = \frac{L_i(1-C_y) + I_i T_y + T_y K_i - L_i M_y}{\det.}$$

If we set equation (13) equal to zero and solve for S_y , we can find the condition under which an exogenous increase in exports will be exactly matched by an induced change in imports, leaving the balance of payments unchanged:

$$L_i(1-C_y) + I_i T_y + T_y K_i = L_i M_y$$

$$I_i T_y + T_y K_i = L_i M_y - L_i(1-C_y)$$

$$T_y(I_i + K_i) = L_i M_y - (S_y + M_y)$$

$$T_y(I_i + K_i) - L_i(-S_y)$$

Solving for S_y , we have

$$S_y = \frac{-T_y(I_i + K_i)}{L_i}$$

$$S_y = \frac{-T_y I_i - T_y K_i}{L_i}$$

$$S_y < 0$$

The result of adding the money market to the model and making capital flows a function of the interest rate is to make the direction of the effect that government spending has in the balance of payments, equation (10), indeterminate. An increase in government spending will cause a deterioration in the balance of payments if $T_y K_i$ is greater than $L_i M_y$. If the converse is true, an increase in government spending will cause an improvement in the balance of payments. The reason is that while an increase in government spending will cause an increase in

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income (equation (8)), which will cause imports to increase, it will also cause the interest rate to rise, which will decrease the net outflow of capital. The net result with respect to the balance of payments depends on which effect is the greatest.

The balance of payments--money multiplier, equation (11), shows a negative sign, since both the income and interest rate effects work in the same direction on the balance of payments. For this reason, a conclusion of the model is that monetary policy is a more efficacious tool for the regulation of the external situation than fiscal policy.¹⁴

Equation (12) is the balance of payments--exports multiplier and exhibits a positive sign, which means that an exogenous increase in exports will cause an improvement in the balance of payments, i.e., the balance of payments will not automatically correct the disequilibrium. Setting equation (12) equal to zero and solving for S_y , we find (equation (13)) that for the balance of payments to return to equilibrium after a disturbance in the export sector requires that S_y be negative--conversely that $C_y + M_y > 1$, an unstable condition.

The conclusion is that if equilibrium is to be restored in the balance of payments after disequilibrating disturbances, it will require discretionary policy action and, of the two economic instruments, fiscal and monetary policy, monetary policy will be more efficient than fiscal policy for the restoring balance.

¹⁴Helliwell, op. cit., p. 36. For the original argument, see Robert A. Mundell, "The Monetary Dynamics of International Adjustment Under Fixed and Flexible Exchange Rates," *Quarterly Journal of Economics*, LXXXIV, No. 2 (May 1960), pp. 227-57, and "The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability," *International Monetary Fund Staff Papers*, IX, No. 1 (March 1963), pp. 70-77.

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Internal-External Balance Under Fixed Exchange Rates

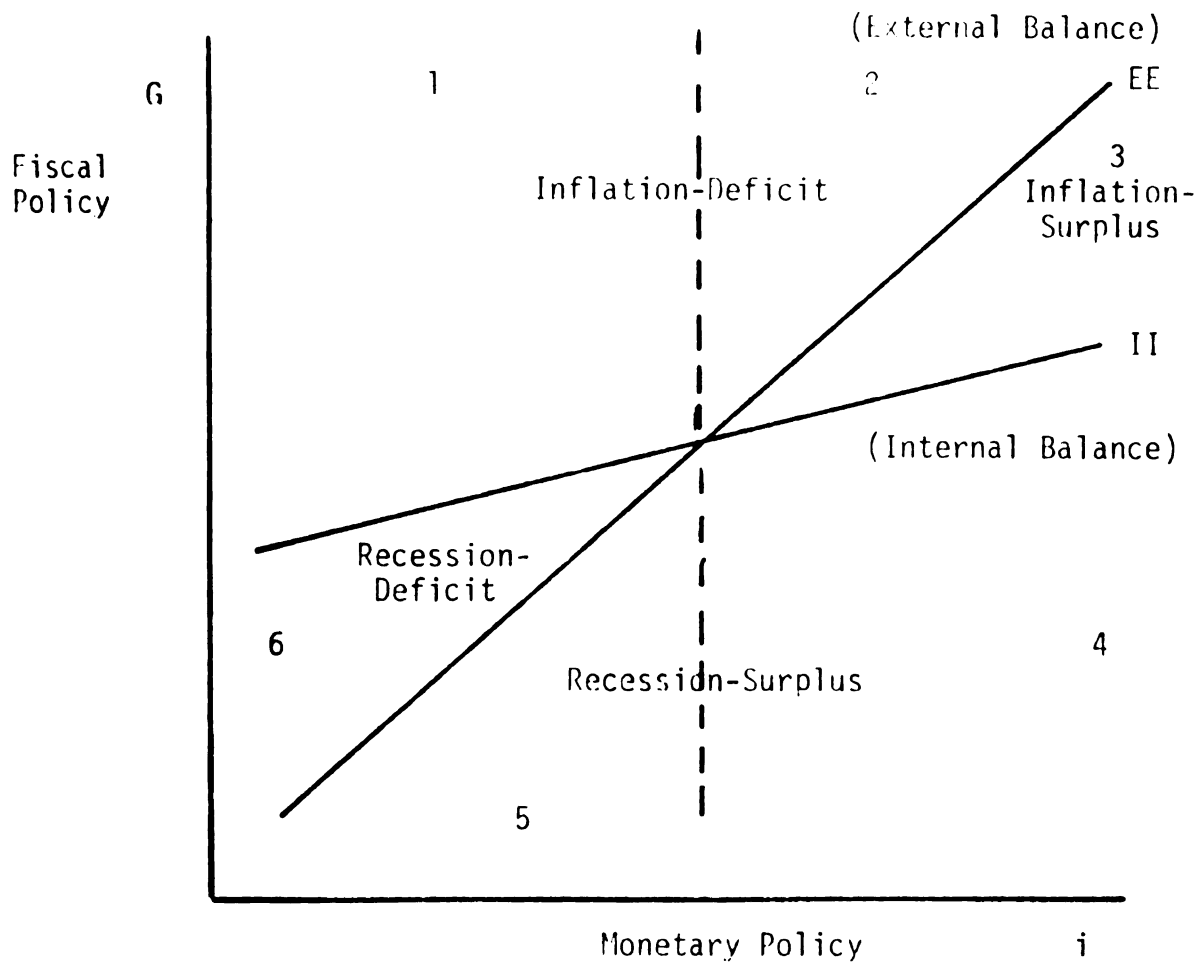
Graph 1 represents monetary-fiscal policy space.¹⁵ On the horizontal axis is plotted the interest rate, which is considered the monetary policy indicator. A movement to the right represents an increase in the interest rate, hence contractionary monetary policy. On the vertical axis is plotted government expenditures.¹⁶ An upward movement represents an increase in government expenditure, hence expansionary fiscal policy.

The EE line in Graph 1 represents the various combinations of monetary and fiscal policy which will result in external equilibrium. The equation for EE is $dB = \frac{\partial B}{\partial i} di + \frac{\partial B}{\partial G} dG = 0$. The line is drawn with an upward slope on the assumption that $\frac{\partial B}{\partial i} > 0$ and $\frac{\partial B}{\partial G} < 0$. Beginning from balance-of-payments equilibrium, contractionary monetary policy, which causes the interest rate to rise, will induce a surplus in the balance-of-payments. An increase in the interest rate must therefore be accompanied by an increase in government expenditure if external balance is to be maintained.

The line labeled II in Graph 1 represents those combinations of monetary and fiscal policy which give rise to internal equilibrium. The equation for the II is $dY = \frac{\partial Y}{\partial i} di + \frac{\partial Y}{\partial G} dG = 0$. The II slopes upward because it is assumed that $\frac{\partial Y}{\partial i} < 0$ and $\frac{\partial Y}{\partial G} > 0$, hence an increase in the interest rate must be accompanied by an increase in government

¹⁵For similar treatment, see Ronald W. Jones, "Monetary and Fiscal Policy for an Open Economy with Fixed Exchange Rates," Journal of Political Economy, Vol. LXXXVI (Part II, July-August 1968), p. 933.

¹⁶The marginal tax rate is assumed to be zero, i.e., $T_y = 0$.



Source: Robert A. Mundell, "The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability," International Monetary Fund Staff Papers, IX, No. 1 (March 1962), pp. 70-77.

FIGURE 1

INTERNAL-EXTERNAL BALANCE

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expenditure to maintain internal equilibrium. The II has less slope than the EE because the EE includes two interest rate effects, the II only one. This proposition can be shown algebraically by solving the equations of the EE and the II lines for the respective slopes of the lines.¹⁷

The equation of the II is $dY = \frac{\partial Y}{\partial i} di + \frac{\partial Y}{\partial G} dG = 0$. Solving for the slope of the II, we have $(\frac{dG}{di})_{II} = -\frac{\frac{\partial Y}{\partial i}}{\frac{\partial Y}{\partial G}}$. Similarly, solving

$dB = \frac{\partial B}{\partial i} di + \frac{\partial B}{\partial G} dG = 0$ for the slope of the EE, we have

$(\frac{dG}{di})_{EE} = -\frac{\frac{\partial B}{\partial i}}{\frac{\partial B}{\partial G}}$. But $\frac{\partial B}{\partial i} = \frac{\partial Y}{\partial i} \text{MPM} + \frac{\partial K}{\partial i}$ where K is the net inflow of

capital which accompanies an increase in the interest rate. And

$\frac{\partial B}{\partial G} = \frac{\partial Y}{\partial G} \text{MPM}$. Substituting these relations into the equation for the slope of EE, we now can see the relationship between the slopes of the EE and II:

$$\begin{aligned} (\frac{dG}{di})_{EE} &= \frac{\frac{\partial Y}{\partial i} \text{MPM} + \frac{\partial K}{\partial i}}{\frac{\partial Y}{\partial G} \text{MPM}} \\ &= (\frac{dG}{di})_{II} + \frac{\frac{\partial K}{\partial i}}{\frac{\partial Y}{\partial G} \text{MPM}} \end{aligned}$$

The slope of the EE is equal to the slope of the II plus some positive number. Only if international capital flows do not respond to the change in the interest rate will the slopes of the two lines be equal.

¹⁷ Whitman, op. cit., pp. 8-9.

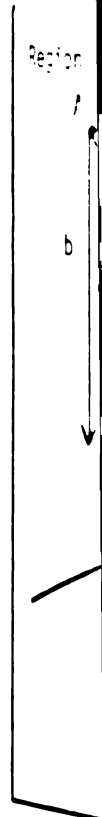
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Graph 1 can now be used to analyze the economic effects of various mixes of monetary and fiscal policies. In doing so, the Mundell effective market classification divides policy space into six regions labeled 1 through 6 on Graph 1.¹⁸

A consistent situation is said to exist when both the external and internal targets call for the same policy reaction. Regions one, two, four and five represent this type of condition. In regions one and two there is an external deficit and internal inflation calling for contractionary economic policy. In regions four and five, the other consistent regions, both the domestic recession and external surplus call for economic expansion. In the remaining regions, three and six, the domestic and external economic goals call for opposite policy actions. In region three domestic inflation calls for contractionary policy whereas the external surplus calls for expansionary economic policy. Conversely, the domestic recession in region six calls for economic expansion while the external deficit calls for contraction. When the domestic and external targets call for the opposite remedies, it is known as an inconsistent situation; and it is in the inconsistent regions where the selection of the proper policy mix is crucial.

Consider Graph 2. In region one it has been determined that both targets call for economic contraction. If we begin from some point of external deficit and internal inflation such as A, a horizontal vector drawn from point A to the right, a, indicates contractionary monetary policy, while a vertical vector drawn from point A downward, b, indicates contractionary fiscal policy. If we assume that monetary and

¹⁸Mundell, "The Appropriate Use of Monetary and Fiscal Policy for Internal and External Stability," p. 72.



POLICY-MIXES

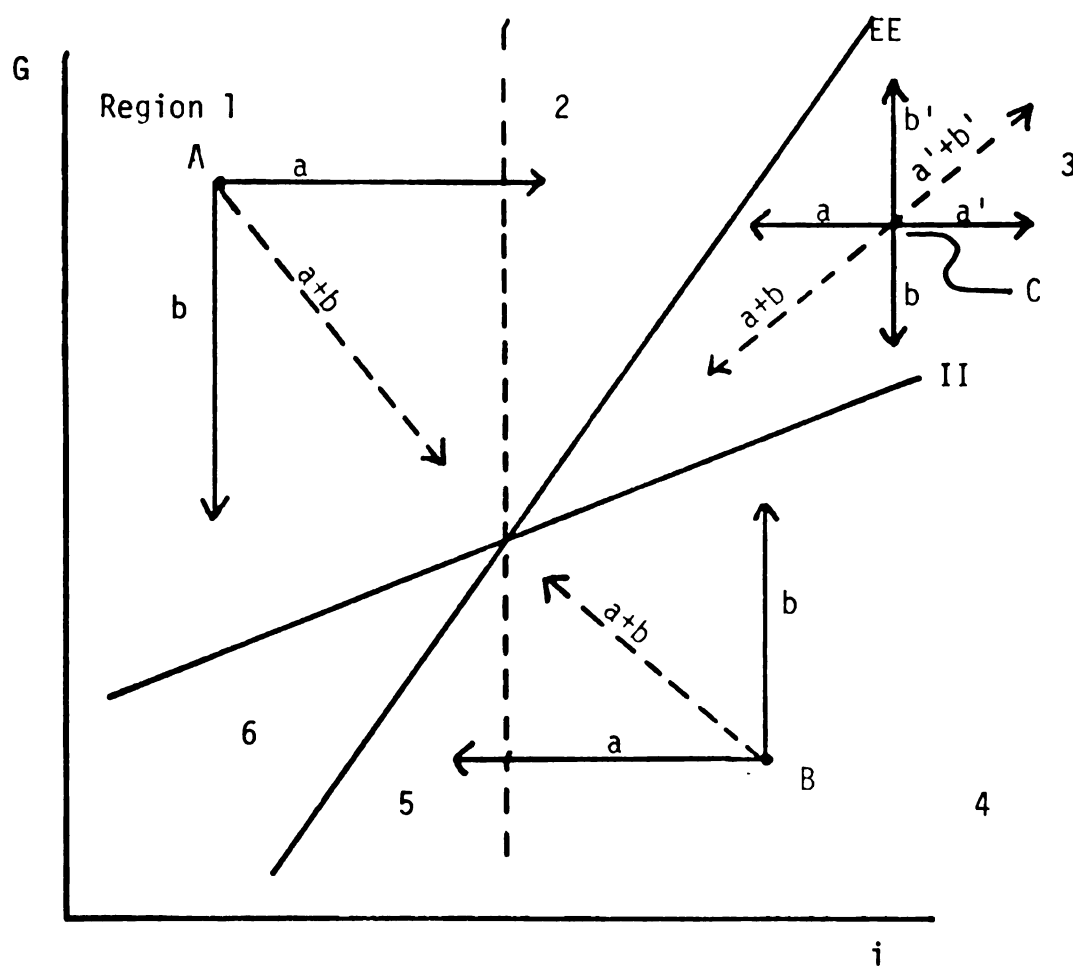


FIGURE 2

POLICY-MIXES TO ACHIEVE JOINT INTERNAL-EXTERNAL BALANCE

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fiscal policy actions occur simultaneously, the resultant policy vector will be the sum of a and b and, conceivably, can lead forward the point where the EE and II intersect. That is the point where external and internal equilibrium are simultaneously achieved. The results are similar when moving from point B, in region four, a position of domestic recession and balance of payments surplus. Economic expansion is now called for by both targets and, if the resulting policy vectors a and b are of the proper magnitude, their sum will lead toward simultaneous internal and external balance. In regions one and four the vectors a and b will be in the same direction no matter which economic target they are assigned to. Thus whether fiscal policy is assigned to the external goal and monetary policy assigned to the internal goal or vice versa is not critical. As we shall see, this conclusion is not true for the inconsistent regions.

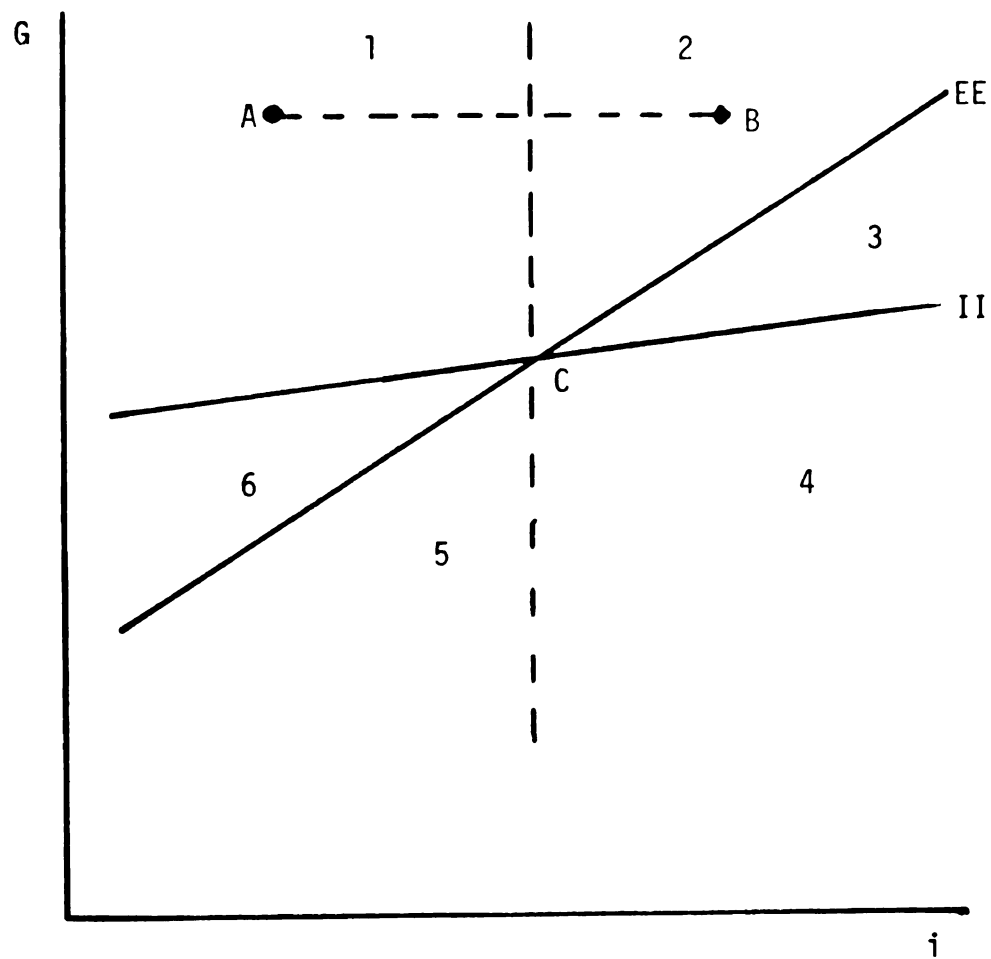
If we begin from a position of external surplus coupled with internal inflation, such as point C in region three, it is crucial that monetary policy, because of its comparative efficiency with respect to the balance of payments, be directed toward the achievement of external equilibrium and fiscal policy be directed toward the internal goal. Under such a policy strategy the resultant policy vector, $a + b$, will be toward the internal-external equilibrium. Reversing the policy assignment, monetary policy towards the internal goal and fiscal policy toward the external, results in the policy vectors a' and b' with the resultant policy vector $a' + b'$ moving away from the internal-external equilibrium. The results are the same for the other inconsistent region, region six. In these regions, monetary policy must be assigned to the external situation and fiscal policy to the internal if internal and external equilibrium are to be simultaneously achieved.

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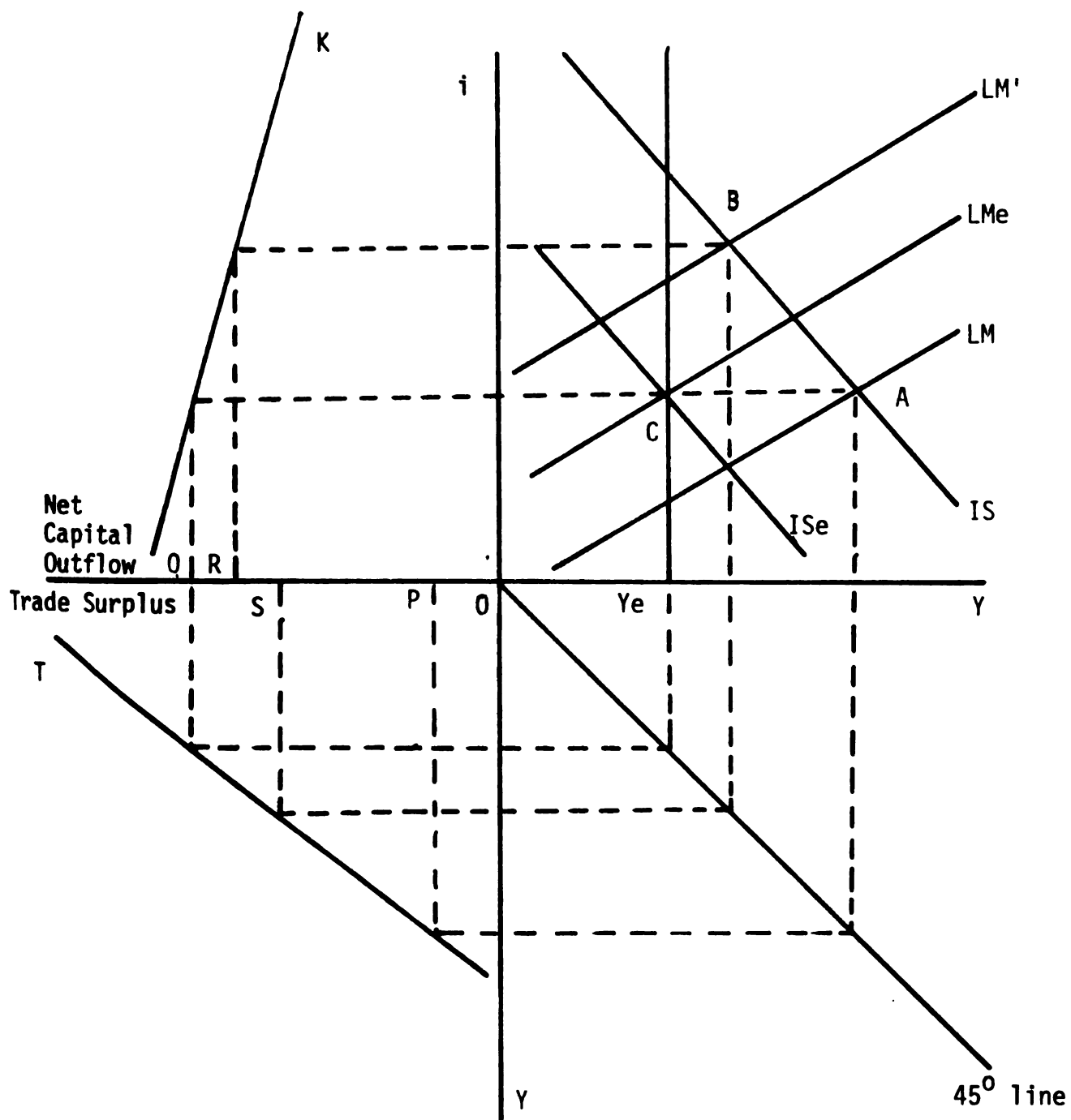
There are two additional regions in the Effective Market Classification diagram that are often overlooked and which create special policy problems. On Graph 2 the consistent regions have been divided into two parts, one and two for the inflation-deficit region, and four and five for the recession-surplus region.¹⁹ Regions one and four are the regions where the instrument-target assignment is not critical. Regions two and five, however, present special problems. Beginning from point A, any target assignment will call for fiscal and monetary expansion, shown respectively as the vectors a and b on the graph. The sum of these vectors, $a + b$, is shown moving away the external-internal equilibrium. This movement is likely to occur until the economy moves into region G, an inconsistent region, where the EMC criterion will call for fiscal expansion and monetary contraction. A more efficient strategy for Region E would call for fiscal expansion and monetary contraction, shown as b and a' on the graph. The resultant vector of forces, $b + a'$, will then move directly toward point B. The difficulty with this assignment is that in regions two and five the monetary instrument, when viewed alone, should not be directed at either the external or internal situation but should be used in the opposite direction if the policy-mix adopted is to be the most efficient. Although in practice it may be hard to distinguish whether a point in the policy-space is in region one or two or four or five, the distinguishing characteristic of two and five is that any point that lies within these regions is closer to the EE than the II. Graph 3 shows the relationship of two points, A in

¹⁹ Ronald W. Jones, "Monetary and Fiscal Policy for an Open Economy with Fixed Exchange Rates," Journal of Political Economy, Vol. LXXVI (Part II, July-August 1968), p. 935.



Source: Bo Sodersten, International Economics (New York: Harper and Row, Publishers, 1970).

FIGURE 3 - Diagram i
THE RELATIONSHIP BETWEEN IS-LM ANALYSIS AND
INTERNAL-EXTERNAL BALANCE



Source: Bo Sodersten, International Economics (New York: Harper and Row, Publishers, 1970)

FIGURE 3 - Diagram ii

THE RELATIONSHIP BETWEEN IS - LM ANALYSIS AND
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Points A and B represent the same fiscal policy, while monetary policy is more contractionary at B than at A. Both are in the inflation-deficit region. Moreover, there is but one fiscal-monetary policy mix, point C, which will simultaneously achieve internal and external balance. The intersection of IS_e and LM_e and the aggregate supply curve demonstrate this point in diagram ii. At this point i_e and Y_e are such that the net outflow of capital and the trade surplus are also equal, i.e., the external sector is also in equilibrium. The intersection of IS and LM indicate a policy-mix such as point A in diagram i. At this intersection aggregate demand exceeds aggregate supply generating inflationary domestic pressure, while externally there is a trade surplus of OP and a net outflow of capital of OQ, resulting in a balance of payments deficit of QP. It is obvious from diagrams i and ii that both monetary and fiscal contraction is necessary to achieve internal-external balance.

The situation at point B in diagram i is indicated by the intersection of IS and LM' in diagram ii. At this point the equilibrium level of income is inflationary and is coupled with an external deficit of RS. Both economic goals would appear to call for monetary contraction, but both diagrams i and ii indicate that the proper policy-mix calls for monetary expansion coupled with fiscal contraction. In regions D and E, therefore, the EMC criteria is not sufficient to insure the most efficient policy-mix.

²⁰The graph is adopted from Bo Sodersten, International Economics (New York: Harper and Row, 1970), p. 333.

Portfolio Adjustment Model

An important reformulation of the basic Keynesian internal-external adjustment model has to do with the distinction between capital stocks and flows. In the foregoing models the external sector was described by the equation $B = T - K$, where T was the trade surplus, a function of income, and K was the net outflow of capital, a function of the domestic interest rates.²¹ The net outflow of capital in this model is essentially the movement of short-term funds in response to international interest rate differentials. The model hypothesizes that this capital movement is a flow which continues at a constant rate as long as the existing interest rate differential does not change. An exception to this formulation of the capital account is found in the various portfolio adjustment models.²²

Portfolio adjustment theory argues that the establishment of a new interest rate differential will not give rise to a new constant flow of capital. Rather, the creation of a new interest rate differential will alter the risk-yield relationship of assets in investors' portfolios, causing investors to substitute to some degree the assets of the country with the relatively higher yields for those whose yields are now relatively less. The result of this portfolio adjustment is to cause a once-and-for-all redistribution of existing capital stocks. In a

²¹This analysis assumes that foreign interest rates remain constant.

²²Ryutaro Komiya, "Economic Growth and the Balance of Payments: A Monetary Approach," Journal of Political Economy, Vol. LXXVII (January 1969), pp. 35-48, and J. E. Floyd, "Monetary and Fiscal Policy in a World of Capital Mobility," Review of Economic Studies, Vol. XXXVI (October 1969), pp. 503-17.

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nongrowing world this initial adjustment to the new interest rate differential will not be followed by a continuous flow of arbitrage funds. The only continuous flow which will arise in such a situation is the debt service payments. In this model, the creation of new interest rate differential will initially attract capital as portfolios are adjusted, but the international capital flow in subsequent periods will be out of the country.²³

In this model the creation of a new interest rate differential will initially cause the foreign ownership of the country's liabilities to increase, but the capital flow which arises out of this action is in the opposite direction as the interest paid to foreigners increases.²⁴ This particular model is described by the equation $B = T - K$, where the only variable changed is K . K is now the net outflow of interest payments.²⁵ K is again a function of the interest rate, but now K_i is positive, the higher the interest rate, the greater the outflow of interest payments. The effect this formulation has on the EMC can be observed by substituting this equation for the original equation and solving for the various multipliers. Doing so, we have:

$$\frac{dB}{dG} = \frac{TyK_i - LiMy}{\det.} < 0$$

$$\frac{dB}{dM} = \frac{-K_i(1-Cy) - MyI_i}{\det.} \geq 0$$

$$\frac{dY}{dG} = \frac{Li}{\det.} > 0$$

$$\frac{dY}{dM} = \frac{I_i}{\det.} > 0$$

²³In a world where the stock of financial assets is growing, the net flow of capital may be in either direction. See Whitman, op. cit., p. 23.

²⁴Repatriated earnings enter the balance of payments in the current account.

²⁵Komiya, op. cit., pp. 35-40.

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Income multipliers have not changed, but now the balance of payments-fiscal policy multiplier is negative, while the balance of payments-money multiplier can be either positive or negative. This result reverses the previous findings and will also reverse the EMC criterion of instrument-target assignment, because fiscal policy is now the more effective instrument for dealing with the external situation. In particular, the income and interest rate effects on the external sector now operate in the same direction for a change in government spending, while they now operate in opposite directions for monetary policy.

Another formulation of the portfolio adjustment model allows for a growing world.²⁶ In this model newly created capital is distributed among international assets in the same proportions as in existing portfolios. If, after portfolio adjustment in response to a change in an interest rate differential, ten per cent of the world's capital is composed of a certain country's assets, then investors will want to hold ten per cent of all newly created capital in that country's assets. An apportionment of newly created capital to a certain country's assets will constitute a continuing flow, but since newly created capital will in general be a small fraction of existing, the flow will be much smaller than the original redistribution of capital stocks.²⁷ This model is described by the equation $B = X - M - K - K'$, or $B = X - M - (K + K')$, where K is the net outflow of interest payments and K' is the net outflow of newly created capital. As before, the

²⁶Ibid.

²⁷Helliwell, op. cit., p. 47.

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$$\frac{dB}{dG} = \frac{T_y(K_i + K_i') - L_i M_y}{\det.} \leq 0$$

$$\frac{dB}{dM} = \frac{-(K_i + K_i')(1 - C_y) - M_y I_i}{\det.} \leq 0$$

$$\frac{dY}{dG} = \frac{L_i}{\det.} > 0$$

$$\frac{dY}{dM} = \frac{I_i}{\det.} > 0$$

Again the income multipliers are unaffected by the change, but now both the balance of payments-government spending multiplier and the balance-of-payments-money multiplier can be either positive or negative. If $K_i < K_i'$, i.e., if the debt service effect of foreign held debt is greater than the net flow of newly created capital, then $\frac{dB}{dG} \geq 0$ and $\frac{dB}{dM} < 0$. If the reverse, $K_i > K_i'$, is true, then $\frac{dB}{dG} < 0$ and $\frac{dB}{dM} \geq 0$. In the second case, the achievement of simultaneous internal-external balance, defining the external balance as a flow equilibrium, requires the reversing of the EMC criteria, while the first case sustains the EMC criteria. In either case, the new flows which exist in response to interest rate differentials are of a lower rate in the portfolio adjustment models than those hypothesized in the first model. The result of this factor is to reduce, in any case, the interest rate effect on external flow equilibrium. If the interest rate effect of a particular policy change is supportive (works in the same direction as the income change), it is less supportive than in the first flow model. And if it is offsetting (works in the opposite direction as the income change), it will be less offsetting. The role of the interest rate changes in achieving external equilibrium is thus diminished.

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Adjustment Through the Current Account

In the previous models, when the economy is at full-employment equilibrium, economic policies designed to restore external equilibrium can affect the balance of payments only through the capital account. The balance of payments is defined in these models as $B = T - K$, where T is the trade surplus and is a function of the level of income, and K is the net outflow of capital, a function of the rate of interest.²⁸ In this situation, the economy begins at some point of internal equilibrium such as position A in Figure 4, and desires to move along the II (the internal equilibrium line) toward simultaneous internal-external equilibrium at point C. A movement along the II implies that full-employment income will be maintained during the adjustment. Since the trade surplus is a function of income alone, no change will occur in the balance of trade. Movement from point A to C will, however, raise the rate of interest which will reduce the outflow of capital and eventually, at point C, restore external equilibrium.

Under similar circumstances, external adjustment in the model described by Jones would occur in both the current account and the capital account.²⁹ Jones begins with the identity $Y \equiv C_d + C_m + I_d + I_m + G_d + G_m + T$ which emphasizes that each component of absorption (C , I and G) is composed of expenditure on domestically produced goods, denoted by the subscript d , and expenditure on foreign produced goods denoted by the subscript m . A simplifying assumption is that the ratios

²⁸This is abstracting from the more general case where K is a function of both the rate of interest and the level of income.

²⁹Jones, op. cit., pp. 929-37.

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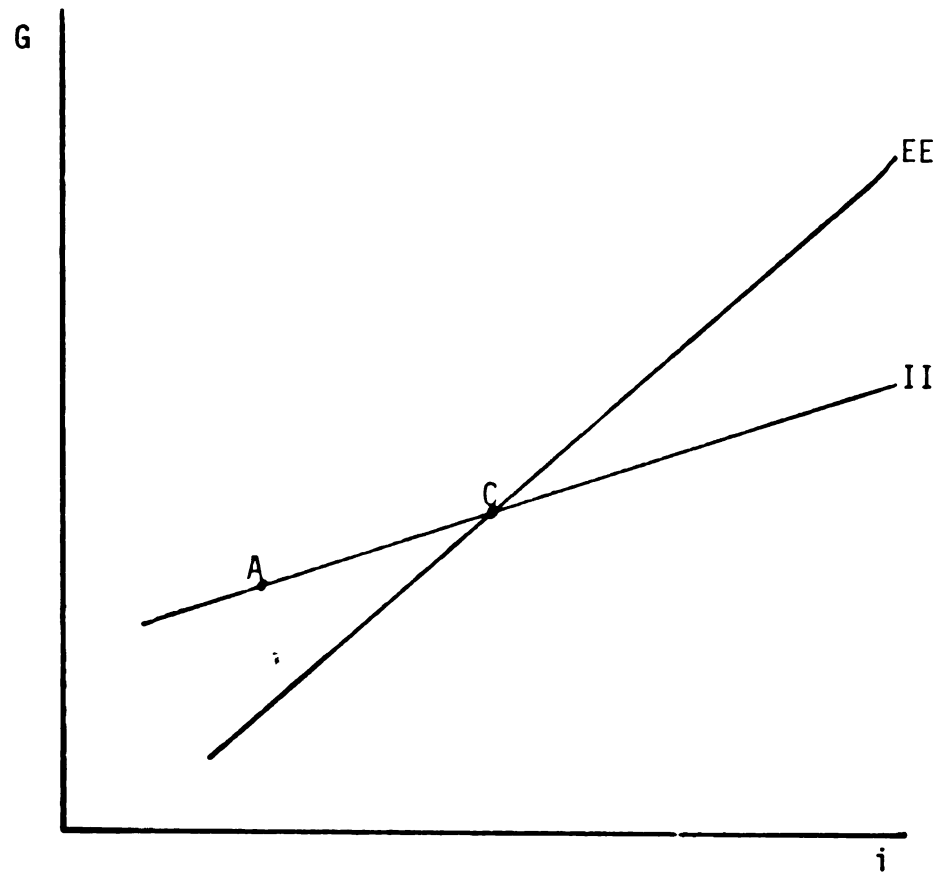


FIGURE 4

INTERNAL-EXTERNAL ADJUSTMENT THROUGH THE CURRENT ACCOUNT

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$\frac{C_m}{C_d}$, $\frac{G_m}{G_d}$, and $\frac{C_m}{C_d}$ are constant but not equal.³⁰

Again, suppose that the economy is at point A in Figure 4 and wishes to move to point C while maintaining internal equilibrium. The proper policy-mix calls for expansionary fiscal policy and contractionary monetary policy. The level of government expenditure increases and the interest rate increases as the country moves along the II curve toward point C. While the level of income does not change as the country moves along the II curve, the composition of absorption does change. If we compare point C with point A, we find that government expenditure is greater and, since the interest rate is higher, the level of investment is lower. If investment has a higher import component than government expenditure, the balance of trade will improve. The effect of this model is to make the trade surplus, T, a function not only of the level of income, but also of the interest rate.³¹

The Price Level

The Keynesian Models examined so far have implicitly assumed that the price level is an exogenously determined variable. Differential rates of inflation between nations, however, are an important factor in explaining the competitive standing of a country's external sector, and it is therefore desirable to examine a model in which the price level is determined endogenously. The model to be examined next assumes that there are no price rigidities and that the equation system is consistent,

³⁰Ibid., p. 930.

³¹Ibid.

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i.e., there is a price level and interest rate at which full-employment equilibrium can be achieved.³² In addition, it is assumed that the labor market is competitive and that the real wage adjusts very rapidly so that aggregate supply is fixed at the full-employment level.

Consider the following model:

$$(1) \quad \frac{Y}{P} = \frac{C}{P} + \frac{I}{P} + \frac{T}{P}$$

$$(2) \quad \frac{Ms}{P} = \frac{Md}{P}$$

$$(3) \quad \frac{B}{P} = \frac{T}{P} - \frac{K}{P}$$

and

$$\frac{C}{P} = C\left(\frac{Y}{P}\right) \quad 0 < \frac{\partial(\frac{C}{P})}{\partial(\frac{Y}{P})} < 1$$

$$\frac{I}{P} = I(i) \quad \frac{\partial(\frac{I}{P})}{\partial i} < 0$$

$$\frac{T}{P} = T\left(\frac{Y}{P}, P\right) : \frac{\partial \frac{T}{P}}{\partial \frac{Y}{P}} < 0 \text{ or } \frac{\partial \frac{T}{P}}{\partial P} < 0$$

$$Ms = Ms(i) ; \frac{\partial Ms}{\partial P} > 0$$

$$\frac{Md}{P} = Md\left(\frac{Y}{P}, i\right) : \frac{\partial \frac{Md}{P}}{\partial P} > 0 ; \frac{\partial(\frac{Md}{P})}{\partial(i)} < 0$$

$$\frac{K}{P} = K(i) : \frac{\partial(\frac{K}{P})}{\partial(i)} < 0$$

Where $\frac{C}{P}$ is real consumption expenditure on domestically produced goods, $\frac{I}{P}$ is real domestic investment on domestically produced goods, $\frac{T}{P}$ is the

³²Helliwell, op. cit., pp. 47-55.

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real trade balance, $\frac{G}{p}$ is real government spending on domestically produced goods, $\frac{B}{p}$ is the real value of the balance of payments, $\frac{K}{p}$ is real capital outflow, $\frac{Ms}{p}$ is the real money supply, $\frac{Md}{p}$ is the demand for real money balances.

Totally differentiating equations (1), (2) and (3) and rewriting them they are:

$$(4) \quad d\left(\frac{Y}{p}\right) - C_y d\frac{Y}{p} - T_y d\frac{Y}{p} - I_i di - T_p dp = \frac{dG}{p}^{33}$$

$$(5) \quad M_y d\frac{Y}{p} + M_i di + M_p dp = \frac{Ms}{p}$$

$$(6) \quad -T_y d\frac{Y}{p} + K_i di - T_p dp - dB = 0$$

Rewriting equations (4), (5) and (6) in matrix form they read:

$$\begin{bmatrix} (1-C_y-T_y) & -I_i & -T_p & 0 \\ M_y & M_i & M_p & 0 \\ -T_y & +K_i & -T_p & 1 \end{bmatrix} \begin{bmatrix} dy \\ di \\ dp \\ dB \end{bmatrix} = \begin{bmatrix} dG \\ dMs \\ 0 \end{bmatrix}$$

The equation system, as it stands, has four endogenously determined variables and only three equations. No unique solution therefore exists. In this model, however, price adjustments will always work to restore full-employment equilibrium after any shock. When starting from full-employment equilibrium, an increase in real government expenditures will shift and aggregate demand schedule to the right, creating excess demand. Prices will then increase and the economy will move back along the aggregate demand schedule until the excess demand disappears,³⁴

³³Where C, T, I, G, Ms, Md, and B all stand for their real values.

³⁴An increase in the price level in this model causes both the LM curve and the IS to shift to the left. Unless the relative intensity of the shifts is specified, a movement up the aggregate of the shifts is specified, a movement up the aggregate demand schedule can signify an increase, decrease, or no change in the equilibrium interest rate.

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$$\begin{bmatrix} -I_i & -T_p & 0 \\ M_{di} & 0 & 0 \\ K_i & -T_p & 1 \end{bmatrix} \begin{bmatrix} d_i \\ dP \\ dB \end{bmatrix} = \begin{bmatrix} dG \\ dM_s \\ 0 \end{bmatrix}$$

The balance of payments multipliers of the system can now be calculated using Cramer's Rule. Solving for the determinate of the system, we have: $T_p M_{di}$ which is positive. Next, solving for dB we have

$$dB = \frac{\begin{vmatrix} -I_i & -T_p & dG \\ M_{di} & 0 & dM_s \\ K_i & -T_p & 0 \end{vmatrix}}{\det.} = \frac{(-I_i T_p) dM_s - T_p K_i dM_s - M_{di} T_p dG}{\det.}$$

$$\frac{\partial B}{\partial M_s} = \frac{-T_p (I_i + K_i)}{T_p M_{di}} = \frac{I_i + K_i}{M_{di}} < 0$$

and $\frac{\partial B}{\partial G} = \frac{-T_p M_{di}}{T_p M_{di}} = -1.$

Both balance of payments multipliers are negative. It is interesting to note, in addition, that the balance of payments-government spending multiplier is equal to -1 . This holds because the partial $\frac{\partial B}{\partial G}$ is specified while holding M_s , the real money supply, constant. Holding the real money supply constant requires that the monetary authorities increase the nominal money supply as the price level increases. If they do react in this manner, the LM will not shift and the IS must shift back to its original position. The final equilibrium position will then be at the original interest rate, but will represent a higher price

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With price flexibility assuring internal equilibrium, either fiscal policy alone, monetary policy alone, or a mix of monetary fiscal policy can be used to simultaneously achieve internal - external balance. The fact that internal full-employment equilibrium is automatically achieved implies that the country's policy mix will always be on the II curve, as shown by points A and B in Graph 5.

If the country begins at point A and directs fiscal policy at the external situation, while holding the interest rate constant, it will move down on a vector such as a. Such policy action will cause the price level to decline, shifting the II down as the trade balance improves while shifting the EE up for the same reason, thus reaching internal - external at some point C, representing the same interest rate, lower real government spending, and balance-of-payments equilibrium.

Alternatively, the country may use only monetary policy. In this case the country moves from point A along the vector b, Graph 6. This policy action will also cause the price level to decline, again shifting the EE up and the II down, reaching internal - external equilibrium at some point D along the vector b.

If prices are assumed to be inflexible in a downward direction, it will be possible for the country to be below the II line, i.e., in a recession. Price will not now automatically restore internal equilibrium and the most efficient policy action will require using both monetary and fiscal policy according to EMC criteria. Price inflation will, however, prevent the country from lying above the II line.

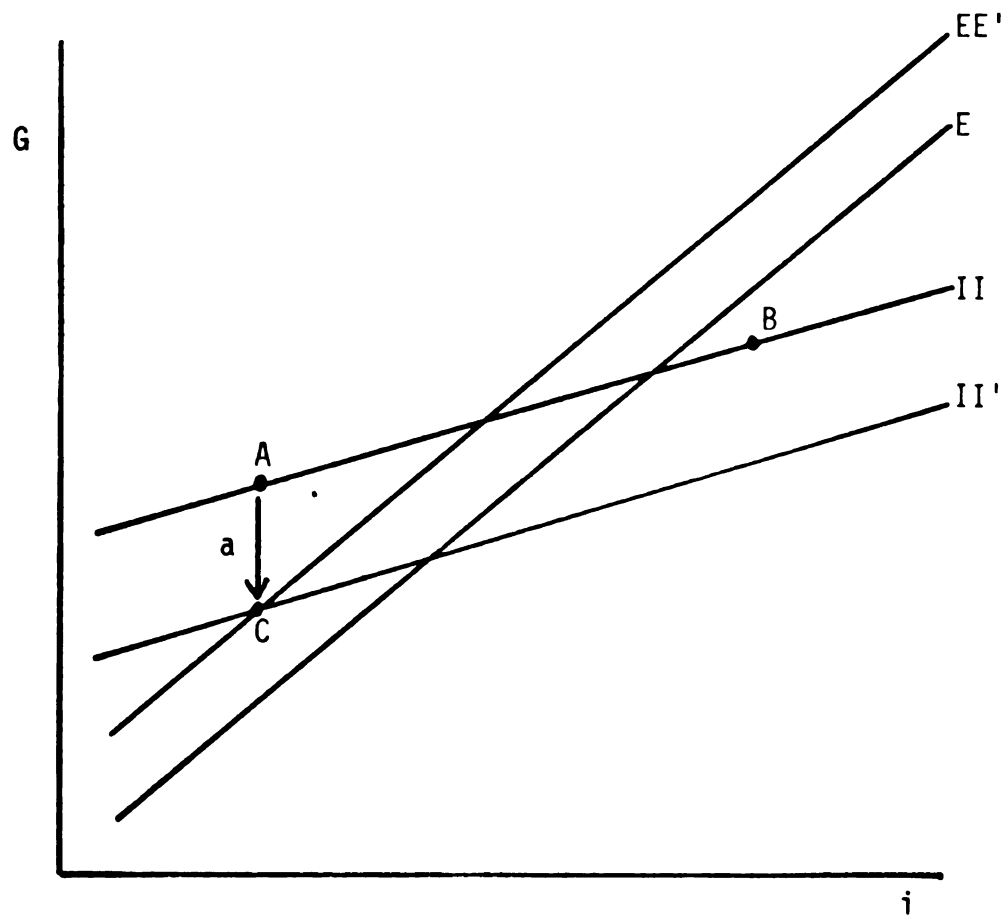


FIGURE 5

USING FISCAL POLICY TO ACHIEVE INTERNAL-EXTERNAL
BALANCE WITH FLEXIBLE PRICES

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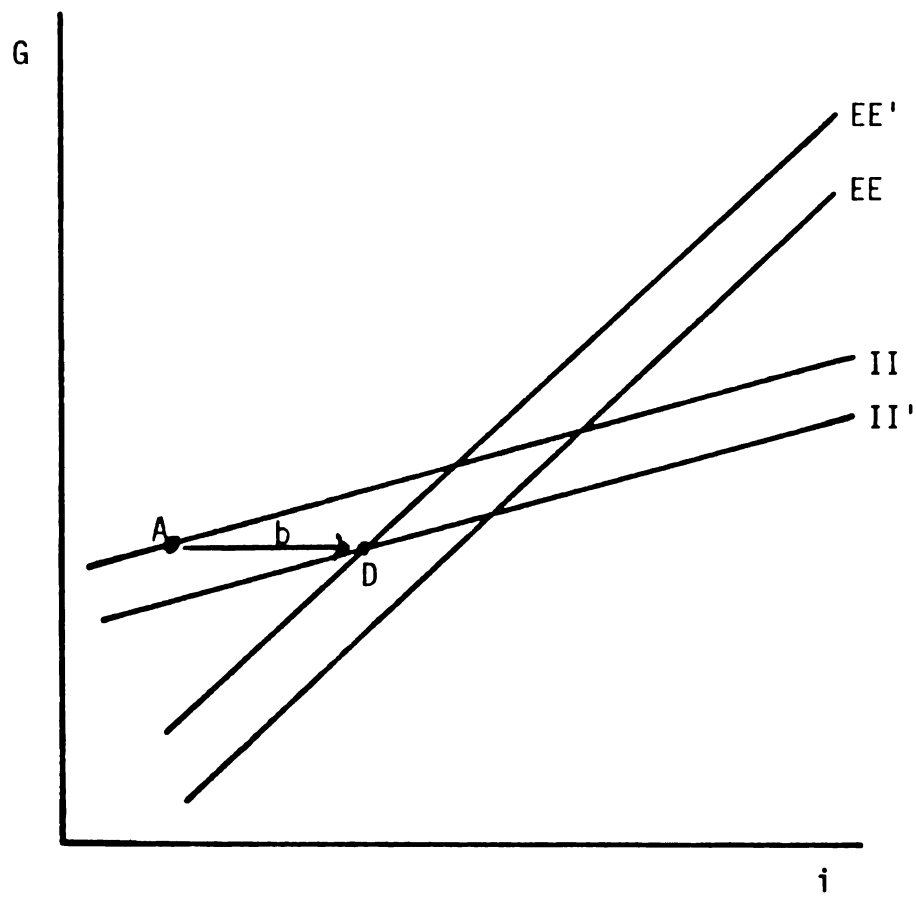


FIGURE 6

USING MONETARY POLICY TO ACHIEVE INTERNAL-EXTERNAL
BALANCE WITH FLEXIBLE PRICES

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A Monetarist View

The preceding discussions on internal - external adjustment under fixed exchange rates were based on Keynesian or Neo-Keynesian models of the economy. The monetarist view of the economy stands in opposition to our previous models. We will now adopt a monetarist viewpoint³⁵ and determine how it might alter the selection of a policy-mix designed to simultaneously achieve internal - external balance under a fixed exchange rate regime.³⁶

Zelder, Ross, and Colbry have examined a monetarist model within the framework of Mundell's EMC scheme.³⁷ Their 3-sector model is as follows:

$$(1) \quad Y = I + X + G$$

$$(2) \quad B = X - M - K$$

$$(3) \quad \frac{L}{P} = \frac{H}{P}$$

and

$$I = I(i) \quad , \quad \frac{dI}{di} < 0$$

³⁵It is beyond the scope of this paper to exhaustively examine the differences between the new-Keynesian and Monetarist views.

³⁶One important monetarist view (see Friedman, "The Role of Monetary Policy," AER, 58 (March 1968), 1-17), does not fall within the purview of adjustment under fixed exchange rates. Exponents of this view believe that the monetary authority, because the lag in the effect of monetary policy is variable and presently largely unpredictable, should not use monetary policy as an anticyclical instrument. Because of the timing problem, they believe that discretionary policy action is as likely to intensify the business cycle as to smooth it out. They therefore urge that anticyclical policy action be replaced by a rule calling for a steady, nondiscretionary expansion of the money supply. Behind this view is the belief that the economy will more or less automatically maintain full-employment output. Flexible exchange rates are then recommended to maintain external balance.

³⁷Raymond E. Zelder, Myron H. Ross, and Arnold Colbry, "Internal and External Balance in an Almost Classical World," Western Economic Journal, X (September 1972), 346-51.

$$X = X(P) \quad , \quad \frac{dX}{dP} < 0$$

$$M = M(Y, P) \quad , \quad \frac{M}{Y} > 0 \quad , \quad \frac{M}{P} > 0$$

$$K = K(i) \quad , \quad \frac{dK}{di} < 0$$

$$L = L(Y, P) \quad , \quad \frac{L}{Y} > 0 \quad , \quad \frac{L}{P} > 0$$

where Y is real output, I is investment, X is exports, G is the budget deficit, i is the real rate of interest, P is the price level, B is the balance of payments, K is the net outflow of capital, M is imports, H is the nominal money supply, and L is the demand for nominal money balances.

There are two distinguishing features in this model. The first, that $\frac{\partial L}{\partial i} = 0$; i.e., the LM curve is perfectly interest inelastic and fiscal policy therefore will affect neither the level of real output nor the price level. The second is that the level of real output is assumed to be automatically maintained at the full-employment level. The internal policy goal then becomes price stability, and the objective of the Mundell type policy-mix is the simultaneous attainment of external balance and internal price stability.

To solve the model, we begin by totally differentiating equations (1) - (3):

$$(4) \quad dY - I di + Xp dP + dG$$

$$(5) \quad dB = Xp dP - Mp dP - My dY - K di$$

$$(6) \quad dH = Ly dY + Lp dP$$

Rewriting equations (4) - (6), we have:

$$(7) \quad dY - I di - Xp dB = dG$$

$$(8) \quad dB - Xp dP + Mp dP + My dY + K di = 0$$

$$(9) \quad Ly dY + Lp dP = dH$$

Using equations

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Putting equations (7) - (9) in matrix form, we have:

$$\begin{bmatrix} 1 & -I_i & -X_p & 0 \\ M_y & K_i & (-X_p + M_p) & 1 \\ L_y & 0 & L_p & 0 \end{bmatrix} \begin{bmatrix} dY \\ di \\ dP \\ dB \end{bmatrix} = \begin{bmatrix} dG \\ 0 \\ 0 \\ dH \end{bmatrix}$$

As the system stands, it is over-determined, but an assumption of the model is that $dY = 0$, which causes the first column of the matrix to drop out, leaving the system with three equations and three unknowns and, consequently, a unique solution.

Solving for the determinate, we have:

$$L_i L_p < 0$$

Using Cramer's Rule, we can now solve for the multipliers

$$\frac{dB}{dG}, \quad \frac{dB}{dH}, \quad \frac{dP}{dG}, \quad \text{and} \quad \frac{dP}{dH}.$$

$$dB = \frac{\begin{vmatrix} -I_i & -X_p & dg \\ K_i & (-X_p + M_p) & 0 \\ 0 & L_p & dH \end{vmatrix}}{\det.}$$

$$(10) \quad dB = \frac{-I_i (-X_p + M_p)(dH) - 0 + X_p K_i dH - 0 + dg K_i L_p - 0}{\det.}$$

$$(11) \quad dB = \frac{-dH I_i M_p + dH X_p I_i + X_p K_i dH + dG K_i L_p}{\det.}$$

Solving equation (11) for the balance of payments-government spending multiplier, we have:

$$\frac{dB}{dH} = \frac{K_i L_p}{\det.} \text{ with } \frac{K_i L_p}{\det.} > 0$$

An increase in deficit spending will therefore improve the balance of payments. The reason for this conclusion is that an increase in deficit spending does not affect either the level of real income or the

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price level but simply raises the interest rate which reduces the net outflow of capital.

Similarly, equation (11) can be solved for the balance of payments-money supply multiplier:

$$\frac{dB}{dH} = \frac{X_p K_i - I_i M_p + X_p I_i}{\det.}$$

The latter expression is negative, meaning that an increase in the money supply will cause the balance of payments to deteriorate.

Again using Cramer's Rule, we can solve for the internal sector multipliers, $\frac{dP}{dH}$ and $\frac{dP}{dG}$:

$$dP = \frac{\begin{vmatrix} -I_i & dG & 0 \\ K_i & 0 & 1 \\ 0 & dH & 0 \end{vmatrix}}{\det.}$$

$$(12) \quad dP = \frac{I_i dH}{\det.} = \frac{I_i dH}{I_i L_p}$$

Solving equation (12) for the price level-deficit spending multiplier, we have: $\frac{dP}{dG} = 0$. This condition, stated earlier, means that a change in deficit spending will not affect the price level.

Next we solve equation (12) for the price level-money supply multiplier:

$$\frac{dP}{dH} = \frac{1}{L_p} \text{ where } \frac{1}{L_p} > 0$$

This result means that an increase in the money supply will cause an increase in the price level.

Graph 7 puts the above information into the Mundell EMC format. The II line in Graph I represents internal price stability, i.e., along the II, $dP = 0$. The fact that the II is drawn as a vertical line

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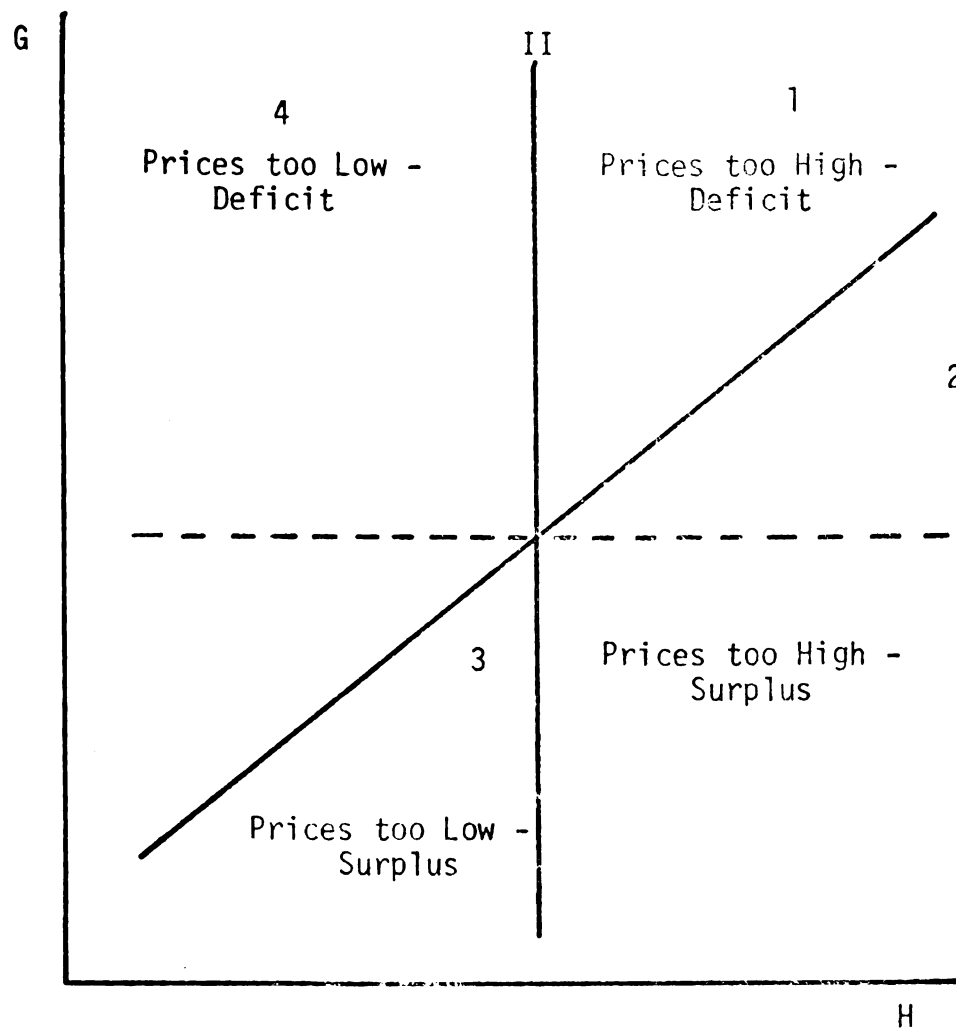
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Source: R.E. Zelder, M.H. Ross, and A. Gollery, "Internal and External Balance in an Almost Classical Model," Western Economic Journal, Vol. X, No. 3, (September 1972), p. 348.

FIGURE 7

INTERNAL-EXTERNAL BALANCE IN A MONETARIST MODEL

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The EE line represents external balance; i.e., along the line $dB = 0$. The line is drawn with a positive slope because $\frac{dB}{dG} > 0$ while $\frac{dB}{dH} < 0$. An increase in deficit spending will improve the balance of payments. It must therefore be accompanied by an increase in the money supply if external balance is to be maintained. Again the intersection of the II and the EE is the point of simultaneous internal-external equilibrium.

The II and the EE divide policy space in Graph 7 into four regions. Regions 2 and 4 represent an inconsistent situation, while regions 1 and 3 are consistent. In each region appropriate fiscal-policy is represented by the vector a and appropriate monetary policy is represented by the vector b. Since $\frac{dP}{dG} = 0$, the appropriate use of fiscal policy in both the consistent and inconsistent regions requires that it be paired with the external goal. In the consistent regions, internal-external balance can be achieved by directing monetary policy toward either the internal or external target. In the inconsistent regions, however, monetary policy must be directed toward the internal policy goal if the economy is to move toward internal-external balance. This latter policy prescription is contrary to the general instrument-target pairing reaching with the past Keynesian models which call for fiscal policy to be directed toward the internal situation and monetary policy toward the external situation.

In summary, a monetarist model used in the context of internal-external adjustment under fixed exchange rates may prescribe different target-instrument pairings than the Neo-Keynesian models earlier examined. Although these policy assignments may be reversed in the different models, it remains true that an incorrect pairing of the target-instrument variables in inconsistent situations will lead the economy away from the joint attainment of its goals.³⁸

³⁸Zelder, et al., op. cit., p. 350.

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Exchange Rate Adjustment

There are two approaches to devaluation theory. One is through partial equilibrium analysis which focuses on the first-order change in relative international prices caused by the devaluation. This approach hypothesizes that devaluation will lessen a deficit in a country's balance of payments if the country's foreign exchange market is stable. The stability of the foreign exchange market is in turn analyzed on the basis of the price elasticities of international supply and demand. The well-known Robinson-Metzler stability conditions or, what is a special case of the above mentioned, the Marshall-Lerner stability conditions, set forth, under various assumptions, the conditions which the relevant price elasticities must satisfy if devaluation is to improve a country's balance of payments.³⁹

Several short-comings in this partial equilibrium approach can be noted. One is that it looks only at merchandise trade flows, ignoring capital flows. Another is that it examines only the first order relative price effects of the exchange rate change, assuming all other factors to be held constant. Yet an exchange rate change has such a pervasive on the whole economy that it is particularly unsuited to partial equilibrium analysis. Along with the first-order change in relative international prices, devaluation is likely to affect international income, the interest rate, and the general price level, all of which will have an effect on the balance of payments.

The alternative approach to devaluation, the absorption technique, stresses still another short-coming of the partial equilibrium price

³⁹ Joan Robinson, "The Foreign Exchanges," Readings in the Theory of International Trade, eds. Howard S. Ellis and Lloyd A. Metzler (Homewood: Richard D. Irwin, 1950), p. 91.

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elasticities approach.⁴⁰ If the country is at full-employment and devalues, even if the proper stability conditions exist, the price elasticity approach cannot accurately predict the balance of payments effects. The reason is that to expand the international trade sector resources must be freed from other sectors of the economy, and unless absorption can be reduced, the import-substitute sector may expand by bidding resources away from the export sector, leaving the balance of payments unchanged.

The following discussion is a synthesis of these two approaches in a general equilibrium neo-Keynesian framework in which the exchange has been added as a policy instrument.

Consider the following neo-Keynesian model:⁴¹

$$(1) \quad Y = C(Y) + I(i) + G + X(r) - M(r, Y)$$

$$(2) \quad MS = MD(i, Y)$$

$$(3) \quad B = X(r) - M(r, Y) - K(i)$$

The behavioral assumptions are:

$$I_i < 0$$

$$G = \bar{G}$$

$$X_r > 0$$

$$M_r < 0$$

$$M_y > 0$$

$$M_{di} < 0$$

$$M_{DY} > 0$$

$$\text{and } K_i < 0$$

⁴⁰Sidney S. Alexander, "Effects of a Devaluation on a Trade Balance," Readings in International Economics, eds. Richard E. Caves and Harry G. Johnson (Homewood: Richard D. Irwin, 1968), pp. 360-65.

⁴¹Helliwell, op. cit., pp. 47-55.

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where Y is income, I is investment, C is consumption, i is the interest rate, G is government deficit spending, X is exports, r is the exchange rate (number of units of domestic currency per unit of foreign exchange), M is imports, M_s is the money supply, M_D is the demand for money, B is the balance of payments, K is the net outflow of capital, and K_i is $\frac{\partial K}{\partial i}$.

Totally differentiating equations (1), (2), and (3) with respect to the variables Y , i , B , r , G , and M_s , we have:

$$(4) \quad Xrdr - Mrdr - Mydy - Kidi - dB = 0$$

$$(5) \quad MDidi + MDydy - dM_s = 0$$

$$(6) \quad CydY + Iidi + dG + Xrdr - Mrdr - MydY - dY = 0$$

Gathering the dY , di , and dB on the left side, and dr , dG , and dM on the right side, we have:

$$(7) \quad -MydY - Kidi - dB = (Mr-Xr) dr + 0dG + 0dM_s$$

$$(8) \quad MDydy + MDidi + 0 = 0dr + 0dG + dM_s$$

$$(9) \quad (Cy-1-My) dy + Iidi + 0 = (Mr-Xr) dr - dG + 0dM_s$$

Writing equations (7), (8), and (9) in matrix form gives:

$$\begin{bmatrix} -My & -Ki & -1 \\ MDy & MDi & 0 \\ (Cy-1-My) & Ii & 0 \end{bmatrix} \begin{bmatrix} dY \\ di \\ dB \end{bmatrix} = \begin{bmatrix} (Mr-Xr) dr & 0 & 0 \\ 0 & 0 & dM_s \\ (Mr-Xr) dr - dG & 0 & 0 \end{bmatrix}$$

The system can be considered as having three target variables, Y , i , B , three equations, and three policy variables, G , r , and M_s . If the interest rate is not considered a target variable, but is allowed to take on any value, then there are three policy variables which can be used to achieve two economic goals. In this case, policy-makers have added flexibility, since there will be an infinite number of combinations of G , My and r that achieve joint internal-external balance. In the

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normal case, however, there will be an acceptable range for the interest rate and only the combination of G , r , and M_s that achieve internal-external balance while keeping the interest rate within this range will be practical.⁴²

Using Cramer's Rule, the multipliers of this system can be calculated as follows:

$$\begin{aligned}
 (1) \quad \frac{dB}{dr} &= \frac{\begin{bmatrix} -My & -Ki & (Mr-Xr) \\ MDy & MDi & 0 \\ (Cy-1-My) & Ii & (Mr-Xr) \end{bmatrix}}{\begin{bmatrix} -MY & -Ki & -0 \\ MDy & MDi & 0 \\ Cy-1-My & Ii & 0 \end{bmatrix}} \\
 &= \frac{(Mr-Xr) MDyIi - MDi(Cy-1-My) + (Mr-Xr) KiMDy - MyMDi}{-1 MDyIi - MDi (Cy-1-My)} \\
 &= (Xr-Mr) \left[\frac{KiMdY - MyMDi}{MDyIi - MDi(Cy-1-My)} + 1 \right] \begin{matrix} \geq 0 \\ \leq 0 \end{matrix}
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad \frac{dB}{dG} &= \frac{\begin{bmatrix} -My & -Ki & 0 \\ MDy & MDi & 0 \\ (Cy-1-My) & Ii & -1 \end{bmatrix}}{\det.} \\
 &= \frac{- [KiMDy - MDi My]}{- [MDyIi - MDi (Cy-1-My)]} \begin{matrix} \leq 0 \\ \geq 0 \end{matrix}
 \end{aligned}$$

⁴²Whitman, op. cit., pp. 34-36.

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(5)

$$(3) \frac{dB}{dMs} = \frac{\begin{bmatrix} -My & -Ki & 0 \\ MDy & MDi & 1 \\ (Cy-1-My) & Ii & 0 \end{bmatrix}}{\det.}$$

$$= \frac{My Ii - Ki (Cy-1-My)}{- [MDyIi - MDi (Cy-1-My)]}$$

$$= \frac{Ki (Cy-1-My) - My Ii}{MDy Ii - MDi (Cy-1-My)} < 0$$

$$(4) \frac{dY}{dr} = \frac{\begin{bmatrix} (Mr-Xr) & -Ki & -1 \\ 0 & MDi & 0 \\ (Mr-Xr) & Ii & 0 \end{bmatrix}}{\det.}$$

$$= \frac{+ MDi (Mr-Xr)}{- [MDyIi - MDi (Cy-1-My)]}$$

$$= \frac{(Xr-Mr) MDi}{[MDyIi - MDi (Cy-1-My)]} > 0$$

$$(5) \frac{dY}{dG} = \frac{\begin{bmatrix} 0 & -Ki & -1 \\ 0 & MDi & 0 \\ -1 & Ii & 0 \end{bmatrix}}{\det.}$$

$$= \frac{MDi}{MDyIi - MDi (Cy-1-My)}$$

$$= \frac{1}{\frac{MDy}{MDi} Ii - (Cy-1-My)} > 0$$

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For convenience, the above multipliers, together with their signs, are displayed in Table L.

Table L

$$(1) \frac{dB}{dr} \begin{matrix} > \\ < \end{matrix} 0$$

$$(2) \frac{dB}{dG} \begin{matrix} > \\ < \end{matrix} 0$$

$$(3) \frac{dB}{dM_s} < 0$$

$$(4) \frac{dY}{dr} > 0$$

$$(5) \frac{dY}{dG} > 0$$

$$(6) \frac{dY}{dM_s} > 0$$

From the table it can be seen that the income multipliers all carry the expected signs, i.e., devaluation, an increase in government expenditure, or an increase in the money supply will all cause an increase in the equilibrium level of income.

With respect to the balance of payment multipliers, we find that an increase in the money supply will cause the balance of payments to deteriorate, while an increase in government expenditure may cause it to improve or deteriorate. These results have already been examined in detail in earlier models and are the basis for the Mundell pairing of monetary policy with the external goal and fiscal policy with the internal goal. The multiplier which merits present attention is the balance of payments-exchange rate multiplier which can be positive, negative or zero. The equation for this multiplier is:

$$\frac{dB}{dr} = (X_r - M_r) \left[\frac{K_i M_{Dy} - M_y M_{Di}}{M_{Dy} I_i - M_{Di} (C_y - 1 - M_y)} + 1 \right] \begin{matrix} > \\ < \end{matrix} 0$$

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The first question which may be asked is if the Marshall-Lerner or Robinson-Metzler stability conditions hold, will this multiplier be positive, i.e., will devaluation improve the balance of payments? And the answer must be no. The stability conditions assure only that, *ceteris paribus*, $\frac{\partial (X-M)}{\partial r} > 0$. Strictly speaking, when the balance of payments is considered in terms of home currency prices, the stability conditions guarantee that $\frac{\partial (X-M)}{\partial r} > 0$, and $\frac{\partial X}{\partial r} > 0$ but not that $\frac{\partial M}{\partial r} < 0$. Even if we take the optimistic attitude that $\frac{\partial M}{\partial r} < 0$, we see that $\frac{dB}{dr} > 0$. The reason for this conclusion is that along with altering relative international prices, devaluation increases income and raises the equilibrium interest rate.⁴³ The increase in the interest rate will help remove the deficit in the balance of payments but the increase in income will work against the improvement. To be exact, the devaluation will improve the balance of payments if $K_i MD_y > M_y MD_i$. For any given value of MD_y and MD_i , the more responsive capital flows are to the interest rate and the lower the marginal propensity to import, the more likely it is that devaluation will improve the balance of payments.

Another question which may be asked is what is proper policy action if the country has a deficit in its balance of payments but has domestic full-employment? Absorption theory in this case would stress that unless devaluation is coupled with policies to reduce absorption, it will not improve the country's balance of payments.⁴⁴

⁴³ $\frac{di}{dr} > 0$.

⁴⁴ The theory recognizes that if efficiency improving structural changes take place because of the devaluation, or the removal of market distorting trade restrictions accompany the devaluation, the level of income may increase. Similarly, the Pigou effect or increased government, because of higher nominal taxes, saving may automatically tend to somewhat reduce absorption.

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The following analysis assumes that $\frac{\partial B}{\partial r} > 0$, that is, devaluation will improve the balance of payments; and $\frac{\partial B}{\partial G} < 0$, that is, an increase in the government deficit spending will cause a deterioration of the balance of payments. On the basis of these assumptions, there are three possible policy strategies available to the government which will result in $dY = 0$ when the country devalues. They are:

$$(1) \quad dr \frac{dY}{dr} = -dG \frac{\partial Y}{\partial G} \quad ; \quad dMs = 0$$

$$(2) \quad dr \frac{\partial Y}{\partial r} = -dMs \frac{\partial Y}{\partial MS} \quad ; \quad dG = 0$$

$$(3) \quad dr \frac{\partial Y}{\partial r} = -dG \frac{\partial Y}{\partial G} - dMs \frac{\partial Y}{\partial MS}$$

In equation (1), contractionary fiscal policy accompanies the devaluation while the money supply is held constant. Substituting the appropriate multipliers into equation (1) and solving for dG we have:

$$dr \frac{(Xr-Mr) MDi}{MDyIi - MDi (Cy-1-My)} = -dG \frac{MDi}{MDy Ii - MDi (Cy-1-My)}$$

$$\text{or} \quad dG = -dr (Xr-Mr)$$

This result indicates that to achieve internal-external balance when the country devalues from full-employment, it must reduce government expenditure by exactly the amount the balance of trade improves. And when strategy 1 is followed, the total improvement in the balance of payments is equal to the improvement in the balance of trade. This can be shown by solving the following equation for the balance of payments:

$$dB = \frac{\partial B}{\partial r} dr + \frac{\partial B}{\partial G} dG$$

The appropriate multipliers are substituted into the equation giving:

$$\begin{aligned} dB &= dr (Xr-Mr) \left[\frac{KiMDy - MyMDi}{MDyIi - MDi (Cy-1-My)} + 1 \right] \\ &\quad \left[\frac{KiMDy - MDiMy}{MDyIi - MDi (Cy-1-My)} \right] \\ &= dr (Xr-Mr) \end{aligned}$$

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Strategy 2 calls for accompanying the devaluation with contractionary monetary policy while holding government deficit spending constant. Solving equation (2), we have:

$$dr \frac{(Xr-Mr) \frac{MDi}{Ii} - MDi (Cy-1-My)}{MDyIi - MDi (Cy-1-My)} = \frac{-dMS}{MDyIi - MDi (Cy-1-My)} \frac{Ii}{Ii}$$

$$\text{or} \quad dMS = -dr (Xr-Mr) \frac{MDi}{Ii}.$$

The result means that the money supply must be reduced by a constant, $\frac{MDi}{Ii}$, multiplied by the effect that devaluation has on the balance of trade, if dY is to be zero. The balance of payments effect of the second policy strategy can also be found by solving the following equation:

$$dB = \frac{\partial B}{\partial r} dr + \frac{\partial B}{\partial MS} dMS$$

Substituting the appropriate multipliers, we have:

$$dB = (Xr-Mr) \left[\frac{Ki MDy - My MDi}{MDyIi - MDi (Cy-1-My)} + 1 \right] dr + \left[\frac{Ki (Cy-1-My) - My Ii}{MDyIi - MDi (Cy-1-My)} \right] \cdot -dr (Xr-Mr) \frac{MDi}{Ii}$$

which yields

$$dB = dr (Xr-Mr) \frac{KiMDy - MyMDi - \frac{Ki MDi}{Ii} (Cy-1-My) + My MDi}{MDyIi - MDi (Cy-1-My)} + 1$$

The total expression is positive, meaning that following the second strategy will improve the balance of payments while at the same time avoiding inflation.

The third policy strategy involves the use of three policy instruments to achieve two policy goals. As a consequence, there will be an infinite number of combinations of the three policy instruments which will achieve joint internal-external balance. Because of this factor, the third strategy will not be closely examined, other than to note that

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if a third policy goal, the level of the interest rate, is added to the full-employment and balance of payments equilibrium goals, there will then be a unique combination of exchange rate, fiscal and monetary policy which will simultaneously achieve the three goals. The inclusion of the interest rate as a policy goal would be appropriate, for example, if the government wished to minimize the cost of solving the public debt.

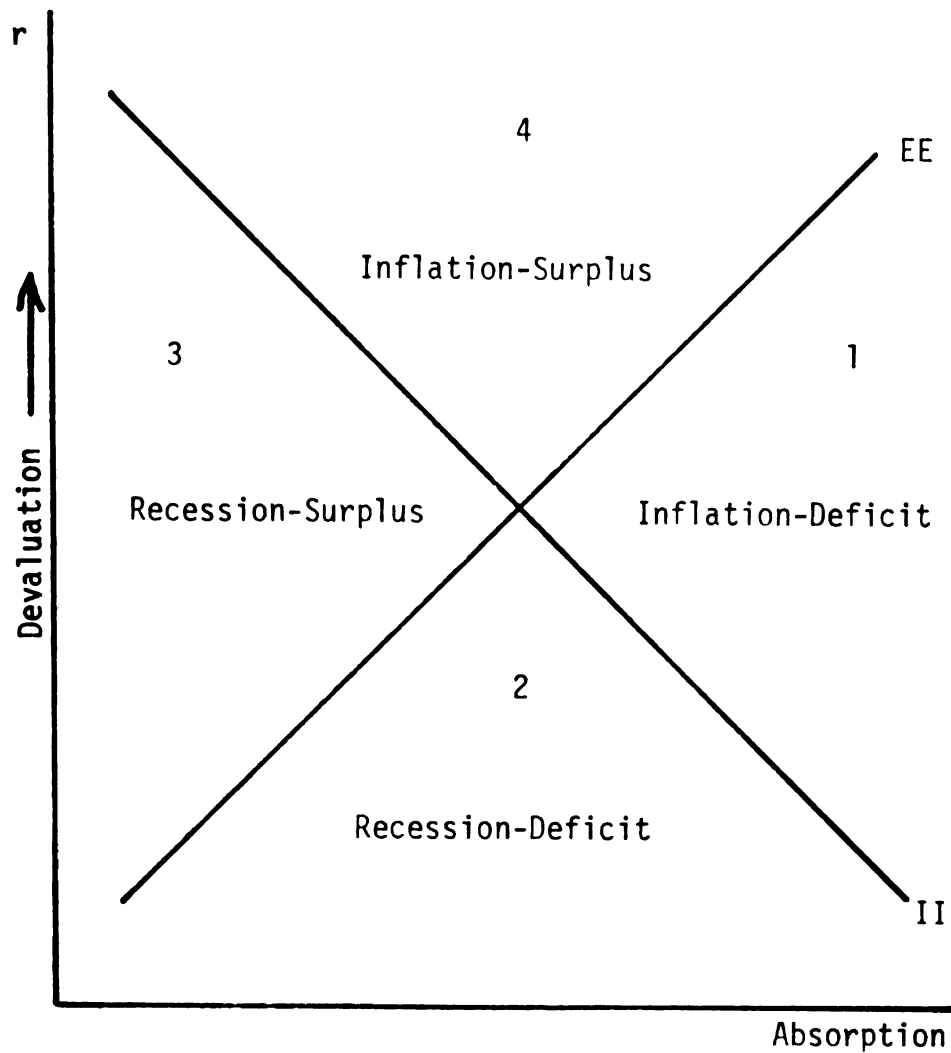
Graph 8 uses the Swan diagram to summarize the foregoing model.⁴⁵ On the vertical axis is plotted the exchange rate, while absorption is plotted on the horizontal axis. A movement out along the horizontal axis represents expansionary monetary and fiscal policy. For convenience, the latter will be referred to as income policy, i.e., designed to reduce (increase) aggregate demand, while exchange rate changes will be referred to as switching policy, i.e., designed to change the composition of aggregate demand between domestic and foreign goods.⁴⁶

The line II represents internal equilibrium. Since $\frac{\partial Y}{\partial r} > 0$ and $\frac{\partial Y}{\partial MS} > 0$ and $\frac{\partial Y}{\partial G} > 0$, the II has a negative slope, i.e., revaluation must be accompanied by expansionary income policy if the level of income is not to change.

The EE line represents external equilibrium. If we assume that $\frac{\partial Y}{\partial r} > 0$ while $\frac{\partial Y}{\partial MS}$ and $\frac{\partial Y}{\partial G}$ are less than zero, it will have a positive slope, i.e., devaluation must be accompanied by expansionary income policy if the balance of payments is not to change.

⁴⁵T. W. Swan, "The Longer-Run Problems of the Balance of Payments," Readings in International Economics, eds. Richard E. Caves and Harry G. Johnson (Homewood: Richard D. Irwin, 1968), p. 458.

⁴⁶Harry G. Johnson, "Towards a General Theory of the Balance of Payments," Readings in International Economics, eds. Richard E. Caves and Harry G. Johnson (Homewood: Richard D. Irwin, 1968), pp. 381-88.



Source: T. W. Swan, "The Longer-Run Problems of the Balance of Payments," Readings in International Economics, eds. Richard E. Caves and Harry G. Johnson (Homewood: Richard D. Irwin, 1968), p. 458.

FIGURE 8

INTERNAL-EXTERNAL BALANCE WITH EXCHANGE RATE ADJUSTMENT

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Together the II and the EE divide policy space into four regions labeled 1 through 4 in Graph 1. Regions 1 and 3 are consistent regions, while in regions 2 and 4 the internal and external goals call for different income policy measures. Region 4 represents internal inflation and external surplus while region 2 represents internal recession and external deficit. It is in these inconsistent regions when the pairing of switching policy with either the external or the internal goal will result in the same policy prescription. In region 4, if switching policy is to achieve either external balance or internal balance, revaluation is in order. In region 2, devaluation will move the economy closer to both internal and external equilibrium. In the consistent regions, if switching policy is directed toward the external goal, it will move the economy away from external equilibrium. The exchange rate policy is more suited for inconsistent situations than consistent situations.

Further Monetary Implications of the Model

The derivation of the balance of payments-exchange rate multipliers assured that $dG = dMS = 0$. The interpretation of this assumption with respect to government expenditure is rather straightforward. Government expenditure simply remains constant. The interpretation with respect to the money supply is not that straightforward. In the foregoing model the money supply was exogenously determined, that is, perfectly inelastic with respect to the interest rate. An exchange rate change, however, does have monetary effects. If devaluation improves the balance of payments, there will be more money supplied to the economy. $dMS = 0$ then does not imply passive monetary policy but that the monetary

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authorities neutralize the balance of payments effects on the money supply so that the net change is zero.⁴⁷ This will require reducing liquidity with devaluation and increasing liquidity with revaluation. The interest rate in the meantime is free to vary.

⁴⁷For alternative formulations of "neutral" monetary policy, see Helliwell, op. cit., p. 36.

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Chapter 3

FINLAND

Monetary Policy

Finnish monetary policy is conducted by the central bank (Bank of Finland), which is an independent state institution functioning under the supervision and guarantee of Parliament. The President of the Republic appoints the Bank of Finland's Board of Managers, which is responsible for the bank's administration and management, while the Parliament elects the nine Bank Supervisors, who have final authority on most bank matters. Members of the Board of Managers are usually appointed for life, while Bank Supervisors are elected for four-year terms and are usually themselves members of the Parliament. The Finnish banking system additionally includes six commercial banks with 834 offices, 330 savings banks, 464 cooperative banks and their central bank and the government-owned Post Office Bank. Other major credit granting institutions are the National Pension Institute and 62 private insurance companies.

The Bank of Finland is not obligated to lend to the central government and normally does not, except in exceptional cases and then only for specific purposes as specified by the Bank Supervisors. The Bank of Finland alone decides whether or not such lending will take place. Central government budgetary deficits must therefore normally be

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financed by borrowing in the domestic or foreign money markets. The Bank of Finland is empowered, however, to lend directly to private non-banking institutions, and its claims on the private sector generally run high. Deposit banks and the Central Bank of the Cooperative Societies are also eligible to rediscount commercial bills at the Bank of Finland, and the value of such rediscounting normally is high. Prior to 1961 the value of Bank of Finland's direct lending to the private nonbanking sector exceeded the rediscounting debt of the banking system. Since 1961, however, the order has been reversed, and rediscounting has become the most important single category, in terms of value, among the Bank of Finland's domestic assets.

Special Characteristics of the Finnish Monetary System

The Finnish monetary system is characterized by an underdeveloped capital market. A limited primary market for bonds does exist, especially for government bonds which have been issued throughout the 1960s, but a secondary bond market is virtually nonexistent. Bonds, as a result, are not traded, but are normally acquired when issued and held to maturity by the original owner. Not only has this lack of a secondary market biased the maturity structure of Finnish credit strongly in favor of short-term securities (most credit, no matter for what purpose, is given for 90 days), but it has precluded the use of open-market operations by the monetary authorities and, further, eliminated the important relationship which exists between bond prices and the interest rate in most industrialized countries. Until 1968 bond values were also commonly tied to the consumer price index, which further removed the link between bond prices and the interest rate.

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The securities market in Finland is also very limited. The turnover rate of the Helsinki Stock Exchange is too low to allow for Bank of Finland's intervention in this market to any reasonable degree without causing unacceptably sharp fluctuations in prices. Furthermore, commercial bank lending seldom takes place through the purchase of bearer bonds, so there is no market for the trading of the commercial banking system's assets. Neither are there markets for Treasury bills, call money, nor short-term money of any sort.

The result is that the Bank of Finland has fewer monetary instruments at its disposal than do the central banks of most other industrialized countries. As mentioned above, open-market operations, which constitute an important monetary instrument in most developed countries, are impossible in Finland where the prerequisite markets do not exist. A corollary of the problem is that commercial banks carry very limited portfolio investments and therefore do not have any portfolio policy which the Bank of Finland can seek to influence in the hope of altering commercial bank liquidity. All this has caused the Finnish authorities to conclude that much interest rate theory does not apply in the Finnish situation, and they discount the effectiveness of interest rate policy in the Finnish economy. The result has been that interest rates have been rather rigid for the past decade.

Interest rates prevailing in Finland are not determined by market forces but by administrative decree. The Bank of Finland dictates directly the whole structure of rates, both on deposits and loans, which are applied by the banking system. Although these rates are legally required only of banks which rediscount at the Bank of Finland, the authorities have made it clear that they favor uniform interest rates,

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and competition through interest rate differentiation does not in fact occur among the banks. The only exception to this is that the Bank of Finland offers interest rates lower than those of private banks in its loans to the private nonbanking sector. The only private institutions free to set their own interest rates are the insurance companies. The central government determines the rates of interest on both their own bonds and those offered by private corporations.

Several other characteristics of the Finnish monetary system should be mentioned here. One is that the responsiveness of short-term international capital flows to changes in Finnish interest rates is low. Part of the reason for this is attributed to the underdeveloped secondary capital markets existing in Finland and part to the portfolio decisions of the suppliers of short-term foreign capital. The creation of an interest rate differential between Finland and the world's money markets apparently causes only a small change in investors' perceptions of the yield-risk composition of their portfolios, as might be expected for a country with such a small capital market. And, if the adjustment of investment stocks in response to a change in the Finnish interest rate is minor, portfolio theory suggests that any continuous flow of capital would be very minor.

Another feature of the Finnish monetary system is that the Bank of Finland holds practically all of the country's foreign exchange. The liquidity of the commercial banking system, as evidenced by the large size of their rediscounting debt, is very low. Consequently they keep their working balance of foreign exchange very small, and the monetary authorities can discount these holdings when examining the country's reserve position.

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The Finnish monetary authorities also claim that an important monetary indicator is the money supply defined to include near-money such as time deposits. The reason for this is that the banking system allows large monthly withdrawals from time deposits without penalty or loss of interest. As a consequence, both business enterprises and individuals keep a larger portion of their transaction balances in time deposits than would be practical in many other countries. The present study will therefore look at how both the money supply and the money supply including quasi-money respond to balance-of-payments disequilibria.

The study now turns to the monetary instruments available to the Bank of Finland.

Policy Instruments

The Discount Rate

The Bank of Finland has adjusted its official discount rate nine times since 1950. The last adjustment was made April 28, 1962. Since then the published rate has remained steady at 7.00 per cent, but this published figure does not give the complete picture of actual Bank of Finland interest rate policy.

The published discount rate does not apply to deposit bank rediscounting but is the minimum rate which the Bank of Finland applies when it lends to the private nonbanking sector. The rate applies to short-term lending normally of three months' duration. During the

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period investigated, the actual rate charged varied between the published minimum and a fixed maximum which ranged from one per cent higher in the early 1950's to three per cent later on.

Commercial banks and the Central Bank of the Cooperatives are eligible to rediscount commercial paper at the Bank of Finland. Most of such rediscounting is for 90-day paper, and the rate applied is called the bank rate. The Bank of Finland has also set ceilings on the level of rediscounting allowed each bank, and as this ceiling is approached progressive penalty rates of interest are added to the bank rate. In May 1958, the maximum penalty rate charged for rediscounting was reduced from 5 per cent to 3 per cent, and it was raised again to 4 per cent in the early 1960's.

The Bank of Finland does not publish statistics of the average interest rate being charged at any time or information concerning the level of penalty rates which are actually being levied. It is, however, reasonable to conclude that the average rate being charged by the Bank of Finland is close to the published minimum when the volume of rediscounting is low and the banks are at least on the average, well below their ceilings. Conversely, it will be close to the maximum when the volume of rediscounting is high. Now the ceilings are being reached and the higher penalty rates are being charged. Such a system adjusts automatically to changes in the demand for rediscounting and when assessing interest rate policy these induced changes must be considered even though the published minimum rate remains stable for long periods.

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Reserve Requirements

Although minimum reserve requirements have been used as an important monetary instrument by a number of countries with under-developed capital markets, they have not been used as a serious monetary instrument by Finland and therefore will not appear in the statistical analysis. The Finnish regulations which exist regarding minimum reserve ratios are concerned primarily with insuring bank solvency and are not designed as a monetary tool useful to regulate domestic liquidity. On two occasions, 1955-56 and 1961-62, the Bank of Finland concluded voluntary cash reserve agreements with the banks, but the results were poor. Cash reserve deposits at the Bank of Finland did not increase enough during either period to have had an appreciable effect on domestic liquidity.

Rediscounting

Rediscounting is the primary monetary instrument used by the Bank of Finland to affect domestic liquidity. Rediscounting as a monetary instrument cannot be considered completely separate from interest rate policy; but in Finland, where the central bank has been reluctant to pursue a vigorous interest rate policy because of a belief in its ineffectiveness, there is a legitimate reason to classify rediscounting, in the sense of credit availability, as a distinct monetary tool. Evidence to support this position is supplied by the fact that, at the prevailing interest rates, there has been chronic excess demand for credit at the Bank of Finland. The Bank chooses to regulate this excess demand by adjusting rediscount quotas rather than by allowing interest

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rate changes to equilibrate the market. That is not to say that the interest rates have not moved in an equilibrating direction. As just mentioned, the automatic effects provided by the application of progressive penalty rates of interest guarantees that the interest rate will move in an adjusting direction to changes in the demand for rediscounting, but they have never moved enough to eliminate the excess demand for credit, and the Bank of Finland has therefore routinely engaged in credit rationing as a matter of policy. Through the adjustment of rediscount ceilings coupled with extensive jawboning of the commercial banks in debt to them, the Bank of Finland has thus pursued a vigorous rediscounting policy largely independent of its rather sluggish interest rate policy.

Bank of Finland Direct Lending to the Private Nonbanking Sector

The Bank of Finland is empowered to lend directly to the private sector and has engaged in this activity throughout the period investigated. The interest rates offered on this lending by the Bank of Finland are slightly lower than those obtainable from the commercial banking system where interest rate differentials are not allowed. The result is a credit queue and the selective rationing of this credit by the Bank of Finland. The importance of such lending has varied considerably in the period under investigation. The volume of central bank lending to private businesses rose gradually from about 150 million marks in 1950 (35 per cent of the Bank's domestic assets) to approximately 465 million marks in 1958 (65 per cent of the Bank's domestic assets), after which it began a long decline, reaching a low of about 110 million marks in 1964 (20 per cent of the Bank's domestic assets).

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In the second quarter of 1965, central bank lending to the private sector began to increase rapidly, jumping from 340 million to over 605 million marks from the third to the fourth quarter of 1967, i.e., when devaluation of the Finnish mark took place. It was not until the end of 1961 that rediscounting credits became more important, in the volume of claims, than central bank lending to the private sector.

Bank of Finland Net Claims
on the Government

The Bank of Finland is not obligated to lend to the central government and does so only in exceptional cases. This category of central bank credit therefore does not contribute greatly to domestic liquidity. Nonetheless, some such lending has occurred over the period and this variable is included in the following statistical analysis. Following Michaely, Bank of Finland claims on the central government are taken net of government deposits with the bank, the reason being that central bank credit which is used by the government to simply increase their deposits at the bank does not affect domestic liquidity. It is granted that governments normally seek credit to spend, and this is especially true in the Finnish situation, but the timing of the expenditure may not coincide with the granting of the credit. And it is the timing of the expenditure and the actual increase in domestic liquidity which is important in this study. Moreover, in the Finnish situation, it is expected that this category of credit, taken net as it is, will be affected primarily by government deposits which in turn are strongly correlated to the central government's budgetary balance.

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Bank of Finland Total Domestic Claims

This variable is the summation of Bank of Finland Claims on banks, the private sector, and the government. It measures, in the aggregate, the liquidity policy followed by the central bank with these policy instruments directly under its control.

Selective Credit Controls

In 1962 Parliament passed a law authorizing the government, at the Bank of Finland's bidding, to fix the minimum down-payment and maximum repayment time on hire-purchase transactions. In late 1964, under the threat of this law, importers and sellers of passenger cars voluntarily tightened credit terms in accordance with the Bank of Finland's wishes. In April 1965 the credit terms for passenger cars were further tightened. At the same time credit regulation was extended to such consumer durables as televisions, refrigerators, washing machines, and deep freezers, and to heavy vehicles such as tractors and trucks. In February 1966, the terms for heavy trucks were relaxed slightly. In March 1969, credit conditions for passenger cars and heavy vehicles were eased considerably, while consumer durables were removed from regulation. In 1970 credit terms were again tightened for all vehicles and consumer durables were placed back under regulation.

Fiscal Policy

The Central government budget has been approximately balanced during the period under investigation, although a number of short-run periods of moderate surpluses or deficits are in evidence. The national debt is moderate, usually running in the neighborhood of 10 per cent of

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GNP or approximately one-half the value of current revenues. Government expenditure on goods and services is split nearly equally between central and local governments and has amounted to less than 25 per cent of GNP. Over the past few years the amount of local government expenditure that is financed by revenue transfers from the central government has increased from less than 15 per cent to about 30 per cent. Local authorities have complete autonomy in the setting of local tax rates and the issuing of bonds, though they may not issue bonds with a maturity of greater than five years without the approval of the Ministry of the Interior.

The Parliament approves the central government budget for each fiscal year and will consider supplementary budget proposals throughout the fiscal year, which in Finland coincides with the calendar year. Central government tax rate changes must have the prior approval of Parliament, although the government gains some flexibility on the revenue side by being able to alter independently, without the Diet's approval, the rates charged on tobacco and alcohol and the prices charged for the services of government enterprises. A two-thirds majority of Parliament is required for tax rate changes which are to last for more than a year. Over half of the central government's tax revenues are supplied by indirect taxes (a general sales tax of 11 per cent, excise taxes, import duties), while progressive income taxes supply roughly one-third. Nevertheless, the elasticity of total tax revenues with respect to changes in the level of income has been estimated to be 1.3 for the recent period.¹ Income taxes are collected on

¹OECD Economic Survey of Finland, May 1970, p. 41.

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a pay as you go basis, and income tax transfers are made to local authorities each month.

Slightly over half of central government current expenditure takes place as income transfers to other public authorities, e.g., to the agricultural sector, to households, etc. Approximately one-third of current expenditure is for goods and services of which roughly one-fourth is defense spending. Central government real investment commonly amounts to about 15 per cent of current expenditure.

The central government may not, as mentioned earlier, generally finance a budget deficit by borrowing from the Bank of Finland. Central government borrowing is therefore normally done in domestic or foreign money markets. The central government also has access to the government-owned Post Office Bank for short-term borrowing.

Statistical Analysis

The change in level of international reserves was chosen as the target variable to represent disturbances in Finland's balance-of-payments. Ideally, time-series data of Finland's actual balance-of-payments would have been used to corroborate the indications given by the international reserve data, but quarterly balance-of-payment information was not available. This cannot, however, be considered a major limitation. Michaely, for example, when both kinds of data were available, found nearly perfect correlation between the two,² as would

²The level of reserves rises with a balance-of-payments surplus and falls with a balance-of-payments deficit. See Michael Michaely, Balance-of-Payments Adjustment Policies: Japan, Germany, and the Netherlands (New York: National Bureau of Economic Research, 1968), p. 28.

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be expected, and he invariably chose the level of international reserves as the working variable in his study, using the balance-of-payment data only as a supplemental check. Since data concerned with the level of international reserves is commonly compiled by central banks with much less delay than that for the balance-of-payments, which must be gathered from many sources, there is reason to assume that it is also the variable most watched by policy-makers, and therefore the most logical variable to include in their reaction function.

Finland's level of international reserves showed a definite cyclical pattern with rather well-defined peaks and troughs. In this first analysis, the period under investigation, 1950 to 1969, was divided into 18 subperiods of upward, downward, or stable trends in the reserve level. Of these, three of the subperiods were of only one-quarter duration. Normally one-quarter period deviations from conspicuous trends were not considered to be separate subperiods, but the three in question had special characteristics. The first occurred the first quarter of 1950 and the second the second quarter of 1950, and thus lent themselves to such interpretation because no trend was yet apparent in the time-series. The third was classified as a separate subperiod because it was a more intense deviation from the trend (III 1967). Of the remaining subperiods, three were of two-quarter duration, three were of three-quarter duration, one was of four-quarter duration, two were of five-quarter duration, one was a six-quarter duration, two were of nine-quarter duration, and, finally, two were of ten-quarter duration. The average duration, then, of these subperiods is 5.2 quarters.

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Table 1 summarizes the behavior of each of the policy variables observed in this study during the subperiods of disturbances in the level of international reserves. The first investigated, the discount rate, appears in column 1. The Bank of Finland has adjusted its official discount rate nine times since 1950. The last adjustment in the rate was made April 28, 1962. Since then the published discount rate has remained steady at 7.00 per cent.

As can be seen from the table, all changes made in the discount rate since 1950 have been in an adjusting direction with respect to the country's external position. Prior to April 28, 1962, the discount rate was changed nine times. During this same period, eleven subperiods representing disturbances in the balance-of-payments have been identified, thus indicating a fairly active discount rate policy. Discount rate changes generally did not take place during the shorter subperiods, but in the downward disturbance of I 1955 to II 1957 the rate was raised twice, and in the following upward disturbance of II 1957 to IV 1960 the rate was lowered twice. Although the evidence cannot be considered conclusive until it is seen if the changes in the discount rate might have been made in response to domestic economic targets, there is a good primary indication that the Bank of Finland used the discount rate as a balance-of-payment adjustment instrument prior to 1962.

From 1962 to the present, however, there appears to have been a change in the Bank of Finland's discount rate policy. Seven payments' disturbances have been identified during this period, but the discount rate has not been changed. It would thus appear that the Central Bank no longer uses the discount rate as a balance-of-payments adjustment

TABLE 1

BEHAVIOR OF POLICY VARIABLES DURING
SUBPERIODS OF DISTURBANCES

Subperiod	International Reserves	(1)	(2)
		Discount Rate	Bank of Finland Claims on Deposit Banks
IV 1949 - I 1950	rise	stable	fall -
I 1950 - II 1950	fall	stable	rise -
II 1950 - IV 1951	rise	lowered +	fall -
IV 1951 - I 1952	stable	stable	rise
I 1952 - IV 1952	fall	stable	rise -
IV 1952 - I 1955	rise	lowered +	fall -
I 1955 - II 1957	fall	raised +	rise -
II 1957 - IV 1959	rise	lowered +	fall -
IV 1959 - II 1960	fall	stable	rise -
II 1960 - II 1961	rise	stable	fall -
II 1961 - I 1962	stable	stable	rise
I 1962 - II 1963	fall	raised +	no trend
II 1963 - I 1964	rise	stable	fall -
I 1964 - III 1964	stable	stable	no trend
III 1964 - I 1967	fall	stable	rise -
I 1967 - III 1967	rise	stable	rise +
III 1967 - IV 1967	fall	stable	rise -
IV 1967 - I 1969	rise	stable	fall -

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Bank of Finland Claims on the Private Sector	Bank of Finland Net Claims on The Government	Bank of Finland Total Domestic Claims
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rise -	fall +	stable
fall -	fall -	fall -
rise	fall	rise
no trend	rise -	rise -
fall -	fall -	stable
rise -	rise -	rise -
fall -	fall -	fall -
stable	fall +	rise -
no trend	no trend	fall -
fall	no trend	rise
rise -	rise -	no trend
fall -	fall -	fall -
stable +	stable +	rise
rise -	rise -	rise -
rise +	fall -	rise +
rise -	rise -	rise -
no trend	fall -	fall -

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TABLE 1 (Cont'd)

(6)	(7)	(8)	(9)
Deposit Bank Lending To the Public (rate of change)	Budgetary Balance	Money Supply (rate of change)	Money Supply Including Quasi-money (rate of change)
increases +	n.a.	increases +	n.a.
decreases +	n.a.	decreases +	negative +
increases +	n.a.	increases +	increases +
increases	surplus	decreases	decreases
decreases +	deficit -	remains negative +	decreases +
increases +	surplus -	increases +	increases +
decreases +	deficit -	increases -	decreases +
increases +	surplus -	increases +	increases +
increases -	surplus +	decreases +	decreases +
remains high +	deficit +	increases +	increases +
stable	deficit	stable	stable +
decreases +	surplus +	increases -	decrease +
remains low -	deficit +	decreases -	increase +
increases	deficit	increases	decrease
increases -	deficit -	decreases +	increase -
decreases -	surplus -	decreases -	decrease -
increases -	deficit -	increases -	increase -
decreases -	deficit +	increases +	decrease -

Note: + means that the variable moved in an adjusting manner with respect to the disturbance.
 - means that the variable moved in a disadjusting manner with respect to the disturbance.
 n.a. means that the data was not available.

Source: Various issues of IMF International Financial Statistics, OECD Main Economic Indicators, and U.N. Balance-of-Payments Yearbook.

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instrument, or, for that matter, as an active monetary instrument for domestic purposes either. Most of the explanation for this lies in the structure of the Finnish monetary market and the view the authorities hold concerning the effectiveness of interest rate policy in the Finnish system. Their experience has been that there is not much portfolio adjustment in favor of Finnish financial securities when a positive international interest rate differential is established.

Another aspect of discount rate policy which must be considered is the quota system coupled with progressive penalty interest rates which the Bank of Finland applies to its rediscounting customers. Since the discount rate published by the Bank of Finland is the minimum rate at which commercial bills may be discounted, it may or may not be an accurate indication of the effective rate being charged. Statistics of an average rate or information concerning the penalty rates being levied are not available. With such a system, however, the average interest rate being charged must certainly move in the direction (assuming that quotas remain relatively stable) of the volume of rediscounting with the Bank of Finland, high when the rediscounting debt is high, and closer to the published minimum when the debt is low. An examination of Bank of Finland claims on deposit banks should then, as a proxy, provide supplementary information concerning the Bank's interest rate policy.

Column 2 of Table 1 shows the performance of the Bank of Finland's claims on deposit banks during the subperiods of external disturbances. In 13 out of the 18 subperiods representing disturbances in the level of international reserves, Bank of Finland claims on deposit banks moved in a disadjusting direction with respect to the external position.

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In only one subperiod, a relatively short one, did this variable move in an adjusting direction. In one subperiod no trend could be identified because the variable both rose and fell. The remaining three subperiods represent times when the level of international reserves remained stable. In one of these the variable rose, in another it fell, and in the last it also remained stable. Only the later of these three can be strictly interpreted as an adjusting reaction to the external situation. The evidence is thus unequivocal. The absolute level of rediscounts rose without exception during periods of downward disturbances in the country's reserve position and fell, with only one exception, during periods when reserves were rising. The interpretation of such offsetting use of their major policy instrument is, however, not so easy. There is no doubt that the change in domestic liquidity brought about by an inflow (outflow) of foreign exchange was dampened by rediscounting policy. The question is whether such action constitutes a decision by policy-makers not to subject the domestic economy to the dictates of the external situation, or whether it is a passive or perhaps even a reluctant accommodation of the automatic offsetting pressures which develop during periods of tight and easy money. Whether or not such offsetting was partial or complete, we must conclude that rediscounting itself has not been used by the Bank of Finland as a balance-of-payments adjustment instrument. It has, on the contrary, been consistently used in a manner opposite to the one which would reduce the external disequilibria.

Column 3 of Table 1 shows the behavior of Bank of Finland claims on the private sector during disturbances in the level of international reserves. Although there have been five periods since 1950 during

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which Bank of Finland claims on the private sector have moved in a direction opposite to Central Bank claims on deposit banks (see Table 1), there is no evidence that this lending to private businesses responded systematically in an adjusting direction to the country's external position. The first episode in which Bank of Finland claims on deposit banks and claims on the private sector moved in opposite directions began the fourth quarter of 1952 and was of two-quarter duration. It came at the trough of the international reserve cycle, when the level of reserves was just beginning to rise. During this period Bank of Finland claims on deposit money banks fell by 90 million marks while their claims on the private sector rose by 45 million marks. This offsetting by 50 per cent the decline in rediscounts to deposit banks came at a time when reserves were rising and in that sense was adjusting. However, the offsetting of rediscounts lasted only two quarters while international reserves continued to rise for the next eight quarters, during which time the level of Central Bank lending to the private sector paralleled in a disadjusting manner the decline in rediscounting. The remaining four episodes in which these Central Bank assets moved in opposite directions were similar to the one outlined. As can be seen in Table 1, the timing and duration of Central Bank lending to the private sector suggests that it was used with a high degree of consistency to offset changes in domestic liquidity brought about by external disturbances.

Column 4 of Table 1 summarizes the behavior of Bank of Finland net claims on the government during each of the subperiods representing external disturbances. In four of the 18 subperiods investigated, Bank of Finland net claims of the government moved in an adjusting manner to

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the balance-of-payments disequilibria. In eleven cases the credit moved in a disadjusting manner, and in three cases there was no clear picture because the variable behaved erratically within the subperiod in question. In subperiods during which the level of international reserves remained stable, a judgment concerning this variable, as with the preceding variables, was omitted unless there was an unusually sharp increase or decrease in the asset. On the whole, as with Central Bank claims on deposit banks and on the private sector, it must be concluded that this credit did not respond systematically in an adjusting direction to balance-of-payments disturbances. Again, to the contrary, Bank of Finland net claims on the government reacted in a disadjusting manner rather than an adjusting manner by a ratio of nearly 3 to 1.

From the foregoing analysis of the individual claims which comprise the Bank of Finland's total domestic assets (columns 2, 3, and 4, Table 1), one would expect that the Bank of Finland's aggregate claims on the domestic economy did not move in an adjusting direction with respect to the external situation. Indeed, such was the case. As can be seen in column 5, the Central Bank's total domestic claims moved in an offsetting direction in ten of the subperiods examined, in an adjusting direction in only one, and remained stable in three subperiods in which the external situation called for either an increase or decrease. The evidence clearly supports the hypothesis that the Bank of Finland did not use its aggregate lending policy in a manner which would reinforce domestic liquidity changes brought about by balance-of-payments disequilibria. Rather, such policy appears to have been used to offset, at least partially, the domestic effects of the

external disturbances. This part of the study would seem to need no further corroboration, although reference cycle analysis will be used later to analyze the same data. If, however, the Central Bank had appeared to use these claims in an adjusting manner, i.e., to reinforce the liquidity changes brought about by the external disequilibria, it would be necessary to see whether or not the alternative domestic target variables might fortuitously have called for the same remedy. The fact that the Central Bank offset at least to some degree the liquidity change brought about by payment disturbances may explain the external pressure which built on the Finnish mark until the 1967 devaluation. It should also be noted that Central Bank domestic claims are only one source of domestic liquidity. Other sources, such as the net inflow (outflow) of foreign exchange, commercial bank credit, and the central government's budgetary balance, must still be examined; and it is not yet possible to assess overall Central Bank policy with respect to balance-of-payments disturbances.

If Nurkse's definition of the rules of the game is accepted, the crucial variable (the Central Bank's domestic assets) has been examined, and the conclusion must be that Finland did not follow the rules as so defined. To apply the Michaely definition, it is necessary to adopt a different crucial variable, in this case the money supply, and recognize that Central Bank domestic assets are only one source of change in the money supply. The analysis will now proceed to examine these other sources and also the money supply itself.

The reaction of commercial bank lending to the public in each of the subperiods may be observed in column 6 of Table 1. Out of the eighteen subperiods, deposit bank lending to the public moved in an

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adjusting direction nine times and in a disadjusting direction six times. As can be seen in the table, the reaction of this variable to the external disturbances can be divided into two distinct periods. Prior to II 1963, the variable moved in an adjusting direction nine times and in a disadjusting direction only once. But since II 1963 the variable has moved five times in a disadjusting direction and never in an adjusting direction. At this stage of the analysis such behavior can be interpreted a number of ways. It is possible that this variable was used as a balance-of-payments adjustment instrument in the earlier period and that in 1963 a new policy evolved which now called for this variable to offset the liquidity changes brought about by balance-of-payments disequilibria. Or it is possible that a consistent situation existed for Finland prior to 1963 and an inconsistent situation after, in which case the conclusion would have to be that this instrument was not, in fact, used in response to the external situation. Later analysis of the alternative domestic target variables will shed light on this dichotomous behavior.

In reaction function analysis the primary emphasis is usually placed on the money supply as the variable representing monetary policy in total. In this analysis the reaction of the money supply may be seen in column 8 of Table 1. The evidence shows that the money supply did generally move in an adjusting direction in response to disturbances in the balance-of-payments. In ten of the subperiods the rate of change in the money supply responded in an adjusting direction to the external situation and in five it responded in a disadjusting manner. Again, this variable seems to exhibit a dichotomous behavior. Prior to 1962 it moved only once in a disadjusting direction and eight times in

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an adjusting direction. Since 1962, however, it has moved four times in a disadjusting direction and only twice in an adjusting direction.

When quasi-money is added to the money supply, as recommended by Finnish analysts,³ the behavior of the variable with respect to the external situation improves slightly. Now it moves in an adjusting direction in only four. Again the dichotomy occurs, only this time it is more pronounced. Prior to 1964 this variable moved only in an adjusting direction with respect to the external situation, and in the four subperiods since 1964 it has moved only in a disadjusting direction. The special circumstances surrounding this later period, e.g., the decline in Finnish production which began in 1965 and culminated in October 1967 (the period of devaluation of the finmark), may aid in explaining this behavior and will be examined in detail later in the study.

The quarterly time-series available for government finance began in 1953 rather than 1950. The variable examined was the overall budgetary surplus (deficit). Central government revenues and expenditures were also examined separately to determine if either category was more sensitive to the external situation. No attempt was made to examine individual tax rates or separate categories of expenditure.

Of the fifteen subperiods since 1953, government finance (column 7, Table 1) acted in an adjusting direction seven times. Of the five times in which it reacted in an adjusting direction to the external situation, four occurred in the five subperiods from IV 1959 to I 1964. The other occurred during the positive disturbance of IV 1967 to

³Rolf Kullberg, "The Money Market Scene After Devaluation," Unitas, Economic Review of Finland, Vol. 40: 3 (1968), 145-148.

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I 1969. Neither the time-series for revenues nor for expenditures evidenced any clear or consistent behavior with respect to the external situation. The primary evidence therefore indicates that fiscal policy was not used as a balance-of-payments adjustment instrument by the Finnish government. This conclusion is consistent with statements by Finnish and OECD economic analysts that prior to the end of the sixties government finance in Finland was not geared anti-cyclically to either the domestic or external situation.⁴

This concludes the first analysis of the selected policy variables with respect to disturbances in the balance-of-payments. The same variables will now be re-examined, for the purpose of corroboration, using reference cycle analysis.⁵ After that the alternative economic objectives of full-employment, price stability, and a high, stable growth rate will be examined, and the study's conclusions will be drawn.

Reference Cycle Analysis

The Finnish time-series of international reserves shows a definite cyclical pattern and therefore lends itself very well to this type of analysis.⁶ The reference cycle is measured from trough to trough and therefore includes both an expansionary and a contractionary phase.

⁴OECD Economic Survey of Finland, op. cit., pp. 35-42.

⁵Arthur F. Burns and Wesley C. Mitchell, Measuring Business Cycles (New York: National Bureau of Economic Research, 1947), Chapter 2.

⁶The analysis is still dealing with the changes in the absolute level of reserves. If a clear time trend had been apparent, fluctuations around the trend would have been examined. As an experiment, fluctuations around an arbitrarily selected 4 per cent growth rate were examined and found not to materially alter the reserve reference cycles.

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Since it is the cycle itself which is basic to this analytical technique, short-run deviations during either the expansionary or contractionary phase do not give rise to separate subperiods as they did in the former analysis. The result is to compress the 18 subperiods previously noted into four and a half reference cycles. The shortest cycle is of two and a half years' duration, while the longest spans a period of six years. The average cycle is approximately four and a quarter years in duration. One may ask what effect this will have on the analysis; and the answer is, I believe, complementary. Some very close relationships, such as Bank of Finland claims on the banking system, which moved in a disadjusting direction even during very brief subperiods, may be somewhat obscured because the averaging methods used in reference cycle analysis tend to smooth out short-run deviations. But relationships which may not have been readily apparent in the shorter subperiods of the previous analysis, because of the lags involved or because of erratic but temporary fluctuations in the data, may now become known.

The first step in reference cycle analysis is to identify the quarters during which the peaks and troughs of the cycle occur. These dates are known as "reference dates," and Table 2 shows the reference dates of the international reserves reference cycle. Figures 9 through 22 show the behavior of the policy variables being examined during each reserve reference cycle. In the figures, each reference cycle is divided evenly into nine parts, parts I and IX representing the troughs, part V the peak, and parts II, III, and IV the expansionary phase, and parts VI, VII, and VIII the contractionary phase. For a more detailed description of the construction of the reference cycles figures, see Appendix A.

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1950-1

1952-1

1957-

1963-

1967-

Source: Vari

TABLE 2

REFERENCE DATES OF INTERNATIONAL
RESERVES REFERENCE CYCLE

Cycle	Trough	Peak	Trough
1950-1952	II 1950	I 1952	IV 1952
1952-1957	IV 1952	I 1955	II 1957
1957-1963	II 1957	II 1961	II 1963
1963-1967	II 1963	I 1964	I 1967
1967-	I 1967	I 1969	

Source: Various issues of IMF International Financial Statistics.

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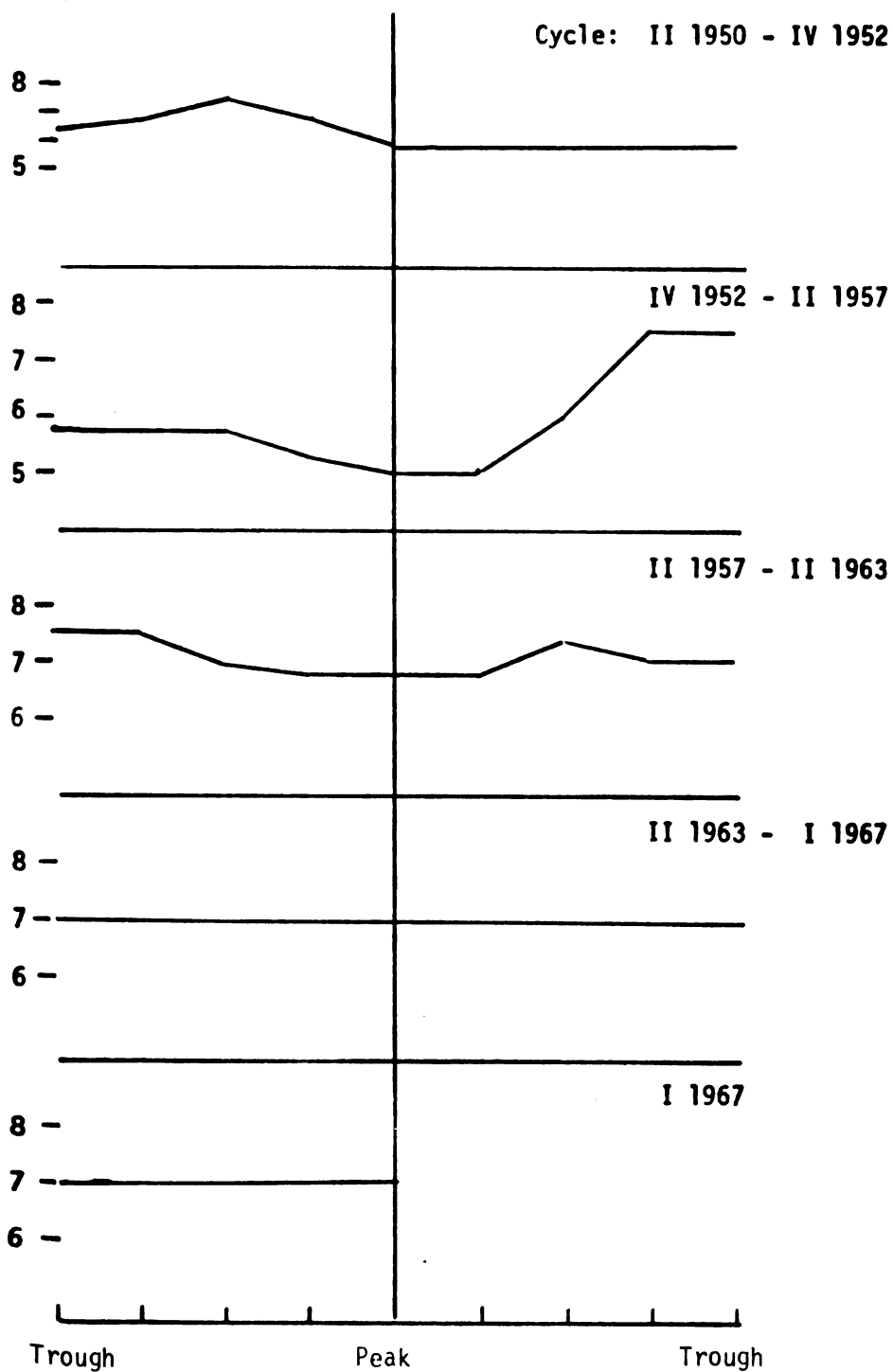


FIGURE 9

THE DISCOUNT RATE DURING INTERNATIONAL RESERVES CYCLE

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Figure 9 examines the discount rate, and reference cycle analysis largely corroborates the earlier findings. It is again evident that the discount rate was not used vigorously as a monetary tool except during the period from 1952 to 1957, but when changes were made in the discount rate they were generally in an adjusting direction with respect to the external situation. There are two brief periods when the discount rate appears to move in a disadjusting direction, the first during the expansionary phase of the 1950 to 1952 cycle, and the second during the contractionary phase of the 1957 to 1963 cycle. The first of these, as the previous analysis showed, was in response to a short-run downward disturbance in the expansionary phase and was therefore an adjusting reaction, although the reference cycle analysis might seem to indicate otherwise. The second period, during the contractionary phase of the 1957 to 1963 cycle, must also be considered an adjusting movement. Here during a period when reserves were falling, the discount rate was raised from 6.75 per cent to 8.00 per cent, where it remained for only a brief period (slightly less than one month) before being lowered to 7.00 per cent. Under the circumstances it would seem erroneous to interpret the move from 8.00 per cent to 7.00 as disadjusting. Rather, since prior to this time a rate change remained in effect on the average for more than a year, the 8.00 per cent can be regarded as an over-reaction, and the change to 7.00 per cent, which is still higher than the original 6.75 per cent, is then in keeping with the intention of adjustment to the external situation. Again, discount rate policy as it is normally understood has not been used as a monetary instrument since 1963, but before that it did move in a direction which had an adjusting influence on the balance-of-payments.

Whether or not other economic targets might have prompted this behavior remains to be investigated.

Bank of Finland claims on deposit banks (Figure 10) show the same disadjusting behavior that was indicated in the first analysis, but some other aspects of their behavior also appear. The most obvious is that the behavior of the variable is not symmetrical during the phases: it rises much more during the contractionary phase than it falls during the expansionary phase. One model which might accommodate this behavior is Wallich's export country with the externally-generated business cycle.⁷ Other than the net inflow (outflow) of foreign exchange, Bank of Finland rediscounting is by far the primary source of the banking system's liquidity. When reserves rise, liquidity increases but business activity led by the export sector also increases, with the effect that, in spite of the favorable reserve position, banks cannot greatly reduce their level of rediscounting if they are to accommodate the increased demand for credit which the increase in exports has fostered. On the other hand, when reserves start to fall, the drop in liquidity forces the banks immediately into the Central Bank before business activity has tapered off enough to reduce the demand for credit. This may also suggest that the Central Bank responds passively to the demand for rediscounting because if the bank was deliberately offsetting less when reserves were rising and more when reserves were falling, it would be operating contrary to the popular thesis that countries react more rigorously to the balance-of-payments deficits than surpluses. Later investigation will seek to determine if, in

⁷ Henry Christopher Wallich, Monetary Problems of an Export Economy (Cambridge: Harvard University Press, 1960), pp. 195-216.

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Cycle: II 1950 - IV 1952

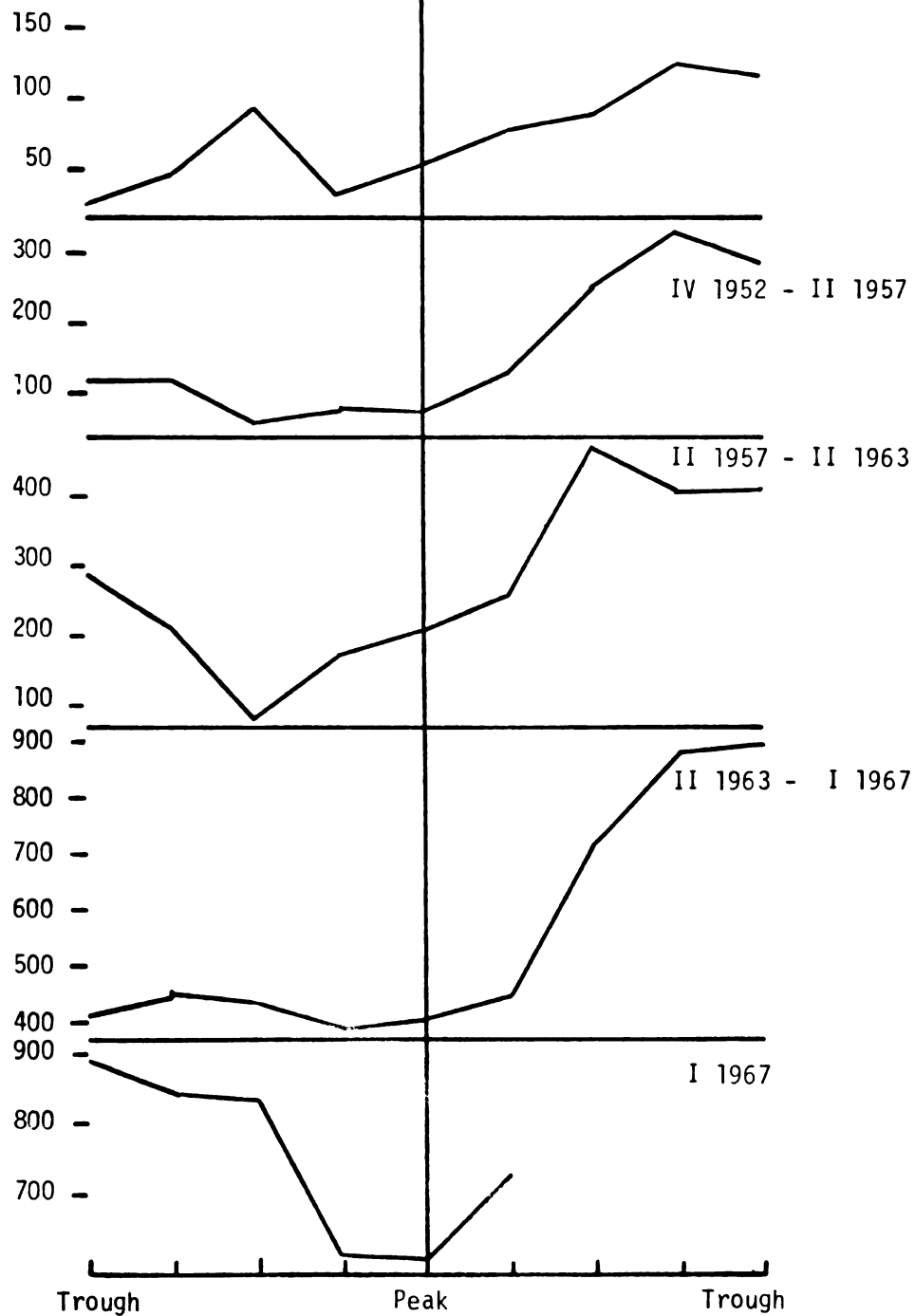


FIGURE 10

BANK OF FINLAND: CLAIMS ON DEPOSIT BANKS DURING
INTERNATIONAL RESERVES CYCLE

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The same conclusion holds true for the behavior of the Central Bank's claims on the private sector (Figure 11). The reference cycle analysis shows two phases during which this variable moved uniformly in an adjusting direction and seven phases in which it did not. Of the two adjusting phases, one must be considered in light of the special conditions prevailing at the time. It is true that Bank of Finland claims on the private sector increased during the expansionary phase which began I 1967 and reached its peak I 1969, and this must be considered as adjusting movement of the variable. But early in this phase the Finnish mark was devalued. An inconsistent situation existed, and it is obvious that the Bank of Finland expansion of credit to the private sector was to finance the increase in business activity which the devaluation brought about and not to dampen the increase in foreign exchange which they also sought through the devaluation. The unequivocal conclusion is that this variable has not been used as a balance-of-payments adjustment instrument.

Bank of Finland net claims on the government also moved in a disadjusting direction throughout the period under investigation, as can be seen from Figure 12, which corroborates the earlier findings. Although there are brief periods during which the variable moves in an adjusting direction, the overall pattern is one which worked consistently to offset liquidity changes brought about by the external

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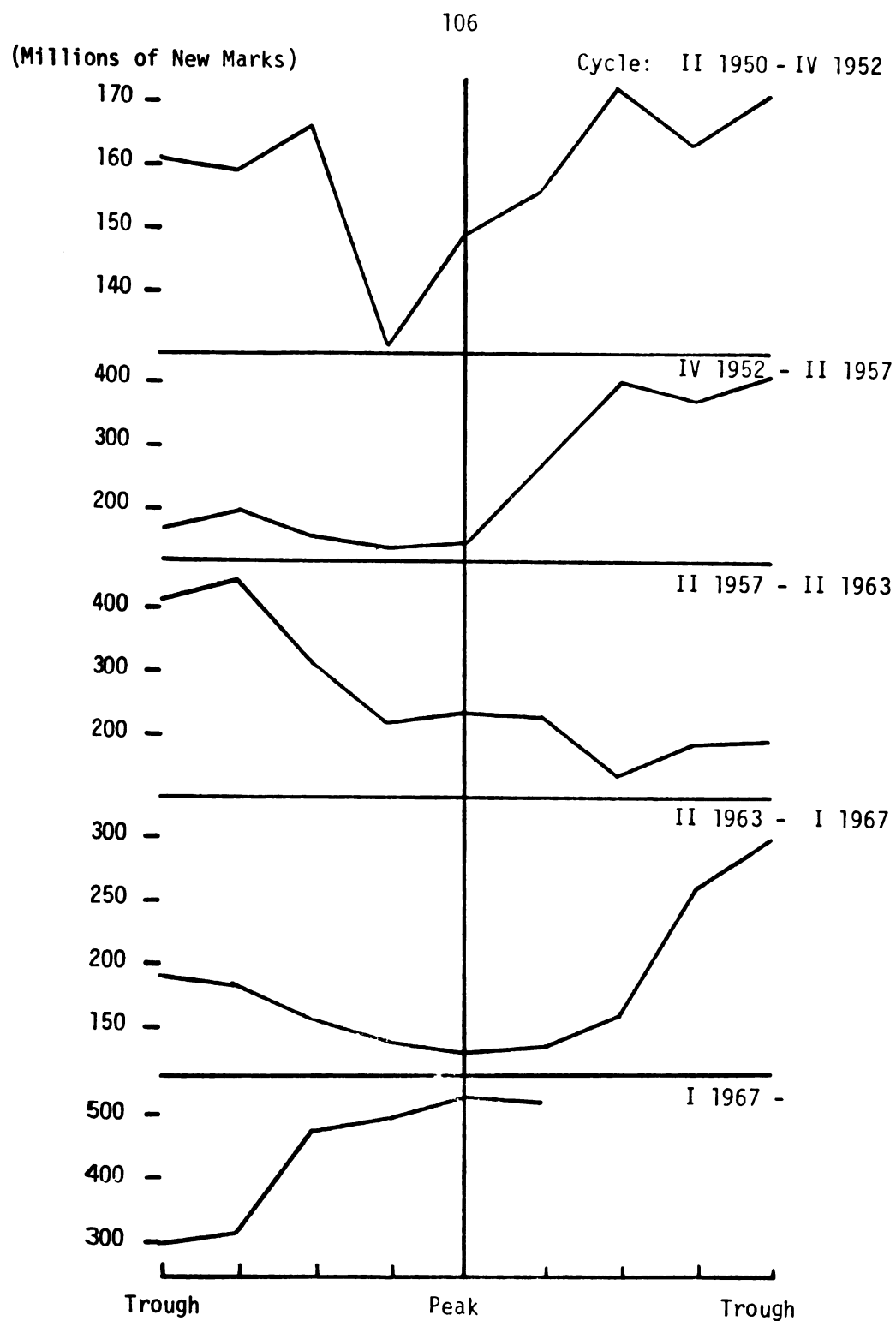


FIGURE 11

BANK OF FINLAND: CLAIMS ON PRIVATE SECTOR DURING
INTERNATIONAL RESERVES CYCLE

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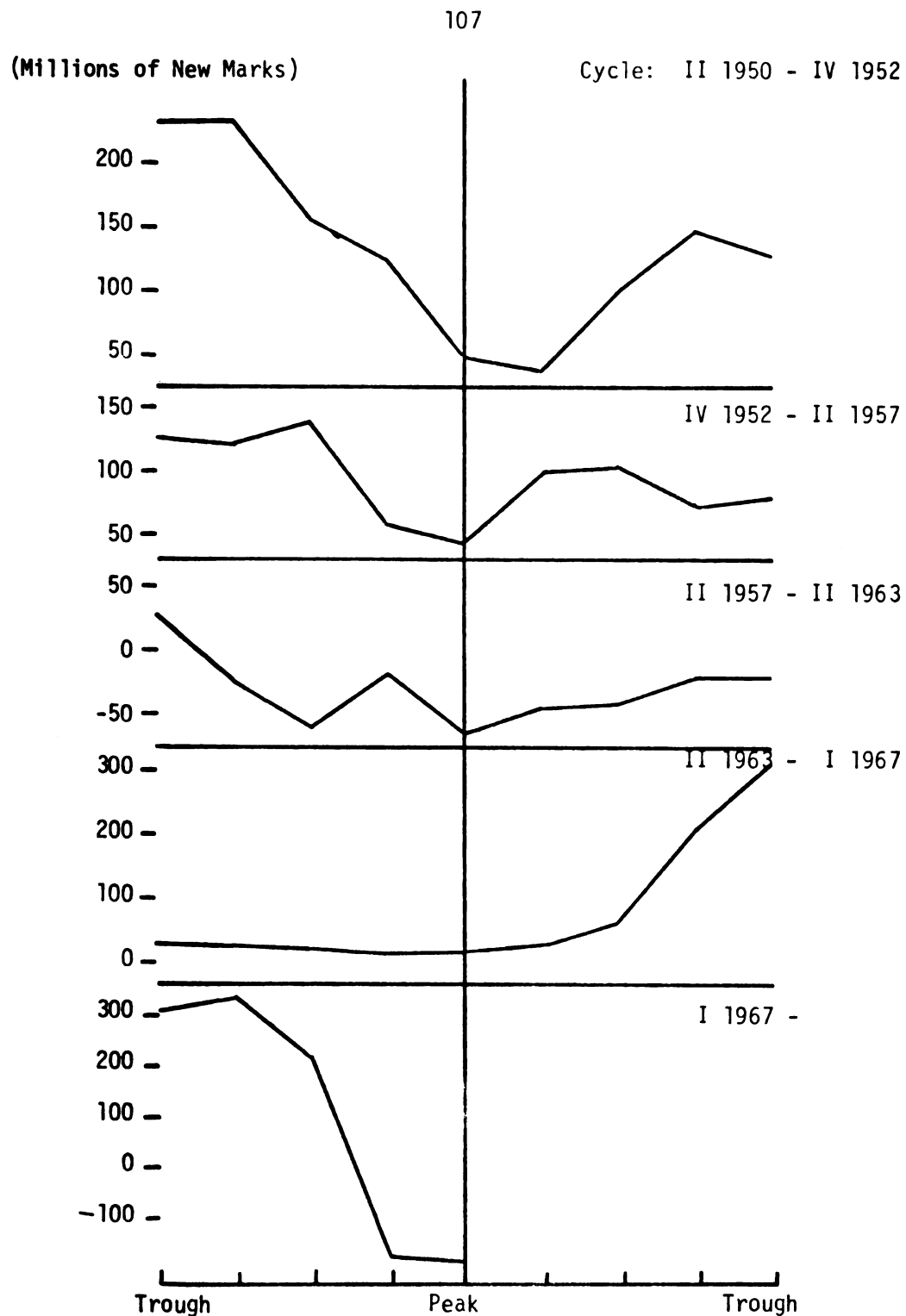


FIGURE 12

BANK OF FINLAND: NET CLAIMS ON GOVERNMENT DURING
INTERNATIONAL RESERVES CYCLE

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disequilibria. Therefore, it must be concluded that the variable was not used as a balance-of-payments adjustment instrument.

Figure 13, Bank of Finland total domestic claims, is simply the sum of Figures 10, 11, and 12, and shows, as would be expected from the behavior of its parts, a disadjusting pattern. There are two phases, however, which catch the eye and merit closer examination. These are the expansionary phase of the 1952 to 1957 reference cycle and the expansionary phase of the 1963 to 1967 reference cycle. During the former, total domestic claims remained stable, and in the latter, the variable fell only slightly relative to the fall during the three other expansionary phases. Although these two phases in no way contradict the conclusion that this variable was not used to adjust disturbances in the balance-of-payments, they may suggest that consistent situations existed at these times since the offsetting was less vigorous than usual. This matter will be investigated later.

The next variable to be examined measures the rate of change of credit expansion by deposit money banks (Figure 14). This variable exhibited an adjusting pattern during the first three reference cycles, and a slightly disadjusting pattern during the last cycle and a half. The evidence is the same as that found before. Prior to 1963, the variable appears to have been used as a balance-of-payments adjustment instrument. Since 1963 it appears to have been used to offset the liquidity changes brought about by external disequilibria. This dichotomous behavior parallels that found for the discount rate and to a lesser extent for the money supply. However, before it can be concluded that a new reaction policy was introduced by the monetary authorities in 1963, the domestic situation must be examined to be sure

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(Millions of New Marks)

Cycle: II 1950 - IV 1952

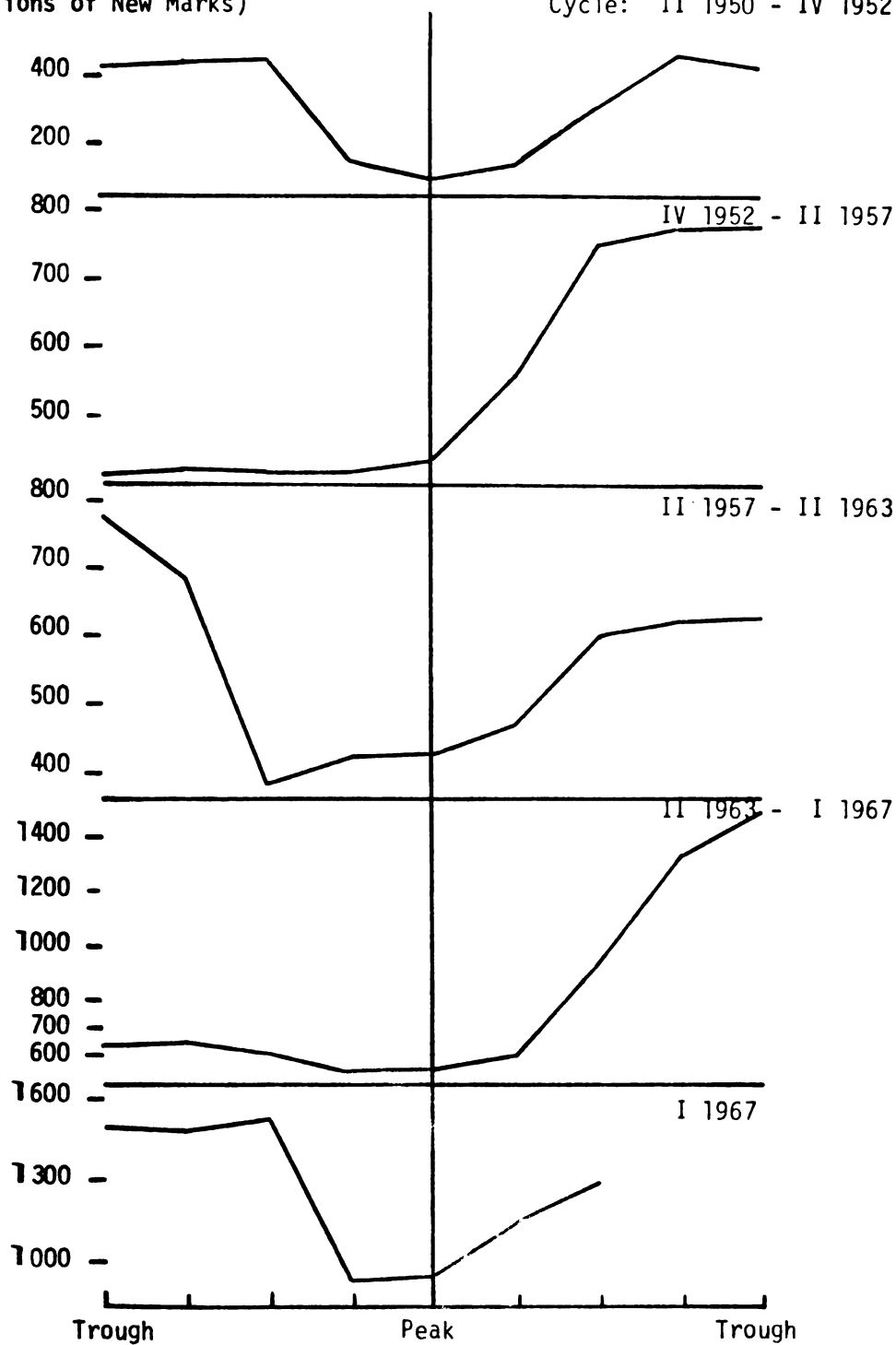


FIGURE 13

BANK OF FINLAND: TOTAL DOMESTIC CLAIMS DURING
INTERNATIONAL RESERVES CYCLE

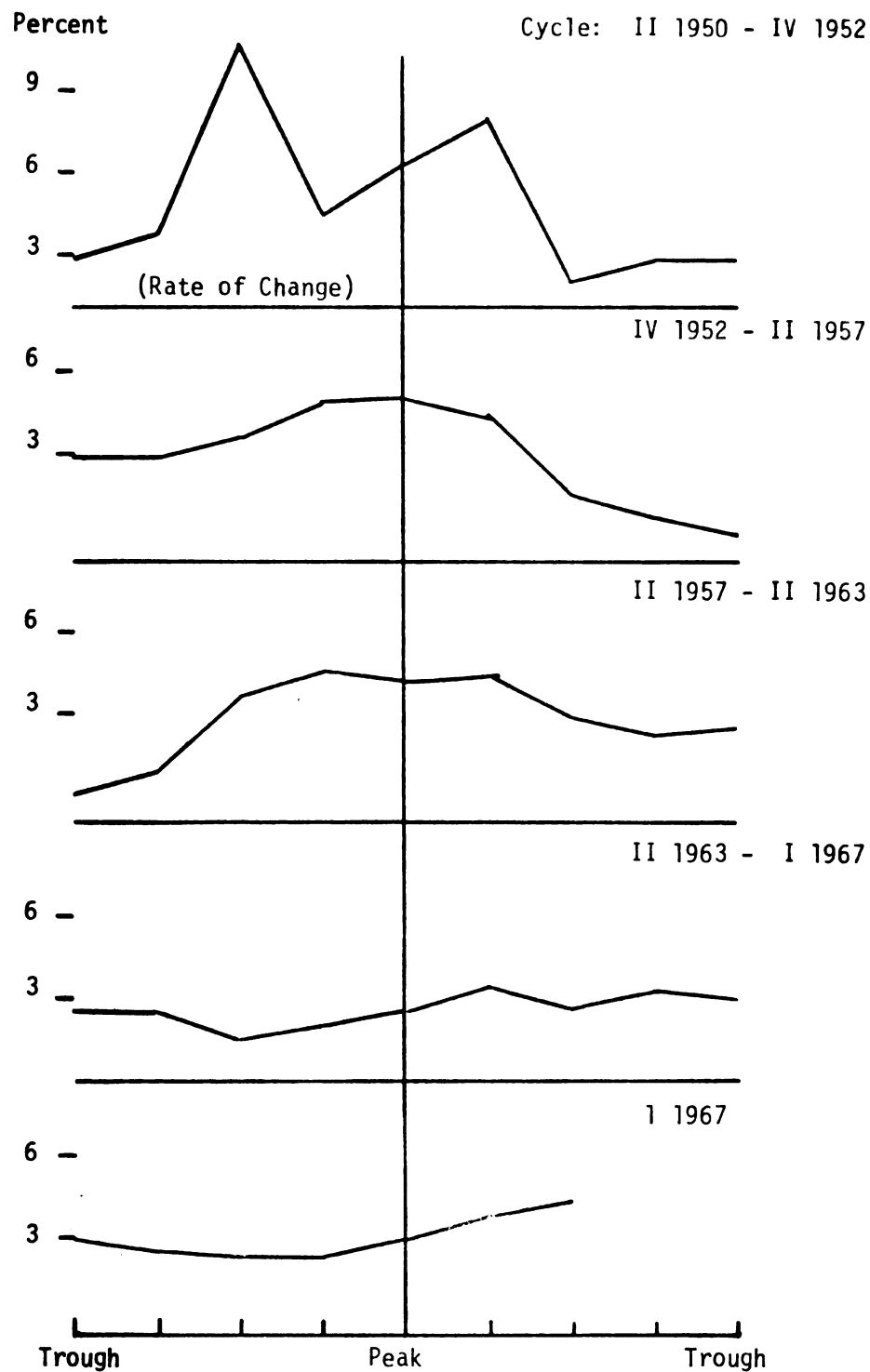


FIGURE 14

DEPOSIT MONEY BANKS: LOANS TO THE PUBLIC DURING
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that consistent situations did not predominate prior to 1963 and inconsistent since.

Fiscal policy, as measured by the budgetary balance (Figure 15), shows no uniform pattern of either adjusting or disadjusting use with respect to the reference cycle. This supports the prior analysis which also indicated that the budgetary balance did not react with any consistent pattern to disturbances in the balance-of-payments. The results are similar when central government revenue and expenditure are examined individually, Figures 16 and 17, respectively. Neither series exhibits any uniform pattern with respect to the reference cycle. The conclusion must be that fiscal policy in Finland has not responded to disturbances in the country's balance-of-payments.

The money supply, including near-money, Figure 18 has generally responded in an adjusting direction to disturbances in Finland's balance-of-payments. The picture with respect to the money supply excluding near-money is not as clear (Figure 19). In this case the money supply expanded during four of the five expansionary phases and fell in two of the four contractionary phases. Because three exceptions to the adjusting influence of the money supply exist, it cannot be generally concluded that this variable was used to correct, or at least mitigate, balance-of-payments disturbances until the other economic targets have been examined. Finnish economic analysts, however, insist that the relevant variable for international comparison is the money supply including near-money. And in this case, the evidence clearly supports the thesis that the relevant variable moved in an adjusting direction with respect to disturbances in the balance-of-payments.

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-200

(Millions of New Marks)

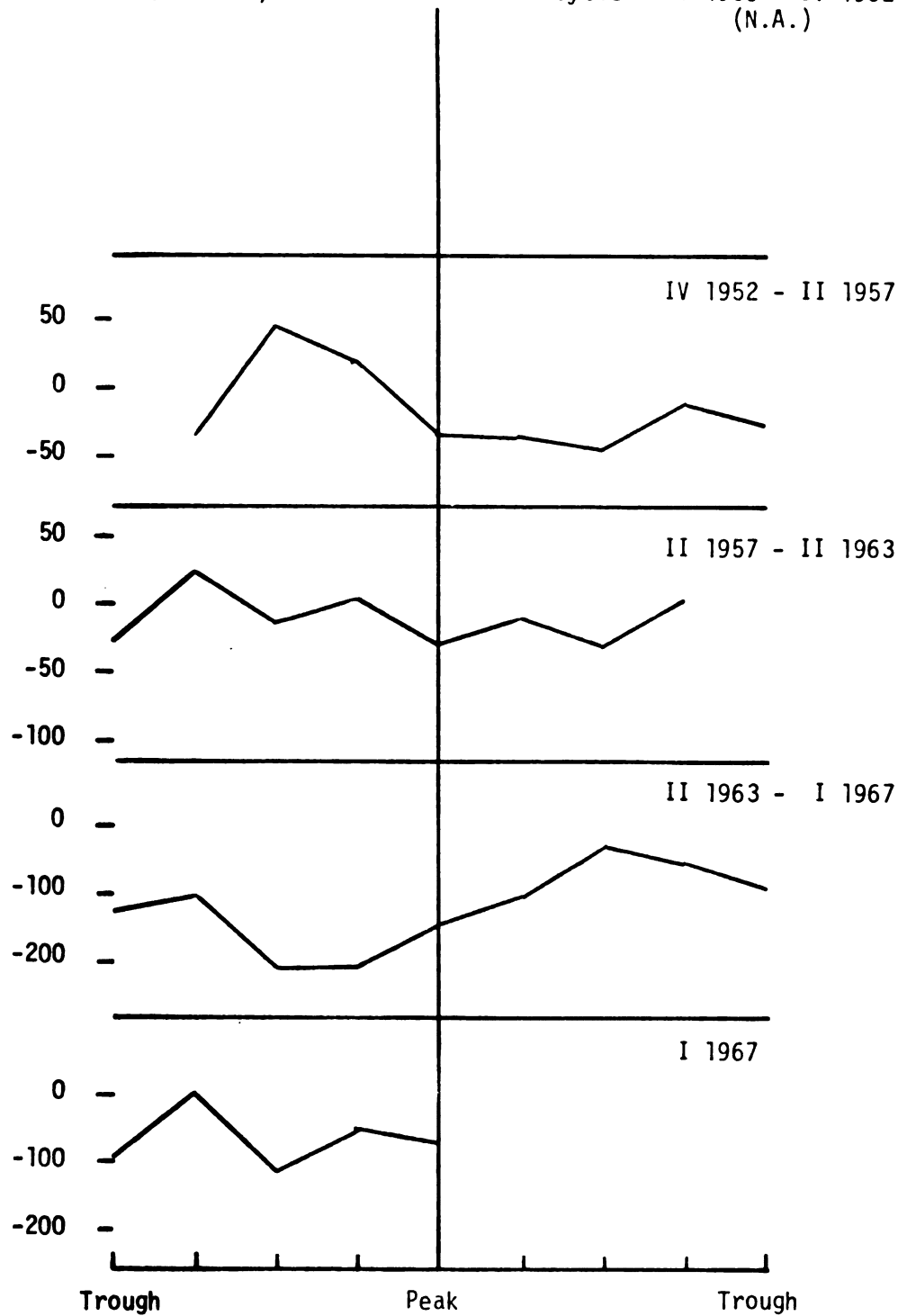
Cycle: II 1950 - IV 1952
(N.A.)

FIGURE 15

BUDGETARY BALANCE DURING INTERNATIONAL RESERVES CYCLE

Perce

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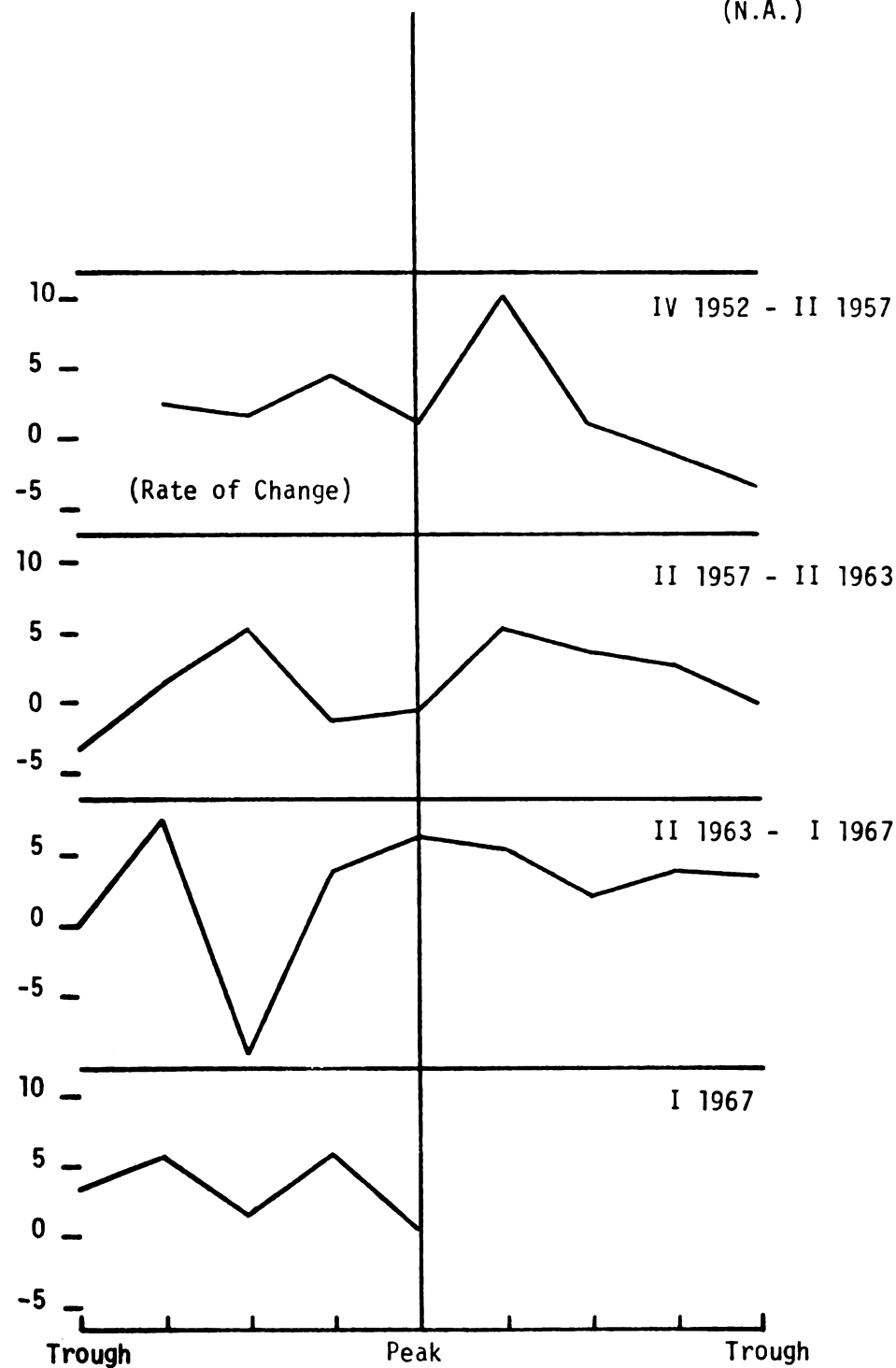
Cycle: II 1950 - IV 1952
(N.A.)

FIGURE 16

CENTRAL GOVERNMENT REVENUE DURING INTERNATIONAL
RESERVES CYCLE

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-5 _

10 _

5 _

0 _

10 _

5 _

0 _

10 _

5 _

0 _

-5 _

Trc

CE

Percent

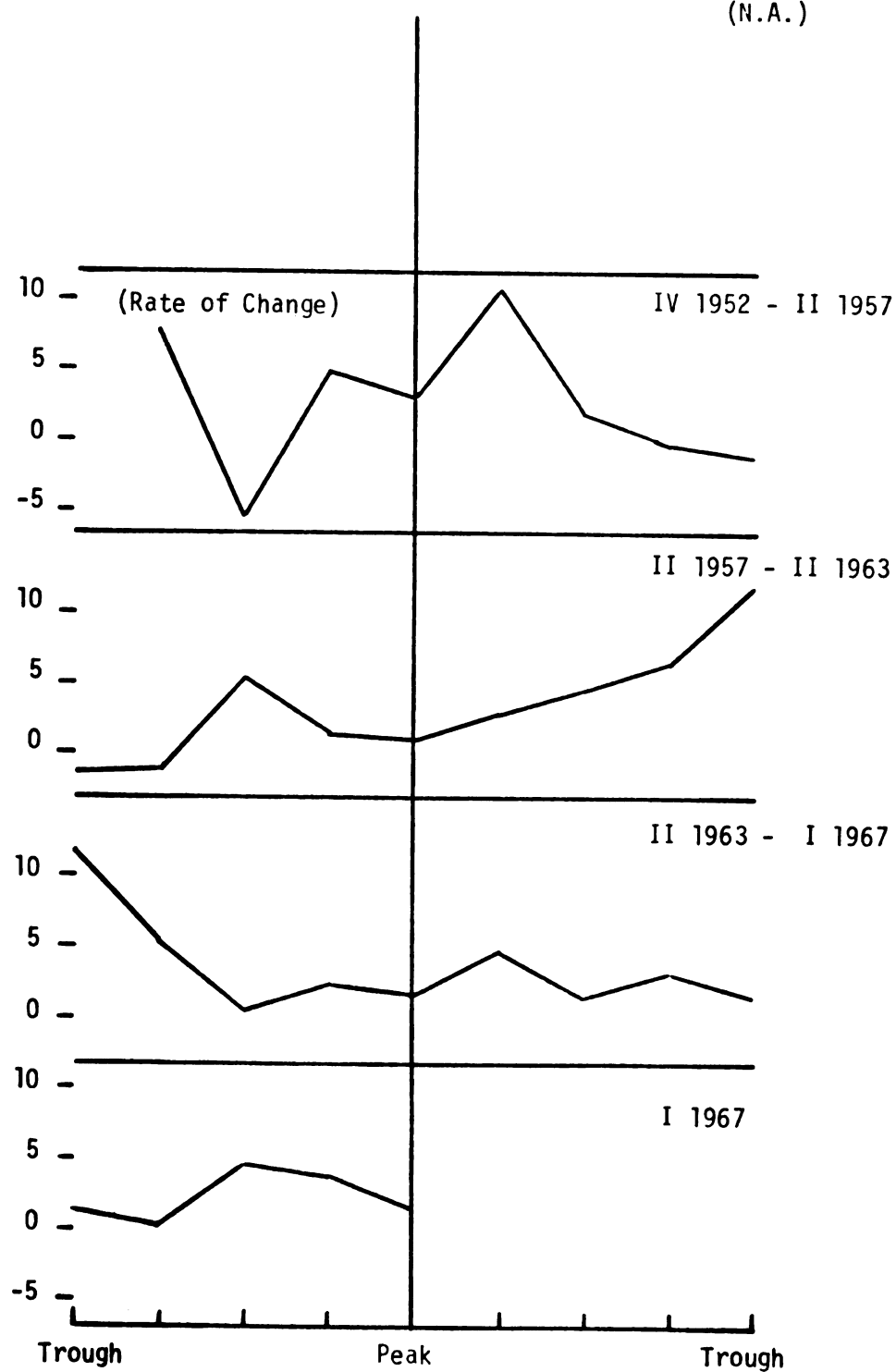
Cycle: II 1950 - IV 1952
(N.A.)

FIGURE 17

CENTRAL GOVERNMENT EXPENDITURE DURING INTERNATIONAL
RESERVES CYCLE

Percent 10 _

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5 _

0 _

-2 _

5 _

0 _

-2 _

5 _

0 _

-2 _

5 _

0 _

0 _

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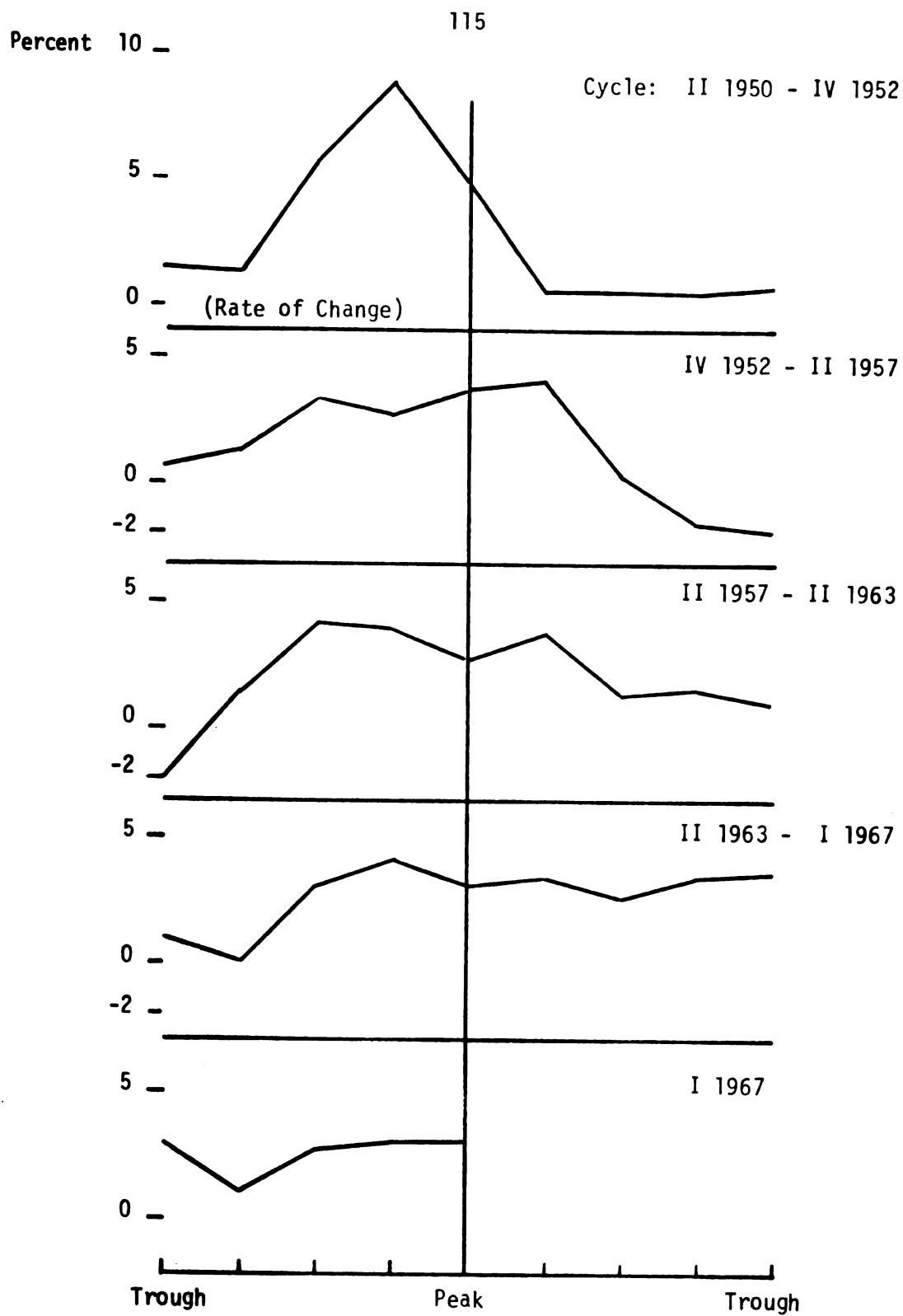


FIGURE 18

MONEY SUPPLY INCLUDING QUASI-MONEY DURING
INTERNATIONAL RESERVES CYCLE

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-5

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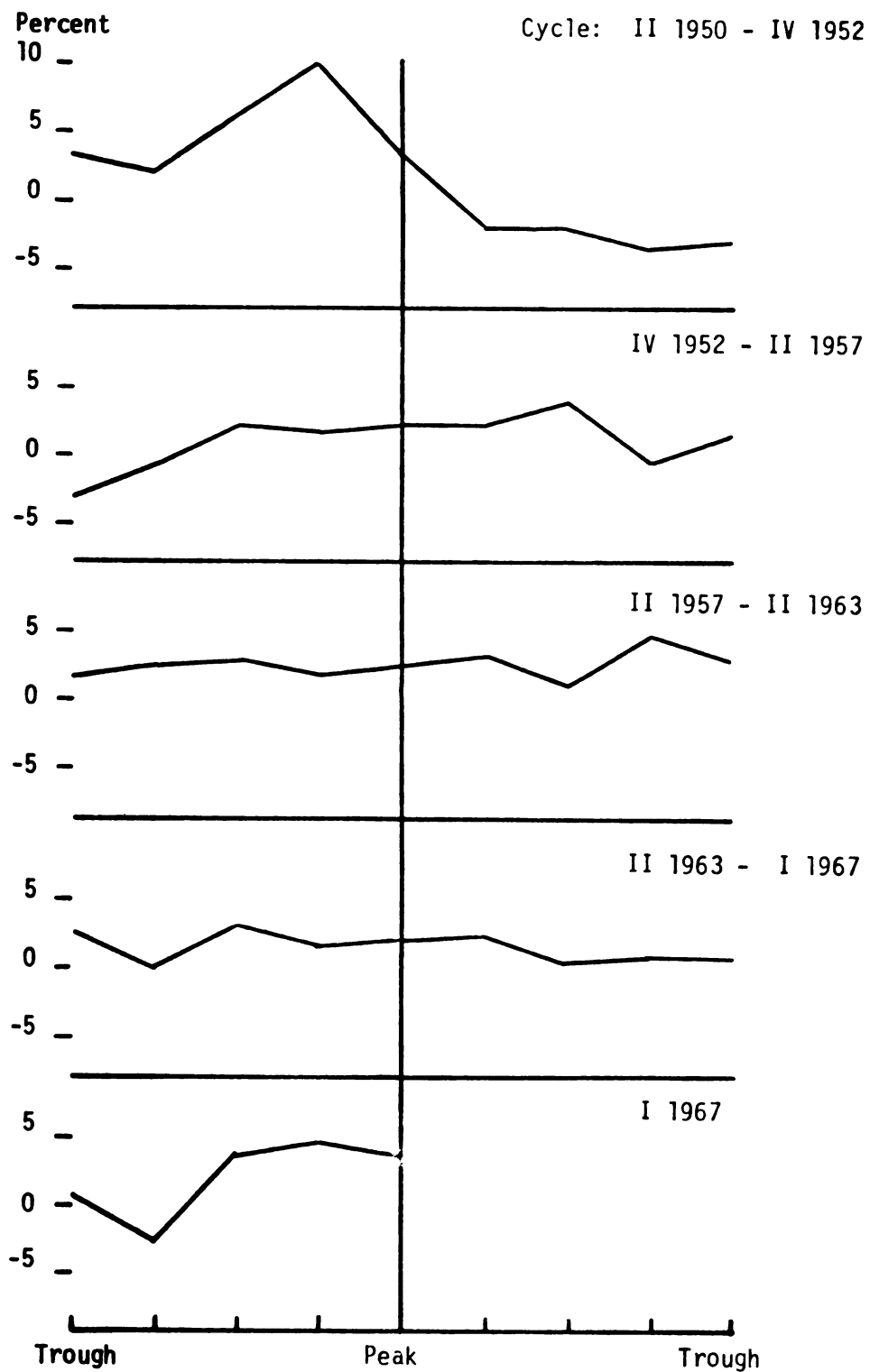


FIGURE 19

MONEY SUPPLY DURING INTERNATIONAL RESERVES CYCLE

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The investigation now turns to the examination of the domestic situation. Both methods of analysis have so far shown that the discount rate prior to 1963, the money supply including near-money, and commercial bank lending prior to 1963 moved in adjusting directions with respect to disturbances in the level of international reserves. It remains to be seen whether or not the domestic situation called for the same remedy as the external. Figures 20, 21, and 22 show the behavior, respectively, of industrial production, unemployment, and the wholesale price level during the international reserve reference cycle, and Table 3 summarizes this information.

Table 3 examines the behavior of the domestic target variables during the international reserve reference cycle. As can be seen from the table, there have been three reference cycle phases during which the three domestic target variables appear to have called for the same remedy, and in all three phases that remedy was the opposite of what the external situation called for. These inconsistent situations existed in both the expansionary and contractionary phases of the IV 1952 to III 1957 reference cycle and during the expansionary phase of the 1957 to 1963 reference cycle. As might be expected, in no other phases do the domestic target variables themselves all call for the same remedy. Table 4 again shows the performance of the domestic target variables during the international reserve reference cycle, but the data is arranged in a different manner to facilitate the examination of the individual targets. Only in the first reference cycle (1950 to 1952) did the industrial production variable call for the same remedy as the external situation. Since 1952 this variable has called for a remedy opposite to the one called for by the balance-of-payments.

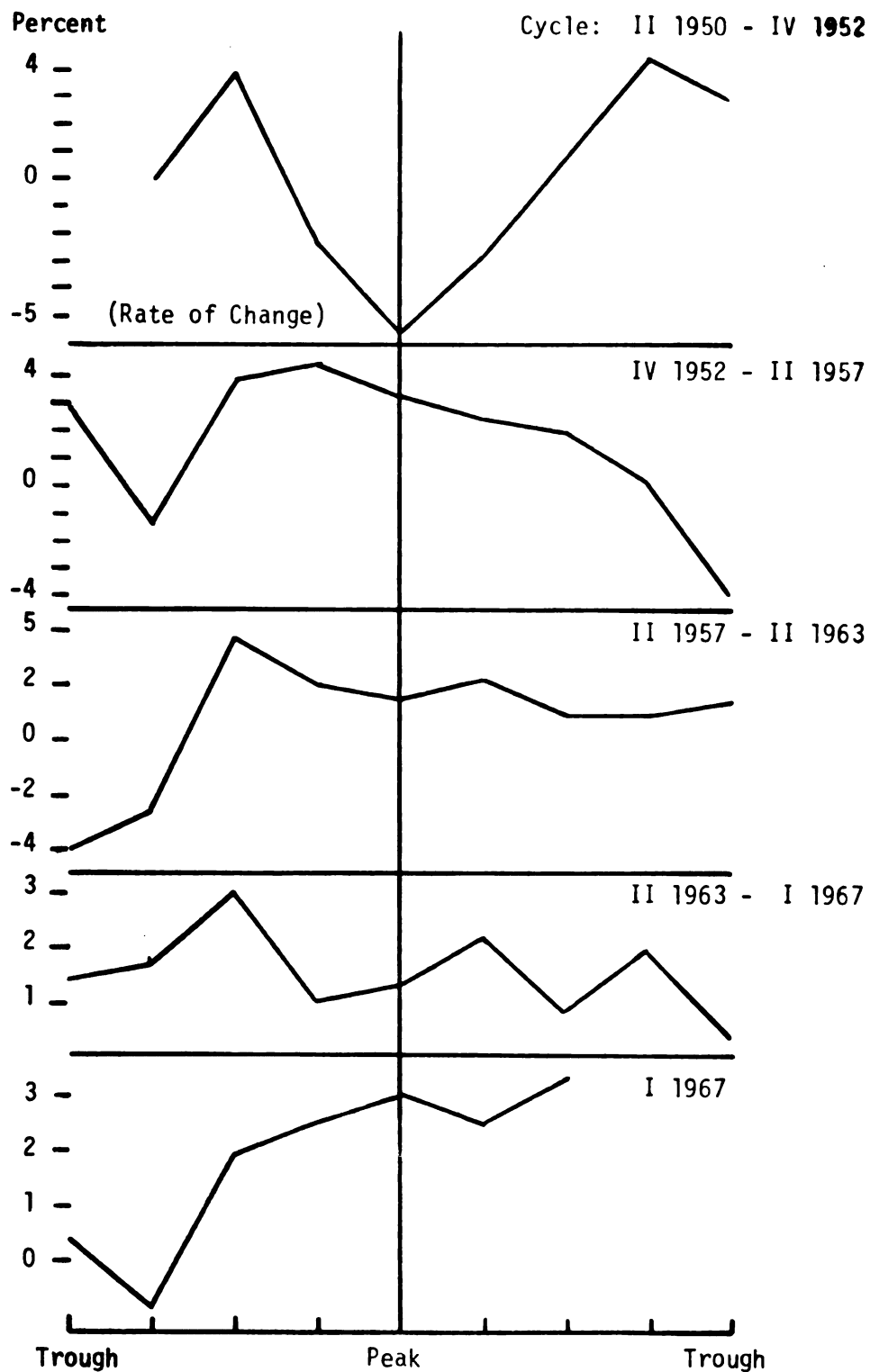


FIGURE 20

INDUSTRIAL PRODUCTION DURING INTERNATIONAL RESERVES CYCLE

1

Percent of Labor Force

Cycle: II 1950 - IV 1952

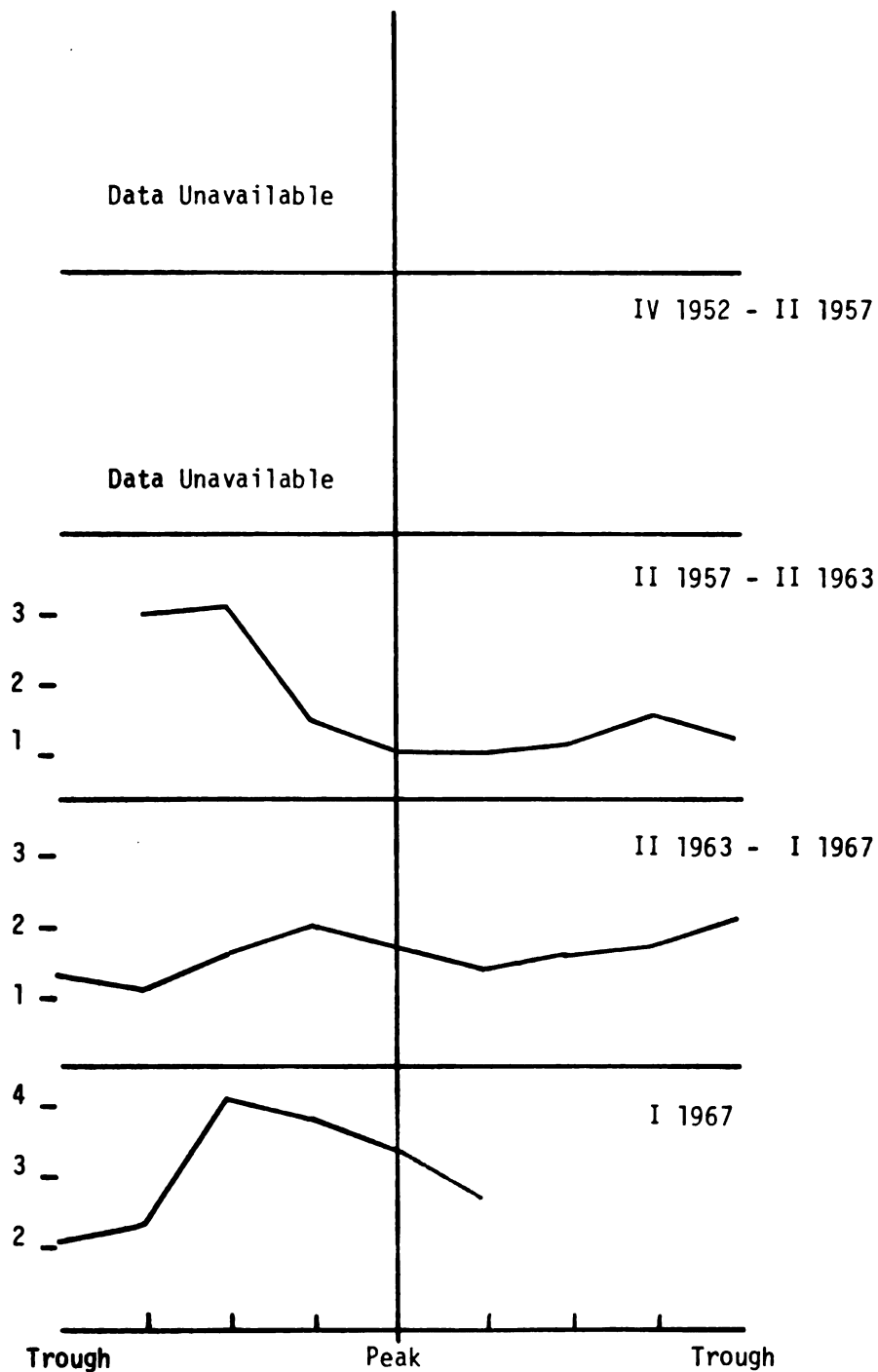


FIGURE 21

RATE OF UNEMPLOYMENT DURING INTERNATIONAL RESERVES CYCLE

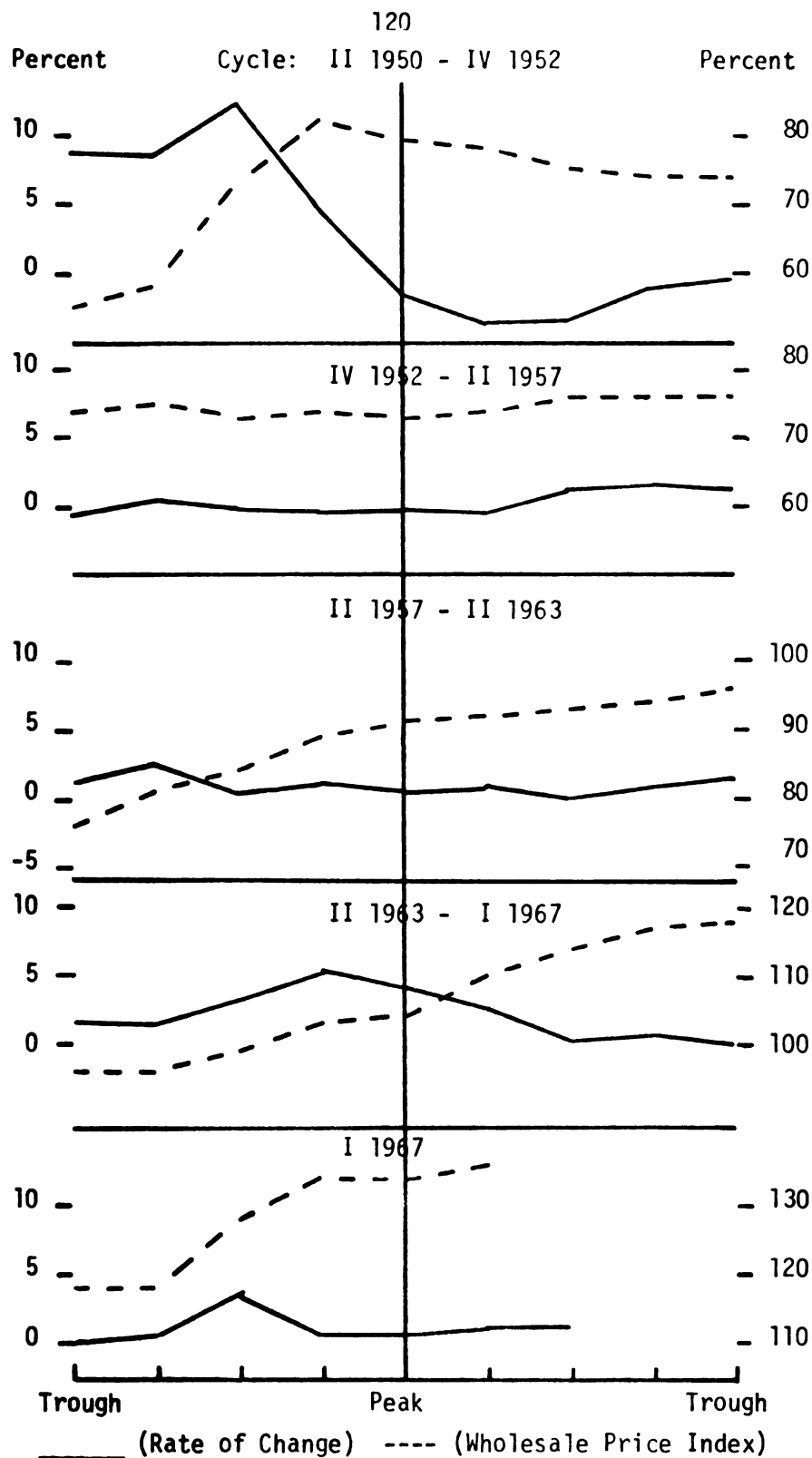


FIGURE 22

WHOLESALE PRICES DURING INTERNATIONAL RESERVES CYCLE

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IV 1952 - I

II 1957 - I

II 1963 -

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TABLE 3

MOVEMENT OF DOMESTIC TARGET VARIABLES
DURING INTERNATIONAL RESERVES
REFERENCE CYCLE

Reference Cycle	Domestic Target Variable	Expansionary	Contractionary
II 1950 - IV 1952	Industrial Prod.	Falling (+)	Rising (+)
	Unemployment	Unavailable	Unavailable
	Wholesale Prices	Rising (-)	Falling (-)
IV 1952 - II 1957	Industrial Prod.	Rising (-)	Falling (-)
	Unemployment	Unavailable	Unavailable
	Wholesale Prices	Stable	Stable
II 1957 - II 1963	Industrial Prod.	Rising (-)	Falling (-)
	Unemployment	Falling (-)	Rising (-)
	Wholesale Prices	Rising (-)	Rising (+)
II 1963 - I 1967	Industrial Prod.	Not clear	Falling (-)
	Unemployment	Rising (+)	Rising (-)
	Wholesale Prices	Rising (-)	Rising (+)
I 1967	Industrial Prod.	Rising (-)	
	Unemployment	Rising (+)	
	Wholesale Prices	Rising (-)	

Note: + means that the domestic target calls for the same remedy as the external situation.

- means that the domestic target calls for a remedy opposite to that required by the external situation.

Source: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

TABLE 4

MOVEMENT OF DOMESTIC TARGET VARIABLES
DURING INTERNATIONAL RESERVES
REFERENCE CYCLE

Reference Cycle Phase	Industrial Prod.	Unemployment	Wholesale Prices
II 1950 - IV 1952			
Expansionary	Falling (+)	Unavailable	Rising (-)
Contractionary	Rising (+)	Unavailable	Falling (-)
IV 1952 - II 1957			
Expansionary	Rising (-)	Unavailable	Stable
Contractionary	Falling (-)	Unavailable	Stable
II 1957 - II 1963			
Expansionary	Rising (-)	Falling (-)	Rising (-)
Contractionary	Falling (-)	Rising (-)	Rising (+)
II 1963 - I 1967			
Expansionary	Not Clear	Rising (+)	Rising (-)
Contractionary	Falling (-)	Rising (-)	Rising (+)
I 1967			
Expansionary	Rising (-)	Rising (+)	Rising (-)
Contractionary			

Note: + means that the domestic target calls for the same remedy as the external target.

- means that the domestic target calls for a remedy opposite to that required by the external target.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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The rate of unemployment series, which was unavailable before 1957, called for an opposing remedy in three out of the five reference cycle phases for which data were available. And the wholesale price index called for action opposite to that of the external situation in five out of seven reference cycle phases and remained stable in two other phases. In no phase did all the domestic target variables examined simultaneously call for action which would have been consistent with that required by the balance-of-payments disturbance. Since this paper does not attempt to measure the trade-offs applied by the authorities to the alternative target variables, nothing can be said about these phases of the reference cycle during which the domestic target variables themselves called for opposing remedies. However, when looking for consistency of behavior over the different reference cycles, the only uniform pattern to appear is the one where the three policy variables respond to the external stimulus. The discount rate, the money supply including quasi-money, and deposit bank lending to the public all responded in an adjusting manner during the three phases when the domestic target variables clearly called for an opposing remedy. Therefore, for the purpose of this study, the evidence strongly indicates that the three policy variables previously found to be responsive in an adjusting manner to the external situation were indeed used as balance-of-payments adjustment instruments.

Further corroboration of these findings is sought in Table 5 which analyzes the behavior of the alternative target during changes in the discount rate. There were nine discount rate changes prior to 1963 and all of them were adjusting with respect to the external situation. Only four of the nine changes, however, applied anti-cyclical

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IV 1954

II 1956

IV 1956

IV 1958

II 1959

I 1962

II 1962

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Source:

TABLE 5

BEHAVIOR OF ALTERNATIVE ECONOMIC TARGETS
DURING DISCOUNT RATE CHANGES

Quarter	Discount Rate	Foreign Exchange Reserves	Industrial Prod. (rate of change)	Unemployment	Wholesale Prices
IV 1950	raised	fall +	rise +	n.a.	rise +
IV 1951	lowered	rise +	fall +	n.a.	rise -
IV 1954	lowered	rise +	fall +	n.a.	stable
II 1956	raised	fall +	fall -	n.a.	rise +
IV 1956	raised	fall +	rise +	n.a.	rise +
IV 1958	lowered	rise +	rise -	rise +	rise -
II 1959	lowered	rise +	rise -	fall -	stable
I 1962	raised	fall +	fall -	rise -	rise +
II 1962	raised	fall +	fall -	fall +	stable

Note: + means that the policy variable moved in an adjusting manner with respect to the movement in the target.

- means that the policy variable moved in a disadjusting manner with respect to the movement in the target.

n.a. means that the data was not available.

Source: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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pressure to the industrial production cycle. The remaining five reinforced the production cycle. The picture with respect to the rate of unemployment is similar. Data for this variable is available for only the last four discount rate changes, but of these only two were consistent with maintaining a stable, low-level of unemployment. The other two discount rate changes were in a direction which would aggravate the unemployment situation. Finally, the discount rate was changed in a direction consistent with the objective of maintaining stable prices four times, in the opposite direction twice. There were three other phases when the wholesale price index remained stable for which no judgment concerning the discount rate has been made. The evidence, however, again clearly supports the proposition that the discount rate, up to 1963, was used in reaction to disturbances in the balance-of-payments.

In Table 6 movements of the targets are examined in relation to changes in the rate of growth of the money supply including quasi-money. Thirteen subperiods have been identified during which the percentage rate of expansion of the money supply was either increasing, decreasing, or stable. In eight of these subperiods, the rate of expansion of the money supply moved in an adjusting direction with respect to changes in the level of international reserves. In only two subperiods did the money supply move in a disadjusting direction, and in both of these subperiods international reserves were rising. In the remaining three subperiods, there was no clear trend in the behavior of the reserve variable. In only three of the subperiods did the rate of expansion of the money supply apply anti-cyclical pressure on the production cycle. In five subperiods movements of the money

TABLE 6
BEHAVIOR OF ECONOMIC TARGETS DURING CHANGES IN MONEY SUPPLY INCLUDING QUASI-MONEY

Subperiod	Money Supply (rate of change)	Foreign Exchange Reserves	Industrial Production (rate of change)	Unemployment	Wholesale Prices
I 1950 - II 1951	increases	rise (+)	rise (-)	n.a.	rise (-)
II 1951 - II 1952	decreases	no trend	no trend	n.a.	no trend
II 1952 - III 1953	increases	no trend	no trend	n.a.	fall (+)
III 1953 - I 1954	decreases	rise (-)	rise (+)	n.a.	rise (+)
I 1954 - III 1955	increases	rise (+)	fall (+)	n.a.	stable
III 1955 - I 1957	decreases	fall (+)	rise (+)	n.a.	no trend
I 1957 - IV 1958	increases	rise (+)	no trend	stable	no trend
IV 1958 - I 1960	decreases	rise (-)	rise (+)	fall (+)	no trend
I 1960 - III 1960	increases	no trend	stable	fall (-)	no trend
III 1960 - I 1963	decreases	fall (+)	fall (-)	no trend	rise (+)
I 1963 - III 1964	increases	rise (+)	rise (-)	stable (-)	rise (-)
III 1964 - III 1967	decreases	fall (+)	fall (-)	rise (-)	rise (+)
III 1967	increases	rise (+)	rise (-)	no trend	rise (-)

Note: + means that the policy variable moved in an adjusting manner with respect to the movement in the target.
 - means that the policy variable moved in a disadjusting manner with respect to the movement of the target.
 n.a. means that the data was not available.

Source: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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supply reinforced the production cycle, and in the remaining subperiods there was no clear trend in the behavior of the production target. Quarterly data for the rate of unemployment became available in 1957, and in the seven subperiods since then, the rate of expansion of the money supply moved only once in a direction consistent with the objective of maintaining a low, stable level of unemployment. In three of the subperiods, it moved in the opposite direction, and in the remaining three subperiods, the unemployment variable did not exhibit a clear trend. Finally, in only four subperiods did the rate of growth of the money supply move in the direction called for by movements in the wholesale price level. In three subperiods, the rate of growth of the money supply reinforced the changes taking place in the price level. In the remaining subperiods, the changes in the level of prices exhibited no clear trend. The evidence in Table 6 therefore would appear to support the conclusion that the money supply did consistently react in an adjusting manner with respect to the external situation.

The relationship between the third policy variable, deposit bank lending to the public, and the targets is examined in Table 7. The table contains eleven subperiods during which the rate of expansion of deposit bank private credit was either increasing, decreasing, or stable. In eight of these subperiods, the rate of expansion of deposit bank credit moved in an adjusting direction with respect to the external situation. In the remaining three subperiods, the external target did not exhibit a clear trend. In no case did this policy variable appear to move in a disadjusting direction with respect to the external target. This behavior is reversed when the target is

TABLE 7
BEHAVIOR OF ECONOMIC TARGETS DURING CHANGES IN DEPOSIT BANK LENDING TO THE PUBLIC

TABLE 7

BEHAVIOR OF ECONOMIC TARGETS DURING CHANGES IN DEPOSIT BANK LENDING TO THE PUBLIC

Subperiod	Deposit Bank Credit (rate of change)	International Reserves	Industrial Production (rate of change)	Unemployment	Wholesale Prices
I 1950 - III 1950	falls	no trend	no trend	n.a.	rise (+)
III 1950 - II 1951	rises	rise (+)	rises (-)	n.a.	rise (-)
II 1951 - II 1953	falls	no trend	falls (-)	n.a.	fall (-)
II 1953 - IV 1954	rises	rise (+)	rises (-)	n.a.	stable (-)
IV 1954 - III 1957	falls	fall (+)	no trend	no trend	rise (+)
III 1957 - IV 1959	rises	rise (+)	rises (-)	falls (-)	no trend
IV 1959 - I 1963	falls	no trend	falls (-)	no trend	rise (+)
I 1963 - II 1965	rises	rise (+)	rises (-)	stable	rises (-)
II 1965 - II 1966	stable	fall (+)	falls	stable	stable (+)
II 1966 - I 1968	falls	fall (+)	falls (-)	rises (-)	no trend
I 1968	rises	rise (+)	rises (-)	falls (-)	rises (-)

Note: + means that the policy variable moved in an adjusting direction with respect to the movement in the target.

- means that the policy variable moved in a disadjusting direction with respect to the movement in the target.

n.a. means that the data was not available.

Source: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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industrial production. In no case did deposit bank credit expansion move anti-cyclically with respect to the rate of change in industrial production. In eight of the subperiods, deposit bank credit expansion reinforced the production cycle. In the remaining three a judgement cannot be made because the production target did not exhibit a clear trend. In the seven subperiods since 1957, deposit bank credit did not once clearly react in a manner consistent with the objective of maintaining a low, stable level of unemployment. In three subperiods, it moved in a manner which would exacerbate the unemployment situation. In the remaining subperiods, the trend in the unemployment target was indiscernible. The last column of Table 7 examines the behavior of the price target. In four subperiods, deposit bank credit moved in a direction consistent with the objective of maintaining a stable price level. In another four subperiods, credit expansion moved in an inflationary direction during periods of rising or stable prices, and in one subperiod it moved in a deflationary direction while prices were falling. Again the evidence appears to support the thesis that deposit bank lending to the public did not systematically respond in an anti-cyclical manner to movements in the internal policy goals, but that it did move in an adjusting direction with respect to the external situation.

Figures 23 and 24 further examine the behavior of the money supply including quasi-money and deposit bank lending to the public during the industrial production reference cycle. The objective here is to use reference cycle analysis to determine whether the two policy variables might have responded to the demands of the production cycle. The technique is identical to that used in the previous reference cycle

Percent

Cycle: 1950 - 1953

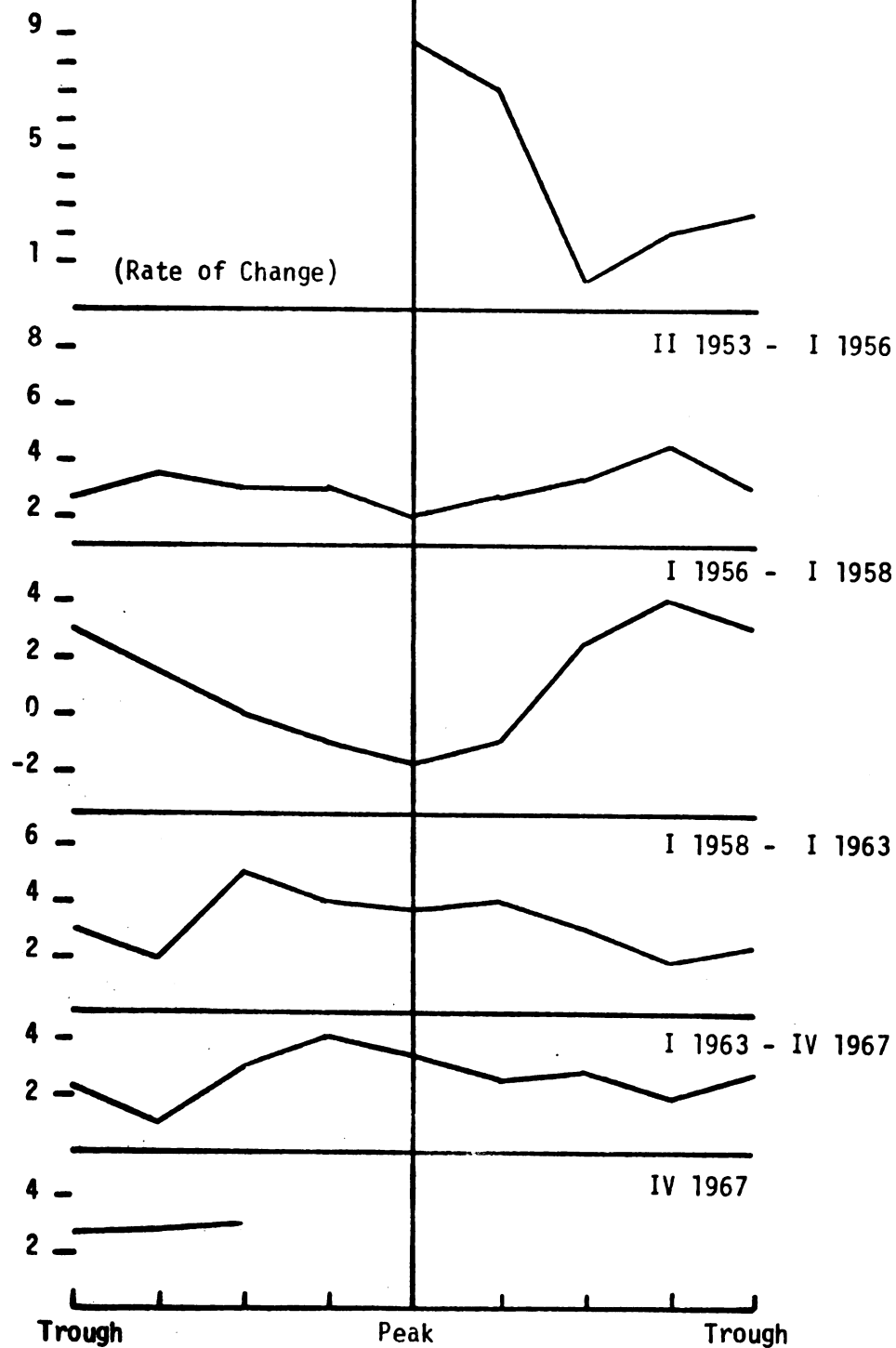


FIGURE 23

MONEY SUPPLY INCLUDING QUASI-MONEY DURING
INDUSTRIAL PRODUCTION REFERENCE CYCLE

Percent

Cycle: 1950 - II 1953

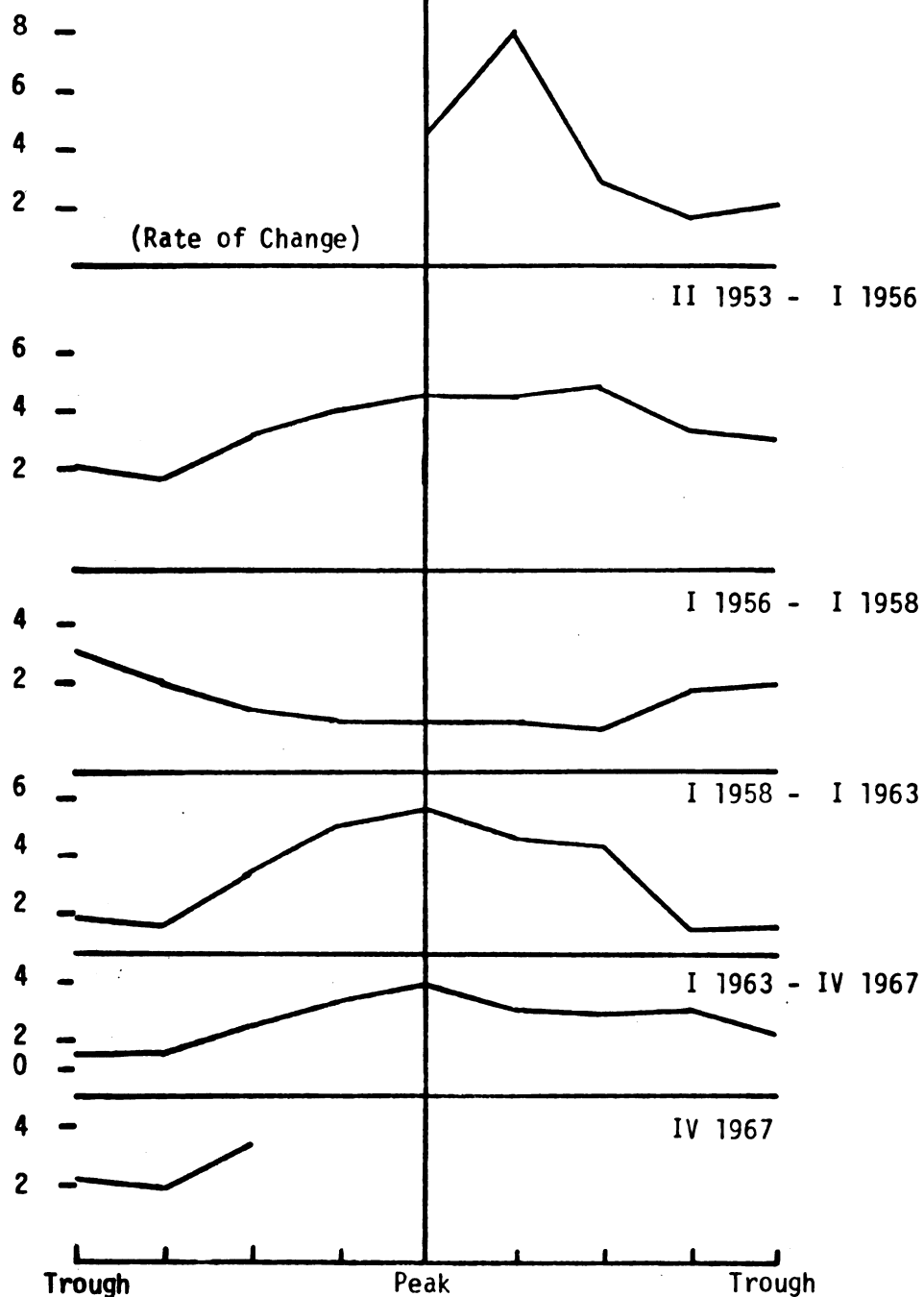


FIGURE 24

DEPOSIT BANK LENDING TO THE PUBLIC DURING INDUSTRIAL
PRODUCTION REFERENCE CYCLE

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analysis, the only difference being that the production cycle rather than the international reserves cycle forms the basis of the reference cycle. This analysis shows that the money supply including quasi-money, Figure 23, moved in an anti-cyclical pattern during the reference cycles of 1953 to 1956 and 1956 to 1958. In the remaining reference cycles the variable moves in a direction which would aggravate the production cycle. Deposit bank lending to the public, Figure 24, behaves anti-cyclically during the production reference cycle of 1956 to 1958, and in all others moves parallel to the production cycle, rising as production rises and falling as production falls. The conclusion is that neither the money supply including quasi-money or deposit bank lending to the public were systematically used in response to changes in the domestic target variable of industrial production.

Table 8 goes on to show the behavior of the above two policy variables with respect to subperiods of disturbances in the rate of unemployment, and Table 9 does the same with respect to disturbances in the wholesale price index. The word "disturbances" here means, as it has throughout the study, that the relevant time-series has simply been divided into subperiods according to whether the series is rising, falling, or stable. This method of analysis is more applicable in this case than reference cycle analysis because neither the wholesale price index nor the rate of unemployment exhibited a clearly defined cycle. Regarding Tables 8 and 9, the term "no trend" means that the policy variable both rose and fell during the subperiod in question or was in some other way erratic.

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TABLE 8

REACTION OF DEPOSIT BANK LENDING AND MONEY SUPPLY INCLUDING
QUASI-MONEY TO SUBPERIODS OF DISTURBANCES.
IN RATE OF UNEMPLOYMENT

Subperiod	Rate of Unemployment	Deposit Bank Lending to the Public	Money Supply Including Quasi-money
III 1957 - IV 1959	Rise	Rise (+)	Rise (+)
IV 1959 - II 1962	Fall	No trend	No trend
II 1962 - I 1964	Rise	No trend	Rise (+)
I 1964 - III 1966	Stable	No trend	No trend
III 1966 - III 1968	Rise	No trend	No trend
III 1968	Fall	Rise (-)	Rise (-)

Sources: Various issues of IMF International Financial Statistics and
OECD Main Economic Indicators.

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II 1
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Source

TABLE 9

REACTION OF DEPOSIT BANK LENDING AND MONEY SUPPLY INCLUDING
QUASI-MONEY TO SUBPERIODS OF DISTURBANCES
WHOLESALE PRICE INDEX

Subperiod	Wholesale Prices	Deposit Bank Lending to the Public	Money Supply Including Quasi-money
I 1950 - IV 1952	Rise	No trend	No trend
IV 1952 - III 1953	Fall	Stable	Rise (+)
III 1953 - II 1954	Rise	Rises (-)	Fall (+)
II 1954 - IV 1955	Stable	Falls	No trend
IV 1955 - II 1958	Rise	No trend	No Trend
II 1958 - II 1959	Stable	Rise	No trend
II 1959 - III 1966	Rise	No trend	No trend
III 1966 - II 1967	Stable	No trend	Fall
II 1967	Rise	No trend	No trend

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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Table 8 identifies six subperiods of disturbances in the rate of unemployment since 1957, the date when the series began. Of these six subperiods, deposit bank lending to the public moved in a direction consistent with the objective of maintaining a low level of unemployment in only one subperiod. The money supply variable moved favorably only twice. During the other subperiods, the predominant behavior of both policy variables was to show no trend. Table 9 identifies nine subperiods of disturbances in the wholesale price level since 1950 with very similar results. Deposit bank lending to the public moved in a direction consistent with the objective of maintaining stable prices in only one of the subperiods, and the money supply including quasi-money moved favorably to this objective twice. Again, both policy variables predominantly failed to display an uniform pattern with respect to disturbances in the wholesale price level. Consequently the results of these tests again support the thesis that the money supply including quasi-money and deposit bank lending to the public were not systematically used in reaction to disturbances in the domestic targets of price stability and the maintenance of a low level of unemployment.

Policy Mix

The study has so far shown that the money supply including quasi-money responded in an adjusting direction to balance-of-payments disequilibria, even when policy-makers were faced with an inconsistent situation with respect to their internal and external positions. An interesting question which may now be asked is whether policy-makers were following an economic strategy which assigned monetary policy to

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the external arena while reserving fiscal policy for the domestic situation when the two called for opposing remedies. Table 10 tests for this model by observing the behavior of the level of international reserves and the three domestic target variables during subperiods when the budget was clearly in surplus, deficit, or balance. The test identifies eleven budgetary imbalances since 1951. In none of these do the three domestic targets all call for the same remedy. What is most obvious from the table, however, is that fiscal policy has not been regularly used to stabilize either the domestic or external situation. Now looking at the target variables one by one, three subperiods (IV 1960-II 1962, II 1962-IV 1962, and III 1967-) are found during which the production target and the external situation call for opposing remedies. In only one of these, the subperiod IV 1960-II 1962, did the budgetary imbalance comply with the policy mix discussed above. Two such inconsistent subperiods (III 1958-III 1959 and II 1962-IV 1962) were also found for the unemployment variable, and in neither of these did the budgetary imbalance conform to the model. The price stability target again shows two subperiods (III 1957-III 1958 and III 1967-) when inconsistent situations existed, and in one of these, III 1957-III 1958, the budgetary imbalance conformed to the policy-mix model. In the other subperiod, the government's excess demand aggravated the price stability target.

This test appears to make three things evident. First, it supports the earlier finding that the government's excess demand is not responsive to disturbances in the balance-of-payments. Second, it has also not been used systematically to achieve the domestic targets of a stable growth rate, price stability, and a low rate of unemployment.

TABLE 10

MOVEMENT OF DOMESTIC TARGET VARIABLES DURING BUDGETARY IMBALANCES

Subperiods	Budgetary Balance	International Reserves	Industrial Production	Unemployment	Wholesale Prices
I 1951 - III 1953	Balances	No trend	No trend	Unavailable	No trend
III 1953 - I 1955	Surplus	Rise (-)	No trend	Unavailable	No trend
I 1955 - III 1957	Deficit	Fall (-)	No trend	Unavailable	Rise (-)
III 1957 - III 1958	Surplus	Rise (-)	Fall (-)	Rise (-)	Rise (+)
III 1958 - III 1959	Deficit	Rise (+)	No trend	Fall (-)	Stable
III 1959 - IV 1960	Surplus	Fall (-)	No trend	Fall (+)	Rise (+)
IV 1960 - II 1962	Deficit	Fall (-)	Fall (+)	Fall (-)	Rise (-)
II 1962 - IV 1962	Surplus	Fall (+)	Fall (-)	Rise (-)	Stable
IV 1962 - I 1967	Deficit	No trend	No trend	Stable	Rise (-)
I 1967 - III 1967	Surplus	Rise (-)	Fall (-)	Rise (-)	Stable
III 1967	Deficit	Rise (+)	Rise (-)	Rise (+)	Rise (-)

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

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The third is that Finland has not followed an economic plan which has called for applying an appropriate mix of fiscal and monetary policy to inconsistent situations. Partial corroboration of this conclusion may be found in the 1970 OECD Survey of Finland where it is concluded that " . . . the efforts made by the authorities to achieve a counter cyclical movement of domestic demand do not appear to have been very strong. . . . Fiscal measures have tended to be too long delayed and the political situation prevailing during the postwar period with generally weak governments has rendered the operation of an appropriate fiscal policy extremely difficult."

Selective Credit Controls

Since 1952 the Finnish government has had the power--at the Bank of Finland's request--to regulate the minimum downpayment and maximum time of repayment for passenger cars, trucks and tractors, and certain consumers' durables. Table 11 shows the behavior of the three domestic target variables and the level of international reserves with respect to changes in the ease (tightness) of this hire-purchase credit. The credit terms have been adjusted three times since 1962, and Table 11 shows that the terms of the credit have responded in an adjusting direction to balance-of-payments' disturbances in all three instances. On the other hand, the credit terms responded anti-cyclically to the production cycle only once. The same is true for the employment objective. Here the credit terms responded favorably to the objective of maintaining a low rate of unemployment only once. A different story appears, however, with respect to the objective of maintaining a stable price level. In this case, the credit terms responded in an

TABLE 11

**MOVEMENT OF ECONOMIC TARGETS DURING CHARGES
IN HIRE-PURCHASE CREDIT TERMS**

Subperiod	Terms of Hire-Purchase Credit	Level of International Reserves	Industrial Production (rate of change)	Unemployment (rate of change)	Wholesale Price Level
I 1964	Tightened	Fall (+)	Rise (+)	Fall (+)	Rise (+)
II 1965	Tightened	Fall (+)	Fall (-)	Rise (-)	Rise (+)
I 1969	Eased	Rise (+)	Rise (-)	Fall (-)	Stable

Sources: Various issues of Unitas: Economic Review of Finland, IMF International Financial Statistics, and OECD Main Economic Indicators.

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adjusting direction to changes in the price level in the first two instances and remained stable during the last. In other words, a consistent situation existed at the times credit-term changes were made, and at first glance it is not possible to determine if the terms of credit were changes in response to the price-level changes or the external disequilibria. Since, however, the regulation of hire-purchase agreements is directed primarily at products which Finland imports, it would seem reasonable to conclude that this instrument was used primarily in response to the balance-of-payments situation rather than in response to changes in the price level. Moreover, it is a double-edged weapon. A contraction of hire-purchase credit, when international reserves are falling, is not only deflationary but would also be expected to work hardest against imports, thus increasing its efficiency for balance-of-payments adjustment relative to credit instruments which bear evenly on both domestic and import goods. The conclusion must be tentative, but it would appear that Finland has used the control of hire-purchase credit as a balance-of-payments adjustment instrument, and perhaps as a deflationary instrument.

Commercial Policy

Finland has used commercial policy unilaterally, with the objective of mitigating serious balance-of-payments deficits, twice in the period under investigation. In both cases, however, it was in conjunction with the devaluation of the Finnish mark. At no other time has Finland used changes in either tariffs, quotas, subsidies, or export levies as a matter of balance-of-payments adjustment policy. The two instances mentioned, therefore, will not be examined here but

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will be included in Chapter 4 which concerns the Finnish devaluation of 1967.

Incomes Policy

Finland has used incomes policy, in the form of price and wage freezes, twice during the period under investigation, again in conjunction with the 1957 and 1967 devaluations of the finmark. For the same reason as before, Finnish incomes policy will not be discussed here but will be included in the chapter dealing with the 1967 devaluation.

Multiple Regression Analysis

A polynomial distributed lag model is used in this section to further test the earlier findings. A polynomial model was considered appropriate for a number of reasons concerning the hypothesized lags in monetary and fiscal policy. Any policy action taken in time period t , for example, will not likely be made on the basis of the target indicators in time t . Most often the period t values of the indicators are not available to policy-makers until time period $t + X$ where X is the lag in collecting and disseminating the data. Further, and it is more a problem the shorter are the time periods being considered, the data from any particular period may contain enough noise to confuse a trend or turning point, thus prompting policy-makers to delay policy action until additional evidence can be gathered. Hence policy decisions based upon the information from period t will not normally be made until period $t + X + R$, where R is the lag in interpreting the data from time t . The sum of X and R is known as the recognition or inside lag. It measures the time which passes from the moment the need

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for policy action arises until the moment that the need is recognized.

Once the need for policy action is recognized, more time may pass before such action is taken. This lapse is known as the action lag and will vary according to the nature of the decision-making institutions involved. An autonomous Central Bank will commonly have a shorter action lag than a Central Bank under close legislative or executive control. In the same vein, monetary policy under Central Bank control will typically have a shorter action lag than fiscal policy under legislative control.

Once the policy action has been taken, additional time may pass before the impact of the action can be observed in the policy variable being examined. This lag will vary with the directness of the authorities' control over the policy variable in question. With the discount rate, which is under direct Central Bank control, the lag will be zero. If the policy variable under investigation is the interest rate on long-term government bonds, which is a step removed from direct Central Bank control, the lag will be positive. If, for example, the discount rate is increased, some time will pass before this increase is reflected in long-term market interest rates. Furthermore, the impact of policy actions on indirect policy variables such as market interest rates and the money supply will not necessarily occur all at once but is likely to be spread over several time periods. A lowering of the required reserve ratio will immediately create additional excess reserves in the commercial banking system and make possible a multiple expansion of the money supply. But the actual expansion of the money supply will not be immediate, and the total effect of the policy change

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on the money supply will spread over a number of time periods.⁸

The overall policy lag is then the sum of the recognition, action and impact⁹ lags; and the regression scheme used to estimate the authorities' reaction function must take their combined effect into account. The geometric, or partial adjustment, model has been used to estimate the reaction function of the U.S. monetary authorities.¹⁰ The primary reason this model was considered inappropriate for this study is that the weights it assigns to the regression coefficients are a monotonically declining geometric function. To explain the variation of the dependent variable in time t , the greatest weight will be assigned to the values of the target variables in time t , the next greatest weight in time $t-1$, and so on. The hypothesized lags, however, suggest that the earliest periods should not necessarily receive the greatest weights. If the money supply were to adjust anti-cyclically to the level of unemployment, for example, we might expect the weights to follow the inverted U form. In this case, an increase in the level of unemployment in time t might be expected to cause little change in the money supply in time t , to cause a small rise in period $t+1$, a larger rise in period $t+2$, perhaps a still larger increase in period $t+3$, and so on, until a maximum is reached, after which the fractional

⁸Michael J. Hamburger, "The Lag in the Effect of Monetary Policy: A Survey of Recent Literature," Federal Reserve Bank of New York, Monthly Review, 53 (December, 1971), pp. 289-297.

⁹This is not to be confused with the lag in the impact of the policy variable on the target.

¹⁰William G. Dewald and Harry G. Johnson, "An Objective Analysis of the Objectives of American Monetary Policy, 1952-61," in Deane Carson, Banking and Monetary Studies (Illinois: Homewood, 1963), pp. 171-189.

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increase in the money supply will decline. Other explanatory variables might be expected to exhibit different patterns. An increase in the level of international reserves in time t might be expected to increase the money supply in time t . In period $t+1$, however, the weights may begin to rise or fall depending on whether or not the authorities act to offset the increase in domestic liquidity caused by the inflow of reserves. For these reasons and for economy and ease of estimation, a polynomial distributed lag model of degree 3 was used to estimate the policy reaction functions.

Two regression models were estimated. In the first, the level of international reserves was considered a single variable. In the second, the reserve variable was divided, using dummy variables, into periods of rising and falling reserves.

The first model considered was of the form

$$\begin{aligned}
 Y_t = & B + B_1 [\lambda_0 x_{t1} + (\lambda_0 + \lambda_1 + \lambda_2 + \lambda_3) x_{t-1, 1} \\
 & + (\lambda_0 + 2\lambda_1 + 2^2\lambda_2 + 2^3\lambda_3) x_{t-2, 1} + \dots \\
 & + (\lambda_0 + m\lambda_1 + m^2\lambda_2 + m^3\lambda_3) x_{t-m, 1}] \\
 & + B_2 [\partial_0 x_{t2} + (\partial_0 + \partial_1 + \partial_2 + \partial_3) x_{t-1, 2} + \dots \\
 & + (\partial_0 + m\partial_1 + m^2\partial_2 + m^3\partial_3) x_{t-m, 2}] \\
 & + B_3 [\delta_0 x_{t3} + (\delta_0 + \delta_1 + \delta_2 + \delta_3) x_{t-1, 3} + \dots \\
 & + (\delta_0 + m\delta_1 + m^2\delta_2 + m^3\delta_3) x_{t-m, 3}] \\
 & + B_4 [n_0 x_{t4} + (n_0 + n_1 + n_2 + n_3) x_{t-1, 4} + \dots \\
 & + (n_0 + mn_1 + m^2n_2 + m^3n_3) x_{t-m, 4}] + E_t
 \end{aligned}$$

where Y_t is the value of the dependent variable in time t , and x_{t1} ,

X_{t2} , X_{t3} , and X_{t4} are the respective period t values of the production index, the wholesale price index, the level of unemployment measured in thousands, and the level of international reserves measured in millions of U.S. dollars.

To estimate, the model was condensed to

$$\begin{aligned} Y_t = & B + B_1^{\lambda_0} Z_{t0,1} + B_1^{\lambda_1} Z_{t1,1} + \dots + B_1^{\lambda_3} Z_{t3,1} \\ & + B_2^{\partial_0} Z_{t0,2} + B_2^{\partial_1} Z_{t1,2} + \dots + B_2^{\partial_3} Z_{t3,2} \\ & + B_3^{\delta_0} Z_{t0,3} + B_3^{\delta_1} Z_{t1,3} + \dots + B_3^{\delta_3} Z_{t3,3} \\ & + B_4^{n_0} Z_{t0,4} + B_4^{n_1} Z_{t1,4} + \dots + B_4^{n_4} Z_{t3,4} + E_t \end{aligned}$$

where

$$\begin{aligned} Z_{t0,1} &= X_{t1} + X_{t-1,1} + \dots + X_{t-m,1} \\ Z_{t1,1} &= X_{t-1,1} + 2X_{t-2,1} + \dots + mX_{t-m,1} \\ &\vdots \\ Z_{t3,1} &= X_{t-1,1} + 2^3X_{t-2,1} + \dots + m^3X_{t-m,1} \\ &\vdots \\ Z_{t3,4} &= X_{t-1,4} + 2^3X_{t-2,4} + \dots + m^3X_{t-m,4} \end{aligned}$$

The length of the lag, m , was set at nine periods after experimenting with lags of five and seven periods.¹¹ A first order autoregressive scheme was assumed. The data was transformed using the Orcutt method¹² and least squares was used to estimate the λ_i , ∂_i , δ_i , n_i and B^* for successive values of ρ , the coefficient of

¹¹For a discussion of possible criteria to determine the appropriate length of the lag, see Jan Kmenta, Elements of Econometrics (New York: The Macmillan Company, 1971), p. 494.

¹²Op. cit., pp. 282-287.

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autocorrelation, ranging from -1 to 1 in .1 intervals. The regression with the minimum error was then considered to have been corrected for auto regressive disturbances. The parameters B_1 , B_2 , B_3 , and B_4 were taken to be unity.

After estimation, the model was put into the form

$$\begin{aligned} Y_t = & B + W_{01}X_{t1} + W_{11}X_{t-1, 1} + \dots + W_{m1}X_{t-m, 1} \\ & + W_{02}X_{t2} + W_{12}X_{t-1, 2} + \dots + W_{m2}X_{t-m, 2} \\ & + W_{03}X_{t3} + W_{13}X_{t-1, 3} + \dots + W_{m3}X_{t-m, 3} \\ & + W_{04}X_{t4} + W_{14}X_{t-1, 4} + \dots + W_{m4}X_{t-m, 4} \end{aligned}$$

where the weights, the w_{ij} ($i=0,1,2 \dots m$, $j=1,2,3,4$) are linear combinations of the estimated λ_i , α_i , δ_i , and η_i such that

$$w_{i1} = \lambda_0 + \lambda_1 i + \lambda_2 i^2 + \lambda_3 i^3$$

$$w_{i2} = \alpha_0 + \alpha_1 i + \alpha_2 i^2 + \alpha_3 i^3$$

$$w_{i3} = \delta_0 + \delta_1 i + \delta_2 i^2 + \delta_3 i^3$$

$$w_{i4} = \eta_0 + \eta_1 i + \eta_2 i^2 + \eta_3 i^3$$

Quarterly data was used in the regressions. In early experimentation with the model, the policy instruments considered were the discount rate, short-term market interest rates, the level of deficit spending, the money supply, and the money supply including quasi-money. Because the early results with the discount rate, interest rates, and the level of deficit spending were poor (none of the estimates were significant at the .05 probability level for a two-tailed test), they were dropped from consideration. The results using the money supply and the money supply including quasi-money were more promising, and further experimentation was conducted using these variables as the policy instruments.

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Because of the length of the regression equation, the results of the regressions will be displayed in tabular and graphical form rather than in equation form. Both the money supply and the quasi-money supplied displayed approximately the same results, but the estimates of the regression coefficients based on the money supply including quasi-money were significant only at much higher probability levels than those based on the money supply. For that reason only the results obtained with the money supply are given.

Table 12 summarizes the results of the regression using the money supply measured in millions of finnmars as the dependent variable. The standard errors of the estimates are shown in parentheses below the coefficients. Only the estimates for B , the λ_i and the η_i ($i=0,1,2,3$) are significant at the .05 probability level. The weights constructed from the regression coefficients are shown in tabular form in Table 13 and in graphical form in Figure 25.

Of the weights displayed, those assigned to the production variable and the international reserve variable are statistically the most reliable, since the λ_i and the η_i ($i=0,1,2,3$) from which they are constructed are all significant at the .05 probability level. None of the α_i and δ_i , corresponding respectively to the price variable and unemployment variable were statistically significant. When the parameters were gathered into their four groups (the λ_i together as one group, the α_i together as another, etc.), each group was significant at the .05 probability level.

TABLE 12

RESULTS OF REGRESSING MONEY SUPPLY AGAINST INDUSTRIAL
PRODUCTION, UNEMPLOYMENT, AND
INTERNATIONAL RESERVES

	Regression Coefficients				
	Industrial Production	Wholesale Prices	Unemployment	International Reserves	Regression Constant
i	λ_i	α_i	δ_i	η_i	β
0	2.97281 ^a (.66530)	- .32318 (1.46101)	3.9720 (3.73154)	.63080 ^a (.24387)	2135.46403 (949.45825)
1	-2.05298 ^a (.79384)	.80980 (1.67819)	-10.29355 (4.44851)	-1.36405 ^a (.32905)	
2	0.61742 ^a (.22425)	- .33019 (.44277)	2.61036 (1.23518)	.45785 ^a (.09119)	
3	- .04996 ^a (.01674)	.02869 (.03180)	- .16823 (.09106)	- .03753 ^a .00671	

^aCorrelation significant at .05 level. Standard errors are shown in parentheses below regression coefficients.

Note: Coefficient of determination (R^2): .9861.

Coefficient of autocorrelation (ρ): -.2.

TABLE 13

WEIGHTS CONSTRUCTED FROM
REGRESSION COEFFICIENTS

	Industrial Production	Wholesale Prices	Unemployment	International Reserves
Period	W_1	W_2	W_3	W_4
t	2.9728	- .3232	3.9720	.6308
t-1	1.4872	.1851	-3.8793	- .3129
t-2	.9364	.2052	-7.5190	- .5560
t-3	1.0204	- .0907	-7.9563	- .3535
t-4	1.4392	- .5304	-6.2004	.0996
t-5	1.8928	- .9417	-3.2605	.5683
t-6	2.0812	-1.1524	- .1458	.8276
t-7	1.7044	- .9903	2.1345	.6525
t-8	.4624	- .2832	2.5712	- .1820
t-9	-1.9448	1.1411	.1511	-1.9009

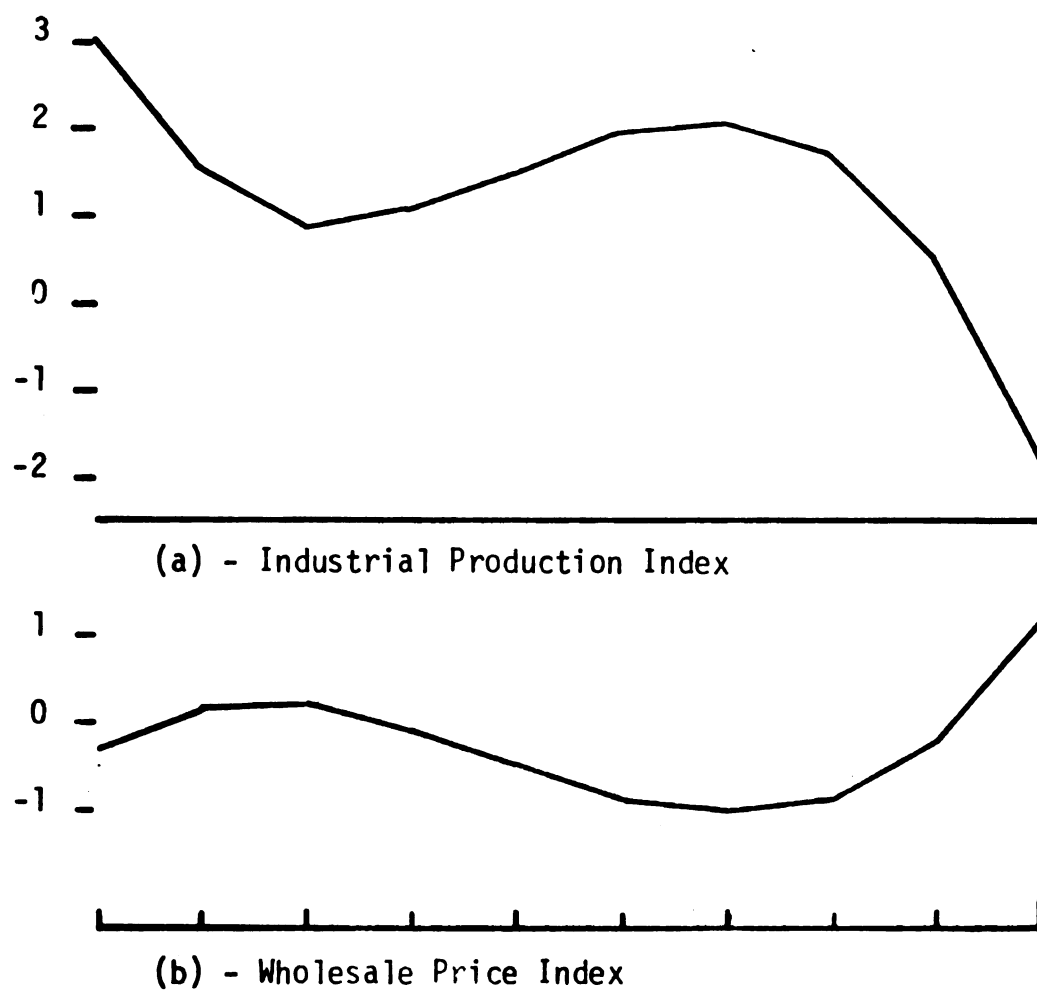


FIGURE 25 (a) & (b)

WEIGHTS CONSTRUCTED FROM FIRST REGRESSION EQUATION: FINLAND

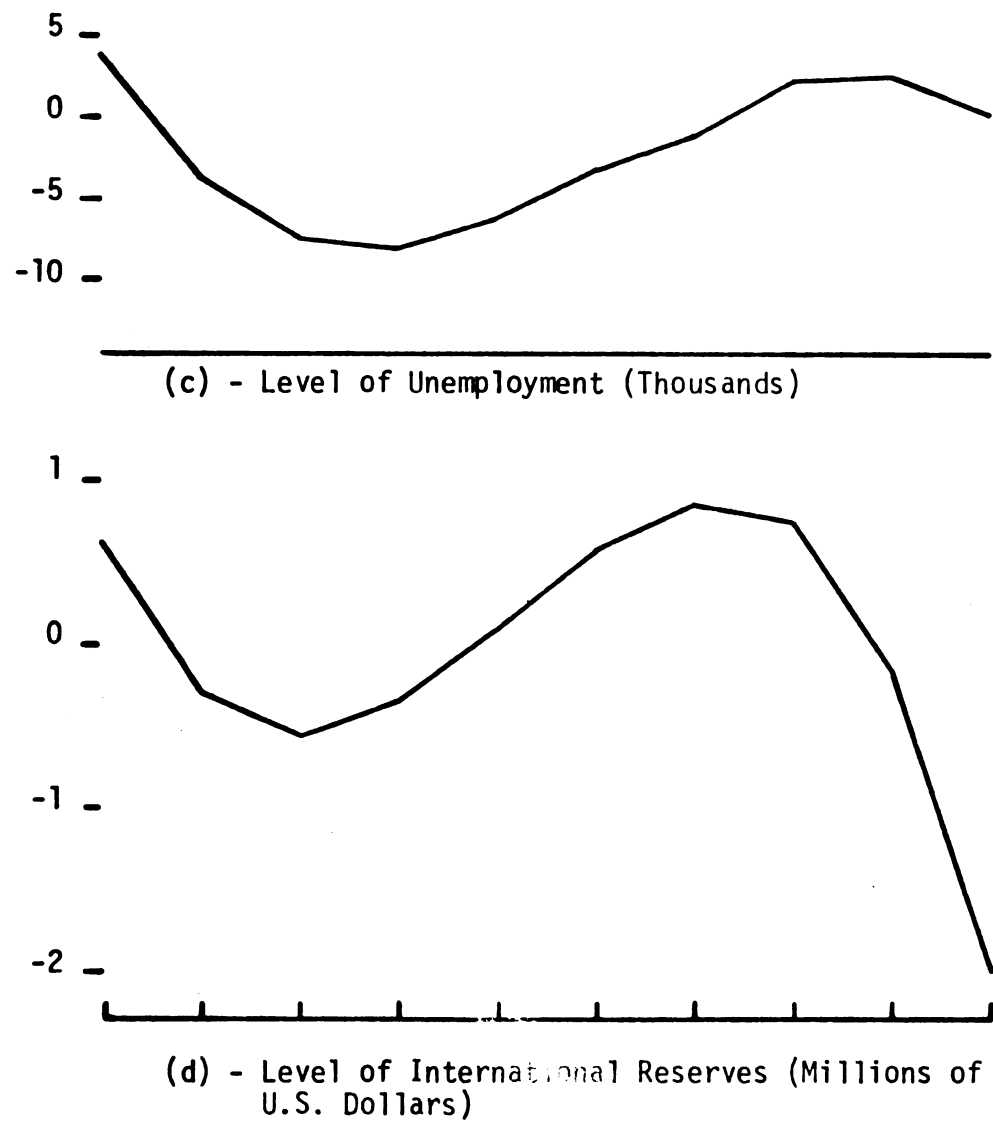


FIGURE 25 (c) & (d)

WEIGHTS CONSTRUCTED FROM FIRST REGRESSION EQUATION: FINLAND

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Interpretation of the Regression Results

The weights shown in Table 13 are interpreted as regular multiple regression coefficients. For example, the weight, W_{t1} , is 2.9728, which means that a 1-unit increase in the industrial production index in period t will be associated with a 2.97 million finnmak increase in the Finnish money supply in period t , providing that the price level, the level of unemployment, and the level of international reserves do not change. The four graphs in Figure 25 then show what the reaction of the money supply to an increase in each target variable would have been had the other three target variables been held constant.

Graph a of Figure 25 shows the weights for the industrial production index, which is usually considered a proxy for the economic growth variable. As can be seen from the graph, the weights are all positive. They decrease for the first two lags, after which they increase, reaching a maximum in period $t-6$. An expansion of the industrial production in time t will therefore cause the money supply to rise in the subsequent eight time periods. However, the fact that the weights decline up to period $t-2$ suggests that the authorities may, on the average, apply anti-cyclical pressure during periods $t+1$ and $t+2$.

The pattern of weights associated with the wholesale price index is shown in graph b. The use of monetary policy to promote price stability would call for an inverse relationship to exist between the wholesale price level and the money supply. After a two-period lag, this relationship does exist. The value of $W_{t-3, 2}$ is $-.09$, which means that a one-unit increase in the wholesale price index in period t will cause the money supply to decrease by .09 million finnmaks in

period $t+3$. This inverse relation exists for nearly the entire lag, although it weakens after period $t+6$ as the weights rise again. Again, this is a theoretically viable use of monetary policy, and evidence suggests that, after a two-period lag, the money supply would have responded in an adjusting manner to the price stability goal.

Graph c shows the pattern of weights corresponding to the unemployment variable. The adjusting of monetary policy in response to the unemployment variable would call for a positive relationship between the two variables. As unemployment rises, the money supply, after some lag, would be expected to rise. Graph c, however, shows that such a relationship does not exist. Beginning with the first lag, the weights are negative and remain so for the critical part of the lag. In period $t-3$, for example, an increase in unemployment of 1000 workers will cause the money supply to decrease by 7.95 million finnmars in period t . This reaction does not correspond to the theoretically correct use of monetary policy with respect to the employment target, and the evidence, therefore, suggests that the employment goal was not one of the monetary authorities' objectives.

The weights associated with the international reserve variable are shown in graph d of Figure 25. An adjusting reaction of the money supply to balance-of-payments disturbances would require that the weights be positive. The graph shows, however, that the weights are not all positive. The period t weight is .6308, which means that a million dollar increase in the level of international reserves will increase the money supply in period t by .63 million finnmars. The automatic effects of the increasing level of international reserves can account for this increase in domestic liquidity. During the first,

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second, and third lags, however, the weights are negative. $W_{t-2, 4}$ is, for example, $-.5560$ which means that a million dollar increase in reserves in period t was associated with a $.56$ million finmark decrease in the money supply in period $t-2$. In period $t-4$, the weights again became positive, but the existence of the three negative weights in the early lags makes it difficult to support the thesis that the money supply moved systematically in an adjusting direction with respect to the international reserve variable.

Theory suggests, however, that there may be asymmetrical policy reaction to balance of payments deficits and surpluses. To account for this hypothesis a model which divided the international reserve variable into a period of rising reserves and a period of falling reserves was estimated. The explanatory variables X_{t1} , X_{t2} , X_{t3} and Y_t in this model are exactly as in the first model. The model estimated was¹³

$$\begin{aligned}
 Y_t = & B + B_1[\quad] + B_2[\quad] + B_3[\quad] \\
 & + B_5 R_i [\theta_0 X_{t4} + (\theta_0 + \theta_1 + \theta_2 + \theta_3) X_{t-1, 4} + \dots \\
 & + (\theta_0 + m\theta_1 + m^2\theta_2 + m^3\theta_3) X_{t-m, 4} \\
 & + B_6 S_i [\theta_0 X_{t4} + (\theta_0 + \theta_1 + \theta_2 + \theta_3) X_{t-1, 4} + \dots \\
 & + (\theta_0 + m\theta_1 + m^2\theta_2 + m^3\theta_3) X_{t-m, 4} + E_t
 \end{aligned}$$

where

$$R_i = 1 \text{ when } X_{t-1,4} > X_{t-1-i,4} \quad (i = 1, 2, \dots m)$$

$$R_i = 0 \text{ otherwise}$$

and

$$S_i = 1 \text{ when } X_{t-1,4} \leq X_{t-1-i,4} \quad (i = 0, 1, 2, \dots m)$$

$$S_i = 0 \text{ otherwise.}$$

¹³For convenience, only that part of the model which has changed has been shown in detail.

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As before, the model can be condensed into

$$Y_t = B + \dots + B_{50} Z_{t0,5} + B_{51} Z_{t1,5} \\ + B_{52} Z_{t2,5} + B_{53} Z_{t3,5} + E_t$$

where

$$\begin{aligned} & \cdot \\ & \cdot \\ & \cdot \\ Z_{t0,5} &= R_0 X_{t4} + R_1 X_{t-1,4} + \dots + R_m X_{t-m,4} \\ Z_{t1,5} &= R_1 X_{t-1,4} + R_2 X_{t-2,4} + \dots + R_m X_{t-m,4} \\ & \cdot \\ & \cdot \\ & \cdot \\ Z_{t3,6} &= S_1 X_{t-1,4} + S_2 X_{t-2,4} + \dots + S_m X_{t-m,4} \end{aligned}$$

The length of the lag, m , was nine periods. A first order autoregressive scheme was assumed. The data were transformed using the Orcutt method and least squares was used to estimate the regression coefficients for successive values of ρ , the coefficient of autocorrelation, ranging from -1 to 1 in $.1$ intervals. The parameters B_1 , B_2 , B_1 , B_2 , and B_5 were taken to be unity.

The results of the regression are displayed in Table 14. The standard errors of the coefficients are shown in parentheses below the estimates. In this case only the λ_i and ϕ_i , corresponding respectively to the production index and the falling level of international reserves variables, are significant at the $.05$ probability level. A Chow test was performed to determine whether periods of rising and falling reserves were significantly different. The value of the F statistic is 1.91 and is distributed $F_{17,44}$. The hypothesis that the two periods were not significantly different was rejected at the $.05$ level.

The weights constructed from these estimates are shown in Table 15 and Figure 26. Examination of the weights makes a number of things

TABLE 14

REGRESSION RESULTS WITH DISTINCTION BETWEEN PERIODS
OF RISING AND FALLING RESERVES

i	Regression Coefficients				
	Industrial Production	Wholesale Prices	Unemployment	Rising Reserves	Falling or Stable Reserves
	λ_i	α_i	δ_i	θ_i	ϕ_i
0	2.25018 ^a (.63226)	-.10205 (2.26858)	13.38356 (4.27549)	.90860 (.34867)	.97745 ^a (.47657)
1	-1.52582 ^a (.71870)	1.24851 (2.01331)	1.15461 (4.22597)	-.49716 (.50934)	-.65392 ^a (.41061)
2	.50948 ^a (.22220)	-.15402 (.51749)	-1.7677 (1.10465)	.06773 (.14238)	.29434 ^a (.12593)
3	-.03987 ^a (.01658)	.00817 (.03755)	.16507 (.07829)	-.00420 (.01027)	-.02404 ^a (.00967)

^aCorrelation significant at the .05 level. Standard errors are shown in parentheses below the regression coefficients.

Note: Regression Constant: -869.898265
(520.899361)

Coefficient of determination (R^2): .9902

Coefficient of autocorrelation (ρ): .8

A Chow test was performed to determine whether periods of rising and falling reserves were significantly different. The value of the F statistic is 1.91 and is distributed $F_{17,44}$. The hypothesis that the two periods were not significantly different was rejected at the .05 level.

TABLE 15

**WEIGHTS CONSTRUCTED FROM REGRESSION COEFFICIENTS
OF THE SECOND REGRESSION**

	Industrial Production	Wholesale Prices	Unemployment	Rising Reserves	Falling or Stable Reserves
Lag	W_1	W_2	W_3	W_4	W_5
t	2.2502	- .1021	13.3836	.9086	.9774
t-1	1.1940	1.0006	12.9355	.4749	.5938
t-2	.9174	1.8445	9.9424	.1514	.6548
t-3	1.1810	2.6830	5.3949	- .0871	1.0164
t-4	1.7454	2.9527	.2836	- .2658	1.5346
t-5	2.3712	3.3154	-4.4009	- .4099	2.0654
t-6	2.8190	3.6161	-7.6680	- .5446	2.4648
t-7	2.8494	3.9040	-8.5271	- .6951	2.5888
t-8	2.2230	4.2283	-5.9876	- .8866	2.2934
t-9	.7004	4.6382	.9411	-1.1443	1.4346

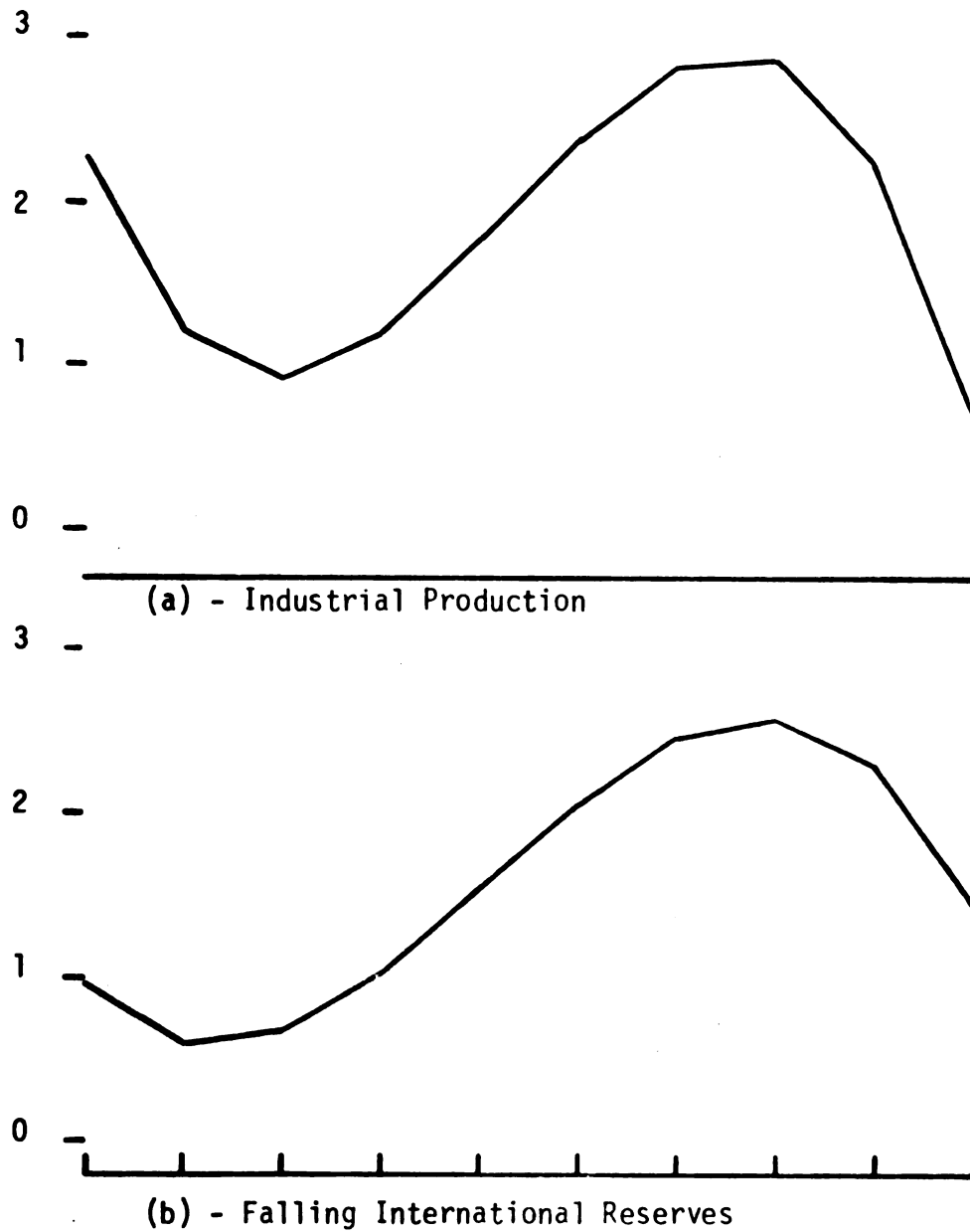


FIGURE 26 (a) & (b)

TIME-PROFILE FROM SECOND REGRESSION EQUATION: FINLAND

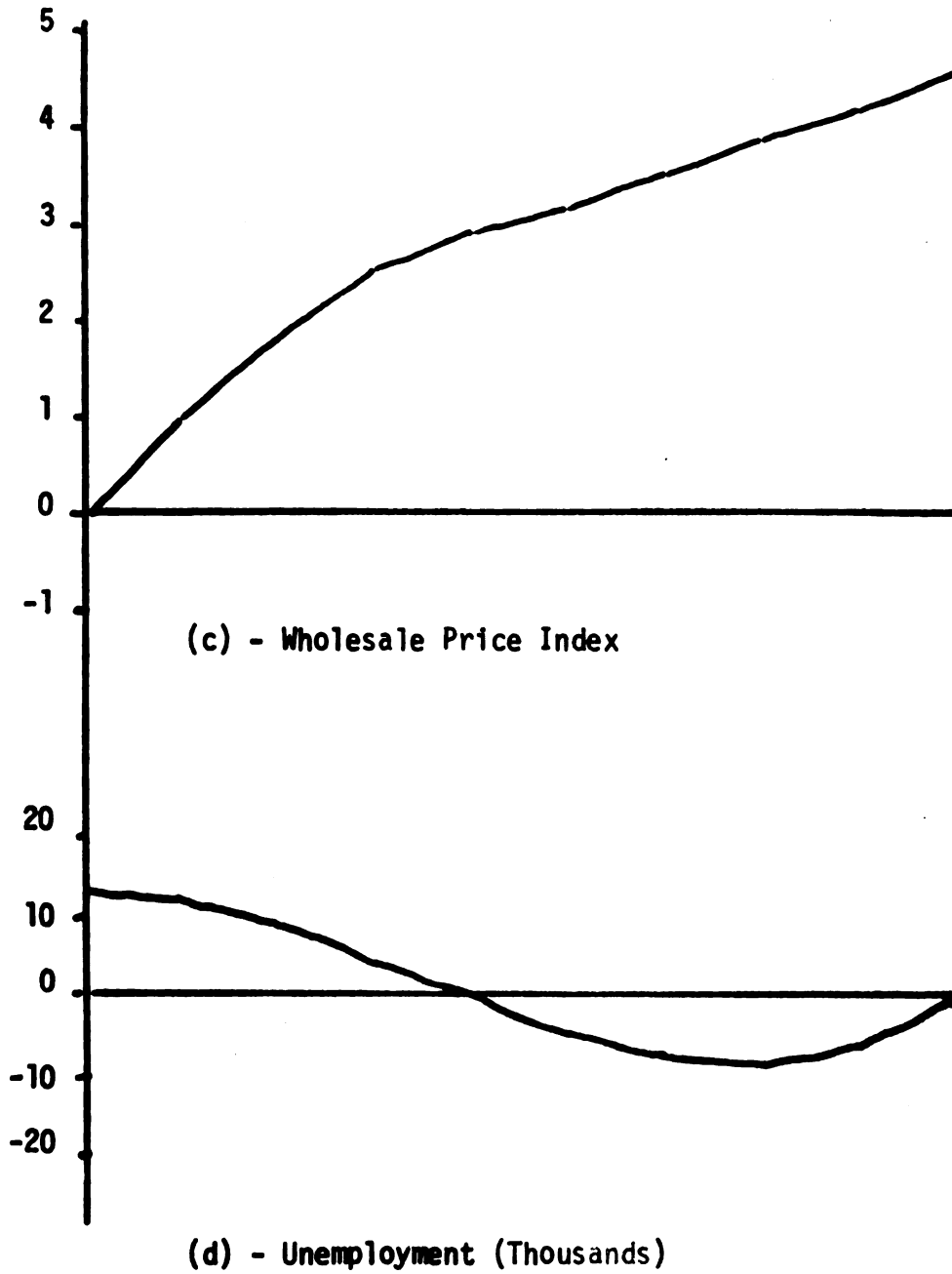


FIGURE 26 (c) & (d)
TIME-PROFILE FROM SECOND REGRESSION EQUATION: FINLAND

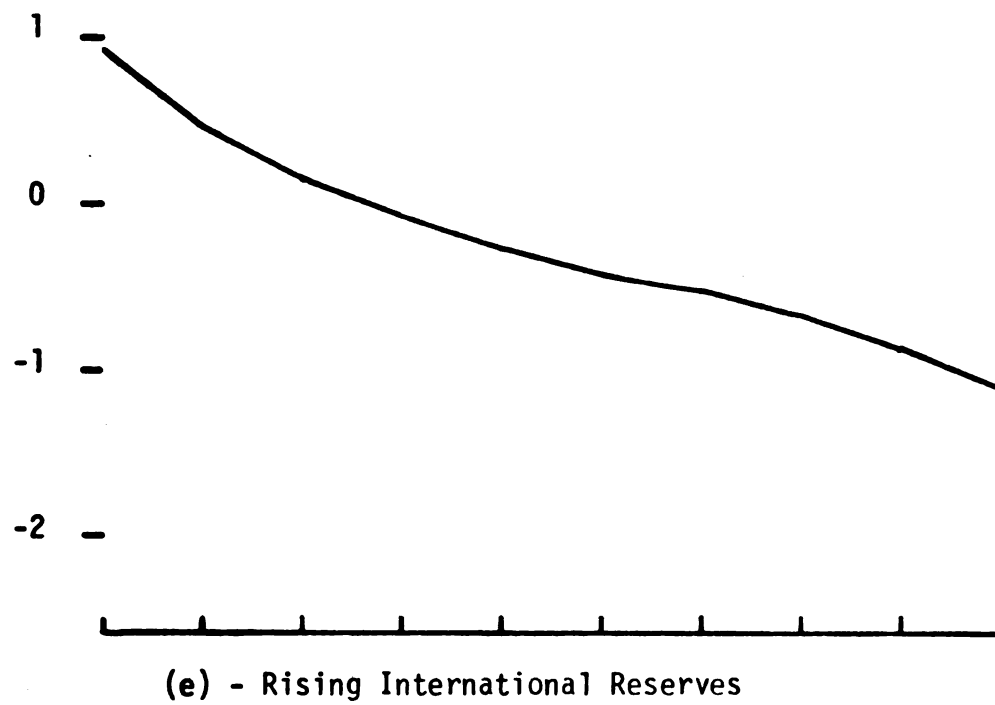


FIGURE 26 (e)

TIME-PROFILE FROM SECOND REGRESSION EQUATION: FINLAND

apparent. The first is that the pattern of weights associated with the price level has reversed itself. The weights are now positive, indicating that monetary policy did not respond in an adjusting manner to the price stability variable. This conclusion is contrary to that reached in the first regression. In both regressions, however, the δ_i from which the weights are computed are significant only at high probability levels, and can be accepted only with the high probability of error. The final conclusion is that the money supply did not respond in a systematic manner to the goal of price stability.

A similar conclusion must be reached for the relationship between monetary policy and the unemployment variable. The weights, the W_{t-1} , now indicate an adjusting pattern up to $t-4$, after which they become negative. In the first regression they became negative in period $t-1$ and remained so until $t-8$. Again the δ_i in both regressions were not statistically significant. Therefore, the weights attached to the unemployment variable are unreliable, and the evidence suggests that the employment goal was not one of the objectives of monetary policy during the period of investigation.

The weights assigned to the production variable, however, were again constructed from λ_i ($i=0,1,2,3$) which were significant at .05 probability level. These weights are displayed in graph a of Figure 18, and they exhibit a pattern very similar to that obtained with the first regression. The weights are all positive, again suggesting that the monetary authorities facilitated any expansion of production by increasing the money supply, providing that other targets' variables remain constant.

More interesting is the pattern, W_5 , displayed by the weights associated with the international reserve variable representing declining reserves. The weights, which were constructed from statistically

significant estimates of the ϕ_1 , are now all positive, indicating that a decline in reserves was accompanied by a contraction of the money throughout the lag. This is now an adjusting pattern with respect to a falling level of international reserves.

The weights associated with the rising level of international reserves variable also display an interesting pattern. The weights up to period $t-2$ are positive, after which they become and remain negative. This pattern suggests that the immediate impact of an increase in the level of international reserves is to increase the money supply. [A one million dollar increase in the level of reserves in period t will increase the money supply by .9 million finnmars in period t , by .47 million in $t+1$, and .15 million in $t+2$.] But this increase appears to be unwanted, and after a two-period lag the money supply has begun to move in an offsetting direction, falling by .08 million in $t+3$, .27 million in $t+4$, .41 million in $t+5$, and so on for the remainder of the lag. These weights, however, were constructed from the θ_i where only θ_1 was significant at the .05 probability level. Nevertheless, the evidence would appear to support the hypothesis that the Finnish authorities, as indicated by the behavior of the money supply, responded in an asymmetrical manner to balance of payments disturbances.

Summary

The preceding analysis has identified two major features in Finnish balance-of-payments adjustment policy. The first is that the Bank of Finland throughout the period under investigation used the monetary policy instruments directly under its control to offset the domestic liquidity changes brought about by net changes in the inflow (outflow) of foreign exchange. Each method of analysis corroborated

this conclusion. The second is that this offsetting was complete for balance-of-payments surpluses but not for deficits. Since it is common to use the money supply as the proxy representing aggregate monetary policy, the conclusion must be that monetary policy was used to balance-of-payments adjustment instrument in Finland only when international reserves were falling. This pattern would support the hypothesis that, in the case of Finland, the international financial system as it existed from 1950 to 1969 exhibited a deflationary bias.

Before going on to outline in detail the Finnish reaction model, a word should be said about the strength of the specie-flow mechanism in that country. To begin with, Finnish exports account for approximately 25 per cent of the country's GNP. Although export diversification has proceeded throughout the period of the study and dates back to the post World War I era, Finland today is still primarily an exporter of crude materials and semi-finished goods. As a consequence, Finland's export earnings are very sensitive to the level of economic activity abroad. Fluctuations in these earnings typically are large, and their impact on the domestic economy is great. Taking the years from 1963 to 1969 as an example, the ratio of Finnish international reserves to the money supply averaged 41 per cent, and, more importantly, the average yearly fluctuation in the level of international reserves amounted to 33-1/2 per cent. Table 16 shows the annual fluctuation in the level of international reserves and gives the corresponding first round impact on money supply that would occur. Clearly a number of these changes are extremely large and could not be tolerated by any country lest they cause major disruptions in economic activity. Not surprisingly, the Bank of Finland felt that such severe adjustment

TABLE 16

CHANGES REQUIRED IN MONEY SUPPLY IF FLUCTUATIONS
IN INTERNATIONAL RESERVES
ARE NOT OFFSET

Year	Annual Fluctuation in International Reserves	First Round Impact on the Money Supply if not Offset
1963	29%	11%
1964	-12%	-6%
1965	-35%	-15%
1966	26%	7%
1967	93%	30%
1968	-6%	-3%
1969		

Source: Various issues of International Financial Statistics.

assigned too much weight to the external situation at the expense of the domestic economy and acted to mitigate the automatic effects of the specie-flow mechanism on the domestic economy through the use of offsetting or partially offsetting discretionary monetary policy. In the case of downward disturbances in the balance-of-payments, the offsetting was only partial; and the rate of change in the money supply systematically moved in an adjusting direction with respect to balance of payments deficits. Only the monetary effects of balance-of-payments surpluses were completely offset.

The process by which Finnish monetary policy typically responded to balance-of-payments disequilibria will now be outlined. Two different models of behavior will be described, one for the period prior to 1963, and one for the period since.

Prior to 1963, a net inflow of foreign exchange led to increased domestic liquidity and improved the liquidity of the banking system. In Finland such times were usually accompanied by increased economic activity, and in this first period deposit bank loans to the public expanded. The increased liquidity brought about by the net inflow of foreign exchange allowed the banks to increase their lending while at the same time reducing their rediscount debt with the Central Bank. The reduction of rediscounting, however, cannot be wholly regarded as a passive response of the Central Bank to a reduced demand for rediscounting brought about by the increase in domestic liquidity, since the interest rates in Finland seldom rose high enough to choke off the excess demand for credit. The reduction of Bank of Finland claims on deposit banks must therefore be interpreted as deliberate offsetting policy, but prior to 1963 this reduction of rediscounting during upward

disturbances in the balance-of-payments was not great enough to cause a contraction in the rate of expansion of deposit bank credit. Along with the decline in rediscounting during an upward disturbance in the balance-of-payments, Central Bank lending to the private nonbanking sector and, in a minor degree, to the government also decreased. For very brief periods lending to the private sector might increase slightly, apparently to ease the transition to tighter credit. Prior to 1963 the discount rate was typically lowered during upward disturbances in the balance-of-payments. Fiscal policy did not appear to respond consistently during this period, or in any other period, for that matter, to either external or internal economic objectives. Rather, it was neutral in the sense that it was not actively used as an economic tool.

The qualitative reaction of the authorities to upward and downward disturbances in the balance-of-payments appeared symmetrical, and a net outflow of foreign exchange usually initiated the opposite chain of events. The discount rate now was typically raised, commercial bank lending to the public decreased, and Bank of Finland claims on the banking system, the private sector, and the government increased. In spite of Central Bank offsetting, the rate of change of money supply responded in an adjusting direction by decreasing. Fiscal policy again remained neutral in the aforementioned sense.

Three factors separate the pre-1963 and the post-1963 periods. The first is that since 1963 the discount rate has remained unchanged. The second is that since 1963 commercial bank lending to the public has moved in an offsetting direction with respect to balance-of-payments disequilibria. And the third is that the money supply, although it

still responds in an adjusting manner to payments' disturbances, does so with less strength. As in the earlier period, Central Bank claims on the domestic economy continue to offset the domestic liquidity changes brought about changes in the net inflow (outflow) of foreign exchange. Now, however, as mentioned, deposit bank lending to the public does the same. During this period the increased liquidity of the commercial banking system brought about by a favorable payments' balance with the rest of the world was offset by reduced Central Bank rediscounting to the point where commercial bank credit also contracted. The opposite was true during times when there was a net outflow of foreign exchange. In this case the reduced banking system liquidity brought about by the loss of international reserves was offset by increased Central Bank rediscounting to a degree which allowed commercial bank lending to expand at an increasing rate. Still, the offsetting was only partial, and the rate of expansion of the money supply fell during downward disturbances. Nevertheless, the response of the money supply was not as great in this period, and the evidence would therefore seem to indicate that the authorities assigned less weight to external adjustment during the post-1963 period than they did in the earlier period.

The question may now be asked whether Finnish authorities followed an economic strategy which assigned monetary policy to the external target while reserving fiscal policy for the domestic targets when the two situations called for opposing remedies. The answer to the question appears twofold. On the one hand, the statements of Finnish policy-makers indicate that they regard fiscal policy as a powerful

tool to affect the level of domestic income and employment.¹⁴ On the other hand, the evidence of the study is that fiscal policy did not respond consistently to the needs of any of the economic targets, either domestic or external. During the period under investigation, political-institutional conditions in Finland apparently impeded the effective use of fiscal policy as an anti-cyclical economic instrument. Corroboration of this point can be found in the 1970 OECD report on the Finnish economy which calls for the more active anti-cyclical use of Finnish fiscal policy.¹⁵

Whether or not Finland's behavior complies to the rules of the game depends on the definition of the rules which is accepted. If the classical version of the rules, as iterated by Nurske, is accepted, then the Central Bank's domestic assets become the deciding variable. Compliance with the rules in this case requires that the Central Bank increase their domestic assets during upward disturbances in the balance-of-payments and decrease them during downward disturbances. The evidence with respect to the Bank of Finland is unequivocal on this matter. They emphatically did not follow this rule, but rather they followed the exact opposite.

On the other hand, the definition which Michaely suggests names the money supply as the crucial variable. In this case the money supply or its rate of expansion must increase with upward disturbances in the balance-of-payments and decrease with downward disturbances. The evidence for Finland clearly indicates that compliance with this

¹⁴John Tvedt, "Stabilizing an Economy," Finance and Development, Vol. III, No. 2 (June 1966), p. 110.

¹⁵OECD Economic Survey of Finland, op. cit., pp. 35-42.

version of the rules occurred during periods of downward disturbances in the balance-of-payments but did not occur during periods of upward disturbances.

CHAPTER 4

THE FINNISH DEVALUATION OF 1967

Introduction

During the period under investigation, 1950-1969, the country of Finland devalued its currency twice. The first devaluation occurred September 15, 1957, and was part of an overall policy package which included the dismantling of multiple exchange rates and import licensing. The policy's objective was to take the country out of the "transition period" in which the IMF allowed exchange controls and into an era where external balance would be maintained without recourse to payments' restrictions. The pro-devaluation argument, at the time, was that the removal of payments' restrictions would undermine the country's external position unless the currency was simultaneously devalued.¹ Once the new, lower par value of the finnmk was established, the country intended to maintain external balance through the use of proper monetary and fiscal policy without recourse to further exchange rate changes.²

The value of the finnmk set in 1957 was maintained for 10 years. Then, in October of 1967, after facing a four-year decline in the

¹Nils Meinander, "The Fimmk Devaluation - Implications and Follow Up Measures," Unitas, Economic Review of Finland, Vol. 40, No. 3 (1968), p. 145.

²Ibid.

level of its international reserves, Finland once again devalued its currency. The concern of the present chapter is with this devaluation. It is particularly interesting for a number of reasons. Certainly foremost among these reasons must be the fact that most analysts consider it a successful devaluation, in the sense of achieving its short-run objectives.³ Another is that the devaluation itself was only part of an ambitious economic strategy designed to bring broad changes to the Finnish economy. These changes, which required the cooperation of the government, management, and labor to bring about, included the elimination of price index-tied wage and financial contracts and the provision of tax incentives to promote export diversification.

The present chapter consists of two parts. The first is a brief overview of the economic conditions which led to the 1967 devaluation, along with an outline of the economic objectives of the devaluation period and a description of the policy-mix adopted by Finland to pursue those objectives. This part of the chapter is indebted to two excellent studies of the Finnish devaluation, one by Finnish economist Gustav Mattson⁴ and the other by the OECD.⁵

The second part of the chapter uses several regression models to estimate the lags involved in Finland's foreign trade and also the lag the devaluation had in affecting the country's balance-of-payments. The price and income demand elasticities estimated with these models

³OECD Economic Survey of Finland (June 1969), p. 23.

⁴Gustav Mattson, "The Devaluation of the Finnish Mark in 1967," Banca Nazionale Del Lavoro: Quarterly Review, Vol. 23, No. 95 (December, 1970), pp. 419-421; and Goran Ehrnrooth, "Towards an Upswing," Unitas, Economic Review of Finland, Vol. 41, No. 1 (1969), p. 4.

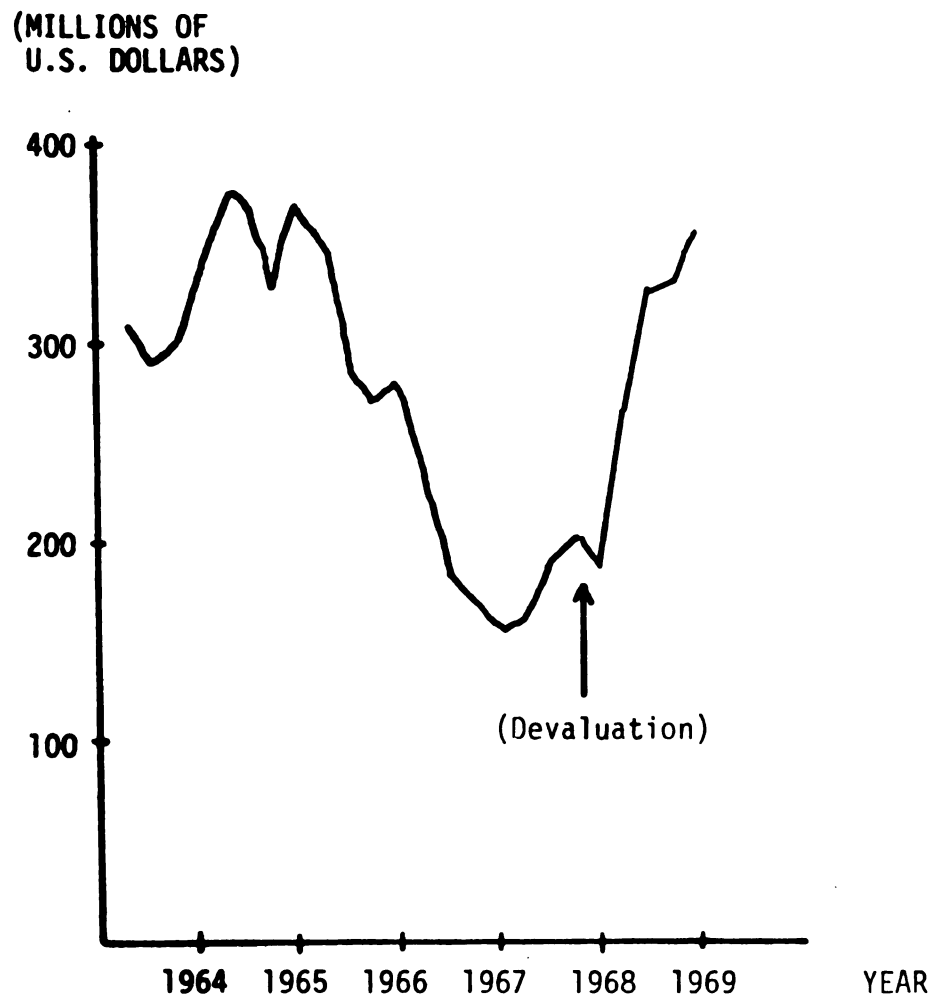
⁵OECD Economic Survey, op. cit., pp. 1-60.

are also used to disaggregate the improvement which occurred in Finland's balance-of-payments into that which can be attributed to changes in relative prices and that which be attributed to changes in domestic and foreign income.

The Pre-Devaluation Situation

Finnish international reserves (Figure 27) reached a peak of nearly 380 million dollars the first quarter of 1964. From then until the first quarter of 1967, Finland's international reserves declined, reaching a low of approximately 158 million in 1967. During this period, the balance-of-payments, by either the basic or official settlement definition, was in continuous deficit. The decline in reserves was accompanied by a decrease in domestic liquidity and by 1966 the rate of economic growth (Figure 28) had fallen to 2 - 3 per cent. Unemployment (Figure 29) was rising, and, at the same time, the Finnish economy was subjected to cost-push inflation due, in part, to the extensive use of price index-tied wage and interest agreements. By 1967 Finnish authorities found themselves in a position of fundamental external disequilibrium coupled with domestic recession, the type of inconsistent situation for which devaluation would be appropriate. Superimposed on this situation was the problem of persistent inflation which the devaluation would aggravate if strong measures were not taken to dampen the income and secondary price effects of the devaluation.⁶

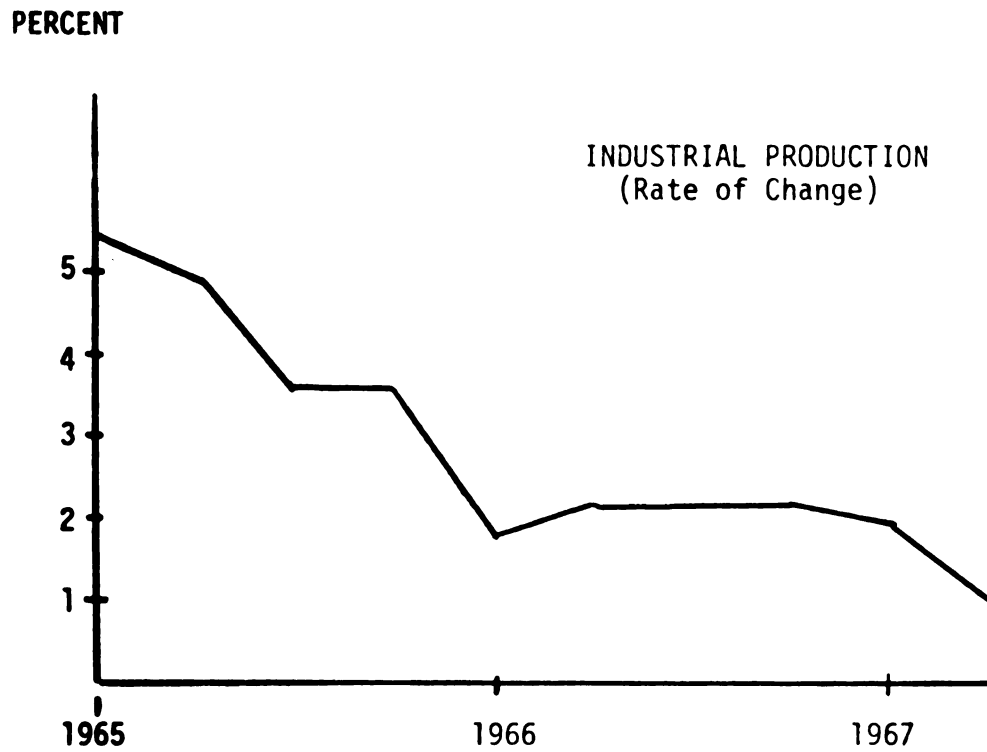
⁶Meinander, op. cit., pp. 182-183.



Source: Compiled from data in OECD Main Economic Indicators

FIGURE 27

FINNISH INTERNATIONAL RESERVES



Source: Compiled from data contained in OECD Main Economic Indicators.

FIGURE 28

FINNISH INDUSTRIAL PRODUCTION: 1965-1967



Source: Compiled from data contained in OECD Main Economic Indicators.

FIGURE 29

FINNISH UNEMPLOYMENT: 1965-1967

Finnish analysts attribute the deterioration of their external position to a number of factors.⁷ They point out that a large part of Finnish post-war development in the 1950's was guided by the need for reconstruction of war damage and the need to make reparations to East Bloc countries and not with an eye to developing those industries which might have been competitive in western markets. After 1958 migration from the agricultural sectors to the industrial sector accelerated and economic policy often sacrificed price stability and external equilibrium to the need of creating employment for these people. When Finland joined EFTA in 1961, it opened the Finnish economy to more import competition. And the increase in per capita income which was occurring, both in Finland and in its trading partners, tended to shift demand away from home production to foreign production. Lastly, in the middle sixties there was a slackening of economic activity in Finnish export markets which led to reduction of Finnish exports and a worsening of Finland's external accounts.

Objectives of the Devaluation

The Finnish economy was relatively undeveloped in comparison with its Western trading partners. Early post-war development had been along traditional lines. Since 1958 the need for economic diversification had been recognized, but was pursued with only limited success. Approximately 60 per cent of Finnish exports at the time of the devaluation were concentrated in the wood processing industries. The gradual erosion of international demand away from primary products was

⁷Meinander, Mattson, Ehrnrooth, and the OECD Economic Survey all mention these factors.

blamed for a large part of Finland's chronic balance-of-payments problem. In response to this situation the objectives of the 1967 devaluation went beyond the adjustment of external disequilibrium and the stimulation of domestic demand along traditional lines. Rather than provide an across-the-board stimulus to domestic production, the devaluation was to be applied selectively, through a system of export taxes and subsidies, to promote industrial diversification along the lines of comparative advantage and thus improve the long-run competitive position of the economy.

Devaluation Strategy

Both Finnish⁸ and OECD economists⁹ estimated that the country's prices had risen 15 to 20 percent more than their major trade partners over the 1958 to 1967 period. They also recognized that any devaluation would have inflationary effects on the economy and for the net result of devaluation to provide a 15 to 20 per cent relative price change the actual devaluation would have to be much higher. It was felt that a large devaluation by Finland would not have serious foreign repercussions since Finland's trade amounted to only about 2 per cent of total OECD area trade with the greater proportion going to the larger countries, especially the U.K. The actual devaluation was 31.25 per cent, but since the U.K. devalued a month later the effective

⁸Gustav Mattson, Op. Cit., p. 409.

⁹OECD, Op. Cit., p. 7.

devaluation was approximately 26 per cent.¹⁰

The 26 per cent effective devaluation was expected to raise the price of imports nearly by 26 per cent, i.e., by the whole amount of the devaluation. The post-devaluation evidence bears this out. Since imports constitute about 20 per cent of the wholesale price index, the index was expected to rise by 5 to 7 per cent. In addition, wage agreements already on the books for 1968 would raise wages that year by approximately 8-1/2 per cent. Since productivity was expected to increase by 3 to 4 per cent during the year, the increase in wages was expected to raise the wholesale price index by approximately another 5 per cent, bringing the total increase in the wholesale price index to 10 to 14 per cent for the year 1968. Since the devaluation was likely to stimulate the economy, the higher estimate was thought more realistic. The cost of living index in turn was expected to rise 10 per cent. Existing wage agreements called for compensation at the beginning in 1968 of any cost of living increase in 1968 which exceeded 4 per cent. Thus, under the wage agreement already settled, wages would be 14 per cent higher by the beginning of 1969 than they were at the time of devaluation and the competitive margin secured through the devaluation would thus have already been whittled down to 5 per cent.¹¹ This situation was held untenable by the government, which therefore

¹⁰The 26 per cent figure for the effective devaluation is used by both Mattson, op. cit., p. 414, and the OECD, op. cit., p. 25. For a discussion of how to compute an effective exchange rate see Fred Hirsch and Ilse Higgins, "An Indicator of Effective Exchange Rates," International Monetary Fund Staff Papers, Vol. XVII, No. 3 (Nov., 1970) pp. 453-485.

¹¹These are Meinander's estimates, op. cit., p. 182.

felt that a strict incomes policy to control price inflation would be necessary if the devaluation were to be successful.¹²

The Devaluation Policy-Mix

The Finnish authorities recognized that for their devaluation to be successful, price increases in the economy had to be minimized. A 5 to 7 per cent increase in the wholesale price index was considered inevitable as import prices rose because of the devaluation. What the authorities felt had to be stopped was the wage and price increases that would automatically occur because most wage and financial contracts were coupled to cost indices. In many countries, the devaluation of the currency brings divisive accusations of economic mismanagement from the political opposition, which often weakens the government's ability to accompany a devaluation with deflationary measures. In Finland this was not the case. Management and labor cooperated with the government, and labor unions agreed to abolish the cost-of-living links in their contracts, provided that other index links in the economy were also eliminated.¹³ The result was that in 1968 index linked issues of government bonds were ended as were index coupled accounts in commercial banks and savings associations. Labor then agreed to limit its wage increases to increases in productivity. After the elimination of index coupled contracts, the government introduced price controls on most commodities.

¹²Mattson, op. cit., pp. 418-419.

¹³OECD, op. cit., pp. 18-20.

Fiscal policy in 1968 was used to further dampen price increases. The budget was in surplus, draining off some of the liquidity caused by a rapidly increasing level of international reserves. The money supply which had contracted during 1966 and 1967 was allowed to expand by 22 per cent during 1968. This expansion was due mainly to the net inflow of international reserves. During 1968 National Bank rediscounts to commercial banks decreased by 250 million marks while lending to the private sector decreased by 77 million finmarks. Commercial bank lending increased by 776 million, an increase in lending of only 6 per cent. The great increase in domestic liquidity came about because the National Bank only partially offset the net inflow of reserves. Finnish authorities defended this increase in liquidity as necessary to lubricate the restructuring of the industrial sector according to their devaluation plan.¹⁴

Thus, incomes policy coupled with contractionary fiscal policy was designed to keep undue pressures on price, while the money supply was allowed to increase to facilitate the expansion of exports which the devaluation would promote.

Within a quarter after the devaluation, the finmark price of exports rose approximately 26 per cent, the whole amount of the devaluation. To promote export diversification and prevent a windfall profit of 26 per cent to traditional exports, the Finnish authorities applied an export tax differentially to different industries. For the lumber and wood processing industries, the export tax was initially 14 per cent. This coupled with the fact that production costs increased

¹⁴Ibid., p. 23.

approximately 7 per cent reduced the profit margin due to devaluation to approximately 5 per cent. This export levy was reduced in stages to 11, 8, 5, and 3 per cent over the eighteen months following the devaluation. The funds collected from this export tax were then disbursed to industries whose exports the government sought to promote. Nearly 80 per cent of the funds collected from the export tax came from the lumber and wood processing industries while disbursements went primarily to mining, oil refining, chemical, engineering, atomic power, and telecommunications industries.¹⁵ Besides changing relative prices in the domestic economy to promote the development of selected industries in an effort to broaden Finland's export base, the tax held back production in the traditional export sectors and thus kept considerable pressure off prices in these sectors.

Analysis of the Devaluation

Introduction and Objectives of the Analysis

In the year following the 1967 devaluation, Finland's balance-of-payments¹⁶ improved by 173 million dollars, an amount equivalent to approximately 11 per cent of the country's annual import bill. The improvement is even more remarkable when IMF drawings are put below the line. In 1967, Finland borrowed 63 million dollars from the IMF which it repaid in 1968. Taking this into account, the "swing" in the balance-of-payments between 1967 and 1968 was 299 million dollars. The

¹⁵Mattson, op. cit., pp. 415-418.

¹⁶The figures are based on the "overall balance." The results were computed from Table G, OECD Economic Survey of Finland: 1969, p. 50.

dollar value of exports which increased 6.6 per cent accounted for 101 million dollars of the improvement, while a 6.2 per cent decrease in the annual import bill contributed another 107 million dollars. Of the 299 million dollar swing, 70 per cent of it was therefore concentrated in the trade balance. Another eight per cent of the improvement came from a 24 million dollar swing in the travel account, while 5 per cent came from a 15 million dollar swing in the long-term capital account, and 24 per cent came from a 65 million dollar swing in the short-term capital account. 3 and 2 per cent reversals came from "other services" and investment income respectively.

The following analysis will have two major objectives. First it will try to disaggregate the balance-of-payments improvement and determine how much of it can be attributed to price and income changes caused by the devaluation policy-mix, and how much to factors outside Finland's control, such as the upturn of economic activity in Finland's export markets that began shortly before the devaluation. Secondly, an attempt will be made to estimate the lags with which the devaluation affected the country's balance-of-payments.

Methodology

The following model is considered

$$(1) B = VX - VM - K$$

where B is the balance-of-payments expressed in foreign currency (U.S. dollars), VX is the foreign currency value of exports, VM is the foreign currency value of imports, and K is the foreign currency value of the net capital outflow. Following conventional theory

$$(2) \quad V_X = V_X(P_{FX}, Y_F, P_F)$$

$$(3) \quad V_M = V_M(P_M, Y_D, P_D)$$

$$(4) \quad K = (Y_D, i, Y_F, i_f)$$

where P_{FX} is the foreign currency price of Finnish exports, Y_F is the level of income in Finland's export markets, P_F is the price level in Finland's export markets, P_M is the finmark price of Finland's imports, Y_D is the level of Finnish income, P_D is the general Finnish price level, i is the Finnish interest rate, and i_f is the foreign interest rate.

Additionally, $V_{Y_f} > 0$, where V_{Y_f} is the partial derivative of V_X with respect to Y_F (providing Finland's exports are normal goods); $V_{P_{fx}} > 0$, if the price elasticity of demand for Finnish exports is inelastic; of $V_{P_{fx}} < 0$, if the export demand is elastic; $V_{P_f} > 0$, that is, an increase in foreign prices, *ceteris paribus*, will cause the value of Finnish exports to increase; $V_{P_m} < 0$, i.e., as long as Finland's price elasticity of demand for imports is not zero, dollar outpayments will decrease as the finmark price of imports increases; $V_{Y_d} > 0$, i.e., outpayments will increase as Finnish income increases (providing Finnish imports are normal goods; $V_{P_d} > 0$, which means that as Finland's general price level rises imports become more competitive leading to a larger import bill; $K_{Y_d} < 0$, an increase in domestic income, *ceteris paribus*, will cause a decrease in net capital outflow; $K_i < 0$, an increase in the interest rate will cause a decrease in net capital outflow;¹⁷ $K_{Y_f} > 0$, an increase in foreign income will divert capital from Finland's market;

¹⁷The interest elasticity of international capital flows for Finland is thought by Finnish authorities to be low, as portfolio theory might predict.

and $K_{ij} > 0$, an increase in foreign interest rates will attract capital from Finland's markets.

The balance-of-payments has thus been specified as a function of eight variables: PXF , YF , PF , PM , YD , PD , i , and i_j . These variables, except for YF , PF , and i_j (foreign income, foreign prices, and foreign interest rates respectively) are in turn considered to be direct or indirect functions of Finnish fiscal, monetary, and exchange rate policy. In particular,

$$(5) \quad YD = YD(F, M, R, YF, PF)$$

$$(6) \quad i = i(G, M, R,)$$

$$(7) \quad PXF = PXF(R, PD)$$

$$(8) \quad PD = PD(YD)$$

$$(9) \quad PM = PM(R, PF)$$

$$(10) \quad YF = \bar{YF}$$

$$(11) \quad PF = \bar{PF}$$

$$(12) \quad i_j = \bar{i_j}$$

where G , M , R stand for the budgetary deficit, the money supply, and the exchange rate respectively. The exchange rate, R , is defined as the number of units of domestic currency per U.S. dollar. An increase in R therefore represents devaluation of the finmark. Foreign income, foreign prices, and the foreign interest rate (equations 10, 11, and 12) are considered variables outside Finland's control.

The partial derivatives associated with equations 5 through 9 are $YD_G > 0$, an increase in deficit spending will increase domestic income; $YD_M > 0$, an increase in the money supply will increase domestic income; $YD_R > 0$, devaluation will increase domestic income; $YD_{YF} > 0$, an increase in foreign income causes Finnish income to rise through the export

linkage; $YD_{pf} > 0$, an increase in foreign prices causes Finnish income to increase through the export linkage; $ig > 0$, an increase in government deficit spending will increase the interest rate; $im < 0$, an increase in the money supply will lower the interest rate; $ir \geq 0$, devaluation, *ceteris paribus*, will increase both the demand for money (by raising income) and the supply of money. Which effect is the greatest cannot be determined on priori grounds; $PX_{Fr} < 0$, devaluation usually, but not always,¹⁸ will cause the foreign price of the country's exports to decline; $PX_{Fpd} > 0$, an increase in the domestic price level will usually, again not always,¹⁹ increase the foreign price of the country's exports; $PD_{yd} > 0$, an increase in domestic income will tend to raise domestic prices; $PM_r > 0$, devaluation will increase the domestic prices of imports; and $PM_{pf} > 0$, an increase in the foreign price of imports will increase the domestic price of imports.

Finally, the policy variables are assumed to be exogenously determined, except for the money supply which will have a component influenced by changes in the country's external position. In equation form

$$(13) \quad G = \bar{G}$$

$$(14) \quad R = \bar{R}$$

$$(15) \quad M = \bar{M} + M(R)$$

where $M_r > 0$, i.e., devaluation will increase domestic liquidity.

¹⁸In this respect Finland behaved like a price-taker in the international market. Her exporters did not lower the dollar prices of their goods, but instead increased the finmark price by the whole amount of the devaluation.

¹⁹There is evidence that Finnish exporters could not pass on price increases. When domestic prices increased faster than world prices, they were therefore caught in a profit squeeze. See Mattson, op. cit., p. 416.

Using the chain rule, equation 1 can now be totally differentiated:

$$\begin{aligned}
 (16) \quad dB = & \underbrace{VXpfx \text{ PFXrdR}}_{(a)} + \underbrace{VMpm \text{ PMr dR}}_{(b)} \\
 & + \underbrace{Ky d \text{ YDr dR}}_{(c)} + \underbrace{Ki \text{ ir dR}}_{(d)} + \underbrace{VMy d \text{ YDr dR}}_{(e)} \\
 & + \underbrace{VMpd \text{ PDyd YDr dR}}_{(f)} + \underbrace{VXpfx \text{ PFXpd PDyd YDr dR}}_{(g)} \\
 & + \underbrace{VXpfx \text{ PFXpd PDyd YDm Mr dR}}_{(h)} \\
 & + \underbrace{VMy d \text{ YDm Mr dR}}_{(i)} \\
 & + \underbrace{VMpd \text{ PDyd YDm Mr dR}}_{(j)} \\
 & + \underbrace{Ky d \text{ YDm Mr dR}}_{(k)} + \underbrace{Ki \text{ im Mr dR}}_{(l)} \\
 & + \underbrace{VXpfx \text{ PFXpd PDyd YDgdG}}_{(m)} \\
 & \quad \underbrace{VMgd \text{ YDgdG}}_{(n)} + \underbrace{Ky d \text{ YDg dG}}_{(o)} \\
 & + \underbrace{Ki \text{ ig dG}}_{(p)} \\
 & + \underbrace{VXpfx \text{ PFXpd PDyd YDm dM}}_{(q)} \\
 & + \underbrace{VMy d \text{ YDm dM}}_{(r)} + \underbrace{Ky d \text{ YDm dM}}_{(s)} \\
 & + \underbrace{Ki \text{ im dM}}_{(t)} + \underbrace{VXyf \text{ dYF}}_{(u)} \\
 & \quad \underbrace{VXpf \text{ dPF}}_{(v)} + \underbrace{Kij \text{ dij}}_{(w)} \\
 & + \underbrace{VMy dYdyfdYF}_{(x)} + \underbrace{VMpdPDyd \text{ YDyf dYF}}_{(y)} \\
 & + \underbrace{VMy dYdyfdYF}_{(x)} + \underbrace{VMpdPDyd \text{ YDyf dYF}}_{(y)} \\
 & + \underbrace{VMy d \text{ YDpf dPF}}_{(z)} + \underbrace{VMpd \text{ PDyd YDpf dPF}}_{(z')}
 \end{aligned}$$

Expressions a through l detail the exchange rate effect on the balance-of-payments, m through p the budgetary effect, q through t the monetary effect, and u through z' the effects of foreign economic activity. As the equation stands, it does not include an expression for the effects of cost-push inflation. $PD = PD(YD)$ is assumed to represent demand-pull inflation.

Equation 16 points out that the total balance-of-payments effect is the net result of the simultaneous interaction of all policy variables, not just the exchange rate. Still an examination of expressions a through l (the exchange rate effect on the balance-of-payments, assuming $dG = dM = dYF = dPF = dif = 0$) is useful for insight into the mix of fiscal, monetary, and incomes policy adopted by Finland to accompany the devaluation.

Table 17 categorizes expressions a through l according to whether they have a positive effect on the devaluation, a reversal effect, no effect, or an indeterminate effect. Expressions a and b ($VXpfX$ $PFXrdR$ and $VMpm$ PMr dR , respectively) represent the first order relative price effects of the devaluation.²⁰ If it is assumed that Finland is a price-taker in world markets,²¹ then PXr , the change in the dollar price of Finnish exports associated with the exchange change, will be zero. Expression "a" will drop out and have no effect on the balance-of-payments. On the other hand, the evidence suggests that PMr was positive and large. The 26 per cent devaluation caused an approximately 26 per cent increase in the finmark price of imports which, as long

²⁰Yeager, International Monetary Relations, op. cit., p. 144.

²¹The evidence mentioned earlier in the text appears to support this thesis.

TABLE 17

BALANCE OF PAYMENTS EFFECT OF DEVALUATION

HOLDING G, M, YF, PF, AND IF CONSTANT

Positive Effect	Reversal Effect	No Effect	Indeterminate Effect
(b) VMpm Pmr dR	(e) VMyd YDr dR	(a) VXpfx PFXrdR	Kiir dR
(c) KydYDrdrR	(f) VMpd PDydYDrdrR		
(k) KydYDm MrdR	(g) VXpfx PFXpd PDyd YDrdrR		
	(h) VXpfx PFXpd PDyd YDm Mr dR		
	(i) VMyd YDm Mr dR		
	(j) VMpd PDyd YDm MrdR		
	(l) Ki im MrdR		

as Finland's price elasticity of import demand was not zero, would cause VM, the dollar value of imports, to fall. Expression b therefore represents a positive effect of devaluation on the balance-of-payments. There are two other expressions which might be expected to have positive effects on the balance-of-payments. Both deal with the effect of domestic income on net capital outflow. The devaluation will increase income directly by expanding net exports through the direct price effects and indirectly through the induced increase in the money supply. The evidence suggests that approximately 5 per cent of Finland's balance-of-payments improvement came through the long-term capital account.

There are seven entries in Table 17 which will tend to reverse the initial relative price effects of devaluation. Four of these expressions represent a decrease in the country's competitive position due to the inflationary effects of the devaluation. Two reflect the increase in imports which will occur because the devaluation has increased income, directly through its effect on net exports and indirectly through its increase in the money supply.

The objectives of the Finnish devaluation can now be examined in light of the model. The authorities faced a balance-of-payments deficit, rising unemployment, declining income, and rising prices. The primary objective of the devaluation was to improve the balance-of-payments.²² At the same time, the stimulation that the devaluation would give to national income and employment was welcome, provided it could be controlled and restrained in an orderly fashion. Otherwise

²²Mattson, op. cit., pp. 421-422.

it was feared that a rapidly rising level of income would increase imports directly through the MPM (expression e) while at the same time increasing inflation and undermining the country's competitive position. Their objectives were then to improve the balance-of-payments (in the short-run, by improving relative prices, in the long-run by diversifying their export sector), moderately stimulate domestic employment, and check domestic inflation.

Now the policy tools adopted by the authorities can be matched to the policy goals. Devaluation was used to correct the balance-of-payments deficit and stimulate the domestic economy. Fiscal policy was used to control and dampen the stimulation of the domestic economy, thereby reducing the reversal effect of income on the balance-of-payments. The monetary authorities allowed the money supply to rise, mostly by not offsetting the monetary effects of the devaluation. The purpose of the monetary authorities was to stimulate the investment needed to diversify the export sector. The inflation problem in turn was attacked on two fronts. On the one, structural changes designed to change the Phillips relation between inflation and unemployment were introduced. In this case the extensive tying of wage and financial contracts was eliminated. On the other front, strict wage and price controls were placed on the economy. If incomes policy would be successful, then $PM_yd = 0$ (approximately), and four of the expressions representing reversal effects through inflation would be eliminated.

The technique of analysis used in this paper is to look at the net change in the major variables, and then estimate the affect that this net change had on the balance-of-payments. For example, the level of Finnish income is hypothesized to have an important affect on Finnish

imports. To determine the importance of the domestic income effect during the devaluation period, the percentage change in income that took place will be measured and multiplied by Finland's income elasticity of demand for imports. No attempt will be made to break down the change in income into the separate components caused by the devaluation, contractionary fiscal policy, easy monetary policy, or a change in foreign economic activity. In this sense, we are not looking at the effects of the "devaluation" itself, but of the total devaluation "policy package," along with exogenous foreign effects. Since most of Finland's balance-of-payments improvement occurred in the trade balance, the major thrust of the analysis will be to examine the relationship that exists between the trade balance and PFX , PD , YD , YF , PM , PF . Estimates of the parameters have been made using the direct least squares method. This procedure has been common in much work dealing with international price and income elasticities;²³ but the possibility of bias due to simultaneity must be recognized.

Analysis

The first step of the analysis will be to estimate the primary effect that devaluation had on the dollar price of Finnish exports and the mark price of Finnish imports. As the earlier discussion indicated, the devaluation caused only slight change in the foreign price of Finnish exports. For practical purposes, PFX_r , the partial derivative of dollar export prices with respect to R , the exchange rate,

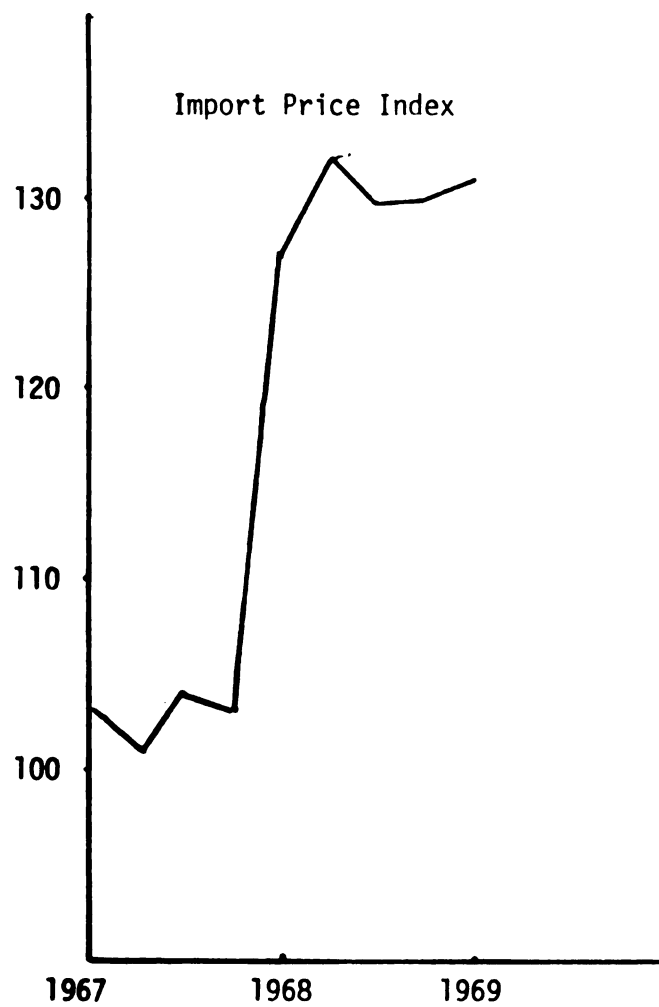
²³See M. E. Kreinin, "Price Elasticities in International Trade," Review of Economics and Statistics, 49 (1967) pp. 510-516, and H.S. Houthakker and Stephen P. Magee, "Income and Price Elasticities in World Trade," Review of Economics and Statistics, vol. LI, no. 2 (May, 1969), pp. 111-125.

can be regarded as zero. This may seem unusual in view of the fact that Finland's export sector was not at full-employment at the time of the devaluation. A possible explanation of this behavior is that an upswing in foreign economic activity accompanied Finland's devaluation. Faced with increased orders for their exports, Finnish producers may have felt no need to cut dollar prices to stimulate sales.²⁴ In this case it would be wrong to regard $PFX_r=0$ as a stable function. Had not foreign economic activity been rising, Finnish exporters might have decreased dollar prices. The conclusion is that the devaluation operating through dollar export prices contributed very little, if anything, to the improvement in Finland's balance-of-payments.

Figure 30 shows the behavior of the finmark price of imports for the 1967 through 1968 period. The devaluation occurred in October, 1967, and by the end of 1967 the finmark import price index had jumped approximately 23 per cent. By the end of the following quarter, I 1968, the index had risen another 4 per cent, for a total two quarter increase of 27 per cent, nearly the exact amount of the effective devaluation. During the remaining three quarters of 1968, the import price index fell an average of 1 per cent.

Two results are evident in this analysis. The first is that the whole effective devaluation was reflected in the increase in domestic import prices. The other is that the change in the domestic price of imports followed the devaluation with a relatively short lag. The total effective exchange rate change appears to have been passed on in two quarters with approximately 88 per cent of the change occurring by the end of the first quarter and the remaining 12 per cent by the end of the

²⁴Data concerning Finland's industrial orders was not available.



Source: Compiled from data contained in OECD Main Economic Indicators.

FIGURE 30

FINNMARK PRICE OF IMPORTS

next quarter. This is admittedly causal empiricism, and an attempt to verify this conclusion using multiple regression analysis has been made. Using quarterly data from the 1966 through 1970 period, the following distributed lag model was estimated:

$$(17) PM_t = B_0 + B_1 PF_t + B_2 PF_{t-1} + B_3 R_t$$

$$+ B_4 R_{t-1} + B_5 PM_{t-1} + u_t$$

when PM_t is the finmark price index of imports in period t , PF_t is the index of the dollar price of Finnish imports, R_t is the exchange rate in period t , PF_{t-1} is the index of dollar prices of imports lagged one period, R_{t-1} is the exchange rate lagged on period, and PM_{t-1} is the dependent variable lagged one period. This regression model allows each of the explanatory variables, PF and R , to enter with its own distributed lag effect. The results of the regression are

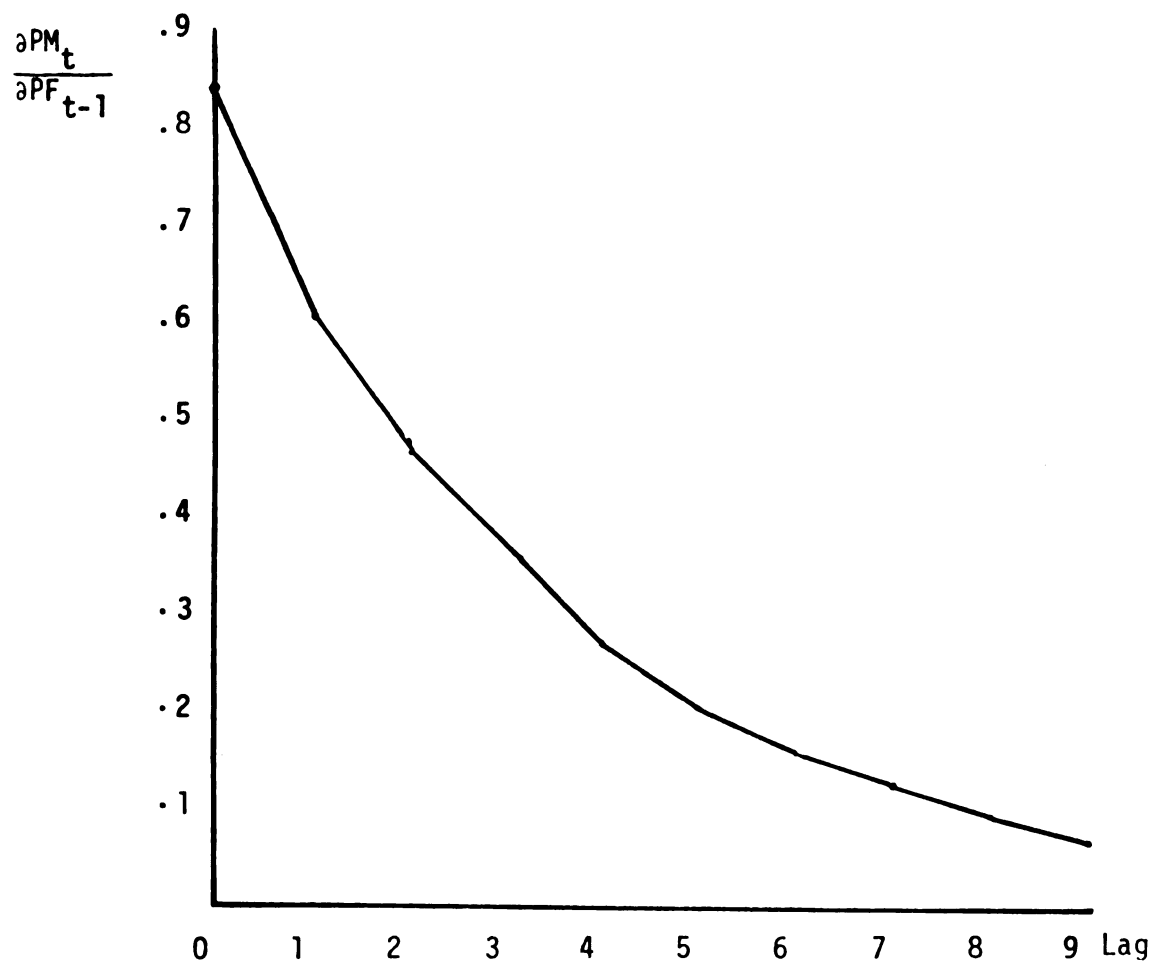
$$(18) PM_t = -47.68800 + \frac{.84079}{(.29281)} PF_t - \frac{.04198}{(.03455)} PF_{t-1} \\ + \frac{31.67319}{(3.71220)} R_t - \frac{22.70305}{(5.87424)} R_{t-1} + \frac{.77041}{(.15928)} PM_{t-1} + e_t$$

$$R^2 = .9950^2$$

$$h: 1.98^{25}$$

All estimates except B_2 are significant at the .05 probability level. Before the equation is interpreted, the time profiles for the effect that the explanatory variables have on Finnish domestic import prices must be computed. Figure 31 (and Table 18) shows the time profile of the effect that the dollar price of imports will have on finmark import

²⁵_h is the Durbin statistic to test for serial correlation in the disturbance when a lagged value of the dependent variable is used as an explanatory variable. In this case, the null hypothesis that the errors are serially correlated is rejected.



Note: 1 is the lag.

FIGURE 31

TIME-PROFILE FOR EFFECT OF DOLLAR IMPORT
PRICES ON FINNMARK IMPORT PRICES

TABLE 18

DISTRIBUTED LAG EFFECT OF DOLLAR IMPORT PRICES ON
FINNMARK IMPORT PRICES HOLDING
EXCHANGE RATE CONSTANT

Lag (1)	PM_t R_2 Constant (w_{t-1})
0	.841 ¹
1	.606
2	.467
3	.359
4	.277
5	.213
6	.164
7	.126
8	.097
9	.075

¹Estimated using a linear equation.

prices, and Figure 32 (and Table 19)shows the time profile associated with the exchange rate.

Figure 31, the time profile of the effect that PF_t has on PM_t can be read in the following manner. A one point increase in the dollar import price index (in 1964 dollars) in time t will cause the finmark import price index (in 1964 finmarks) to increase by .841 of a point in time period t , by .606 of a point in time period $t+1$,²⁶ by another .467 of a point in time $t=2$, and so on. The average lag is equal to $\frac{\sum lW_l}{\sum W_l}$, where l , the lag, runs from zero to m , the length of the lag, and W_l is the weight associated with explanatory variable in lag l . The average lag measures the distribution of the weights over time.²⁷ A small average lag indicates that most of the effect of the explanatory variable is felt quickly. A large average lag indicates that the effect of a change in the explanatory variable in period t is spread over a longer time period. The average lag in the effect of a change in the international price of Finnish imports on the domestic price is 3.3 quarters.

When the distributed lag effect of a change in the exchange rate is examined, Figure 32, a curious difference appears. As can be seen in the figure, the exchange rate has a much weaker time profile. While a one mark increase in the price of a dollar in period t will cause the Finnish price index of imports to rise 31.7 points in period t , the

²⁶ $\frac{\partial PM_t}{\partial PF_{t-1}}$ can also be written $\frac{\partial PM_{t+1}}{\partial PF_t}$. See Potluri Rao and Roger

LeRoy Miller, Applied Econometrics (Belmont, California: Wadsworth Publishing Co., 1971), p. 161.

²⁷ Miller and Rao, op. cit., pp. 175-176.

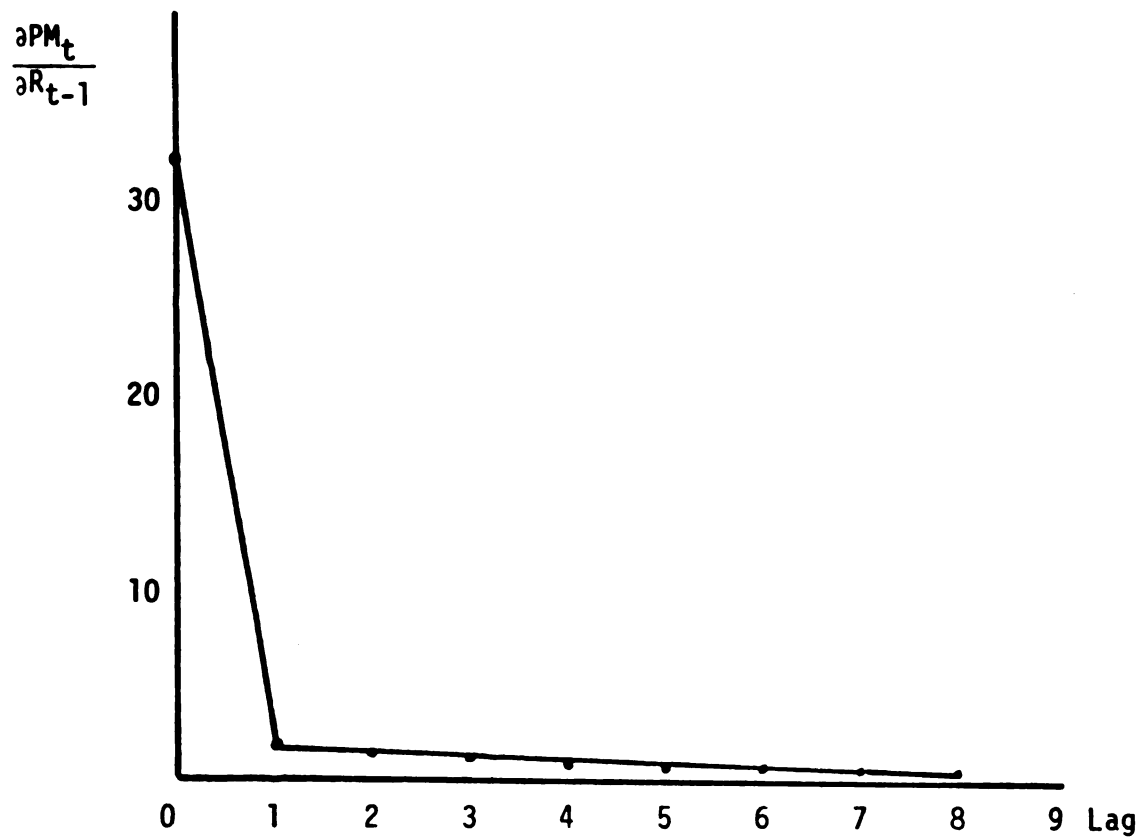


FIGURE 32

TIME-PROFILE OF EFFECT OF EXCHANGE RATE
ON FINNMARK IMPORT PRICES

TABLE 19

DISTRIBUTED LAG EFFECT OF EXCHANGE RATE ON
FINNMARK IMPORT PRICES WITH DOLLAR
PRICES CONSTANT

Lag (1)	PM_t (W_{t-1})	R_t Constant
0	31.6773 ¹	
1	1.6981	
2	1.3081	
3	1.0081	
4	.7765	
5	.5982	
6	.4609	
7	.3550	
8	.2736	
9	.2100	

¹Estimated using a linear equation.

increase in the index in period $t+1$ will be only 1.7 points. The average lag for the exchange rate effect on the Finnish price of imports is .82 quarters. This means that most of the effect of a period t change in the exchange rate on import prices is felt in period t . A change in the exchange rate affected domestic prices of imports much more quickly than did a change in the dollar price of imports. A possible explanation of this phenomenon is that the only variation in the exchange rate occurred because of the devaluation. After the devaluation, it was held constant at 4.2 finmarks per dollar and did not even fluctuate within the IMF's allowable limits.²⁸ Consequently, almost the only change observed in the exchange was caused by the devaluation. Business and public reaction to the devaluation, because of the government's publicity campaign, may therefore have been quantitatively different than their attitude to the normal quarter to quarter changes in international prices. With the devaluation, importers knew that the government's objective was to discourage imports and they co-operated by quickly passing the price increase along. If Finland were to float the mark, it is likely that this special attitude toward exchange rate changes would disappear. In this case the time profile of the exchange rate effect on domestic prices might look more like that of international dollar prices.

Equation 17 was also estimated in doublelogarithmic form. The justification for this is that the regression coefficients are easier to interpret, since percentage changes in dollar import prices and the exchange rate will be related to percentage changes in Finnish import prices. The results of the regression are:

²⁸IMF, International Financial Statistics indicated no quarter to quarter variation in the exchange rate.

$$\begin{aligned}
 (19) \log PM_t = & .11257 + .59802 \log PF_t - .34451 \log PF_{t-1} \\
 & (.22661) \quad (.26112) \\
 & + .93301 \log R_t - .70887 \log R_{t-1} + .80687 \log PM_{t-1} \\
 & (.10494) \quad (.17186) \quad (.15901)
 \end{aligned}$$

$$R^2: .9952 \quad +et$$

$$h: 1.99$$

The fit of the equation (as measured by R^2) was only slightly better than the linear form. All the estimates are significant at the .05 probability level, except for B_2 , associated with dollar import prices lagged one quarter, which is significant at the .10 level. Table 20 and Figure 33 again show the distributed lag effect of dollar export prices on Finnish import prices. It is similar to the time profile derived from the linear equation. A one percent increase in the dollar price index of imports will cause the Finnish price index of imports to go up .598 of one percent in time period t , .138 in time period $t+1$ and so on. The average lag computed from equation 19 is 2.82 quarters, slightly less than that obtained from the linear equation.

Figure 34 shows the time profile of the effect of a percentage change in the exchange rate on a percentage change in the finmark price of imports. Again the time profile is similar to that obtained from the linear equation. A one per cent increase in the exchange rate in time period t will cause a .93 per cent increase in the Finnish import price index in time period t , a .04 per cent in $t+1$, and so on. The average lag of the exchange range effect in this equation is 1.02 quarters, which is slightly larger than the .82 quarter lag obtained with the linear equation. Finnish import prices appear to have responded very quickly to the devaluation. By the end of 2 quarters,

TABLE 20

DISTRIBUTED LAG EFFECT OF DOLLAR IMPORT PRICES ON
FINNMARK IMPORT PRICES HOLDING
EXCHANGE RATE CONSTANT

Lag (1)	PM_t R_2 Constant (W_{t-1})
0	.598 ¹
1	.138
2	.111
3	.090
4	.072
5	.058
6	.047
7	.038
8	.031
9	.025

¹Estimated using a doublelogarithmic equation. The W_{t-1} are interpreted as elasticities.

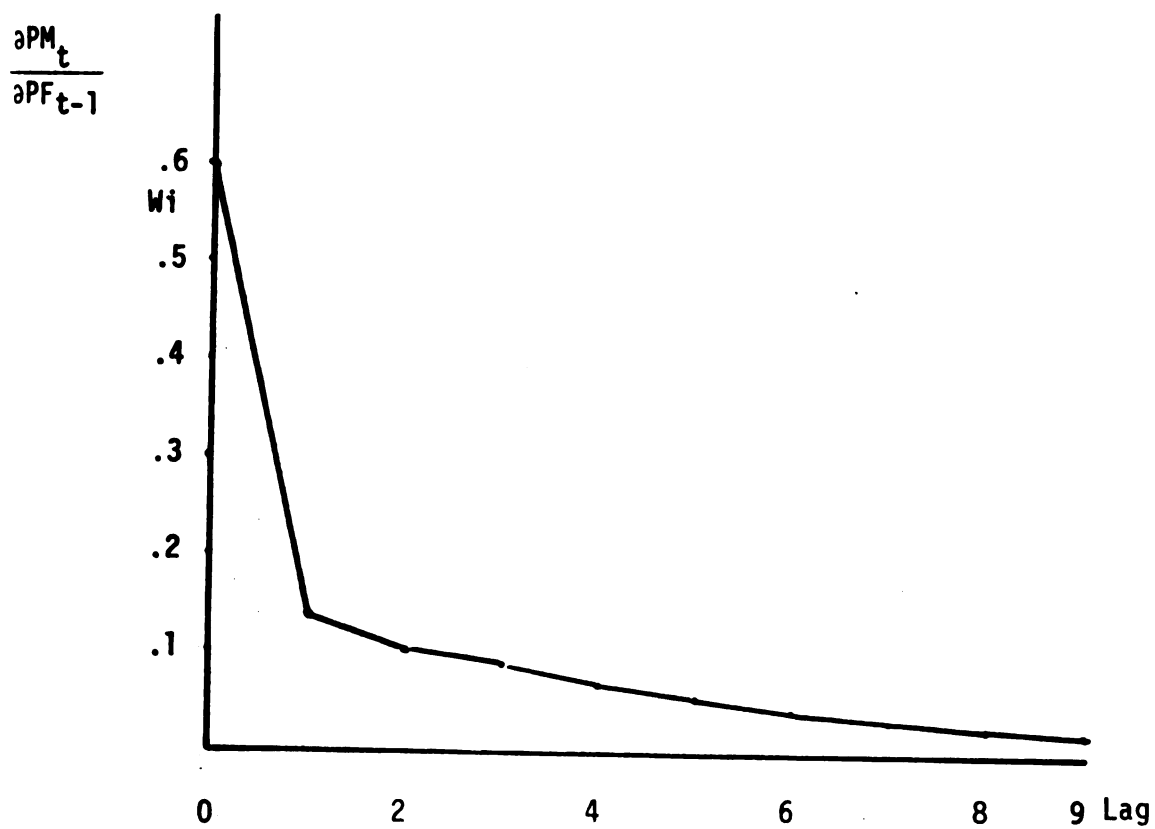


FIGURE 33

TIME-PROFILE OF EFFECT OF DOLLAR IMPORT PRICES ON
FINNISH IMPORT PRICES: DOUBLELOGARITHMIC
EQUATION

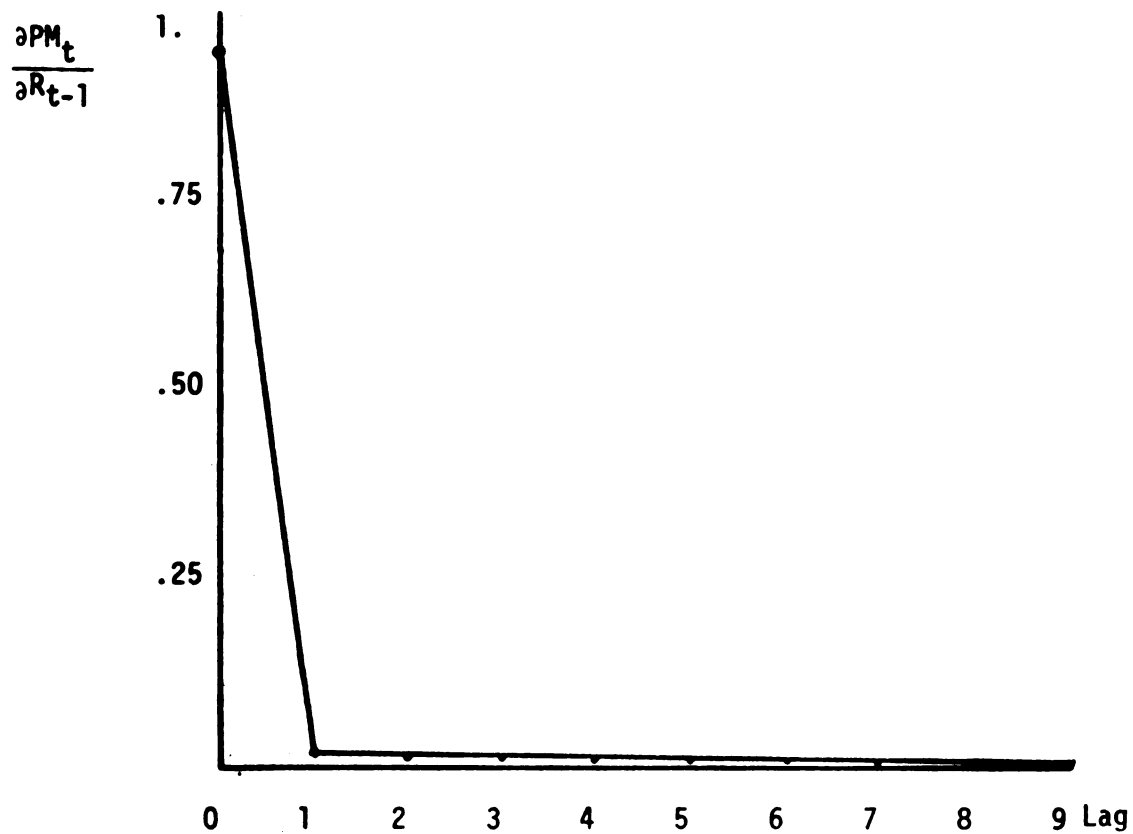


FIGURE 34

TIME-PROFILE OF EFFECT OF EXCHANGE RATE ON
FINNMARK IMPORT PRICES: DOUBLELOGARITHMIC
EQUATION

approximately 97 per cent of the devaluation had been passed on.

Expression b contains two partial derivatives, VM_{pm} and PM_r . The latter partial, which considers the effect of devaluation on the domestic price of imports, has just been examined. Now the analysis will consider VM_{pm} , which examines how a change in the domestic price of imports will affect the country's foreign currency import bill. A simplifying assumption that will be made is that Finland faces a perfectly elastic import supply curve. Since Finland imports only 2 per cent of total OECD exports, that assumption is a reasonable one. The effect of the assumption is that the foreign price of Finland's imports will not change because of the devaluation. Any decrease in the quantity imported will be therefore translated to a reduction in VM.

In equation form,

$$(20) \quad VM = VM(PF, QM)$$

where VM and PF are defined as before, and QM is the quantity of imports.

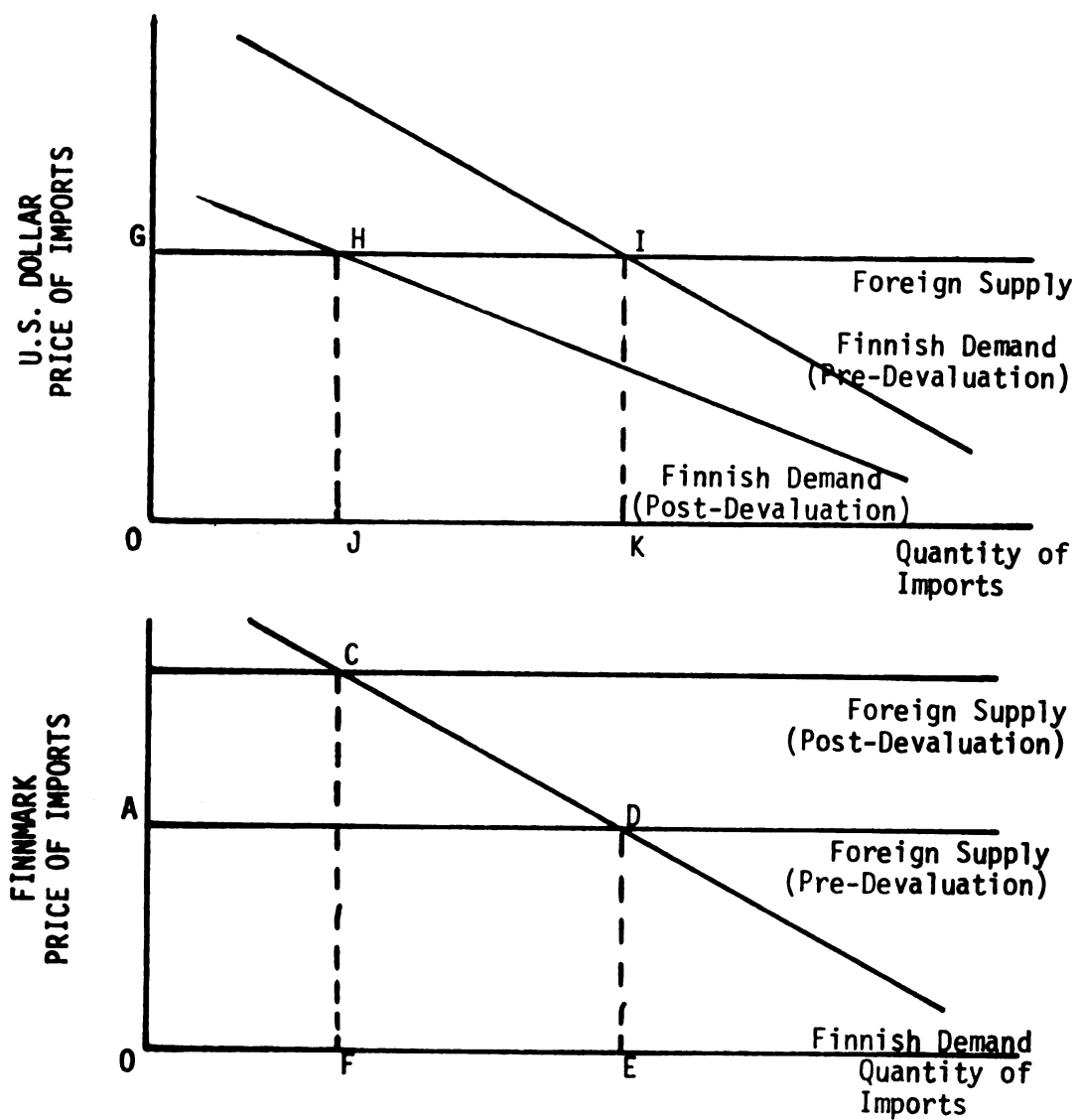
Totally differentiating the equation gives

$$(21) \quad dVM = VM_{pf} dPF + VM_{qm} dQM$$

Since in Finland's case the assumption is $dPF = 0$, the equation reduces to

$$(22) \quad dVM = VM_{qm} dQM$$

This situation is depicted in Figure 35. The quantity of imports is plotted on the horizontal axes of both graphs, while on the vertical axis of the upper graph the dollar price of Finnish imports is plotted. The lower graph has the finmark price of imports on the vertical axis. The import supply curve is perfectly elastic in both graphs while the demand curve is downward sloping. In the lower graph we can examine the effect of the devaluation on the finmark value of imports, in the upper the effect on the dollar value of imports. Looking at the lower graph, we



Source: Mordechai E. Kreinin, International Economics: A Policy Approach (New York: Harcourt Brace Jovanovich, Inc., 1971), pp. 95-99.

FIGURE 35
THE EFFECT OF DEVALUATION ON FINLAND'S
OUTPAYMENTS FOR IMPORTS

see that the devaluation of the finnmak shifted the export supply curve up approximately 26 per cent, from price OA to OB. The Finnish demand schedule, expressed as a function of finnmaks, does not shift. Finnish consumption of imports therefore decreases from quantity OE to quantity OF, and the total value of imports expressed in finnmaks changes from OADE to OBCF. Whether OCBF is greater than, equal to, or less than OADE depends on the Finnish price elasticity of demand for imports. But the Finnish government is more interested in its foreign exchange position. This situation can be examined in the upper graph. Now the export supply curve, which is a function of dollar prices, does not shift, but the Finnish demand curve, which is a function of finnmak prices, shifts back. The decrease in quantity of imports shown as KJ in the upper graph is the same as that shown in the lower graph. The total dollar value of imports has, however, decreased from OGIJ to OGHK. The magnitude of the decrease in turn depends on the Finnish elasticity of demand for imports. In equation form, the problem can be generally stated as:

$$(23) \quad dVM = dPF \, dQM + dPF \, QM + PF \, dQM.$$

If the country faces a perfectly elastic import supply curve, $dPF = 0$, and the equation reduces to

$$(24) \quad dVM = PF \, dQM,$$

which can be put into more convenient form by dividing both sides by VM, so that we have

$$(25) \quad \frac{dVM}{VM} = \frac{PF \, dQM}{VM}.$$

But $VM = PF \, QM$, so that the equation becomes

$$(26) \quad \frac{dVM}{VM} = \frac{dQM}{QM}.$$

or, the percentage change in the dollar value of imports is equal to the percentage change in the quantity of imports. The percentage change in the quantity of imports is in turn equal to the percentage change in the Finnish price of imports multiplied by the Finnish elasticity of demand for imports, which is stated in equation form as

$$\% dQM = \% dPM N_m,$$

where N_m is the Finnish price elasticity of demand for imports. We already have examined the effect that the devaluation had on the domestic price of imports. To translate the price change to a change in quantity, the import elasticity of demand must be estimated.

Several regression models were used to estimate the price (and along with it, the income elasticity) of Finland's demand for imports. The basic model theorized that the demand for imports was a function of the domestic price of imports and the level of domestic income.²⁹ A number of different distributed lag models, along with models without a distributed lag, were estimated using quarterly data from the 1960-1971 period. A first hypothesis was that the explanatory variables, price and income, would each have their own distributed lag effect on the quantity of imports. On this basis, a doublelogarithmic equation was estimated of the form

$$(27) \log QM_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PM_t + B_5 \log PM_{t-1} \\ + B_6 \log YD_t + B_7 \log YD_{t-1} + B_8 \log QM_{t-1} + u_t$$

where B_1, B_2, B_3 are seasonal dummies, QM_t is Finland's imports in period t , in 1964 dollars, PM_t is the period t ratio of the Finnish

²⁹This is following Houthakker and Magee, op. cit., p. 112.

import price index to the Finnish wholesale price index,³⁰ and YD_t is the Finnish production index in period t . This model would have given a separate time profile to the income and price variables, but the "fit" of the equation was relatively poor and most of the estimates were insignificant at the .05 probability level. Consequently, the results of this equation were relegated to the Appendix.

A distributed lag model based on the habit persistence hypothesis gave somewhat better results.³¹ This model assumed that the log of the desired level of Finnish imports in period t , say QM_t^* , was a function of the log of relative import prices in period t and the log of the production index in period t and a disturbance, i.e.,

$$(28) \log QM_t^* = B_0 + B_1 \log PM_t + B_2 \log YD_t + u_{t1}.$$

It is hypothesized that the desired level of imports, QM_t^* , is related to the actual level of imports in the following manner:

$$(29) QM_t - QM_{t-1} = \alpha(QM_t^* - QM_{t-1}) + u_{t2}$$

where α is the adjustment coefficient which measures the rate of adjustment of the actual level of imports to the desired level, and u_{t2} is a disturbance. The adjustment coefficient will be greater than zero or less than or equal to 1. The less habitual is the purchase of imports, the greater α will be, i.e., the faster will be adjustment of the actual level of imports to the desired level of imports. Kmenta shows that this model can be estimated as

$$(30) \log QM_t = \alpha B_0 + \alpha B_1 + \alpha B_2 + \alpha B_3 + \alpha B_4 \log PM_t + \alpha B_5 \log YD_t + (1-\alpha) \log QM_{t-1} + u_t$$

³⁰Ibid.

³¹Jan Kmenta, *Elements of Econometrics* (New York: Macmillan Co., 1971) pp. 474-477.

where B_1 , B_2 , and B_3 are seasonal dummies. Equation 30 was estimated, using quarterly data, for the 1960-1967 pre-devaluation period, and for the 1967-1971 post-devaluation period.

The results of the regression for the pre-devaluation period are

$$(31) \log QM_t = 3.99815 + .04667 + .04932 + .04888 \\
\quad \quad \quad (.01979) \quad (.02765) \quad (.01773) \\
\quad \quad \quad -1.06168 \log PM_t + .71034 \log YD_t - .12943 \log QM_t \\
\quad \quad \quad (.52138) \quad (.32950) \quad (.20550) \\
\quad \quad \quad + e_t \\
R^2 = .864$$

$$h = \text{not defined},^{32} \text{ D.W.} = 1.7365$$

The numbers in parenthesis below the regression coefficients are the standard errors of the estimates. All estimates are significant at the .05 probability level, except B_4 and B_5 , which are significant at the .075 and greater than .15 level respectively. Decoding the equation, the adjustment coefficient is equal to .87057. Solving for the B s gives

$$B_0 = 4.59256$$

$$B_1 = .053608$$

$$B_2 = .068139$$

$$B_3 = .056147$$

$$B_4 = -1.219522$$

$$B_5 = .815948$$

B_4 and B_5 are respectively interpreted as the long-run price and income elasticities. The price elasticity of import demand is -1.22, and the income elasticity of import demand is .81. Since these

³²In this equation, the computation of h is not possible since it involves taking the square root of a negative number.

estimates are based on a statistically unreliable estimate of the adjustment coefficient, α , the elasticities themselves cannot be regarded as reliable. Moreover, the average lag of the equation is -.12 quarters, which has an unacceptable sign.

The results suggest that a distributed lag effect may not exist between the explanatory variables, PM_t and YD_t , and the dependent variable QM_t . To follow this tract, the following unlagged double logarithmic model was estimated using the same pre-devaluation data.

$$(32) \log M_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PD_t + B_5 \log YD_t + u_t$$

The results of this equation are

$$(33) \log QM_t = 3.55357 + .05409 + .05427 + .05318 - .94266 \log PM_t$$

$$(.01569) (.02611) (.01614) (.47951)$$

$$+ .62196 \log YD_t + e_t$$

$$(.29420)$$

$$R^2 = .86193$$

$$D.W. = 1.7365$$

All the estimates again are significant at the .05 probability level except the price coefficient which is significant at the .075 probability level and has the proper sign. The import price elasticity of demand is -.943 and the income elasticity of demand is .622.

Of the two estimates of price and income elasticities, those from the unlagged equation appear the most reliable. The evidence also suggests that there was not an important distributed lag effect in the operation of PM_t and YD_t on QM_t during the pre-devaluation period.

Similar regressions were run using quarterly data from the devaluation period, 1967-1970, on the theory that developments which accompanied the devaluation may have shifted the demand function. The habit persistence model was again estimated with the following results:

$$\begin{aligned}
 (34) \log QM_t = & .43039 + .05504 + .07640 + .09626 - .42815 \log PM_t \\
 & (.02249) (.02145) (.02368) (.31554) \\
 & + 1.09485 \log YD_t + .36269 \log QM_{t-1} + e_t \\
 & (.28159) (.16214)
 \end{aligned}$$

$$R^2 = .909$$

$$h = 1.6720$$

This model has a better fit. Again only the price variable has a coefficient not significant at the .05 probability level, in this case the .2 level. Decoding the equation, the coefficient of adjustment is .637. Solving for the Bs we have

$$B_0 = .67565$$

$$B_1 = .086405$$

$$B_2 = .119937$$

$$B_3 = .15111$$

$$B_4 = -.672135$$

$$B_5 = 1.71875$$

Again B_4 and B_5 are respectively interpreted as the long run price and income elasticities. The price elasticity of import demand is now estimated at $-.67$, which is, however, a statistically unreliable estimate. The estimate of the income elasticity of demand is 1.72 , a sizable increase from the $.62$ (unlagged) and $.81$ (lagged) estimates of the pre-devaluation period. The average lag for the post-devaluation period is $.57$ quarters. In this case it is computed from statistically reliable estimates, and it has the right sign. Still it is very small and suggests that a distributed lag effect may not have been important in the post-devaluation period. Table 21 and Figure 36 show the distributed lag effect of PD_t on QM_t , and Table 22 and Figure 37 show the same for the effect of YD_t on QM_t . The time profiles, Figures 36

TABLE 21

DISTRIBUTED LAG EFFECT OF FINNMARK IMPORT PRICES ON
QUANTITY OF IMPORTS

Lag (1)	PM_t R_t Constant (W_{t-1})
0	-.428 ¹
1	-.155
2	-.020
3	-.007
4	-.003
5	-.001
6	-.000
7	-.000
8	-.000
9	-.000

¹Estimated using a doublelogarithmic equation. The W_{t-1} are interpreted as elasticities.

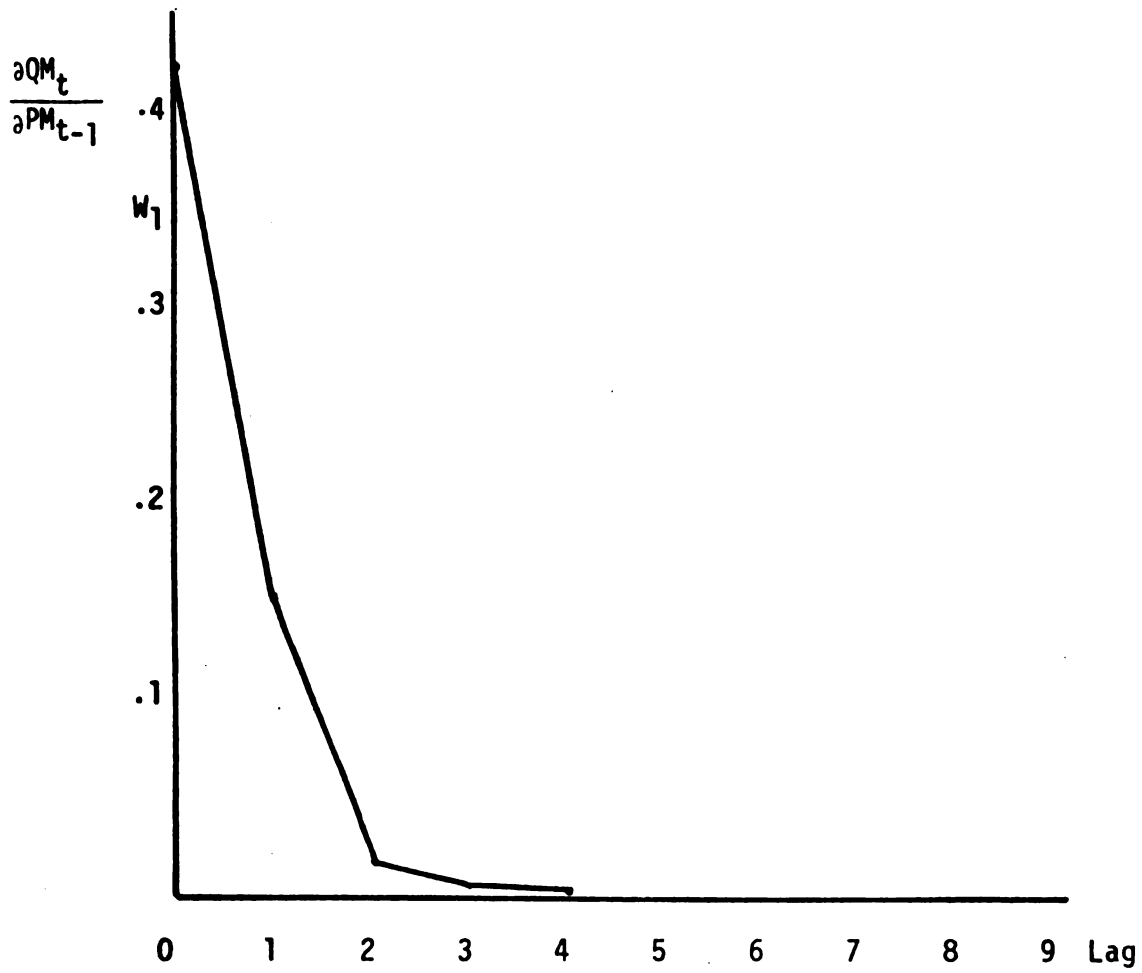


FIGURE 36

TIME-PROFILE OF EFFECT OF FINNMARK IMPORT PRICES
ON QUANTITY OF IMPORTS

TABLE 22

DISTRIBUTED LAG EFFECT OF FINNISH PRODUCTION ON
 QUANTITY OF IMPORTS HOLDING FINNMARK
 IMPORT PRICES CONSTANT

Lag (1)	$Q M_t$ $P M_t$ Constant W_{t-1}
0	1.090
1	.397
2	.144
3	.052
4	.019
5	.007
6	.003
7	.001
8	.000
9	.000

¹Estimated using a doublelogarithmic equation. The W_{t-1} are interpreted as elasticities.

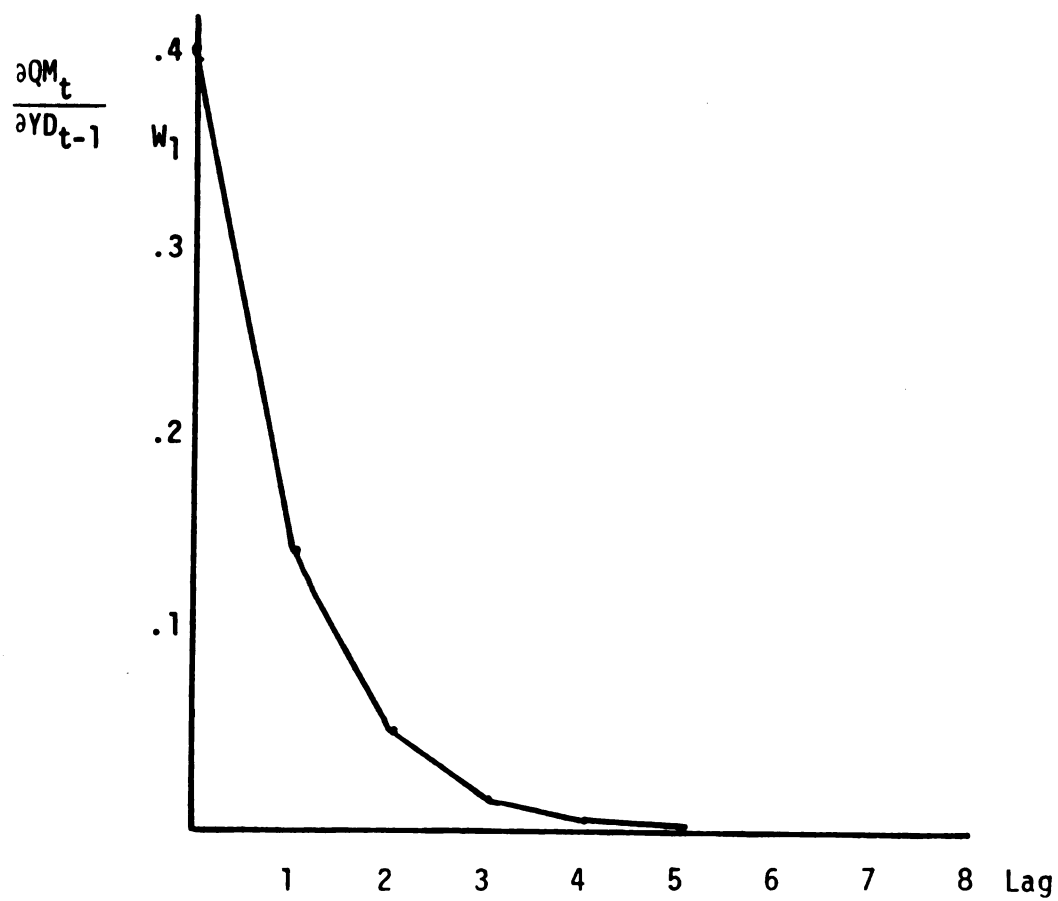


FIGURE 37

TIME-PROFILE OF EFFECT OF FINNISH PRODUCTION
ON QUANTITY OF IMPORTS

and 37, are weak. This model indicates that approximately 87 per cent of the total effect of an income or price change on the quantity of imports will be felt in two quarters.

Since the evidence suggests that a distributed lag effect may not have existed for the import demand equation, an unlagged model of the form

$$(35) \log QM_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PM_t + B_5 \log YD_t + u_t$$

was estimated with results as follows:

$$(36) \log QM_t = .78351 + .02247 + .08295 + .06211 - .41551 \log PD_t \\ (.01979) (.02454) (.02091) (.35433) \\ + 1.45576 \log YD_t + e_t \\ (.26650)$$

$$R^2 = .8681$$

$$D.W. = 2.54$$

All estimates are significant at the .05 probability level except for B_4 , the price coefficient, which is significant at the .25 probability level but has the proper sign. Since the reliability of the price coefficient of the distributed lag equation is greater than that of the unlagged equation, the former will be used to estimate the import quantity effects of a change in the price of imports. Comparing the equations of the pre and post-devaluation period indicates that there was a shift of the import demand function between the two periods. The elasticities estimated using data from 1967 to 1970 will be used to analyze the balance-of-payments effects of the devaluation.

Again it is useful to recall expression b from equation 16, $VM_{pm} PM_r dR$, which looks at how devaluation affects the foreign currency value of imports through the primary price effect. The percentage

change of the latter, VM, we have specified, will be equal to the percentage change in quantity, QM. Finland's long-run price elasticity of demand for imports has been estimated at $-.67$. The total long-run effect of a 26 per cent increase in the domestic price of imports would be to reduce the quantity of imports by 17.42 per cent, which, as long as the foreign price of Finland's imports remained constant, would translate into a 17.42 per cent decrease in dollar outpayments.

While this is the total long-run effect, it would be interesting to examine how rapidly this adjustment will take place. This information is available in Table 21. Sixty-four per cent of the long-run change in imports caused by a price change in period t will occur in period t . Another 23 per cent will occur in the following period, 3 per cent the next quarter, and 1 per cent the next. By the end of one year, it is therefore estimated that 91 per cent of the effect of an import price change would be felt in the Finnish economy. A 26 per cent change in import prices should therefore cause the volume of imports to fall by $.91$ multiplied by the total long-run elasticity. This translates to 15.85 per cent decrease in the volume of imports for 1968.

The next step is to estimate the change in the volume of imports due expressly to the devaluation. The hypothesis has been that the devaluation will affect the foreign currency value of imports through two distributed lag relationships: the first the distributed lag effect of the devaluation on domestic prices, and the second the distributed lag effect of prices on quantity demanded. In Table 23 these two effects are combined. In time period t , a one per cent devaluation will lead to a $.933$ per cent increase in the price of imports. A one per cent increase in import prices in turn would

TABLE 23

COMBINED DISTRIBUTED LAG EFFECTS OF
EXCHANGE ON PRICES AND PRICES
ON QUANTITY OF IMPORTS

Lag (1)	$\frac{\partial PM_t}{\partial R_{t-1}}$	$\frac{\partial QM_t}{\partial PM_{t-1}}$	$\frac{\partial QM_t}{\partial PM_t} \frac{\partial PM_t}{\partial R_t}$
0	.933 ¹	-.428 ¹	-.3990
1	.434	-.155	-.067
2	.035	-.020	-.0007
3	.029	-.007	-.000213
4	.023	-.003	-.00006
5	.019	-.001	-.000018
6	.015	-.0004	----
7	.015	-.0001	----
8	.012	-.00004	----
9	.010	-.00001	----

¹Estimated using a doublelogarithmic equation.

decrease the quantity of imports by .428 per cent. The combined effect of a one per cent devaluation in period t is then to reduce the quantity of imports by .399 per cent ($.933 \times .428$) in period t . We can see that 60 per cent of the effect occurs in period t . Another one per cent decrease in the quantity of imports will occur in period $t+1$, and from there the decreases are too small to be of practical use. The total effect of a one per cent devaluation on QM after a year would be approximately .41 per cent. The 26 per cent devaluation would lead to a 10.66 decrease in the volume of imports after one year. The total decrease in volume by the end of 1968 is estimated at 15.85 per cent. With 10.66 of the decrease accounted for by the devaluation, the remainder, 5.19 per cent, is attributed to other policy measures and exogenous foreign effects.

Another variable which will have a major effect on Finland's balance-of-payments is the level of Finnish income. The hypothesis is that there will be two income effects, one operating on the quantity of imports through the marginal propensity to import, the other on the capital account. Since quarterly data concerning the level of GNP or NNP was unavailable, the Finnish production index was used as a proxy. The movement of the production variable is affected by all three economic policy variables and by exogenous foreign economic activity. The devaluation would stimulate income by increasing demand for home production through relative price effects. An induced increase in the money supply would also tend to increase income. The discretionary use of contractionary fiscal policy, on the other hand, would tend to slow down the growth in income caused by the devaluation, while the easy monetary policy would tend to stimulate it. Additionally, an upturn

in foreign economic activity would increase Finnish exports and also stimulate Finnish income.

The technique here will be to look at the final change in Finnish income and estimate the effect it produced on the balance-of-trade. The change in the balance-of-payments due to a change in income can be expressed as $\frac{dB}{dYD} = VM_{yd} + K_{yd}$ where VM_{yd} is the effect of income changes on the trade balance and K_{yd} is the effect of income changes on the long-term capital account. The investigation will focus on the former effect, since the effect of domestic income on the net capital inflow was not estimated.

To measure the total affect of income on the volume of imports for the year following the devaluation, the total change in income during the year was multiplied by the income elasticity of demand for Finnish imports.

The total import reversal caused by increased income during 1968 is equal to:

$$\begin{aligned} (37) \quad & dYD_t (W_t + W_{t-1} + W_{t-2} + W_{t-3}) \\ & + dYD_{t+1} (W_t + W_{t-1} + W_{t-2}) \\ & + dYD_{t+2} (W_t + W_{t-1}) \\ & + dYD_{t+3} (W_t) \end{aligned}$$

where dYD_t is the change in the production index in period t , (I 1968) and W_t are $\frac{\partial QM_{t+1}}{\partial YD_t}$, 1 the lag, going from 0 to 4. Equation 17 can be

rewritten to show the quarterly change in the volume of imports due to changes in production:

$$\begin{aligned} (38) \quad & \text{I 1968: } dQM_t = dYD_t W_t \\ & \text{II 1968: } dQM_{t+1} = dYD_t W_{t-1} + dYD_{t+1} W_t \end{aligned}$$

$$\text{III 1968: } dQM_{t+2} = dYD_t W_{t-2} + dYD_{t+1} W_{t-1} + dYD_{t+2} W_t$$

$$\text{IV 1968: } dQM_{t+3} = dYD_t W_{t-3} + dYD_{t+1} W_{t-2} + dYD_{t+2} W_{t-1} \\ + dYD_{t+3} W_t$$

where dQM_t is the percentage change in the volume of imports in period t , dYD_t is the percentage change in income in period t , and W_t is the income elasticity in period t . The results of the equation are calculated to be:

$$\text{I 1968: } QM_t = +1.64\%$$

$$\text{II 1968: } QM_{t+1} = 2.24\%$$

$$\text{III 1968: } QM_{t+2} = -15.32$$

$$\text{IV 1968: } QM_{t+3} = \frac{19.05}{+7.61\%}$$

Where 7.61 per cent is the net increase in the volume of imports caused by Finnish income changes in 1968.

The net price and income effects on the volume of imports can now be stated. The increase in relative import prices are estimated to have reduced imports by 15.85 per cent, while the increase in domestic production was estimated to have increased import volume by 7.61 per cent, for a net decrease in volume of 8.24 per cent. The actual decrease in the volume of imports was 9.4 per cent,³³ leaving a 1.16 per cent decrease unexplained by the present estimates.

The study now turns to the export side of the trade balance. It has already been hypothesized that the devaluation had minimal effects on the formation of the dollar prices of Finland's exports. The effect

³³ Computed from IMF International Financial Statistics import volume index.

of foreign income on Finland's exports remains to be examined.

To measure the income elasticity of demand for Finnish exports, a number of regression models were estimated using quarterly data. Production indices were used as proxies for indices of income, since quarterly income data was not generally available. The 1960 to 1972 period was divided into pre-devaluation and post-devaluation subperiods. The results indicate that there was a shift in the export demand function for the two periods. Only the results of the post-devaluation period, 1967 to 1971, as the most relevant, are given here. The results of the pre-devaluation period, 1960 to 1967 may be found in the Appendix.

Following Houthakker and Magee, it was hypothesized that the quantity of Finland's exports was a function of their foreign currency price and the level of foreign income. The first hypothesis was that the P and Y variables would affect the volume of exports thru a distributed lag relationship. On this basis, the following model was estimated for the 1967-1971 period:

$$(39) \log QX_t = \alpha D_0 + \alpha D_1 + \alpha D_2 + \alpha D_3 + \alpha D_4 \log PX_t + \alpha D_5 \log YF_t \\ + (1-\alpha) D_6 \log QX_{t-1} + u_t$$

where QX_t is Finland's exports in 1964 dollars, D_1, D_2, D_3 are seasonal dummies, PX_t is an index of the relative foreign price of Finnish exports formed by dividing the dollar price index of Finnish exports by an index of the export prices of its fifteen major Western trading partners,³⁴ YF_t

³⁴Again following Houthakker and Magee, the index was obtained in two steps. First a price index constructed for each of fifteen countries (Finland's major export markets) to the other fourteen countries weighted by each exporters 1964 share in that market. The 15 indexes thus formed were weighted by the share of Finland's exports going to that market and combined.

is an index of foreign income, and QX_{t-1} is the dependent variable lagged one period. The results of the regression are

$$\begin{aligned}
 (40) \log QX_t &= .21056 + .08236 + .12401 + .07117 \\
 &\quad (.03257) (.01552) (.01833) \\
 &\quad - .24354 \log PX_t = 1.27315 \log OF_t + .20470 \log QX_{t-1} \\
 &\quad (.032442) (.43455) (.30361) \\
 &\quad + e_t \\
 R^2 &= .9704 \\
 h &= 1.6067
 \end{aligned}$$

The fit is relatively good, and all estimates are significant at the .05 probability level except for D_6 , the estimate of the coefficient of adjustment, α , ($D_6 = 1 - \alpha$). Solving the equation for the D_s gives

$$\begin{aligned}
 D_0 &= .26475 \\
 D_1 &= .10356 \\
 D_2 &= .15593 \\
 D_3 &= .08949 \\
 D_4 &= -.30622 \\
 D_5 &= 1.60084
 \end{aligned}$$

where D_4 is interpreted as the long-run price elasticity of demand for Finnish exports, and D_5 is the long-run income elasticity of demand for Finnish exports. Since the estimate of α is unreliable, the elasticity estimates are also unreliable. The distributed lag effect is shown in Table 24. The average lag of the estimate is .257 quarters, very short, which goes along with the weak time profile apparent in the table. Eighty per cent of the total income effect occurs in the period in which it occurred, and another 16 per cent occurs by the end of the following quarter.

TABLE 24

DISTRIBUTED LAG EFFECT OF FOREIGN INCOME
ON FINNISH EXPORTS

Lag (1)	$\frac{DX_t}{W_{t-1}} \mid PX_t \text{ Constant}$
0	1.27315 ¹
1	.26061
2	.05370
3	.01099
4	.00225
5	.00040
6	.00009
7	.00002
8	.00000
9	---

¹Estimated using a doublelogarithmic equation. The W_t are interpreted as elasticities.

In view of the weak time profile, an unlagged equation was estimate using the same data. The equation again was of double logarithmic form, as follows:

$$(41) \log QX_t = D_0 + D_1 + D_3 + D_4 \log PX_t + D_5 \log YF_t + u_t$$

where all the variables are defined as before. The results of this regression are

$$(42) \log QX_t = .03001 + .06168 + .13108 + .06181 \\ (.01066) (.01113) (.01163) \\ - .12688 \log PX_t + 1.55360 \log OF_t + u_t \\ (.26683) (.12228)$$

$$R^2 = .970$$

$$D.W. = 2.2598$$

The coefficient of the relative export price variable, D_4 , is the only estimate not significant at the .05 probability level. The income (production) elasticity of demand is estimated as 1.5536. This elasticity can now be used to estimate the exogenous increase in Finnish exports caused by increased production in her export markets. The estimate of the production elasticity of demand for Finland's exports is 1.5536. The increase in the foreign production index for 1968 was 10.25 per cent, which, based on the elasticity estimate, would cause a 15.92 per cent increase in the volume of Finland's exports. The actual increase was approximately 12 per cent. During the year, however, the relative dollar price of Finland's exports increased by approximately 4 per cent. On the basis of the estimated price elasticity (-.12688) this might be expected to reduce exports by .5 per cent. Although these estimates are 3.5 per cent above the actual change in the volume of exports, they do make it evident that much of the improvement in Finland's balance-of-payments came from income changes beyond the

country's control.

The question may be asked whether Finnish exporters could have met this increase without the devaluation which allowed them to raise the finmark price of exports and thus move up their supply curves. Finnmark export prices had, in fact, increased approximately 26 per cent by the end of 1968. The answer to this question is probably that enough slack existed in the export sector at the time of the upturn of foreign economic activity to have enabled exports to increase some amount without an increase in their finmark price. But the devaluation did ease the problem of increasing productivity by allowing exporters to receive higher finmark prices.

If the Finnish export supply elasticity were known, it could be used to estimate the increase in the volume of exports made possible by the devaluation. Several export supply equations were estimated, but the results were poor. The equations and the results are contained in the Appendix. The estimates of the elasticity of supply varied from .12 to .53. If they encompass the possible range, it means that the 26 per cent increase in the finmark price would have elicited anywhere from 3.12 to a 13.78 per cent increase in the quantity of exports supplied.

Summary

Three factors are apparent from the foregoing analysis. The first is that the effects of changing the international price of the finmark were transmitted very quickly to the Finnish economy. Finnmark import prices rose by the whole amount of the effective devaluation, and approximately 97 per cent of the total change in import prices due to the

devaluation occurred within two quarters. In addition, there was only a short lag in the adjustment of the quantity of imports to the change in finnmark import prices. In two quarters 87 per cent of this adjustment is estimated to have taken place.

The second is that much of the success of the devaluation was due to a fortuitous turn of events beyond Finland's control. Had not an upturn in foreign economic activity occurred simultaneously with the devaluation, approximately one-half of the improvement in Finland's balance-of-payments might not have materialized. How successful price cuts might have been in stimulating export sales under less favorable circumstances is a moot question, but the evidence on this point is not encouraging.³⁵

And finally, Finland was able to keep firm control of the post-devaluation economy to prevent inflation and sharp increases in income from excessively reducing the newly-gained price advantages. A strict incomes policy worked for the country because of the cooperation given to the government by management and labor.

³⁵The price elasticity of demand for Finnish exports was estimated to be $-.12$. This figure is much lower than might be expected on a priori grounds. For a discussion of the relation between a country's share in world export markets and the price elasticity of demand for its exports, see Kreinin, International Economics: A Policy Approach, p. 354.

Chapter 5

DENMARK

Introduction

The National Bank of Denmark and, to a much lesser degree, the Treasury are responsible for conducting Danish monetary policy. The present National Bank has its legal basis in the Act of April 7, 1936, which changed the institution from a privately owned joint-stock bank to a self-governing public institution. The bank is controlled by a Board of Directors, a Committee of Directors, and a Board of Governors. Representatives of Parliament, the Crown, industry, trade, and labor sit on the twenty-five member Board of Directors which recommends over-all bank policy. Seven members from the Board in turn form the Committee of Directors which is responsible for the day to day implementation of policy. Two of these members are chosen by the Minister of Economic Affairs, while the remaining five are elected by the Directors themselves. Highest authority rests with the three-member Board of Governors. The Crown appoints the chairman of the Board of Governors, and the Board of Directors elects the remaining two. It is the Board of Governor's responsibility to set the discount rate and the other rates of interest charged by the National Bank. Denmark also has 160 commercial banks and 450 savings banks. Other financial institutions include mortgage societies, insurance companies, and the stock exchange.

The National Bank functions as banker to the central government. Its two principle monetary tools are the discount rate and open market operations. The Bank does not have the legal power to vary minimum reserve requirements, but since 1965 has maintained voluntary agreements with the commercial and savings banks to control reserve levels. The size of the money supply is determined mainly by National Bank lending, by its dealings in foreign exchange, and by the balances in its government accounts. Along with the National Bank, the Treasury may also conduct open market operations.

The interest rates of the commercial and savings bonds normally follow discount rate changes. Traditionally, the financial assets of the commercial banks consist to a large degree of relatively liquid central government, local government, and mortgage society bonds, and National Bank Certificates of Deposit. Traders surrender foreign exchange to the National Bank or licensed foreign exchange dealers, i.e., those commercial banks and brokers who are members of the Copenhagen Stock Exchange.

Policy Instruments

Open Market Operations

Both the National Bank and the Treasury may engage in open market operations, but they do so normally with different objectives. Short-run fluctuations in the bond market are traditionally dampened by National Bank intervention, while the capacity of the banks to extend credit has been modified through Treasury intervention. Treasury bills are convertible securities with a maturity of 5 years or less.

Discount Rate

The discount rate is one of the National Bank's major monetary tools. Since 1950, the discount rate has been changed nineteen times. Commercial and savings banks normally adjust their own interest rates in accordance to the discount rate changes.

National Bank Lending

The National Bank lends by rediscounting commercial bills of exchange, by lending against Treasury bills, central and local government bonds, deposit receipts, stocks, shares and a number of other less important securities. It can also create credits by adjusting the payment time of government taxes and charges which come through the commercial banks. The banks mainly borrow from the National Bank by mortgaging deposit receipts and by using the credit facilities involved in the handling of government accounts. Credit is created in the latter case by delaying the transfer to the National Bank of government taxes and other charges which have been collected in the commercial bank. During periods of tight money the rediscounting of commercial bills of exchange and mortgage bonds becomes more frequent.

Minimum Reserve Requirements

A voluntary agreement with the commercial and savings banks reached in 1965 requires the banks to deposit with the National Bank 20 per cent of any increase in their deposits. To avoid a credit expansion based on foreign short-term borrowing, the National Bank also required the banks to deposit with the Central Bank 100 per cent of any increase in their net foreign borrowing. Other than this agreement, the National Bank has no power to manipulate minimum reserve requirements, and has not in fact used the instrument.

Statistical Analysis

Quarterly data concerned with balance-of-payments' surpluses or deficits, by any definition, was not available for Denmark. This is not a serious shortcoming for Danish analysts most often speak of the international reserve position of the country when discussing the external situation. The level of international reserves therefore has been chosen to represent Denmark's external position. As in the case of Finland, only the reserves possessed by the National Bank have been used, the justification for which is twofold: First, examination of the level of reserves held by licensed exchange dealers showed their magnitude to be small when compared to National Bank holdings. Second, although international reserves held by the commercial banking system certainly can be counted as part of Denmark's foreign exchange position, monetary officials stress National Bank official holdings most often when discussing the external situation.

The time-series of the level of international reserves exhibited cyclical behavior, thus lending itself to both methods of analysis used previously for Finland. Prior information, supplied by statements of policy-makers, suggested that before 1958, most National Bank policy was directed toward the external position, and that since 1958, the level of reserves has risen enough to allow more flexible monetary policy. This may suggest external balance was viewed by the authorities as a constraint in the achievement of certain domestic economic goals and not as a distinct goal in itself. This hypothesis and its implications along with the alternative thesis that balance in the country's external accounts was itself a goal will be investigated in the following analysis.

The international reserves time-series data was divided into 17 subperiods of disturbances. A disturbance is a period of time in which the series either clearly rises, falls, or remains stable. By comparison, the Finnish time-series exhibited 18 such subperiods.

The policy variables examined are National Bank domestic assets, the discount rate, commercial and savings bank credit expansion, the money supply, the budgetary balance, and the interest rate on short-term government bonds. The latter variable was used as a proxy for open market operations since quarterly data on Treasury and National Bank security sales and purchases was not available.

Several models of adjustment with respect to these variables were experimented with. The experimentation was guided foremost by the statements of policy-makers as to which model or models they deemed most important, and, secondly, by the characteristics of the time-series, as explained earlier in the study. The models of reaction subsequently settled on are the direction of change for the National Bank's domestic assets, the direction of change of the discount rate, the direction of change of other interest rates, the rate of change in per cent of both commercial and savings bank credit expansion and the money supply, and whether the budget was in surplus, deficit, or balance. The models will be discussed and defended in greater detail as the analysis comes to them.

The available data did not subdivide National Bank's domestic claims into fine categories. Prior to 1957 National Bank claims are divided into only two groups: claims on the government and claims on the nongovernment, the latter including credit extended to the banking

TABLE 25

MOVEMENT OF POLICY VARIABLES DURING DISTURBANCES
IN LEVEL OF INTERNATIONAL RESERVES

(1)	(2)	(3)	(4)
Period ¹	International Reserves ²	Bank of Denmark Claims on Banks ³	Bank of Denmark Net Claims on Government ⁴
I 1950 - I 1951	stable		no trend
I 1951 - IV 1952	rises		rises +
IV 1952 - II 1953	stable		
II 1953 - I 1954	rises		no trend
I 1954 - II 1955	falls		rises -
II 1955 - IV 1955	rises		rises +
IV 1955 - I 1957	falls		falls +
I 1957 - IV 1959	rises	rises +	falls -
IV 1959 - III 1960	falls	rises -	falls +
III 1960 - I 1961	rises	falls, rises no trend	falls -
I 1961 - III 1961	falls	rises, falls no trend	rises -
III 1961 - II 1962	rises	no trend	rises +
II 1962 - I 1963	stable	rises	no trend
I 1963 - IV 1964	rises	falls, rises, falls, no trend	falls
IV 1964 - III 1965	falls	rises, falls no trend	rises
III 1965 - I 1966	rises	rises +	no trend
I 1966 - III 1969	falls	rises, falls, rises	rises -

TABLE 25 (cont'd.)

(1)	(5)	(6)	(7)
Period ¹	Bank of Denmark Claims on Non-Government ⁵	Bank of Denmark Total Domestic Claims ⁶	Commercial & Savings Banks Claims on Private Sector ⁷
I 1950 - I 1951	rises -	falls	
I 1951 - IV 1952	rises +	rises +	falls -
IV 1952 - II 1953		falls	rises
II 1953 - I 1954	rises +	stable	falls
I 1954 - II 1955	rises, falls no trend	rises -	falls +
II 1955 - IV 1955	falls, rises no trend	rises +	rises +
IV 1955 - I 1957	falls +	falls +	rises -
I 1957 - IV 1959		falls -	rises +
IV 1959 - III 1960		stable	rises -
III 1960 - I 1961		stable	rises +
I 1961 - III 1961		stable	falls +
III 1961 - II 1962		stable	rises +
II 1962 - I 1963		no trend	falls
I 1963 - IV 1964		rises +	rises +
IV 1964 - III 1965		rises -	falls +
III 1965 - I 1966		rises +	rises +
I 1966 - III 1969		rises -	rises -

TABLE 25 (cont'd.)

(1) Period ¹	(8) Government Finance ⁸	(9) Money Supply ⁹	(10) Discount Rate ¹⁰
I 1950 - I 1951		falls	rises
I 1951 - IV 1952		rises +	stable
IV 1952 - II 1953		falls	stable
II 1953 - I 1954		rises +	falls +
I 1954 - II 1955		falls +	rises twice +
II 1955 - IV 1955		rises +	stable
IV 1955 - I 1957		stable	stable
I 1957 - IV 1959	surplus -	rises +	falls, rises
IV 1959 - III 1960	surplus +	falls +	rises +
III 1960 - I 1961	surplus -	rises +	stable
I 1961 - III 1961	deficit -	falls +	rises +
III 1961 - II 1962	deficit +	rises +	stable
II 1962 - I 1963	surplus	falls -	stable
I 1963 - IV 1964	surplus -	rises +	falls, rises
IV 1964 - III 1965	surplus +	falls +	stable
III 1965 - I 1966	surplus -	rises +	stable
I 1966 - III 1969	surplus +	falls +	rises, falls, rises + (rises most)

TABLE 25 (cont'd.)

(1)	(11)	(12)
Period ¹	Government Bonds Yield ¹¹	Government Finance ¹²
I 1950 - I 1951	rises	
I 1951 - IV 1952	stable	
IV 1952 - II 1953	falls	
II 1953 - I 1954	stable	
I 1954 - II 1955	rises +	
II 1955 - IV 1955	rises -	
IV 1955 - I 1957	rises +	
I 1957 - IV 1959	falls, rises	surplus
IV 1959 - III 1960	rises -	surplus, increase +
III 1960 - I 1961	stable	surplus, increase -
I 1961 - III 1961	rises +	deficit -
III 1961 - II 1962	stable	deficit decreases
II 1962 - I 1963	riese	surplus
I 1963 - IV 1964	falls, rises	surplus decreases +
IV 1964 - III 1965	rises +	surplus decreases -
III 1965 - I 1966	stable	surplus increases -
I 1966 - III 1969	rises +	surplus decreases -

¹Period of disturbance in
international reserves

²Direction of change

³Direction of change

⁴Direction of change

⁵Direction of change

⁶Direction of change

⁷Percent rate of
change

⁸Deficit or surplus

⁹Percent rate of
change

¹⁰Direction of change

¹¹Direction of change

¹²Direction of change

Sources: Various issues of IMF International Financial Reserves, OECD Main Economic Indicators, and United Nations Balance-of-Payments Yearbook.

system. Since 1957, the series has been divided into claims on the government and claims on the banks.

National Bank claims on the nongovernment, column 3, Table 25 moved in an adjusting direction with respect to external disturbances in three of the seven subperiods from 1950 to 1957. In two subperiods the level of international reserves remained stable, calling for no adjustment. In one of these the variable rose and in the other, data was not available. In two other of the subperiods this variable exhibited no trend. The only clearly-definable movements were, therefore, adjusting; but they occurred in only three of the seven subperiods studied.

National Bank's claims on the banks, column 3, Table 25, moved in an adjusting direction in two of the 10 subperiods since 1957. In only one subperiod did this variable move in an offsetting direction. In the remainder, and by far the majority of subperiods, the variable exhibited no trend. Lagging the variable one and two quarters did not resolve the "no trend" behavior with respect to the payments' disturbances.

National Bank's claims on the government, column 4, Table 25 present a clearer picture of behavior. In the seventeen subperiods since 1950, this variable moved in an adjusting direction five times and in a disadjusting direction seven times. Prior to 1958, it moved in an adjusting direction 3 times and in a disadjusting direction twice. Since 1958, the variable has moved twice in an adjusting direction and five times in a disadjusting direction.

National Bank's total domestic claims, column 6, Table 25, represents the Bank's aggregate domestic credit position and is the sum of

the two foregoing variables. Changes in this series were dominated by changes in claims on the government. Total domestic claims moved in an adjusting direction in five of the seventeen subperiods since 1950 and in a disadjusting direction four times. It remained stable in four subperiods when the external situation called for change. Based on the above analysis, the conclusion was reached that none of the Central Bank claims on the domestic economy were used consistently in the period under investigation as a balance-of-payments adjustment instrument.

Changes in the discount rate, column 10, Table 25, are examined next. As is readily apparent from the table, in no instance did the discount rate move in a disadjusting direction with respect to the external situation. The discount rate was changed 19 times since 1950. In two cases the discount rate both rose and fell during a disturbance in the level of international reserves. For these periods the judgment was omitted as to whether it was adjusting or disadjusting. In the downward disturbance of I 1966 to III 1969, the discount rate was lowered in three consecutive quarters in 1968 only to be raised again, more sharply than it had been reduced, in 1969. Investigation of this behavior revealed that policy-makers wished to keep interest rates low to encourage the investment necessary in the export and import substitute industries if the economy was to adjust to the 1967 devaluation. At the same time fiscal policy was tightened to avoid inflationary pressure. The case is interesting in that it reverses the so-called policy mix which directs monetary policy toward the external situation while reserving fiscal policy for the domestic. Prior to this period, however, discount rate policy appears to have been directed towards the external situation. Later in the study it will be seen whether

this behavior might be explained by the position of alternative target variables.

The yield on short-term government bonds, column 11, Table 25 followed the movement of the discount rate rather closely. In five of the 17 subperiods it moved in an adjusting direction. In two it moved in an offsetting direction. Three of the remaining subperiods were periods of external balance and called for no adjustment. In two of these periods the yield rose; in one it fell. In the remaining seven subperiods, the rate was stable in five and exhibited no trend in two. The evidence would seem to indicate that interest rates, as represented by the yield on short-term government bonds, were seldom used as balance-of-payments adjustment instruments.

The preceding policy instruments were those more or less under the direct control of the National Bank. The policy instruments to which we turn next are affected only indirectly by the Central Bank.

The time-series of commercial and savings bank credit expansion increased monotonically. The rate of change in the expansion of bank credit therefore provided the most meaningful model of reaction. A decrease in the rate of change of credit expansion is considered an adjusting reaction to a falling reserve level, while an increase in the rate of change of credit expansion is an adjusting reaction to a rising level of international reserves. The behavior of this variable is summarized in column 7, Table 25. In nine of the seventeen subperiods since 1950, commercial and savings bank credit to the private sector moved in an adjusting direction. In five of the subperiods it moved in a disadjusting direction. In the other three subperiods, the level of reserves was stable, calling for no policy action. In one of these

bank credit rose, in one it fell, and in one, which occurred in early 1950, bank credit data was not available. The first evidence indicates that commercial and savings bank credit expansion moved in an adjusting manner over half the time and in an offsetting manner less than one-third the time. Moreover, since III 1960, this variable responded in an adjusting manner in six out of eight subperiods, and in a disadjusting direction only once. The primary evidence would then indicate that this variable responded reasonably consistently in an adjusting direction to the external situation in the latter half of the period under investigation. Before a final conclusion can be reached, however, the other economic target variables must be examined.

The time-series for the money supply, column 9, Table 25, also exhibited secular expansion and, therefore, lent itself best to the rate of expansion model of reaction. From the table it can be seen that the money supply responded in an adjusting manner in 13 of the 17 subperiods since 1950. In no subperiod did it move in an offsetting direction to payments' disequilibria. In the three subperiods where the level of international reserves remained stable, the rate of expansion fell. These stable periods came between upward disturbances in the level of international reserves, and the observed reaction of the money supply indicates that the authorities may have regarded stable periods the same as downward disturbances. Although the reaction of the money supply was symmetrical in the sense that it reacted in an adjusting manner to both upward and downward disturbances in the reserve level, the fact that it contracted when the level of reserves remained stable may indicate a slightly asymmetrical reaction biased in favor of reserve accumulation. Reaching such a conclusion on

the basis of three observations is, however, admittedly risky. Other than that, the evidence thus far strongly supports the hypothesis that the money supply moved consistently in an adjusting direction with respect to payments' disequilibria. Later analysis will investigate whether the movement of alternate economic target variables might also account for this behavior, i.e., whether consistent situations normally, or often, prevailed.

The budgetary balance is next examined. Two models of reaction were investigated for this variable. The behavior of the first, whether the budget was in surplus or deficit in the subperiod in question, is summarized in column 8, Table 25. The second model incorporated the direction of change of government finance as the dependent variable, and its performance is summarized in column 12. Quarterly data concerning budgetary balance was not available until 1957.

In the first reaction model, a budgetary surplus is considered an adjusting reaction to a negative disturbance in the level of international reserves, and a budgetary deficit is considered an adjusting reaction to a rising level of international reserves. In the 10 subperiods since 1957, the variable moved in an adjusting direction four times and in a disadjusting direction five times. In the one subperiod when the level of international reserves remained stable, the budget was in surplus.

The second reaction model requires that a deficit budget only become less of a deficit to adjust to a negative disturbance in the balance-of-payments, and that a budgetary surplus only becomes less of a surplus to adjust to a positive disturbance in the level of

international reserves. Using this model we must give up the first observation. In the nine subperiods after, the variable moved in an adjusting direction twice, and in a disadjusting direction six times. The variable moved from a deficit to a surplus during the subperiod in which the level of international reserves remained constant. The primary evidence would therefore indicate that the budgetary balance was not used as a balance-of-payments adjustment instrument.

In summary, the preliminary analysis indicates that two policy variables, the discount rate and the money supply, consistently moved in an adjusting direction with respect to disturbances in the balance-of-payments. Another policy variable, commercial and savings bank credit expansion, moved in an adjusting direction with respect to the external situation during approximately half of the subperiods investigated. The first examination of the data also reveals that the Bank of Denmark appeared to regard periods of stable international reserves the same as periods of declining reserves. In this sense, the rate of growth of the money supply declined both during periods of stable reserves and during periods of declining reserves. No firm conclusions can yet be drawn, however, since the possibility that the policy variables were responding to other targets has not been investigated. Such investigation will occur later.

Reference Cycle Analysis

The same evidence will now be analyzed using the technique of reference cycle analysis. Denmark's level of international reserves exhibits cyclical behavior, thus lending itself well to this type of investigation. The method of analysis is complementary to the first

in that it is less sensitive to short-run changes, but because the typical reference cycle spans a number of years, it may reveal long-run relations concealed by the first method. Four reference cycles were observed in the period from 1950 to 1970. Table 26 gives the reference dates of these cycles. The length of the cycle ranged from 4 to 6 years with the average length approximately 4-1/2 years.

Figure 38 shows the performance of the discount rate during the international reserves reference cycle. Again the discount rate exhibits a generally-adjusting pattern of change with respect to the external situation. In three of the four contractionary phases of the cycle, the discount rate increases, while in the fourth, it remains stable. In the expansionary phases of the reference cycles, the evidence points to roughly the same conclusion, though it is not as clear. In the first expansionary phase, the discount rate fell, which is clearly an adjusting reaction to a balance-of-payments surplus. In the expansionary phase of the second reference cycle, the discount rate first fell but then rose. It does not rise to its original level, however, until after the peak of the cycle is reached and reserves begin to fall. One possible interpretation is that the first adjusting decrease of the rate was considered excessive, and the authorities, therefore, raised it slightly but not to its former level. In the third expansionary phase, the pattern is the same, though the rate was not raised until the peak was reached. During the fourth reference cycle, the discount rate remained stable during the expansionary phase. The evidence would appear to corroborate the earlier findings that the discount rate did respond in an adjusting direction to external disequilibria.

TABLE 26

INTERNATIONAL RESERVES REFERENCE

CYCLE DATES

Trough	Peak	Trough
I 1951	I 1954	I 1957
I 1957	IV 1959	III 1961
III 1961	IV 1964	III 1965
III 1965	I 1966	III 1969

Sources: Various issues of IMF International Financial Statistics.

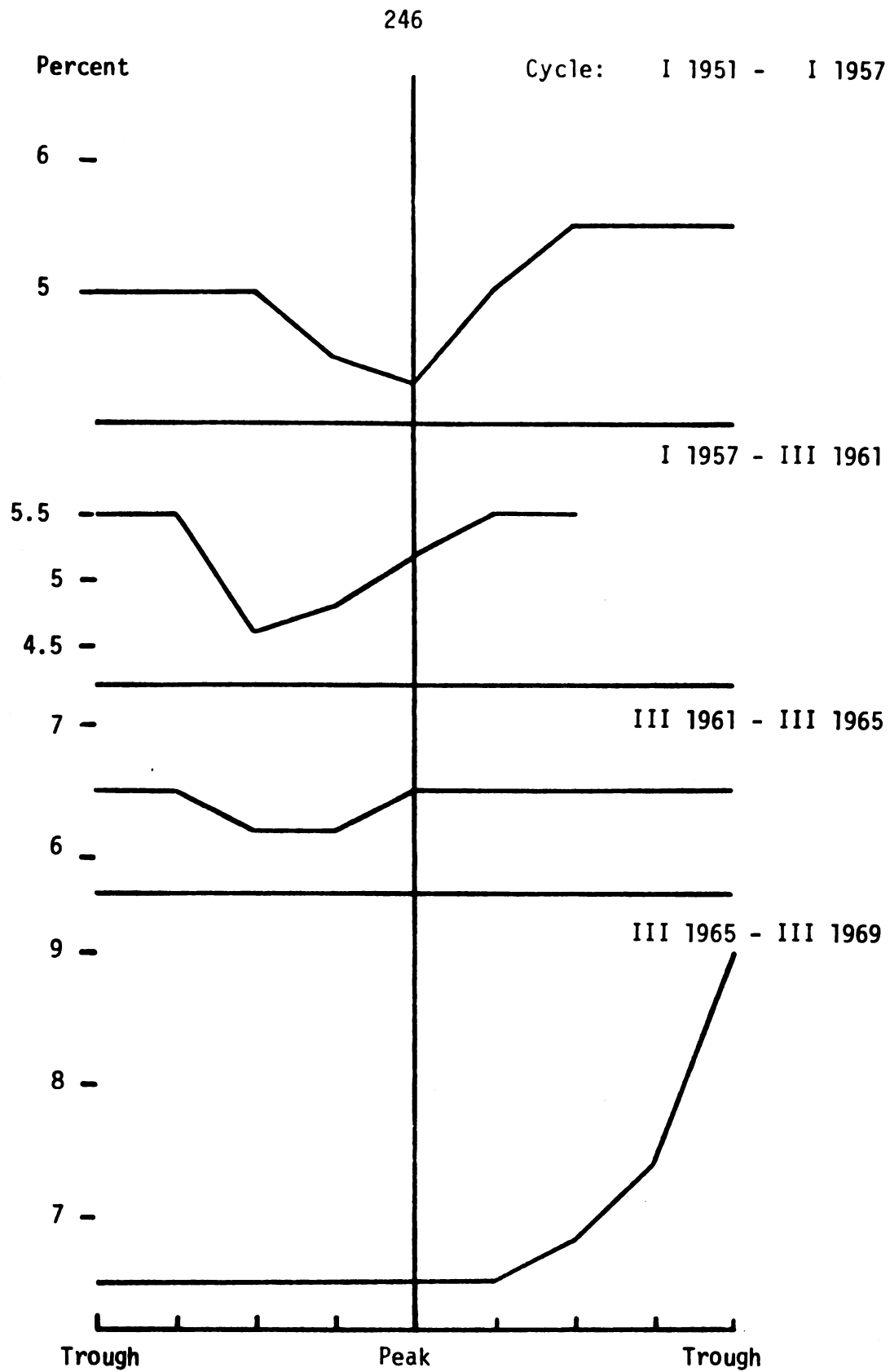


FIGURE 38

DISCOUNT RATE DURING INTERNATIONAL RESERVES REFERENCE CYCLE

Figure 39 shows the behavior of the yield on Government Bonds during the international reserves reference cycle. The pattern of reaction of this variable is asymmetrical. It rises without exception when reserves are falling, but it does not always fall when the level of reserves is increasing. In the first expansionary phase, the variable rises for a period and then falls. In the second expansionary phase, the rate falls rather steeply but then begins to rise again while the reserve level is also rising. In the third expansionary phase it rises, although at a slower rate than during the contractionary phase. In the fourth expansionary phase the rate remains stable. The preliminary evidence therefore indicates that the yield on government bonds did generally respond in an adjusting direction to balance-of-payments disequilibria, with the greatest response during periods when the level of reserves was falling.

Figure 40 indicates the performance of Bank of Denmark claims on the private sector during the international reserve reference cycle. Two models of reaction are investigated. The first, the solid line, summarizes the behavior of the absolute level of credit expansion, while the second, a dashed line, indicates the behavior of the per cent rate of change of credit expansion (contraction).

The absolute level of credit expansion exhibited more or less secular expansion in the 1950 to 1970 period, consequently rising through both the expansionary and contractionary phases of the reference cycles. When the rate of change of National Bank credit expansion to the private sector is examined, however, a different picture appears. In this case, the rate of change typically rose during the expansionary phase of the reference cycle and fell during the

Percent

Cycle: I 1951 - I 1957

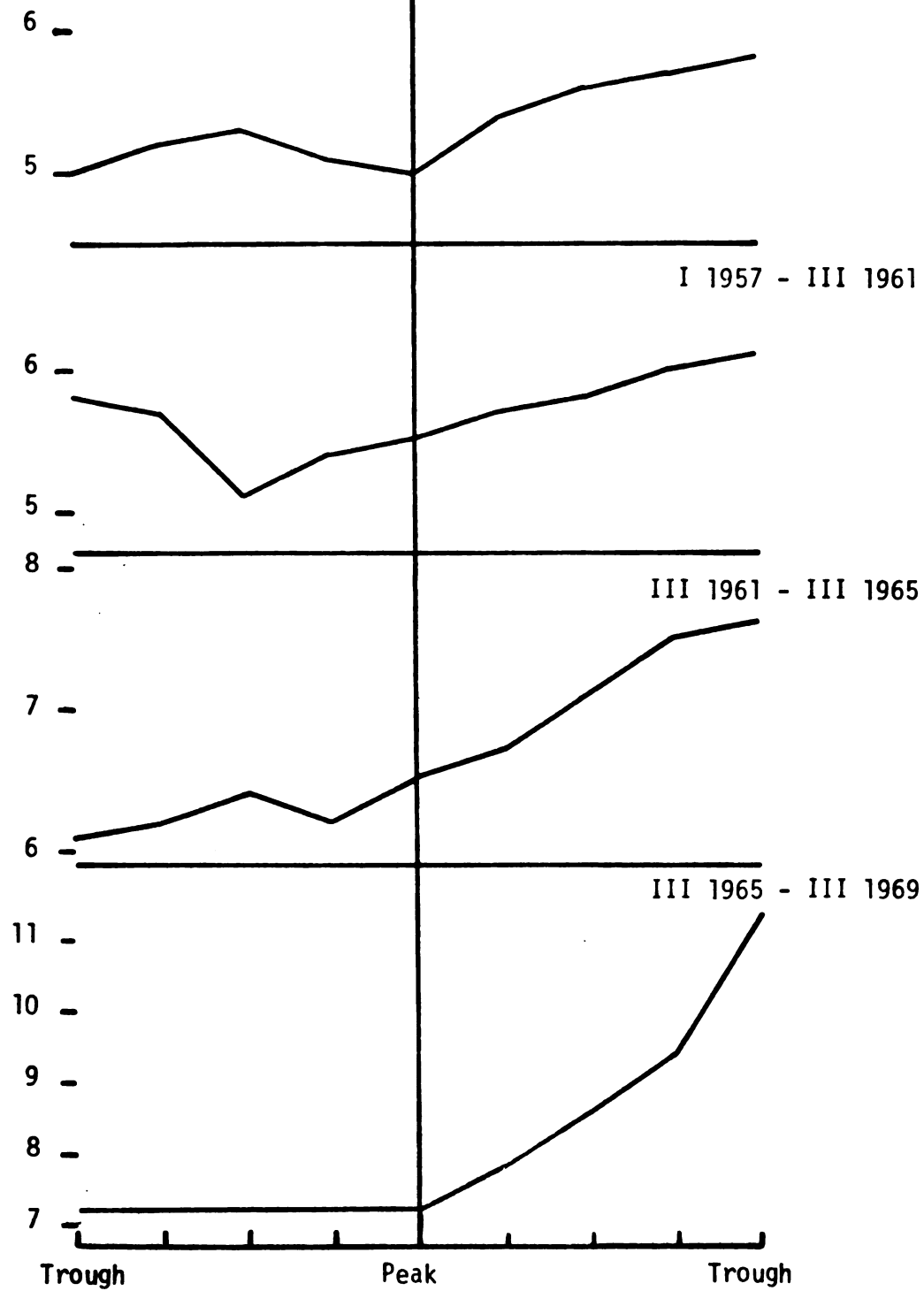


FIGURE 39

GOVERNMENT BOND YIELD DURING INTERNATIONAL
RESERVES CYCLE

(Billions of Kroner)

Cycle: I 1951 - I 1957

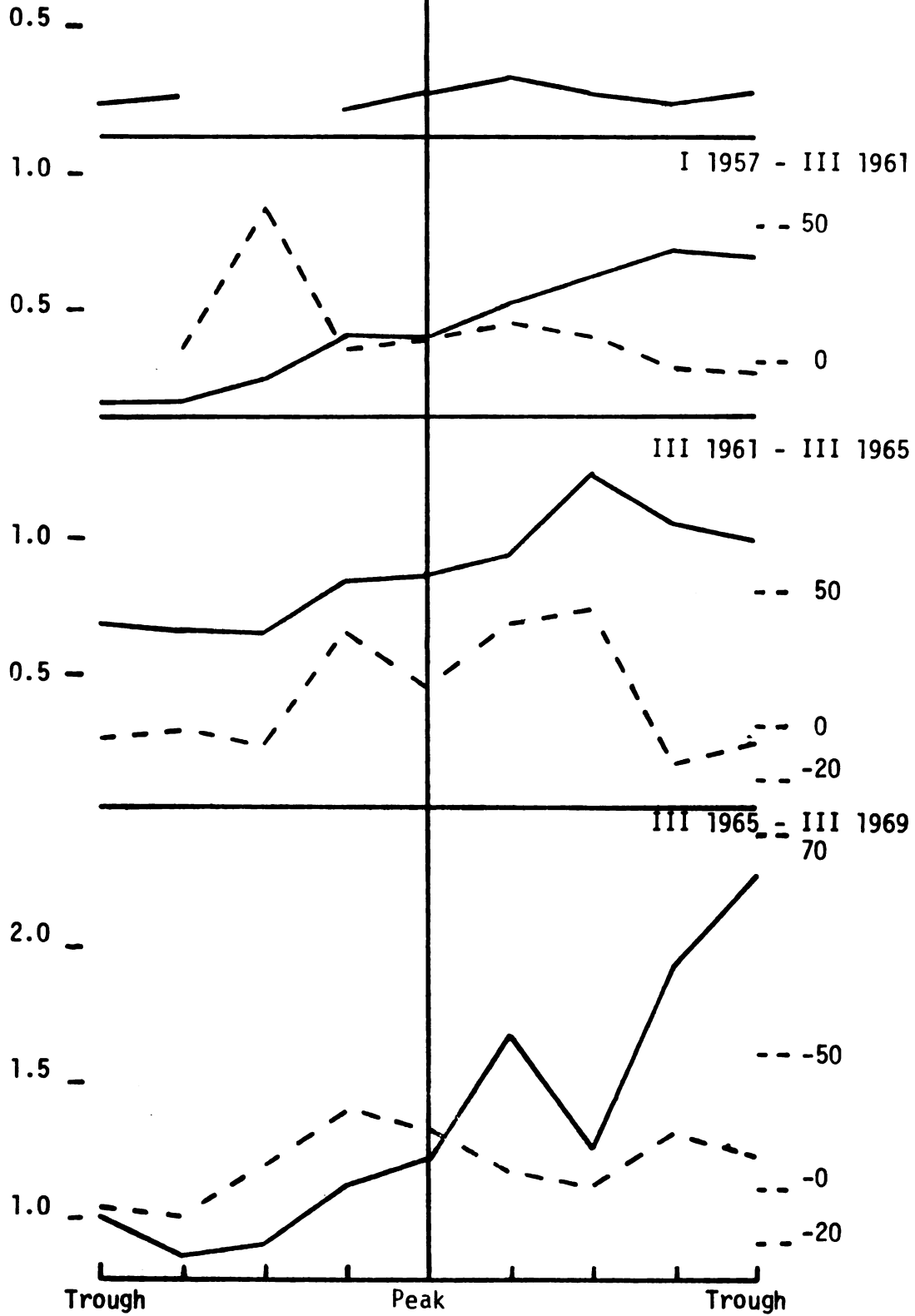


FIGURE 40

BANK OF DENMARK: CLAIMS ON PRIVATE SECTORS DURING
INTERNATIONAL RESERVES CYCLE

contractionary phase--both reactions in an adjusting direction--with respect to the external situation. This evidence would tend to support the hypothesis that National Bank credit facilities were used as balance-of-payments adjustment instruments, especially since passive reaction would tend to have the rate of change of credit expansion fall when reserves were rising and bank liquidity was increasing, and rise when reserves were falling and banks were losing liquidity. The evidence of the first investigation was inconclusive. Further analysis will determine if this reaction might have been taken to achieve alternative economic goals.

Figure 41 summarizes the behavior of Bank of Denmark's net claims on the government during the reserve reference cycle. This variable displays a generally disadjusting movement with respect to the external situation. In three out of the four phases when reserves were rising, Bank of Denmark's net claims on the government decreased. Also, in three out of four phases when reserves were falling, Bank of Denmark's net claims on the government increased. The result is that in six out of nine cases, this variable moved to offset liquidity changes brought about by the external situation. The conclusion must be that this variable was not used as a balance payments adjustment instrument. This evidence corroborates the conclusion of the first investigation.

Figure 42 aggregates Bank of Denmark's domestic claims and summarizes the behavior of the aggregate variable vis-à-vis the reserve reference cycle. In two of the four phases when reserves were rising, this variable also rose. In two, it fell. In all four of the contractionary phases, however, this variable rose. The conclusion, therefore, must be that in total the Danish National Bank did not tailor its

(Billions of Kroner)

Cycle: I 1951 - I 1957

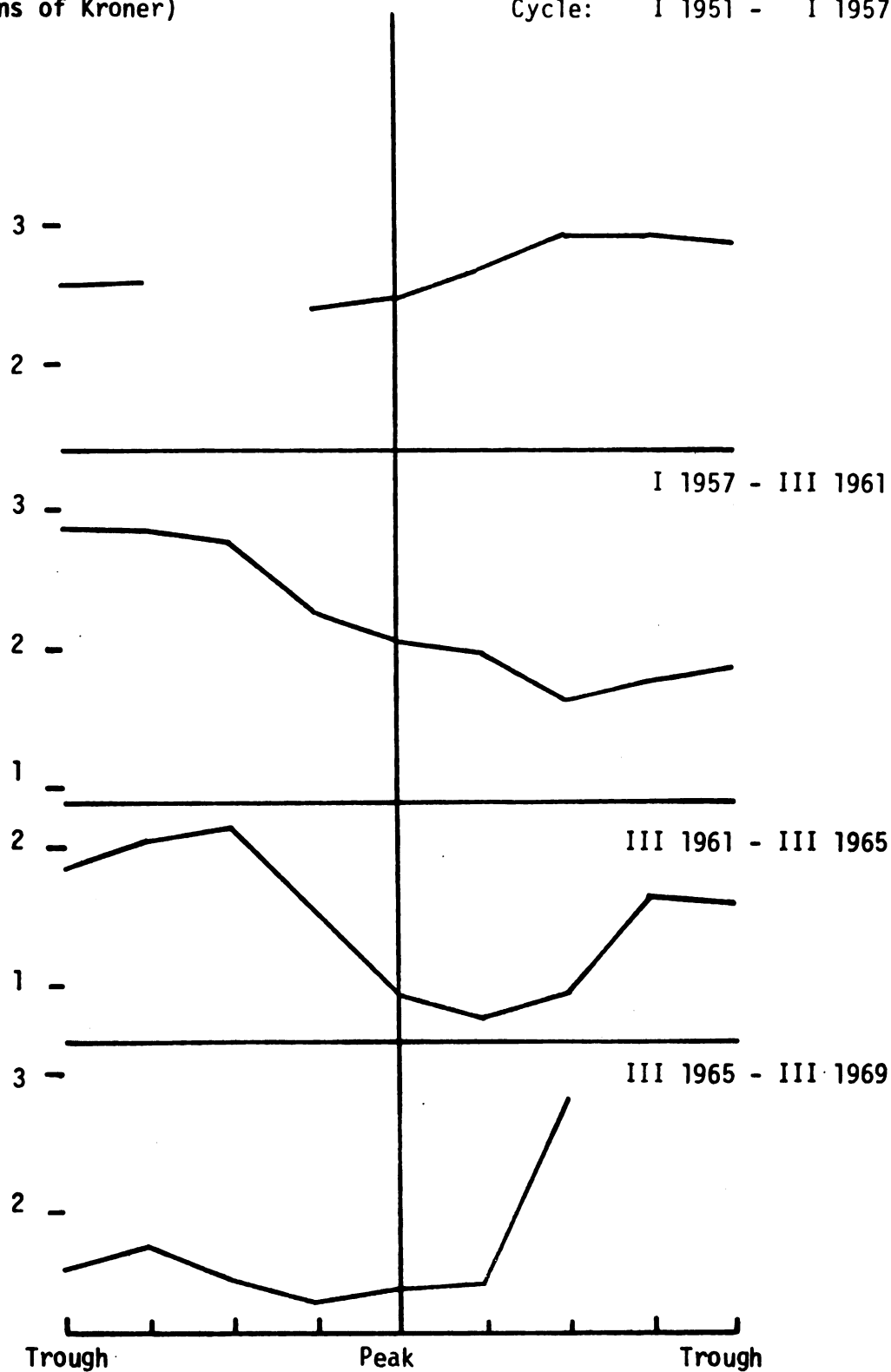


FIGURE 41

BANK OF DENMARK: NET CLAIMS ON GOVERNMENT DURING
INTERNATIONAL RESERVES CYCLE

(Billions of Kroner)

Cycle: I 1951 - I 1957

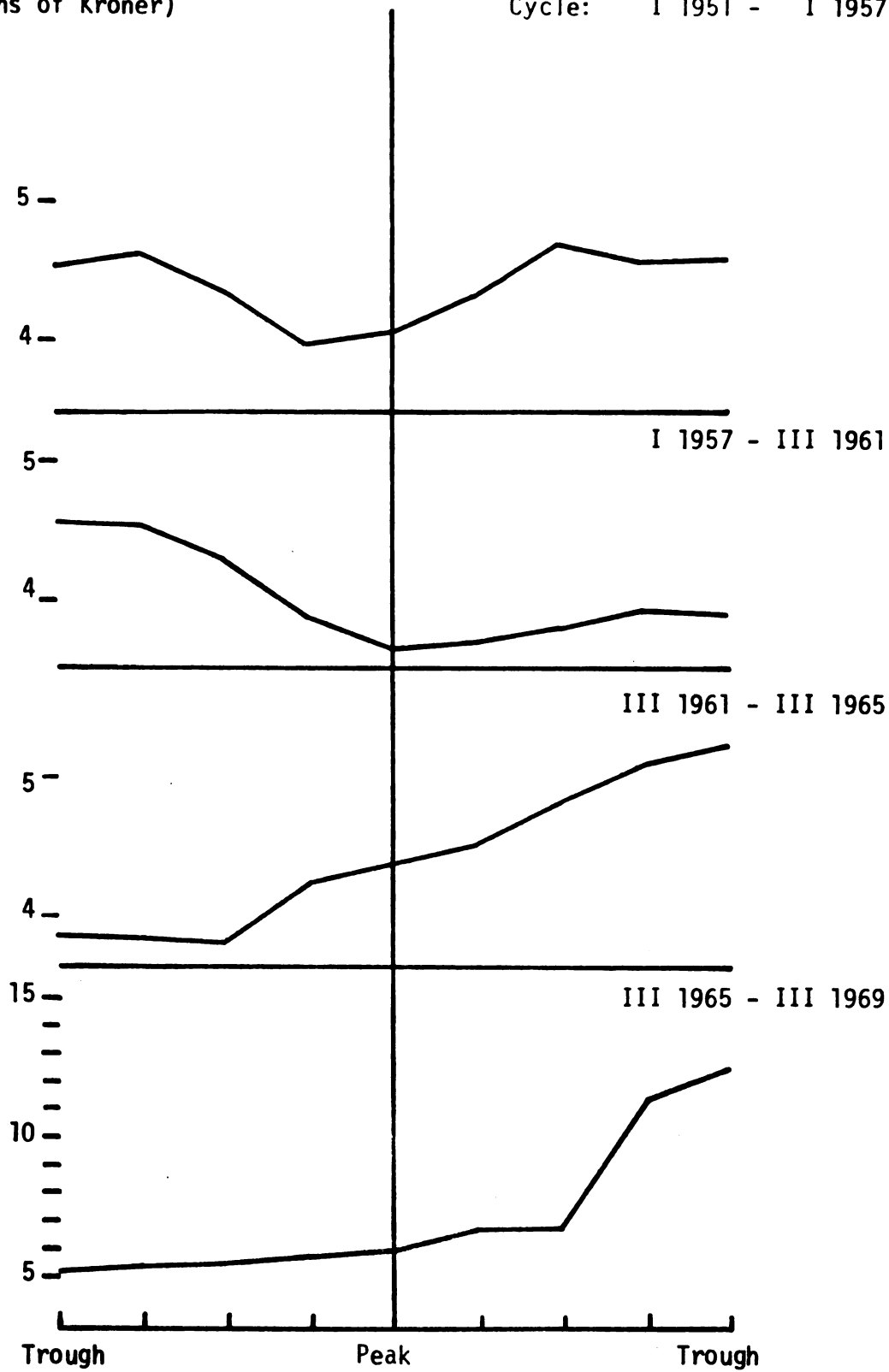


FIGURE 42

BANK OF DENMARK: TOTAL DOMESTIC CLAIMS DURING
INTERNATIONAL RESERVES CYCLE

domestic credit policy to the needs of the external situation. Further, it can be said especially that it is in its role as banker to the central government that the bank most often moves in a disadjusting direction with respect to the external situation.

Figure 43 shows the behavior of commercial and savings banks credit expansion during the international reserve reference cycle. This variable rose in the four phases in which reserves were rising, and fell in two of the four contractionary phases. In the other two contractionary phases, the variable both rose and fell, thus indicating no clear trend. The earlier investigation indicated that the variable moved in an adjusting direction over half the time, and this analysis indicates that it moved in an adjusting direction roughly seventy-five per cent of the time. The conclusion is that the variable may have been controlled with an eye to the external situation. Later analysis must determine whether alternative economic targets might account for its behavior.

The per cent rate of change in the money supply is examined with respect to the international reserve reference cycle in Figure 44. In three of the four expansion phases of the reference cycles, the variable increases; and in three of the four contractionary phases, the variable falls. The conclusion is that the rate of change of the money supply moved in an adjusting direction to the external situation about seventy-five per cent of the time. This evidence supports the earlier examination which found the variable responded in an adjusting direction to payments disequilibria seventy-six per cent of the time. Further investigation will try to determine whether such behavior can be accounted for by the movement of other target variables, or whether

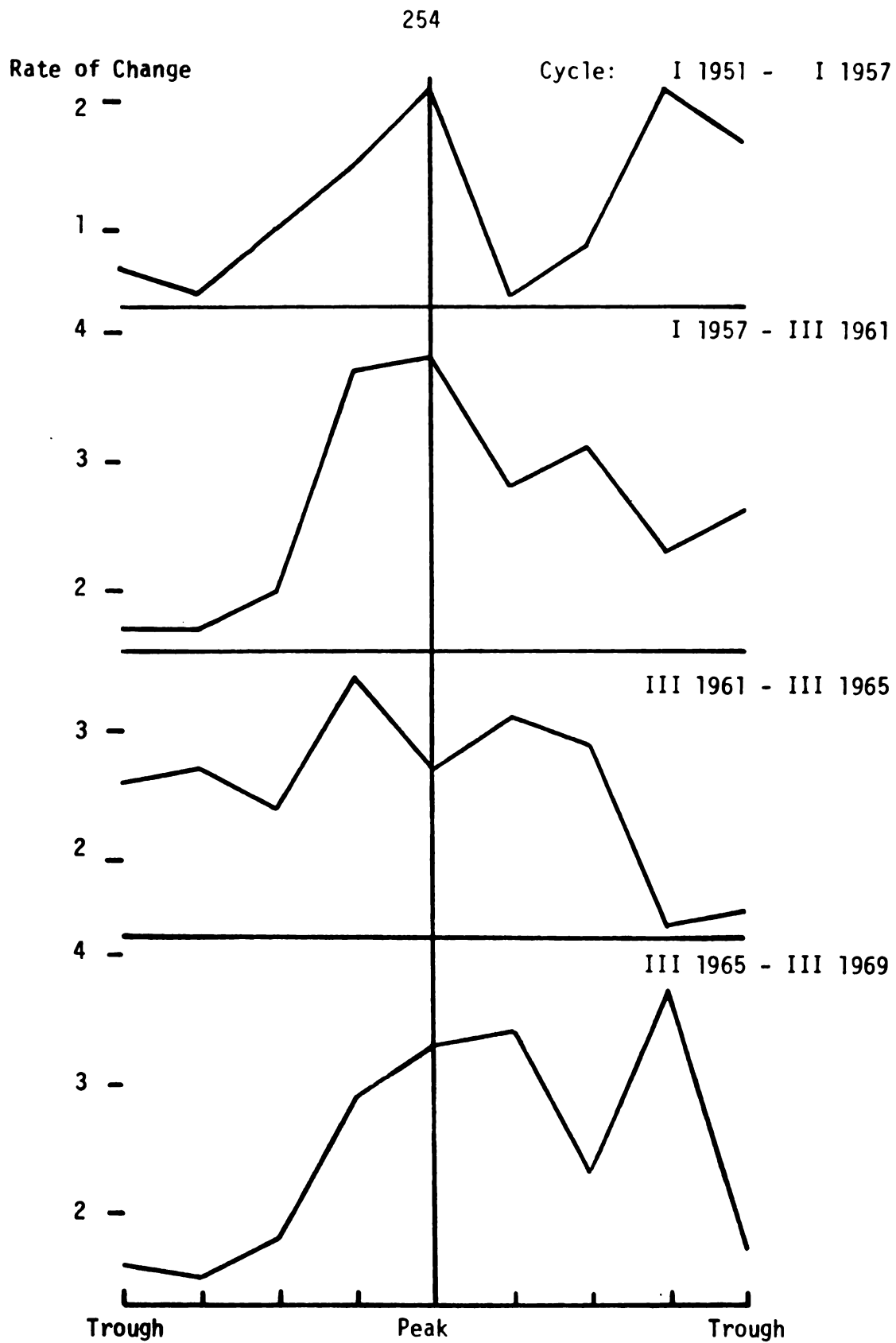


FIGURE 43

COMMERCIAL AND SAVINGS BANK CLAIMS ON PRIVATE SECTOR DURING
INTERNATIONAL RESERVES CYCLE

Rate of Change

Cycle: I 1951 - I 1957

3 -

2 -

1 -

0 -

I 1957 - III 1961

4 -

3 -

2 -

1 -

0 -

III 1961 - III 1965

4 -

3 -

2 -

1 -

III 1965 - III 1969

4 -

3 -

2 -

Trough

Peak

Trough

FIGURE 44

MONEY SUPPLY DURING INTERNATIONAL RESERVES CYCLE

in fact it was in response to the external situation.

Figure 45 shows the status of the budgetary balance during the reserve reference cycle. The variable plotted in this case is the over-all surplus or deficit. Quarterly budgetary data were not available prior to 1953, so the variable is plotted for only the last three reference cycles. In two of the three expansionary phases of the reference cycle, the government ran an increasing budgetary surplus. In the third expansion phase, the budgetary surplus increased half the period and then decreased for the second half. In the first contractionary phase, the budgetary surplus first remained constant and then fell and became a deficit. In the second contractionary phase, the budget surplus first increased, then fell sharply to a deficit. In the final contractionary phase, the surplus fell for the first half (becoming a deficit), then rose sharply only to again fall. Thus out of the six phases, not a single case of clear adjustment to the external situation is evident, but in two--and possibly three--the reaction is clearly in an offsetting direction to the external situation. The conclusion must be that the variable is not used as a balance-of-payments adjustment instrument.

In summary, both techniques of analysis have suggested that the discount rate, the money supply, commercial bank credit expansion, and the National Bank lending to the banking system tended to respond in some degree in an adjusting direction with respect to external disequilibria. The study will now proceed to study the behavior of the postulated alternative target variables with respect to the external situation to determine whether the existence of consistent situations might explain the noted behavior of the above policy variables.

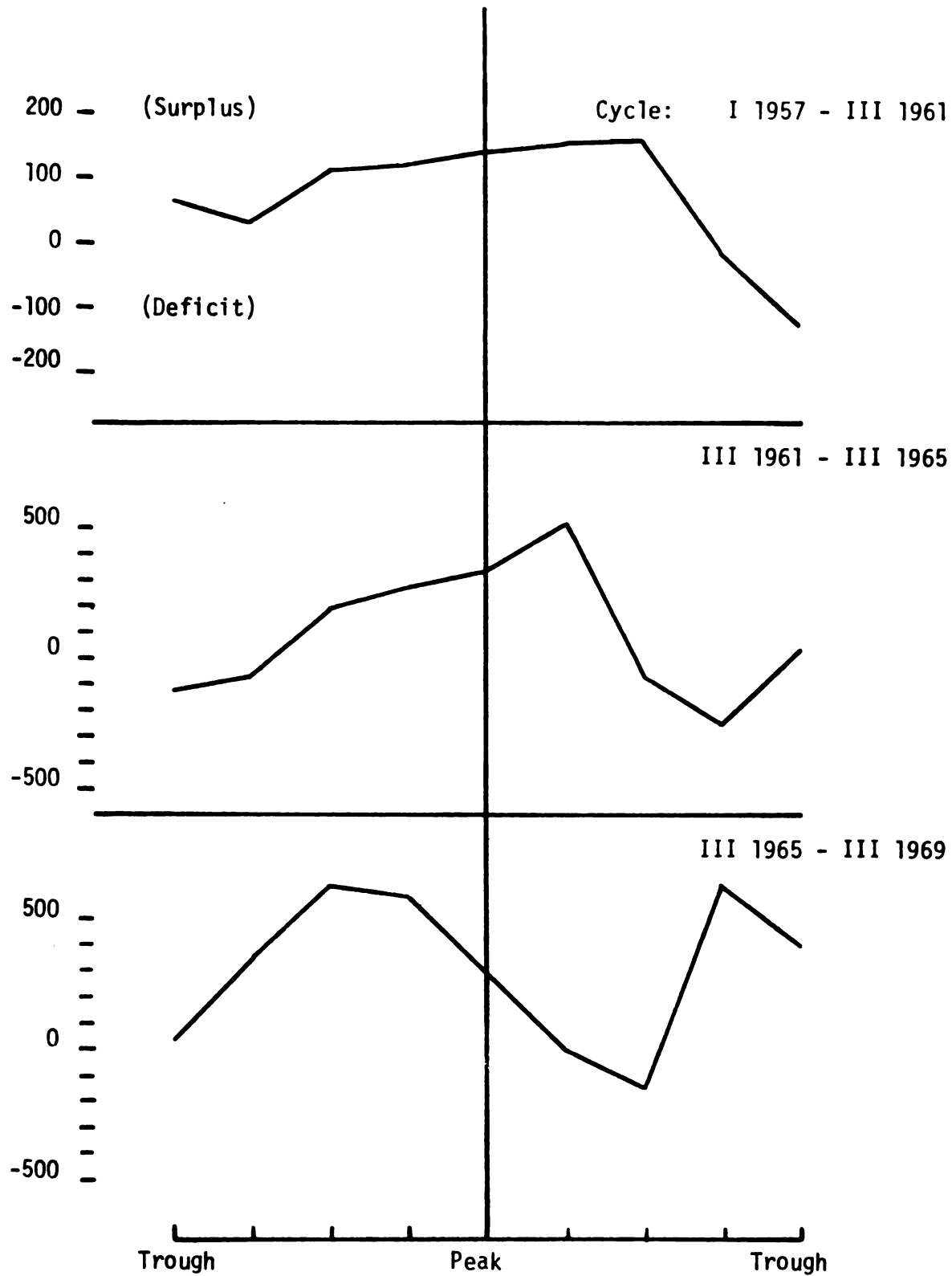


FIGURE 45

BUDGETARY BALANCE DURING INTERNATIONAL RESERVES CYCLE

Domestic Policy Goals

The investigation turns to the examination of the domestic situation. Both methods of analysis have so far shown that the discount rate and the money supply moved almost without exception in adjusting directions with respect to disturbances in the level of international reserves. Two additional policy variables, National Bank claims on the private sector and Commercial and Savings Bank's credit expansion, responded in an adjusting direction with respect to external disequilibria often enough to also merit further investigation. The objective of the study will now be to determine whether or not the domestic situation might also explain the observed behavior of these policy variables. Figures 46, 47, and 48 show the behavior, respectively, of industrial production, unemployment, and the wholesale price level during the international reserve reference cycle, and Table 27 summarizes this information.

Not surprisingly, as indicated by Table 27, there was no time during the period studied in which all the target variables called for the same economic remedy. In only one subperiod, the contractionary phase of the I 1957 to III 1961 international reserve reference cycle, did two domestic target variables call for the same remedy as the external situation. In this case, a downward disturbance in the level of international reserves was accompanied by falling unemployment and rising prices. The rate of change in industrial production, however, was falling and called for an opposing remedy.

The expansionary phase of the III 1965 - III 1969 cycle might be considered a consistent situation. In this case, the rate of industrial production was falling, calling for the same remedy as the external

Rate of Change

Cycle: I 1951 - I 1957

Percent

10 -

5 -

0 -

-5 -

I 1957 - III 1961

5 -

0 -

-5 -

III 1961 - III 1965

15 -

10 -

5 -

0 -

III 1965 - III 1969

10 -

5 -

0 -

Trough

Peak

Trough

FIGURE 46

INDUSTRIAL PRODUCTION DURING INTERNATIONAL RESERVES CYCLE

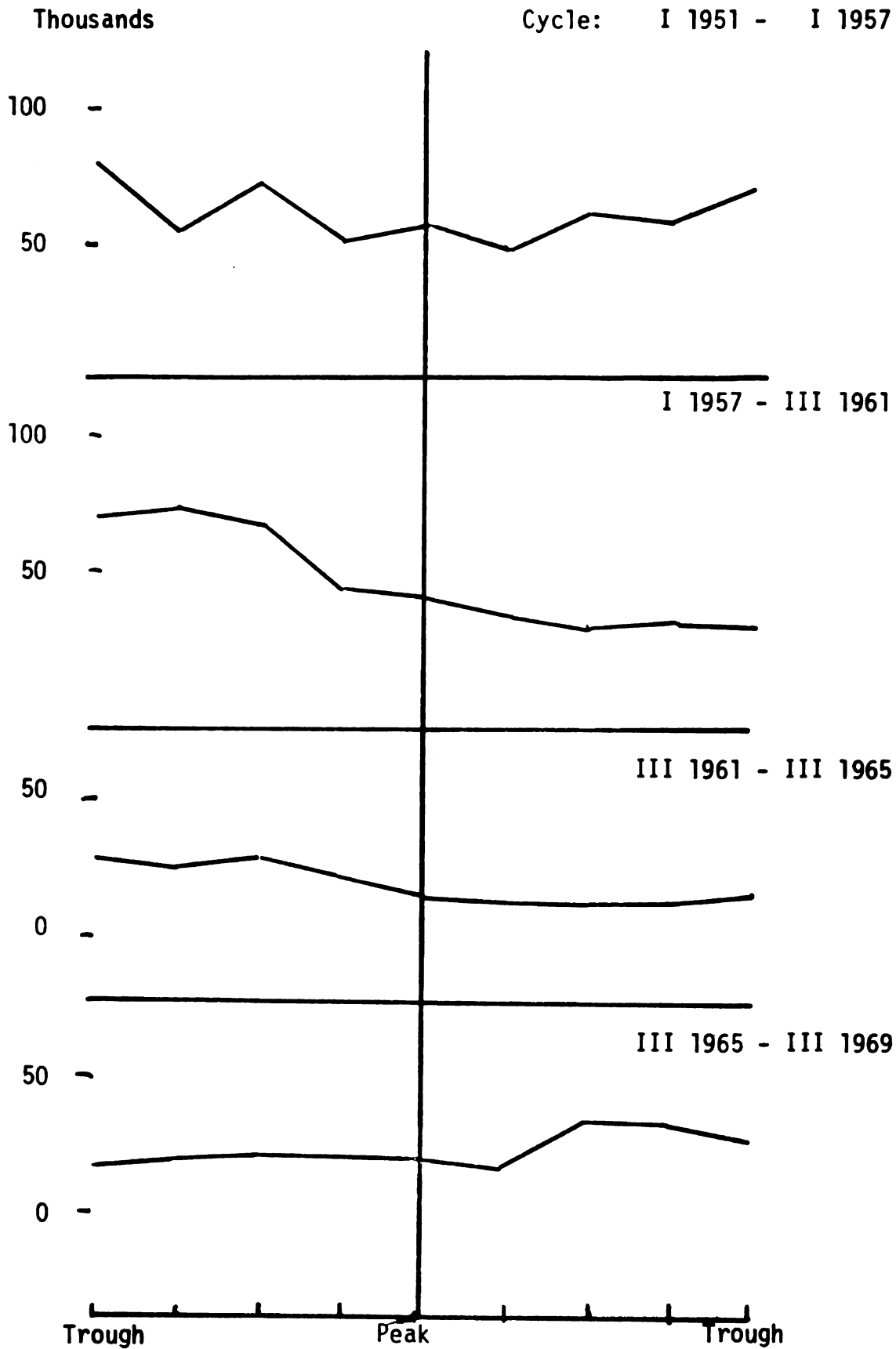


FIGURE 47

UNEMPLOYMENT DURING INTERNATIONAL RESERVES CYCLE

Rate of Change

Cycle: I 1951 - I 1957

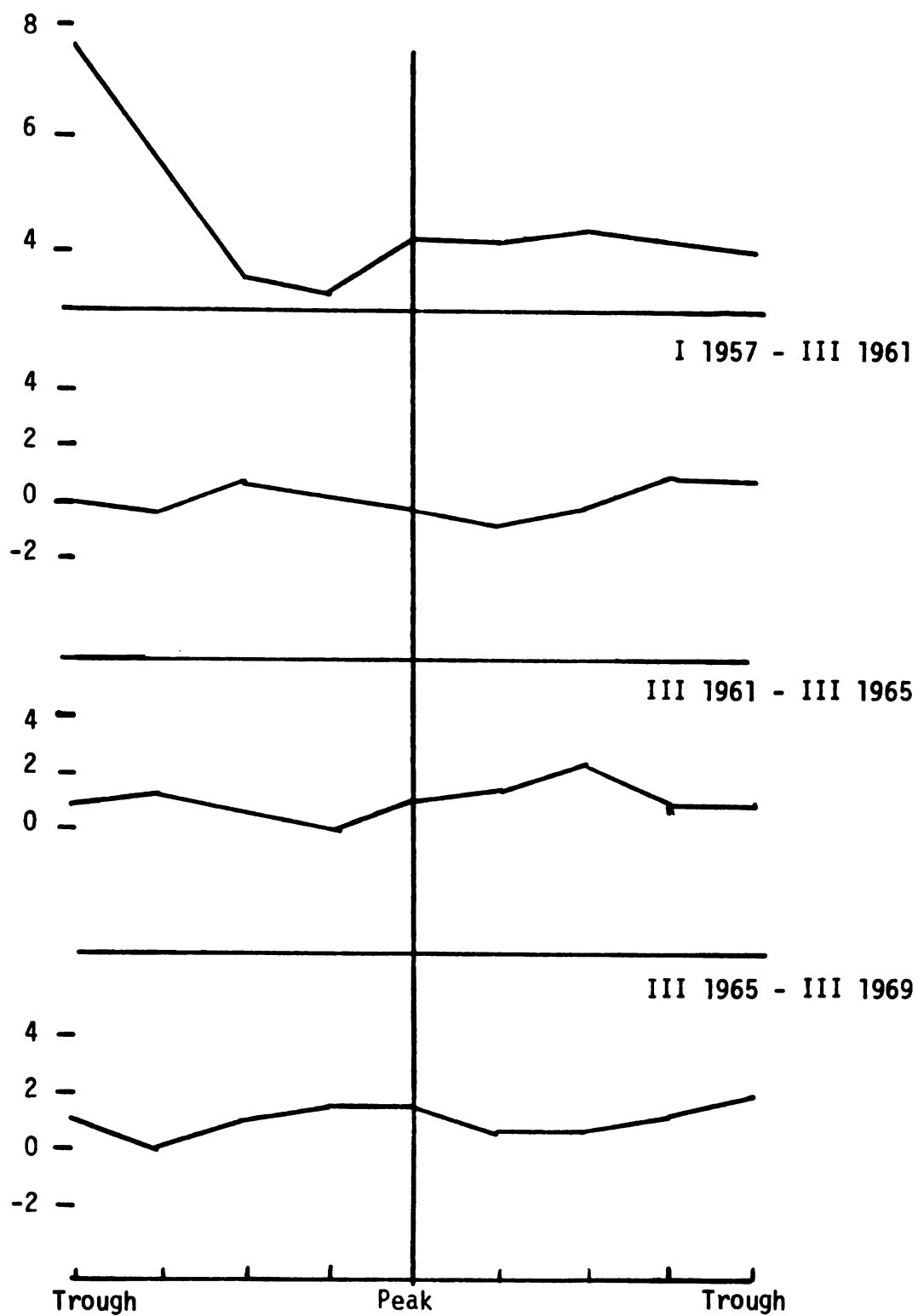


FIGURE 48
WHOLESALE PRICES DURING INTERNATIONAL RESERVES CYCLE

TABLE 27

MOVEMENT OF DOMESTIC TARGET VARIABLES
DURING INTERNATIONAL RESERVES
REFERENCE CYCLE

Reference Cycle Phase	Industrial Production (Change over previous Corresponding Quarter)	Unemployment (thousands)	Wholesale Prices
I 1951 - I 1957 Expansionary Contractionary	no trend no trend	falling - rising -	falling + stable
I 1957 - III 1961 Expansionary Contractionary	no trend falling -	falling - falling +	no trend rising +
III 1961 - III 1965 Expansionary Contractionary	rising - falling -	falling - stable	no trend no trend
III 1965 - III 1969 Expansionary Contractionary	falling + rising +	stable rising -	no trend no trend

Note: + means that the domestic target calls for the same remedy as the external situation.

- means that the domestic target calls for a remedy opposite to that required by the external situation.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

situation, while unemployment was stable and the wholesale price index exhibited no trend. If the model of reaction with respect to the unemployment variable is correct, namely that a stable level (abstracting from whether the level is high or low) calls for no policy adjustment, then this could be considered a consistent period.

As for inconsistent situations, there are no subperiods in which the three domestic target variables all called for a remedy opposite the one called for by the external situation. In three phases (contractionary I 1951 - I 1957, expansionary I 1957 - III 1961, and contractionary III 1961 - III 1965), one domestic target variable (unemployment the first two phases, and industrial production the last) called for an opposite remedy while the two other domestic targets exhibited either no trend or were stable. In this sense, these three subperiods are inconsistent. Additionally, during expansionary phase of III 1961 - III 1965, both industrial production and unemployment called for opposite remedy while no trend was observed in the price variable. To sum, the contractionary phase of I 1951 - I 1957, the expansionary phase of I 1957 - III 1961, and both the contractionary and expansionary phases of III 1961 - III 1965 can be classified, with the aforementioned reservations, as inconsistent periods. The behavior of the policy variables during these periods will now be reviewed.

The discount rate, Figure 38, rises during the contractionary, falls, then rises slightly during the expansionary phase of I 1957 - III 1961, falls, and then rises during the expansionary phase of III 1961 - III 1965, and is stable during the contractionary phase.

The money supply, Figure 44, moves in an adjusting direction in all the phases except the expansionary period of I 1957 - III 1961, during which it exhibits no trend.

Commercial and Savings banks claim on the private sector behave in a manner adjusting to external disequilibrium in all phases except the contractionary phase of I 1951 - I 1957, during which they exhibit no clear-trend falling first, then rising by an equal amount. Finally, Bank of Denmark claims on the private sector clearly move in an adjusting manner in respect to the external situation only in the expansionary phase of III 1961 - III 1965. This evidence would seem to indicate that the money supply and commercial and savings bank credit expansion generally moved in response to the external situation during periods when the domestic economy called for different remedies, while National Bank lending to the private economy moved in an offsetting direction three out of four times. The reference cycle analysis, with respect to the discount rate, is rather inconclusive. Corroboration of these first results will now be sought by examining the behavior of the target variables during changes of the discount rate. Table 28 summarizes this information. In the nineteen times the discount rate has been changed in the period under investigation, thirteen of the changes were in an adjusting direction with respect to the level of international reserves. In five it moved in a disadjusting direction and of these five, three were inconsistent periods where the domestic variables uniformly called for the same remedy. In only one of the fourteen adjusting periods did all of the domestic variables call for an opposite remedy.

With respect to the industrial production variable, the discount rate responded in an adjusting direction six times and in a disadjusting direction twelve times. Eight times it responded adjustingly to the unemployment variable, six times in a disadjusting direction. Finally,

TABLE 28

BEHAVIOR OF TARGET VARIABLES DURING
DISCOUNT RATE CHANGES

Quarter Discount Rate	Foreign Exchange Reserves	Industrial	Unemployment	Wholesale Prices Per cent rate of Change
III 1950 rises	falls +	falls -	n.a.	rises +
IV 1950 rises	stable	fills -	n.a.	rises +
III 1953 falls	rises +	rises -	falls -	falls -
II 1954 rises	falls +	rises +	falls +	stable
II 1955 rises	falls +	falls -	rises -	rises +
II 1958 falls	rises +	rises -	rises +	falls +
III 1958 falls	rises +	rises -	falls -	rises -
III 1959 rises	rises -	stable	falls +	falls -
I 1960 rises	falls +	falls -	falls +	falls -
II 1961 rises	falls +	falls -	rises -	rises +
III 1963 falls	rises +	rises -	falls -	falls +
IV 1963 falls	rises +	rises -	rises +	rises -
II 1964 rises	rises -	rises +	falls +	stable
IV 1967 rises	falls +	falls -	rises -	rises +
I 1968 falls	falls -	falls +	stable	rises -
II 1968 falls	falls -	falls +	rises +	falls +
III 1968 falls	rises +	rises -	stable	stable
I 1969 rises	falls +	rises +	stable	rises +
II 1969 rises	rises -	rises +	falling +	stable

Note: + means that the discount rate moved in an adjusting direction with respect to the target.
- means that the discount rate did not move in an adjusting direction with respect to the target.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

it responded adjustingly ten times with respect to the price variable while moving in a disadjusting direction five times. In three of these last five subperiods, the reserve variable was served in an adjusting manner. In eight of the ten adjusting changes a consistent situation existed between the price variable and the international reserve variable. In all, twelve of the subperiods involved a consistent relationship between the price variable and the reserve variable. Although the discount rate moved in an adjusting direction most often with respect to the reserve variable, this later evidence must somewhat temper the conclusion that it was used exclusively in response to external stimuli. The fortuitous correlation of price and reserve movements allowed the variable to serve two goals more often than not.

Figures 49 and 50 further examine the behavior of the discount rate and the money supply during the industrial reference cycle. The objective here is to use reference cycle analysis to determine whether the two policy variables might have responded to the demands of production stabilization. The technique is identical to that iterated with respect to international reserves, the only difference being that the industrial production variable establishes the reference cycle. This analysis shows that the discount rate, Figure 49, moved in an anti-cyclical pattern in only two of the thirteen phases, i.e., during the expansionary and contractionary phases of the II 1961 - II 1963 reference cycle. In four phases it responded in a disadjusting direction: contraction 1950 - 1951, contraction IV 1951 - I 1956, expansion and contraction of IV 1957 - II 1961. In three places it was stable and in the remainder it exhibited no clear trend. The conclusion must be that it was not used with any regularity as a tool to achieve stability of production.

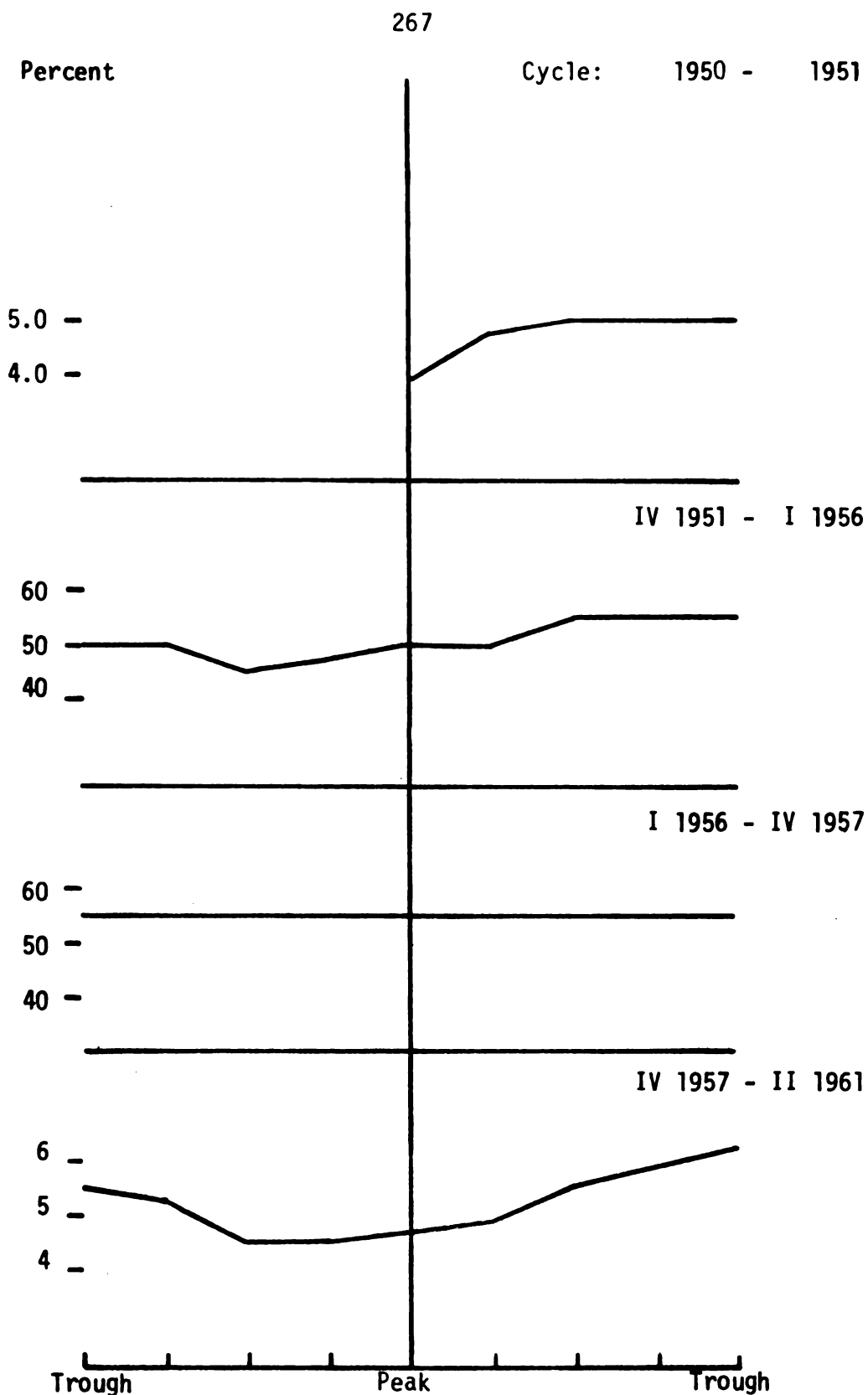


FIGURE 49
CHANGES IN DISCOUNT RATE DURING INDUSTRIAL PRODUCTION
REFERENCE CYCLE

268

Percent

Cycle: II 1961 - II 1963

7 -

6 -

5 -

4 -

II 1963 - I 1966

7 -

6 -

5 -

I 1966 - II 1968

7 -

6 -

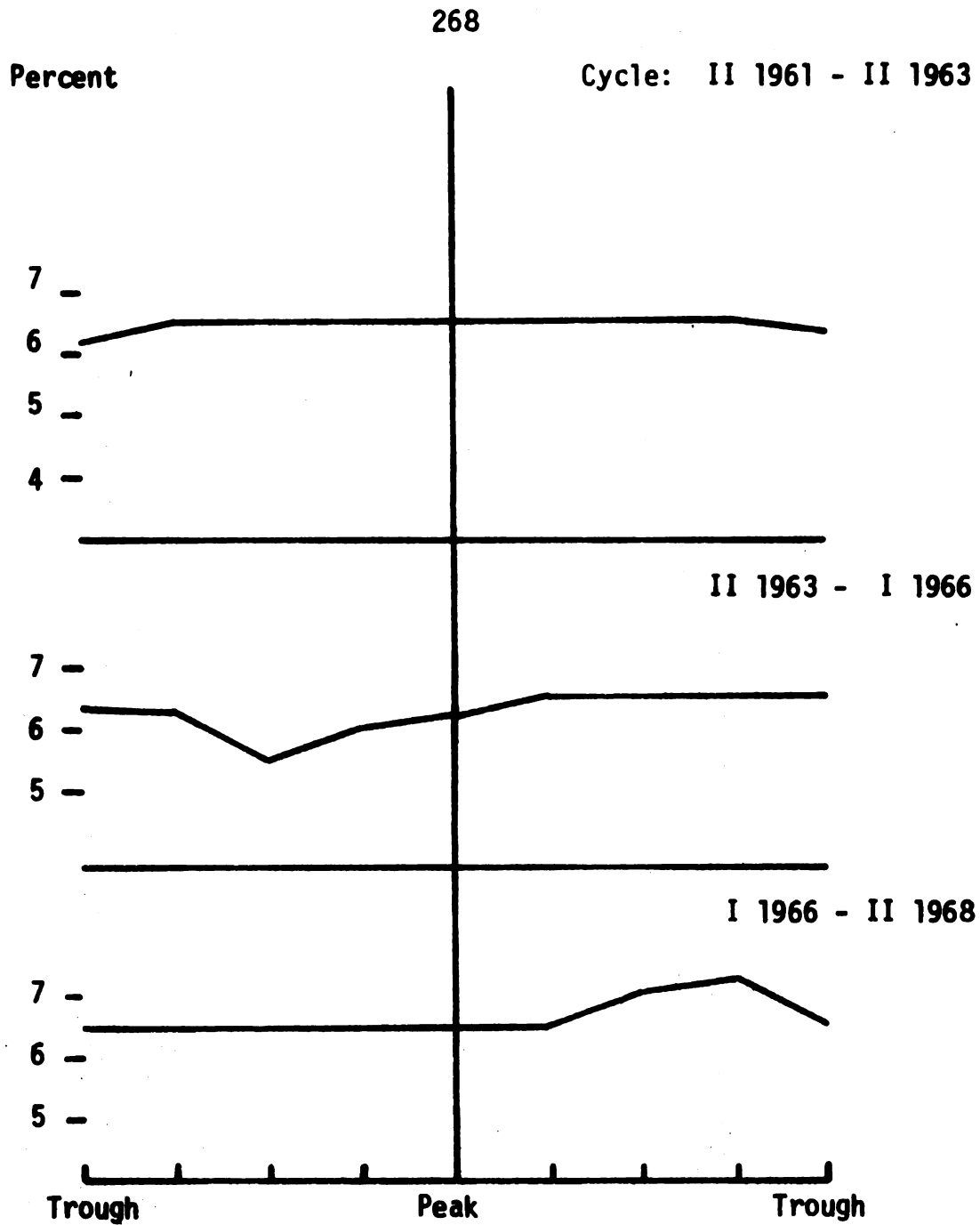
5 -

Trough

Peak

Trough

FIGURE 49 (cont'd.)



Rate of Change

Cycle: 1950 - 1951

1 -
0 -
-1 -

IV 1951 - I 1956

4 -
2 -
0 -
-2 -

I 1956 - IV 1957

2 -
0 -
-2 -

IV 1957 - II 1961

4 -
2 -
0 -
-2 -

Trough

Peak

Trough

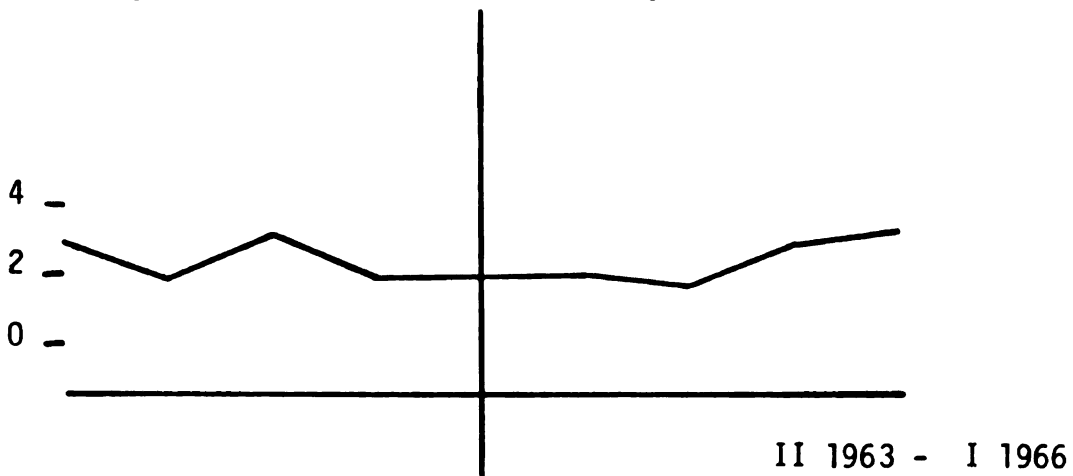
FIGURE 50

MONEY SUPPLY DURING INDUSTRIAL PRODUCTION REFERENCE CYCLE

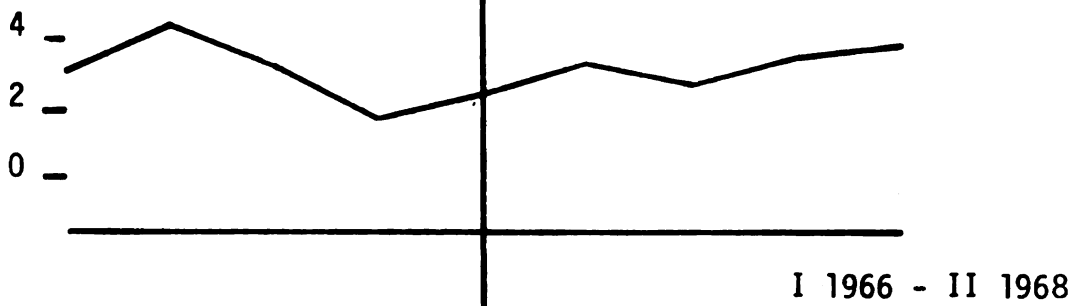
270

Rate of Change

Cycle: II 1961 - II 1963



II 1963 - I 1966



I 1966 - II 1968

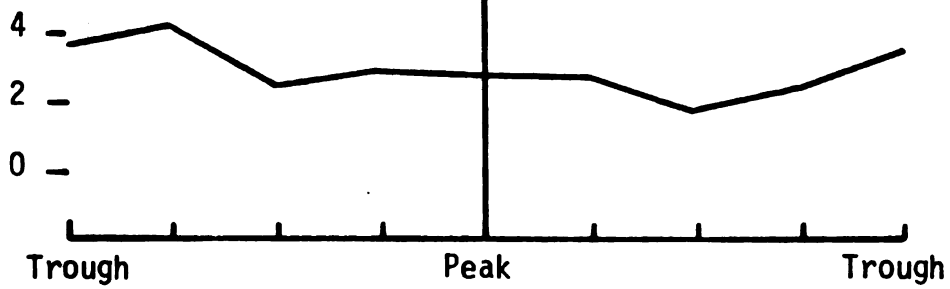


FIGURE 50 (cont'd.)

Figure 50 examines the behavior of the money supply during the industrial production reference cycle. The money supply moved in an adjusting direction during eight of the thirteen phases and in a disadjusting direction two times. In the remainder, it exhibited no clear trend both rising and falling during the phases. This evidence indicates that the money supply may have possibly been reacting to the business cycle (as approximated by industrial production) rather than to the external position. Multiple regression analysis will later be used to try to sift out the true reaction patterns.

Budget policy was earlier found not to have reacted consistently to external disequilibria. A corollary investigation is now made concerning the behavior of government finance with respect to the industrial production reference cycle (Figure 51). Quarterly data for this variable were unavailable prior to 1957. Observing the variable from 1957 on, it most clearly demonstrates anti-cyclical behavior during the IV 1957 to II 1961 cycle, during which the surplus increases during the phase when production is expanding and the surplus decreases during the phase when production is falling. [The problem inherent in reading meaning into these movements must be remembered.] In the expansionary phase of the I 1966 - II 1968 reference cycle, government finance is clearly destabilizing, showing an increasing deficit throughout the phase. In the remainder of the phases, the behavior of the variable is not as clear, both rising and falling. It would be difficult to suggest that fiscal policy, on the basis of this evidence, was used anti-cyclically with respect to industrial production.

Table 29 further examines the behavior of government finance, this time by observing the movement of the four target variables during

(Millions of Kroner)

Cycle:

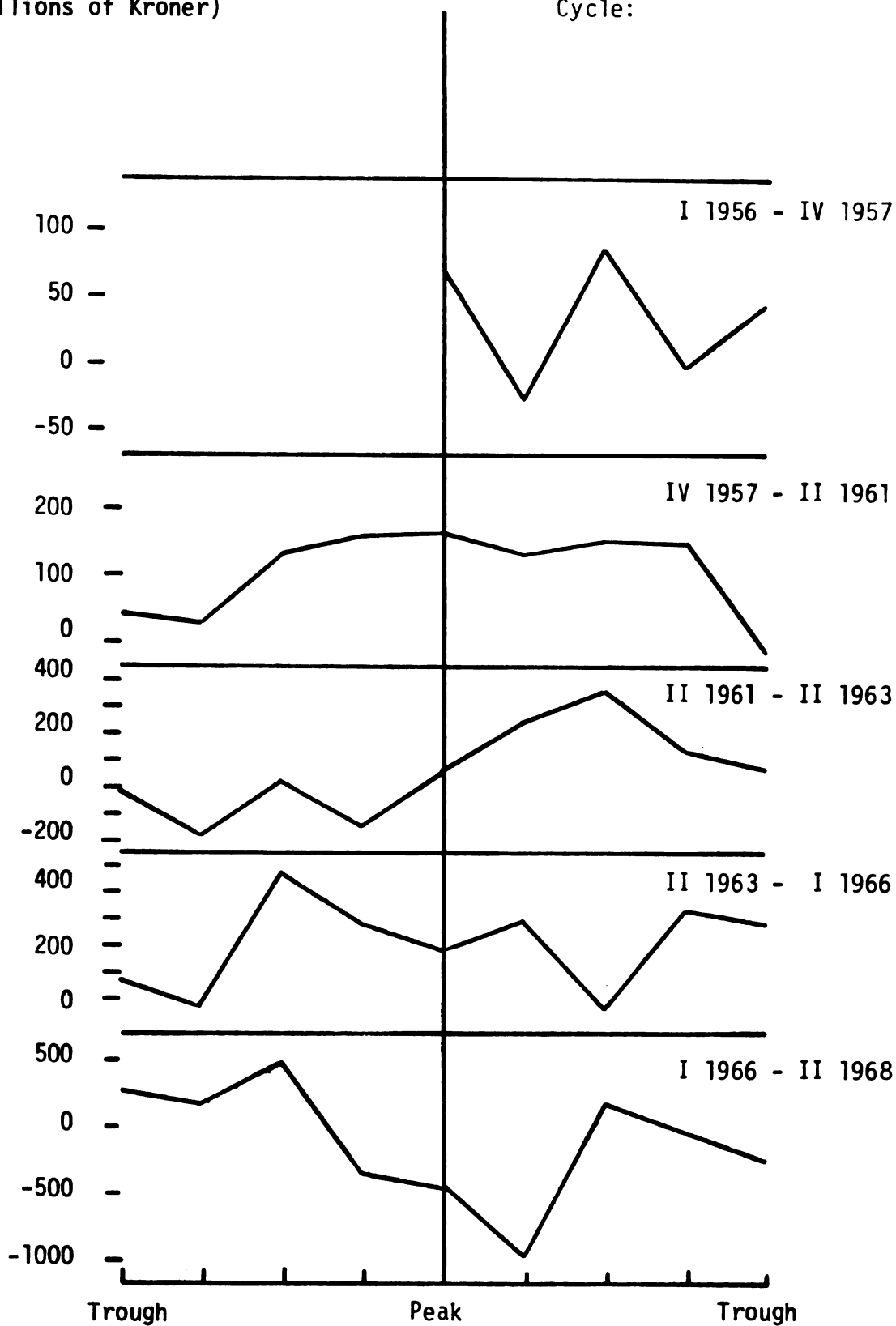


FIGURE 51

BUDGETARY BALANCE DURING INDUSTRIAL PRODUCTION REFERENCE CYCLE.

TABLE 29
BEHAVIOR OF TARGET VARIABLES DURING BUDGETARY DISTURBANCES

Disturbances in Budget	Industrial Production Per cent Rate of Change	Prices (Direction of Change)	Per cent Rate of Change	Unemployment Direction of Change	International Reserves Direction of Change
II 1957 - IV 1957 deficit	falls +	stable	falls + -.37	rises +	rises +
I 1958 - I 1961 surplus	rises & falls equally (no trend)	stable	rises + .16	falls +	rises -
II 1961 - II 1962 deficit	rises -	rises -	rises - 1.9	falls -	no trend
III 1962 - I 1967 surplus	falls, rises, falls, rises (no trend)	rises +	falls - .84	no trend	rises -
II 1967 - II 1968 deficit	falls +	rises -	falls + .75	rises +	falls -
III 1968 - IV 1969 surplus	rises +	rises +	rises + .84	falls +	falls +

Note: + means that the budgetary balance moved in an adjusting direction with respect to the target.
- means that the budgetary balance moved in a disadjusting direction with respect to the target.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

budgetary disturbances. Using this technique, the budget reacted in an adjusting manner to the industrial production variable in three out of the six subperiods, in a disadjusting manner in only one and exhibited no clear trend in the remaining two. It reacted in an adjusting direction to price changes in four of the six subperiods, in a disadjusting direction in only two. With respect to unemployment, the budget moved in an adjusting direction four times, in a disadjusting direction once, and it showed no trend in one. In the case of the external target, it moved in an adjusting direction in two subperiods and in a disadjusting direction three times. In the one remaining subperiod, no trend was observed. The weight of this evidence would suggest that government finance was directed more toward the internal situation than to the external, possibly indicating, when combined with previous findings, that Denmark pursued an economic strategy which assigned government spending to the internal situation and monetary policy to the external.

Table 30 relates the behavior of the four policy variables [money supply, bank lending, discount rate, and National Bank's private claims] during disturbances in the wholesale price index. Ten subperiods are identified in the wholesale price index.

In five out of ten of these subperiods, the money supply is found to move in an adjusting direction with respect to the wholesale price variable. In two periods it moved in disadjusting directions. In the three subperiods, when the wholesale price index remained stable, the money supply increased.

Commercial and saving bank credit expansion, column 2, Table 30, moved in a disadjusting direction with respect to disturbances in the

TABLE 30

**BEHAVIOR OF POLICY VARIABLES DURING
DISTURBANCES IN WHOLESALE
PRICE LEVEL**

Disturbances in the Wholesale Price Index	Per cent Rate of Change in Money Supply	Per cent Rate of Change in Commercial Bank Lending	Discount Rate	National Bank Private Claims
II 1950 - II 1951 rises	rises -	falls -	rises +	rises -
II 1951 - III 1953 falls	rises +	falls -	falls +	falls -
III 1953 - I 1954 stable	rises	rises	stable +	no trend
I 1954 - II 1956 rises	falls +	falls +	rises +	no trend
II 1956 - I 1961 stable	rises	rises	no trend	rises
I 1951 - I 1963 rises	rises -	rises -	rises +	rises -
I 1963 - III 1963 falls	rises +	falls -	falls +	falls -
III 1963 - I 1968 rises	falls +	falls +	no trend	rises -
I 1968 - IV 1968 stable	rises	rises	falls	no trend
IV 1968 - IV 1969 rises	falls +	rises -	rises +	n.a.

Note: + means that the policy variable moved in an adjusting direction with respect to the target.

- means that the policy variable moved in a disadjusting direction with respect to the target.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

price index in five of the subperiods, in an adjusting direction twice, and the rate of commercial and saving bank credit expansion increased during stable subperiods of the price variable.

The discount rate, third column, moved seven times in an adjusting direction with respect to the price variable. At no time did it move in a disadjusting direction. In two of the subperiods when the price index was stable, the discount rate showed no trend. In the other stable subperiod, the discount rate falls. The weight of this evidence corroborates the earlier finding that the discount rate may have been directed toward the price level and/or toward the country's external position.

In the fourth column of Table 30, National Bank lending to the private sector is examined, and its behavior approximates the behavior of commercial bank lending. In five of the subperiods, the variable moves in a disadjusting direction with respect to the price index. In three subperiods the variable exhibited no clearly-defined trend, two of these in stable subperiods. In the other stable subperiod, National Bank lending increased.

In total, Table 30 supports earlier findings: The discount rate is the only policy variable to establish a strong regular pattern of adjustment consistent with the objective of maintaining price stability. The money supply moved in an adjusting direction about half the time. And National Bank and Commercial and Savings Bank credit generally responded in a disadjusting direction.

Table 31 examines these same policy variables with respect to disturbances in the unemployment variable. The period from 1950 to 1970 is divided into 15 subperiods according to whether unemployment was rising, stable, or falling.

TABLE 31

BEHAVIOR OF POLICY VARIABLES DURING
DISTURBANCES IN RATE
OF UNEMPLOYMENT

Disturbances in Rate of Unemployment	Per cent Rate of Change in Money Supply	Discount Rate	Per cent Rate of Change in Commercial Bank Lending	National Bank Private Claims
IV 1950 - I 1951 rises	falls -	rises -	falls -	rises -
I 1951 - III 1951 stable	falls	stable +	rises	rises
III 1951 - IV 1951 falls	rises -	stable	falls +	n.a.
IV 1951 - IV 1952 rises	rises +	stable	rises +	n.a.
IV 1952 - IV 1954 falls	falls +	no trend	rises -	rises -
IV 1954 - III 1956 rises	rises +	rises -	falls -	falls -
III 1952 falls	falls +	stable	rises -	rises -
I 1957 - II 1958 rises	rises +	falls +	rises +	stable
II 1958 - IV 1962 falls	rises -	rises +	rises -	rises -
IV 1962 - II 1963 rises	rises +	stable	falls -	falls -
II 1963 - II 1965 falls	rises -	no trend	rises -	rises -
II 1965 - I 1966 rises	falls -	stable	falls -	no trend
I 1966 - I 1967 falls	rises -	stable	rises -	rises -
I 1967 - I 1969 rises	rises +	no trend	falls -	no trend
I 1969 - IV 1969 falls	falls +	rises +	rises -	n.a.

Note; + means that the policy variable moved in an adjusting direction with respect to the target.

- means that the policy variable did not move in an adjusting direction with respect to the target.

Sources: Various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

Column 1 examines the behavior of the money supply. In eight of the subperiods, the money supply is found to move in an adjusting direction with respect to disturbances in the unemployment variable. In six subperiods it moves in a disadjusting direction. In the one subperiod during which the unemployment variable was stable, the percentage rate of change in the money supply decreased.

The discount rate, column 2, Table 31, reacted in an adjusting direction during only four subperiods. During nine subperiods of disturbance in the unemployment variables, the discount rate was either stable or exhibited a trend. In two subperiods, the discount rate moved in a disadjusting direction.

Commercial and savings bank credit expansion moved in a disadjusting direction in eleven subperiods. In only two subperiods did the variable respond in an adjusting direction with respect to the unemployment variable.

National Bank lending and the private sector also moved primarily in a disadjusting direction with respect to disturbances in the unemployment variable, in this case, during seven subperiods. In only one subperiod did it clearly move in an adjusting direction. In the remaining seven subperiods, the variable either exhibited no trend or data were not available (in three subperiods).

The evidence in Table 31 thus suggests that none of the policy variables considered were directed with any regularity toward the goal of maintaining full employment. Such a conclusion supports the earlier findings.

Regression Analysis

A major difficulty in the study continues to be the isolation of the effect of each target variable on the policy variable. Again, multiple regression has been used, with limited success, to examine these relationships in the hope of corroborating the previous findings and to quantify, where possible, the policy "trade-offs" which have existed. The model used is the same one used for Finland. Regressions were run with the discount rate, the short-term government bond rate, the level of deficit spending and the money supply as policy variables against proxies for the full-employment, price stability, economic growth and balance-of-payments policy goals. Lags of 5, 7, and 9 were experimented with. The results were poor with the shorter lags (the estimates of the parameters were significant only at high probability levels) and were discarded. Neither were any of the regression coefficients significant when the discount rate, the government bond rate, or the level of deficit spending were used as policy variables. Better results were obtained with the money supply as the dependent variable. In this case, the money supply measured in billions of kroner was regressed against the industrial production index, the wholesale price index, the level of unemployment measured in thousands of workers, and the level of international reserves measured in millions of U.S. dollars. As before, the regression was corrected for auto regressive disturbances. The results of the regression are given in Table 32 where the λ_i , ∂_i , δ_i , and η_i ($i=0,1,2,3$) are the estimated regression coefficients from which the regression weights are computed according to the polynomial model described in Chapter 3. Only B and the λ_i and

TABLE 32

RESULTS OF REGRESSING MONEY SUPPLY AGAINST
INDUSTRIAL PRODUCTION, WHOLESALE PRICES,
UNEMPLOYMENT, AND INTERNATIONAL
RESERVES

	Regression Coefficients			
	Industrial Production	Wholesale Prices	Unemployment	International Reserves
i	λ_i	α_i	δ_i	η_i
0	.014958 ^a (.00427)	.023704 (.21403)	-.009754 (.002088)	-.005142 ^a (.000807)
1	-.012573 ^a (.004622)	-.015002 (.024695)	-.000687 (.002262)	.002989 ^a (.001107)
2	.004194 ^a (.001222)	.00213 (.006565)	.001218 (.000614)	-.000722 ^a (.000311)
3	-.000330 ^a (.000091)	-.000040 (.000467)	-.000100 (.000044)	.000054 ^a (.000023)

^aSignificant at the .05 probability level. Standard errors appear in parentheses below the estimates.

Note: Regression Constant: -27.07447
(3.73919)

Coefficient of autocorrelation (ρ): -.4

Coefficient of determination (R^2): .9970

η_i are significant at the .05 probability level. The weights, w_{j1} and w_{j4} ($j=0,1,2,\dots,9$), corresponding respectively to the production and international reserves variables, are shown in Table 33. The weights constructed from the ∂_i and δ_i are considered statistically unreliable and are not shown.

The weights belonging to the production variable (graph a, Figure 52) display a pattern similar to the one found for Finland. All the weights are positive. The interpretation is that when industrial production increased, while prices, unemployment and international reserves remained constant, the authorities increased the money supply. The weights increase rapidly, reaching a maximum in period $t-6$. The latter part of the lag, unfortunately, may partly reflect an endogenous relationship between the two variables. But the early weights are also positive. A unit increase in the industrial production index in period t would be accompanied by a 14 million kroner increase in the money supply in period t , a 6 million increase in period $t+1$, and a 4 million increase in period $t+2$. The conclusion is that one of the policy goals of Danish monetary policy was the facilitation of economic expansion by allowing expansion of the money supply to keep pace with expansion in production.

The weights associated with the international reserve variable (graph b, Figure 52) show an interesting pattern. They are negative, indicating offsetting monetary policy, for nearly the entire lag. The fact that the period t weight is negative means that the liquidity effect of a period t increase in the level of international reserves is offset within the same period. This rapid reaction may in part be explained by the fact that all traders must immediately turn over

TABLE 33

REGRESSION WEIGHTS FOR INDUSTRIAL PRODUCTION AND
INTERNATIONAL RESERVES

	Regression Weights	
	Industrial Production	International Reserves
lag	W_1	W_4
t	.014958	-.005142
t-1	.006249	-.002821
t-2	.003948	-.001620
t-3	.006075	-.001215
t-4	.010650	-.001282
t-5	.015693	-.001492
t-6	.080439	-.001536
t-7	.019263	-.001075
t-8	.013830	-.000210
t-9	.000945	-.002643

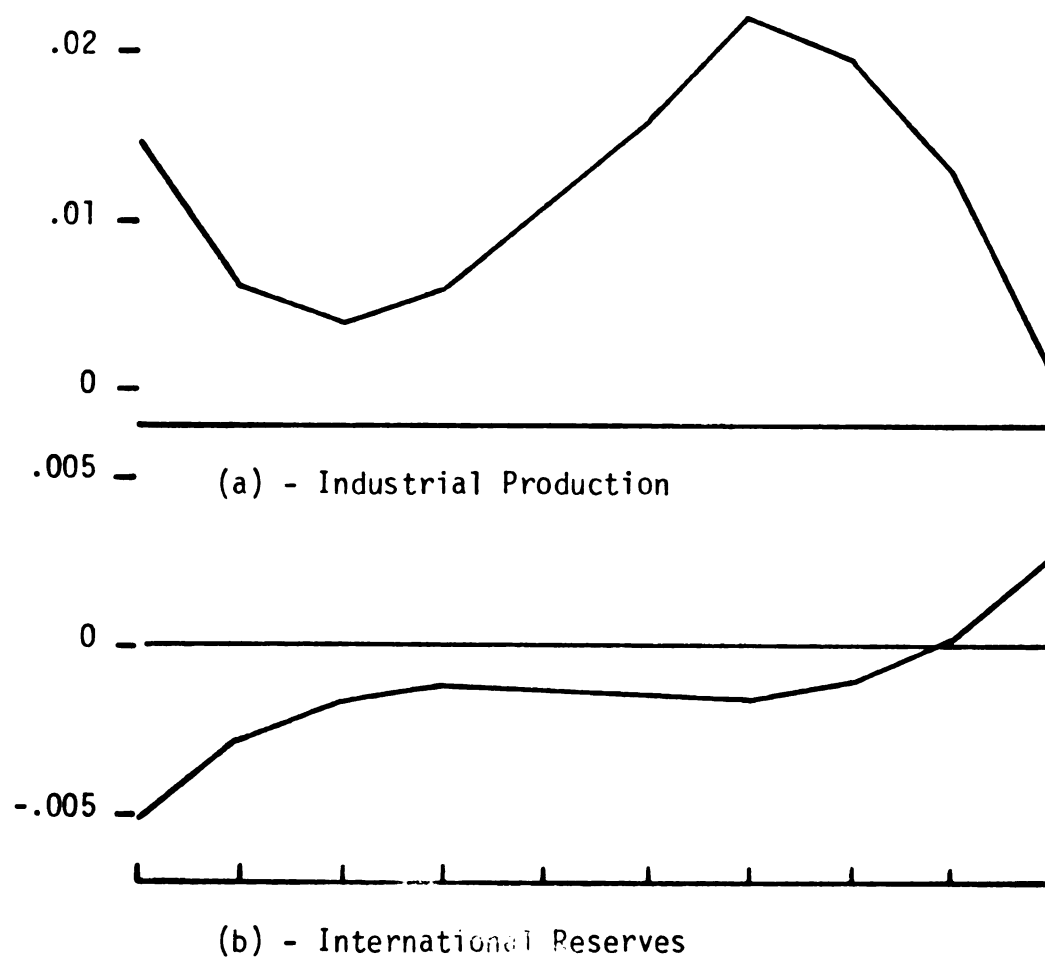


FIGURE 42

TIME-PROFILE FOR PRODUCTION AND INTERNATIONAL RESERVES: FIRST EQUATION

foreign exchange to licensed foreign exchange dealers from whom the authorities get speedy and accurate accounting.

However one explains this rapid offsetting, the fact is that this regression does not support the hypothesis that the authorities used monetary policy, when the money supply is considered the crucial variable, to adjust balance-of-payments disturbances. Rather the goal appears to have been to offset the liquidity changes brought about by fluctuations in the level of international reserves. There remains the possibility that asymmetrical policy behavior with respect to balance-of-payments disturbances is confusing the result.

To test the latter hypothesis, the international reserve variable was divided into periods of rising and falling reserves. The technique used is described in Chapter 3. The results of this regression are shown in Table 34 where λ_i , ∂_i , and δ_i are the same as before while θ_i is associated with a rising level of international reserves and ϕ_i with a constant or falling level. A Chow test was performed to determine whether the periods of rising and falling reserves were significantly different. The F statistic calculated for the test is 40.06 and is distributed $F_{17,42}$. The hypothesis that the periods were not significantly different is rejected at the .05 level. Only the λ_i and ϕ_i are significant at the .05 probability level. The regression weights constructed from these estimates are shown in tabular form in Table 35 and graphically in Figure 53.

The pattern formed by the w_{j1} (Figure 53, graph a) is similar to that obtained with the first regression equation. Again the money supply is shown to respond positively to the proxy for the growth goal. Different results were obtained with the international reserve variable.

TABLE 34

**RESULTS OF REGRESSING MONEY SUPPLY AGAINST INDUSTRIAL
PRODUCTION, WHOLESALE PRICES, UNEMPLOYMENT,
RISING RESERVES, AND FALLING RESERVES**

	Regression coefficients				
	Industrial Production	Wholesale Prices	Unemployment	Rising Reserves	Falling Reserves
i	λ_i	α_i	δ_i	θ_i	ϕ_i
0	.022213 ^a (.003458)	-.012947 (.017178)	-.011551 (.001695)	-.006598 (.001131)	-.000989 (.000349)
1	-.016186 ^a (.003527)	.000349 (.018739)	.001884 (.001864)	.003770 (.001212)	-.000377 (.000299)
2	.004997 ^a (.000921)	.001259 (.004928)	.000609 (.000506)	-.000397 (.000319)	.000373 (.000083)
3	-.000385 ^a (.000068)	-.000111 (.000350)	-.000062 (.000036)	.000003 (.000024)	-.000034 (.000006)

^aSignificant at the .05 probability level. Standard errors are shown in parentheses below estimates.

Note: Regression Constant: -15.752242
(2.833696)

Coefficient of autocorrelation (p): -.2

Coefficient of determination (R^2): .9987

The F statistic for the Chow test is 40.06 and is distributed $F_{17,42}$. The hypothesis that the periods of rising and falling reserves were not significantly different is rejected at the .05 level.

TABLE 35

REGRESSION WEIGHTS FOR INDUSTRIAL PRODUCTION
AND FALLING INTERNATIONAL RESERVES

lag	Industrial Production	Falling Reserves
	w_1	w_5
t	.022213	-.000989
t-1	.010639	-.001027
t-2	.006749	-.000523
t-3	.008233	.000319
t-4	.012781	.001295
t-5	.018083	.002201
t-6	.021829	.002833
t-7	.021709	.002987
t-8	.015413	.002459
t-9	.000631	.001045

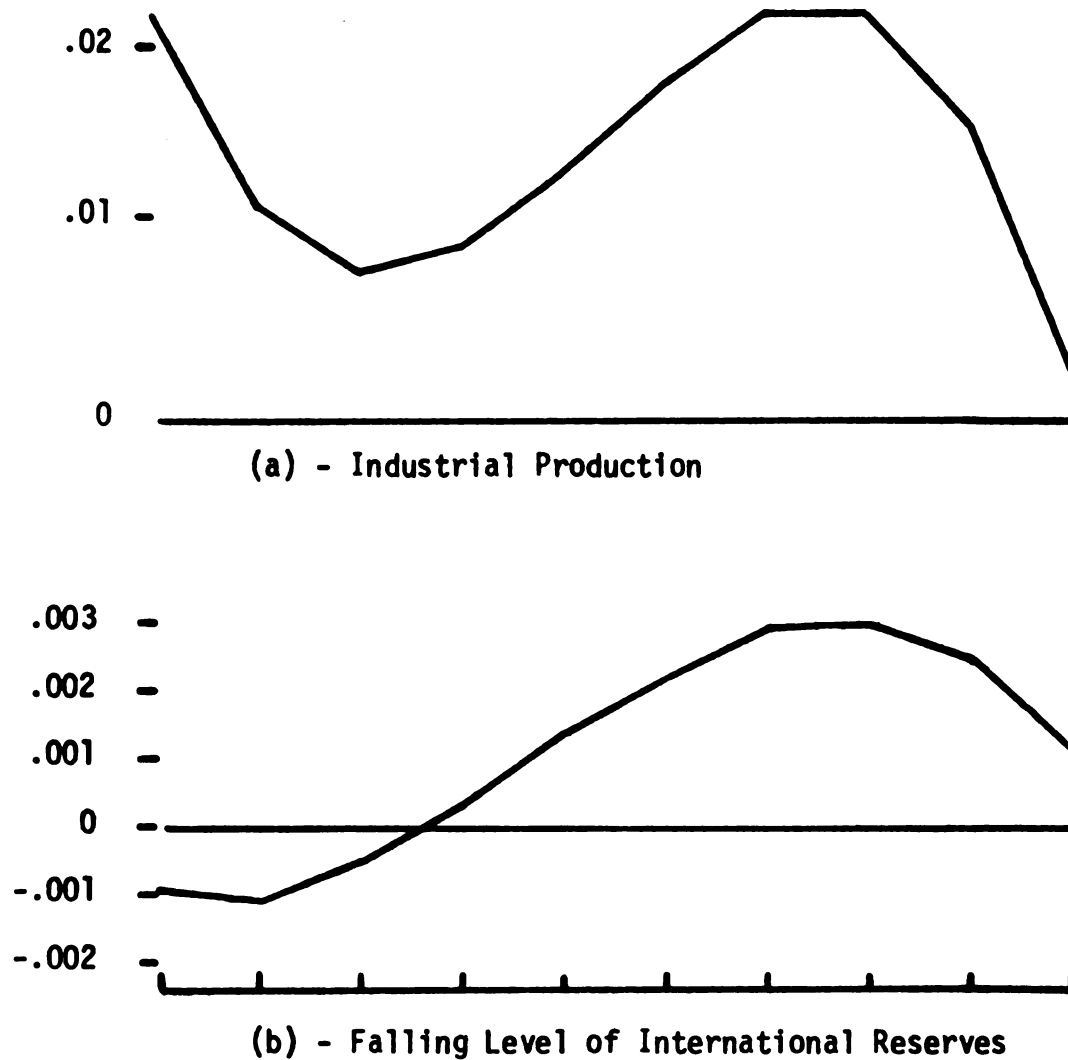


FIGURE 53

TIME-PROFILE FOR PRODUCTION AND FALLING RESERVES:
SECOND EQUATION

Only the weights associated with a falling level of reserves are reliable, and the pattern they form indicates that, after a two-period lag, movement in the money supply is in an adjusting direction with respect to decreases in the level of international reserves. It appears that short-run decreases in domestic liquidity due to a loss of reserves are offset, while in the long-run (from period $t-3$ to $t-9$) the money supply contracts in response to a downward disturbance in the level of international reserves.

The conclusion of this section is that, in the period under investigation, monetary policy, as represented by the money supply, responded to two target goals: economic growth, represented by the industrial production index, and balance-of-payments deficits, represented by a falling level of international reserves.

Summary

Denmark's "typical" policy reaction to negative balance-of-payments disturbances will now be reconstructed on the basis of the foregoing investigation. Multiple regression analysis has revealed that the immediate liquidity effect of a decrease in international reserves, *ceteris paribus*, will be offset, but after that a two-quarter lag, the money supply will begin to contract. This is considered an adjusting reaction of the crucial policy variable, the money supply, with respect to a falling level of international reserves. All three methods of analysis corroborate this finding.

Multiple regression analysis also revealed that the money responded positively to the proxy for economic growth. To compel the adjustment of the money supply to balance-of-payments deficits then requires that the fall in the level of international reserves must be of greater importance in the authorities' minds than any opposite change which

may have occurred in the growth variable. Reference cycle analysis indicates that the money supply moved in an adjusting direction in approximately 75 per cent of the balance of payments disturbances, while the production variable and the reserve variable called for the same policy remedy approximately 30 per cent of the time. Thus it would appear that in roughly 40 per cent of the cases where two variables called for opposite policy remedies, the reserve variable was given the greater weight in policy reactions.

The evidence cannot substantiate the hypothesis that the money supply moved in an adjusting direction with respect to increases in the level of international reserves. Again it appears that asymmetrical policy reaction occurred. Monetary contraction followed negative disturbances but monetary expansion was not systematically followed by expansion of the money supply. This model of reaction again supports the thesis that the "adjustable peg" system of international finance exhibited a deflationary bias.

When there is a negative disturbance in the balance of payments, the National Bank typically responds, after some lag, by raising the discount rate and reducing its lending to the private banking sector. The fact that short-term interest rates on government bonds also rises suggests that the bank may simultaneously be engaged in open market sales. National Bank lending to the government does not contract. Since lending to the government comprises a large proportion of total National Bank credit, the overall rediscounting policy is disadjusting. Nevertheless, the net effect of National Bank policy is to reduce the money supply by reducing the liquidity of the commercial banking system. During approximately 3 out of 4 of the payments disturbances, commercial bank credit responded in an adjusting direction.

Fiscal policy did not respond to payments disturbances but appeared to be paired most consistently with the unemployment and production variables. This pattern of policy reaction suggests that Denmark directed fiscal policy toward internal policy goals and monetary policy toward external goals.

The country has responded differently to balance of payments deficits and surpluses. It did not inflate to counteract surpluses, but it did contract to adjust deficits, a type of policy reaction criticized by many students of the "adjustable peg" system of international finance.

Chapter 6

NORWAY

Monetary Policy

The Norges Bank, Norway's central bank, is responsible for conducting Norwegian monetary policy. The Norges Bank was founded in 1816 as a joint-stock company. In 1949 outstanding privately owned stock was purchased by the government, making the bank a publicly owned institution. The bank's Board of Directors has five members. Its chairman and deputy chairman are appointed by the King, the remaining three members are elected by the Parliament. Norges Bank maintains 20 branches throughout Norway and has the sole right to issue currency. The Norwegian monetary unit is called the krone (Norwegian crown). Besides the Norges Bank, the Norwegian banking system consists of four major commercial and savings banks with 174 branches.

Under an 1892 act, the Norges Bank is prohibited from lending to the government. The government must borrow from the general public or from the private banks. Although direct loans from the Norges Bank to the private sector were an important source of credit in the pre-World War II period, they have not been in the period under investigation.¹

¹Erik Brofoss, "The Status of the Central Bank in Constitutional and Administrative Law," Norges Bank Bulletin, Vol. XXX, No. 4 (December 1959), p. 91.

Such loans were made only to the fishing industry, and were insignificant in relation to the total credit market.

Monetary Policy Instruments

The Discount Rate

During the period under investigation, the Norges Bank did not use the discount rate as an active tool to affect either the rate of credit expansion or the country's net outflow of international capital. From 1950 to the end of 1969, the Norges bank changes the discount rate only twice, from 2.5 per cent to 3.5 per cent in 1954 and from 3.5 per cent to 4.5 per cent in 1969.

Interest Rates

Until the late 1960s, the objective of Norwegian interest rate policy was single fold. Interest rates were to be kept low to stimulate capital investment.² Contractionary monetary policy therefore entailed a system of credit allocation (in the credit availability sense) at low interest rates. Credit for high priority investments was available from specialized financial institutions³ which relied heavily on the availability of government funds.

Norges Bank Claims on the Banking System

Neither the rediscounting of securities nor direct loans to the banking system were an important source of credit to the banking system during the period of investigation. Although the Norges Bank is

²Walter J. Sedwitz, "Inflexible Interest Rates and Economic Policy: The Case of Norway, 1946-1956," *Political Science Quarterly*, Vol. 71, No. 4 (New York: Academy of Political Science, Columbia University, 1956), pp. 591-592.

³OECD, Economic Surveys: Norway, (Paris: January 1972), p. 7.

empowered to loan to private banks to affect credit expansion, it used the power sparingly. Consequently, private banks were typically not in debt to the Norges Bank.

Open Market Operations

During the 1950s open market operations were perhaps the Norges Bank most important monetary instrument for affecting domestic liquidity.⁴ Because of the country's underdeveloped (both in size and in the variety of securities available) capital market, the Norwegian version of open market operations does not follow the U.S. model. When conducting open market sales the Norges Bank sells the securities directly to the banks. Often the yield of the securities being sold may be below effective market yields, in which case the banks are induced to purchase the securities through moral suasion. Since the Norges Bank must deal with only four major commercial banks, it can effectively control their behavior with moral suasion. Because of this they have been able to conduct open market operations while still maintaining a rather inflexible interest rate policy.⁵

Required Reserve Ratio

In 1952, a law was passed giving the Norges Bank the right to establish reserve requirements. The law was first passed to increase the effectiveness of Norges Bank voluntary guidelines to the commercial banks, since non-compliance with the guidelines would now raise the prospect of official retribution in the form of a higher reserve ratio.⁶

⁴Sedwitz, op. cit., pp. 581-582.

⁵Ibid.

⁶Ibid.

The Norges bank did not establish a legal reserve ratio until 1955. By the late 1960s the required reserve ratio had replaced open market operation as the Norges Bank most important monetary tool.⁷

Fiscal Policy

Norway's national budget is prepared by the ministry of Finance subject to the approval of Parliament. The budget for the coming calendar year is submitted to the Parliament in October, and is then reviewed at least twice during the calendar year, once at the end of the first quarter, and again at the half year mark. Income and capital taxes provide a third of national tax revenue, the general turnover tax another third, and customs duties and other excise taxes the final third. The major national expenditures are for defense, social security, communications, education, research and general administration.⁸

Incomes Policy

Norway has used incomes policy to influence wage, price, and income formation throughout the post-World War II period. Since the early 1950s the system has involved the centralized negotiation of wage and salary contracts by national labor and employer associations. The government influences the negotiations by outlining the economic policy it intends to pursue for the contract period under negotiation. This outline includes the disposition of all governmental policies and programs affecting income distribution in the economy, such as tax

⁷OECD, Economic Surveys: Norway, (Paris: July 1969), p. 20.

⁸Grant Olson, "Basic Data on the Economy of Norway," Overseas Business Reports, OBR 70-5, (Washington, D.C.: U. S. Department of Commerce, April 1970), p. 10.

and transfer payments, agricultural and fishery supports, industrial subsidies, social programs, etc.⁹ The employer and labor associations are then free to negotiate a settlement without government interference. A tentative settlement by the national associations is subject to the ratification of member unions and companies. If it is not ratified, the contract is subject to renegotiation. The government has the power to make a settlement approved by a simple majority of the members binding on all members. Should the national associations be unable to reach agreement, the law calls for a cooling-off period during which the government, in conjunction with labor and management, searches for a basis of settlement.

The authorities state that the objective of incomes policy has been to control inflation while maintaining full-employment.¹⁰ The authorities believe that the program has been very successful.¹¹ While admitting that such an assessment is difficult to prove without knowing what the rate of inflation and unemployment would have been without the program, they cite a number of facts as prima facie proof of the program's efficacy. Although Norway's price level and per unit labor costs have risen at about the same rate as the OECD member country average, Norway's unemployment has been consistently below the average, its growth has been steady and strong, and its export sector has been without competitive reversals.

⁹OECD, Economic Surveys: Norway (Paris: January 1971) p. 41.

¹⁰Ibid., p. 44.

¹¹Ibid.

Statistical Analysis

The quarterly time-series of Norges Bank international reserves is the variable selected to represent Norway's external position. The reason for the selection is twofold. The first is that there is evidence that this variable is closely watched by Norwegian policy-makers,¹² and the second is that quarterly balance-of-payments data was unavailable for most of the period under investigation.

Three distinct periods are apparent in the international reserves times series. The first period extends from I 1950 to II 1962. During this period the level of Norway's international reserves did not exhibit a positive time trend. The second period extends from II 1956 to II 1965 and is characterized by a substantial upward trend over time. A trend line was fitted to the data of this period using regression analysis. The equation

$$R_t = B_0 + B_1 T_t + u_t$$

was estimated, where R_t is the level of reserves in millions of U.S. dollars, T_t an index of time, and u_t a disturbance. The results of the regression are

$$R_t = 34.4599 + \underset{(.38946)}{5.63708} T_t + e_t \quad R^2 = .86$$

The standard error appears in parentheses below the estimate. B_1 is significant at the .05 probability level and indicates that a one quarter increase in time during this period tended to raise the level of Norway's official international reserves by 5.6 million dollars. The third period extended from II 1965 to IV 1968 and exhibited an

¹²Erik Brofoss, "Address at the Meeting of the Supervisory Council," Economic Bulletin, Vol. XLI, No. 1 (Oslo: Norges Bank, 1970), pp. 15-16.

even more pronounced upward trend than the second period. A trend line fitted to the data of this period gave these results:

$$R_t = -467.32739 + \frac{14.82921}{(2.43218)}T_t + e_t$$

$$R^2 = .71$$

Again the estimate of the slope is significant at the .05 level. Norwegian international reserves tended to increase 14.8 million U.S. dollars per quarter during this period.

Identification of disturbances in Norway's external position was made more difficult by the more or less secular expansion of reserves which occurred after II 1956. Two models of identification were experimented with. In the first, changes in the absolute level of international reserves were used to delineate subperiods of external disturbances. In the second, deviations from the trend were used. Both techniques identified 18 subperiods of reserve disturbances, and they differed from each other in their delineation of six of the subperiods. Since the authorities appeared to regard the accumulation of international reserves as desirable,¹³ the subperiods identifying deviations from the trend were selected for analysis.

Table 36 examines the behavior of the monetary policy variables during the subperiods of disturbances in Norway's international reserves. During a subperiod where international reserves are said to be "above," it means they are rising faster than the trend. When international reserves are said to be "below," they can be either falling or rising slower than the trend. A subperiod during which international reserves are "on" means they are rising at the same rate as the trend.

¹³OECD, January 1972, op. cit., pp. 14-15.

TABLE 36
BEHAVIOR OF POLICY VARIABLES DURING SUBPERIODS OF
DISTURBANCES IN INTERNATIONAL RESERVES

Subperiod	(1) International Reserves ¹	(2) Money Supply ²	(3) Norges Bank Claims on the Private Sector
I 1950-III 1951	above	rises (+)	rise
III 1957- II 1954	on	rises	no trend
II 1954- I 1955	below	falls (+)	rise
I 1955- IV 1955	above	stable	rise
IV 1955- II 1956	below	rises (-)	rise
II 1956- I 1957	above	falls (-)	fall
I 1957-III 1957	below	falls (+)	stable
III 1957- II 1958	on	rises	no trend
II 1958- IV 1958	above	rises (+)	fall (-)
IV 1958-III 1959	below	rises (-)	fall (+)
III 1959- IV 1960	on	rises	rise
IV 1960- II 1962	below	rises (-)	fall (+)
II 1962- II 1963	above	falls (-)	rise (+)
II 1963- I 1964	below	rises (-)	rise (-)
I 1964- II 1965	on	falls	fall
II 1965- I 1966	above stable	rise (+)	fall (-)
I 1966-III 1966	below	falls (+)	rise (-)
III 1966- II 1968	above	rises (+)	rise (+)
II 1968-III 1969	below	rises (-)	fall (+)

TABLE 36 (cont'd.)

Subperiod	(4) Commercial and Savings Banks Claims on the Private Sector ²	(5) Commercial and Savings Banks Claims on the Government ²	(6) Deposit Reserve Ratio ³	(7) Yield on Long-term Government Bonds
I 1950-III 1951	fall (-)	fall (+)	n.a.	rises (-)
III 1951- II 1954	fall	rise	n.a.	stable
II 1954- I 1955	fall (+)	fall (-)	n.a.	rises (+)
I 1955- IV 1955	fall (-)	rise (-)	n.a.	rises (-)
IV 1955- II 1956	rise (-)	falls (-)	n.a.	rises (+)
II 1956- I 1957	fall (-)	rise (-)	n.a.	no trend
I 1957-III 1957	rise (-)	fall (-)	n.a.	rises (+)
III 1957- II 1958	fall	rise	rises	falls
II 1958- IV 1958	fall (-)	rise (-)	rises (-)	no trend
IV 1958-III 1959	rise (-)	rise (+)	falls (-)	falls (-)
III 1959- IV 1960	rise	fall	falls	stable
IV 1960- II 1962	rise (-)	fall (-)	falls (-)	rises (+)
II 1962- II 1963	fall (-)	fall (+)	falls (+)	no trend
II 1963- I 1964	fall (+)	fall (-)	rises (+)	stable
I 1964- II 1965	rise	rise	rises	stable
II 1965- I 1966	rise (-)	rises (-)	falls (+)	
I 1966-III 1966	rise (-)	fall (-)	stable	no trend
III 1966- II 1968	fall (-)	rise (-)	falls (+)	falls (+)
II 1968-III 1969	rise (-)	rise (+)	falls (-)	falls (-)

Note: + means that the policy variable moved in an adjusting direction with respect to the external position.
 - means that the policy variable moved in a disadjusting direction with respect to the external position.
 n.a. means that the data was not available.

¹Deviation from trend: "above" means international reserves are rising faster than the trend.
 "below" means international reserves are rising slower than the trend.
 "on" means international reserves are rising as fast as the trend.

²Rate of change.

³The ratio of bank reserves to demand deposits.

Sources: The table was compiled from statistics contained in various issues of IMF International Financial Statistics and OECD Main Economic Indicators.

An overview of Table 36 finds none of the monetary instruments examined responding in an adjusting direction with respect to the reserve variable more than 50 per cent of the time. The money supply, which in the Finland and Denmark studies was considered the "crucial" indicator of monetary policy, moves in an adjusting direction with respect to the reserve variable during seven of the subperiods. In another seven it moves in a disadjusting direction. During the remaining four subperiods, international reserves are increasing at the same rate as the trend. In three of these subperiods, the rate of growth in the money supply also increases. Since the level of reserves in these periods is increasing, this could be considered an adjusting change in the money supply. In this case, it would have moved in an adjusting direction in ten of the 18 subperiods.

Of the remaining policy variables, the most important are two commercial and savings banks claims on the government and the deposit reserve ratio. The former is an indicator of the direction of the Norges Bank open market operations, and the latter of the Bank's required reserve policy. For much of the period under investigation, the Norges Bank relied on the voluntary cooperation of the private banks in the use of both of these instruments. By the late 1960s, however, the Norges Bank had begun to use changes in the legal deposit reserve ratio as a tool to control the creation of credit.

When commercial and savings bank claims on the government are examined (column 5, table 36), we see that the variable moved in an adjusting direction in only three of the 18 subperiods. The deposit reserve ratio (Table 36, column 6) moves in an adjusting direction in four of the 12 subperiods for which data was available.

The less important policy variables, Norges Bank lending to the private sector (Table 36, column 3) and the yield on long-term government bonds (Table 36, column 7) both moved in adjusting direction to the reserve variable during five subperiods.

The results of this initial investigation indicate that the money supply may have responded in an adjusting direction with respect to the balance-of-payments approximately 40 to 55 per cent of the time. Even if the possibility that the money supply was responding to other targets during these subperiods is ruled out, it would appear that Norway did not assign monetary policy the job of maintaining external equilibrium.

Quarterly budgetary data for Norway was unavailable. Table 37 was compiled using annual data and relates changes in fiscal policy to the changes in the four target variables: international reserves, industrial production, unemployment, and wholesale prices. During 16 of the 20 years examined, the budget was in deficit. The direction of change from the previous year in net fiscal spending is considered the indicator of fiscal policy. Fiscal policy, so defined, is seen to have moved in an adjusting direction to the external situation, defined in this case as the rate of change in the level of international reserves, during 12 of the 20 years. Another year may be added when 1957 is considered. Although the direction of change in 1957 was not adjusting, the fact that the budget was in surplus could be considered an adjustment to a falling level of reserves. Moreover, in 1952 and 1953 the level of international reserves was stable. During both of these deficit grew smaller. Since Norway's reserves were relatively low during these years, the less expansionary fiscal policy could be considered an adjusting reaction. Adding these years to the original

TABLE 37

BEHAVIOR OF TARGETS IN RELATION TO FISCAL POLICY

Year	Net Government Spending	International Reserves ²	Industrial Production ²	Unemployment	Wholesale Prices ²
1950	larger deficit	rise (+)	rises (-)	rises (+)	rise (-)
1951	larger deficit	rise (+)	falls (+)	rises (+)	fall (but high) (-)
1952	smaller deficit	stable	falls (-)	rises (-)	fall (but high) (+)
1953	smaller deficit	stable	rises (+)	rises (-)	fall (-)
1954	larger deficit	fall (-)	rises (-)	rise	rise (-)
1955	larger deficit	rise (+)	rises (-)	stable	stable
1956	surplus	rise (-)	falls (-)	rise	rise (+)
1957	smaller surplus	fall	falls (+)	stable (but high) (-)	falls (-)
1958	larger surplus	rise (-)	falls (-)	zero	zero
1959	smaller surplus	rise (+)	rises (-)	rises (-)	rises (-)
1960	deficit	rise (+)	falls (-)	stable (but low)	stable (but low) (-)
1961	smaller deficit	fall (+)	falls (+)	rises (+)	rises
1962	larger deficit	no trend	falls (+)	falls (-)	zero
1963	larger deficit	rise (+)	rises (-)	rises (+)	zero
1964	larger deficit	rise (+)	rises (-)	falls (-)	rises (but high) (-)
1965	larger deficit	rise (+)	falls (+)	falls (-)	falls
1966	smaller deficit	fall (+)	rises (+)	falls (+)	falls
1967	larger deficit	rise (+)	falls (+)	falls (-)	falls
1968	larger deficit	fall (-)	falls (+)	rises (-)	falls
1969	smaller deficit	fall (+)	rises (+)	falls (+)	rises (+)

¹Direction of the change from previous year.²Rate of change.Source: Compiled from data contained in IMF, International Financial Statistics.

12 brings the total number of possible adjusting fiscal reactions to 15. In only four subperiods did fiscal policy clearly move in a disadjusting direction with respect to the external situation.

Fiscal policy's record with respect to industrial production is not as good. In only nine years did fiscal policy move in an adjusting direction with respect to industrial production. In 11 it moved in a disadjusting direction. The preliminary evidence must be that fiscal policy was not consistently directed at the production variable.

In eight of the fourteen periods for which data was available, fiscal policy responded in an adjusting direction to the level of unemployment. Three of these periods during which fiscal policy responded in a disadjusting manner to the external situation occur during the period for which unemployment data was unavailable. In the remaining disadjusting period for the external situation, the budget tended to adjust the unemployment situation. Finally, in only five years did the budget move in an adjusting direction with respect to wholesale prices. The conclusion must be that fiscal policy responded most consistently during the period under investigation to the needs of the external situation.

Table 37 can also be used to examine the relationship between the domestic targets and the external position. In eight years a consistent situation existed between the external position and industrial production. During nine years an inconsistent situation existed. In seven of the nine inconsistent periods, fiscal policy responded in an adjusting manner to the external situation rather than to the production variable.

In five years an inconsistent situation existed between unemployment and the country's external position. In four of these five years, fiscal policy responded to the external position rather than to unemployment.

The rate of change in wholesale prices called for a different policy remedy than the external situation during eight of the years. In six of these eight years, fiscal policy responded in an adjusting direction to the reserve position rather than to wholesale prices. The evidence appears rather conclusive that fiscal policy responded in an adjusting direction with respect to the external situation.

The evidence so far has indicated that fiscal policy was consistently moved in an adjusting direction with respect to the external situation, even when there was a conflict between the needs of the external and internal situations. The question which remains to be answered is which policy tools were directed toward the internal targets of full-employment, adequate growth, and price stability.

Table 38 examines the behavior of the monetary policy variables with respect to disturbances in the level of production. Twelve subperiods of production are identified according to whether the level of production, defined as the rate of change from the previous corresponding quarter, is rising, falling, or stable. The rate of growth of the money supply (Table 38, column 2) moved anticyclically with respect to the production variable in six of the twelve periods. In the remaining six it reinforced the production cycle. The required reserve ratio, column 5, moved in an adjusting direction with respect to the production cycle in four of the six subperiods for which data was available. Commercial and savings banks lending to the government, (Table 38, column

TABLE 38

BEHAVIOR OF POLICY VARIABLES DURING SUBPERIODS OF DISTURBANCES IN INDUSTRIAL PRODUCTION

Subperiod of Disturbance in Production	(1) Production ¹	(2) Money Supply ²	(3) Norges Bank Claims on the Private Sector	(4) Commercial and Savings Banks Claims on Private Sector ²	(5) Deposit Reserve Ratio	(6) Yield on Long-term Government Bonds	(7) Commercial and Savings Banks Claims on the Government ²
IV 1950-III 1952	falls	rises (+)	rise (+)	fall (-)		stable	rises (-)
III 1952-II 1954	rises	falls (+)	no trend	fall (+)		stable	rises (+)
II 1954-III 1955	falls	falls (-)	rise (+)	fall (-)		rises (-)	falls (+)
III 1955-II 1957	rises	rises (-)	no trend	fall (+)		rises (+)	rises (+)
II 1957-III 1958	falls	fall (-)	stable	fall (-)		rises (-)	falls (+)
III 1958-II 1961	rises	rise (-)	stable	rise (-)	rises (+)	falls (-)	rises (+)
II 1961-II 1962	falls	rises (+)	no trend	fall (-)	falls (+)	no trend	falls (+)
II 1962-II 1965	rises	falls (+)	rise	rise (-)	falls (-)	stable	stable (but negative (+))
II 1965-III 1966	falls	stable (+) (high)	rise	rise (+)	rises (-)	falls (+)	rises (-)
III 1966-I 1967	rises	stable (-) (high)	stable	rise (-)	rises (+)	falls (-)	falls (-)
I 1967-IV 1967	falls	rises (+)	no trend	fall (-)	falls (+)	falls (+)	rises (-)
IV 1967-IV 1969	rises	rises (-)	rise (-)	rise (-)	falls (-)	falls ³	falls (-)

¹Rate of change from previous corresponding quarter.²Rate of change.³It falls up to IV 1969, then rises sharply.

7) moved in an adjusting direction to the production variable in seven of the subperiods, while both commercial and savings bank lending to the private sector and Norges Bank lending to the private sector behaved in an adjusting manner during only two and three subperiods respectively.

Although this analysis appears to indicate that monetary policy did not move in an adjusting direction with respect to the production variable, the analysis is incomplete because the Norwegian use of monetary policy does not lend itself well to a statistical indicators type of analysis. The Norwegian authorities have consistently maintained that the long-term interest rate is the best indicator of their monetary policy.¹⁴ Additionally, they have pointed out that the long-term interest rate has been kept purposely low throughout the post World War II period to stimulate capital investment and economic growth. During the 1960 to 1969 period, for example, the yield on long-term government bonds varied between 4.18 and 4.76 per cent, while from 1950 to 1955 it varied from 2.58 to 2.99 per cent, and from 1956 to 1959 from 4.31 to 4.77 per cent. By comparison, Denmark's yield on long-term securities ranged from 5.73 per cent in 1959 to 10.60 per cent in 1969. The proper indicator of monetary policy would therefore not be the minor drift of the long-term interest rate within relative narrow limits, but the fact that the rate was kept low. The type of monetary policy described would normally be thought appropriate during periods of slackening economy activity, but Norway was able to maintain this interest rate stance during both the contractionary and expansionary phases of the production

¹⁴Sedwitz, op. cit., pp. 581-582.

cycle by using incomes policy to control the inflationary effects of the expansionary phase. The conclusion must be that monetary policy in Norway was used to maintain a high level of production and investment.

Examination of Table 39 indicates that, as would be expected from the previous discussion, monetary policy did not respond in an adjusting manner to changes in the level of wholesale prices. In this table 12 subperiods are identified according to whether the rate of change in wholesale prices is increasing, decreasing, or stable. During the subperiods where wholesale prices are identified as stable, it means that the rate of change was zero, i.e., the wholesale price index was constant. In none of the subperiods did the money supply move in an adjusting direction with respect to the rate of change in wholesale prices. Of all the policy variables, commercial and savings bank lending to the private sector (Table 39, column 4) responded most often in an adjusting direction with respect to wholesale price changes, and then it was in only four out of the 12 subperiods. Based on both the statistical evidence and the policy statements of the authorities, the conclusion must be that monetary policy was not generally responsive to changes in the price level.

The target remaining to be examined is the rate of unemployment. The time-series of this variable exhibited a well-defined cycle with relatively long rising and falling phases, which made it better suited to the reference cycle technique of analysis than the "subperiod of disturbance" type. Table 40 identified the reference dates of the unemployment cycle. Figure 54 examines the behavior of commercial and savings bank lending to the government during the unemployment cycle.

TABLE 39

BEHAVIOR OF POLICY VARIABLES DURING SUBPERIODS OF DISTURBANCES IN WHOLESALE PRICES

Subperiod	(1) Wholesale Prices	(2) Money ¹ Supply ¹	(3) Norges Bank Claims on the Private Sector	(4) Commercial and Savings Banks Claims on the Private Sector ¹	(5) Deposit Reserve Ratio	(6) Yield on Long-term Government Bonds	(7) Commercial and Savings Banks Claims on the Government ¹
I 1950- IV 1952	rise	rises (-)	rises (-)	fall (+)		no trend	fall (-)
IV 1952- IV 1953	stable	falls	stable	fall		falls	rise
IV 1953-III 1954	rise	rises (-)	falls (+)	rise		stable	no trend
III 1954- II 1955	fall	falls (-)	rises (+)	rise (+)		rises (-)	fall (+)
II 1955- II 1957	rising	rises (-)	no trend	fall		rises (+)	rise (+)
II 1957-III 1958	fall	falls (-)	stable	fall (-)	rises (-)	rises (-)	falls (+)
III 1958- I 1961	stable	rises	no trend	rise	rises	falls	rise
I 1961- IV 1961	rise	rises (-)	no trend	fall (+)	falls (-)	rises (+)	fall (-)
IV 1961- II 1963	stable	rises	rises	rise	falls	no trend	rise
II 1963- IV 1965	rise	rises (-)	rises (-)	fall (+)	rises (+)	no trend	fall (-)
IV 1965- II 1967	stable	falls	no trend	rise	rises	falls	rise
II 1967-	rise	rises (-)	rises (-)	fall (+)	falls (-)	falls (-)	rise (+)

Note: + means that the policy variable moved in an adjusting direction with respect to the target.

- means that the policy variable moved in a disadjusting direction with respect to the target.

¹Rate of Change.

TABLE 40

REFERENCE DATES OF UNEMPLOYMENT CYCLE

Trough	Peak	Trough
	I 1959	IV 1961
IV 1961	I 1963	I 1967
I 1967	IV 1968	IV 1969

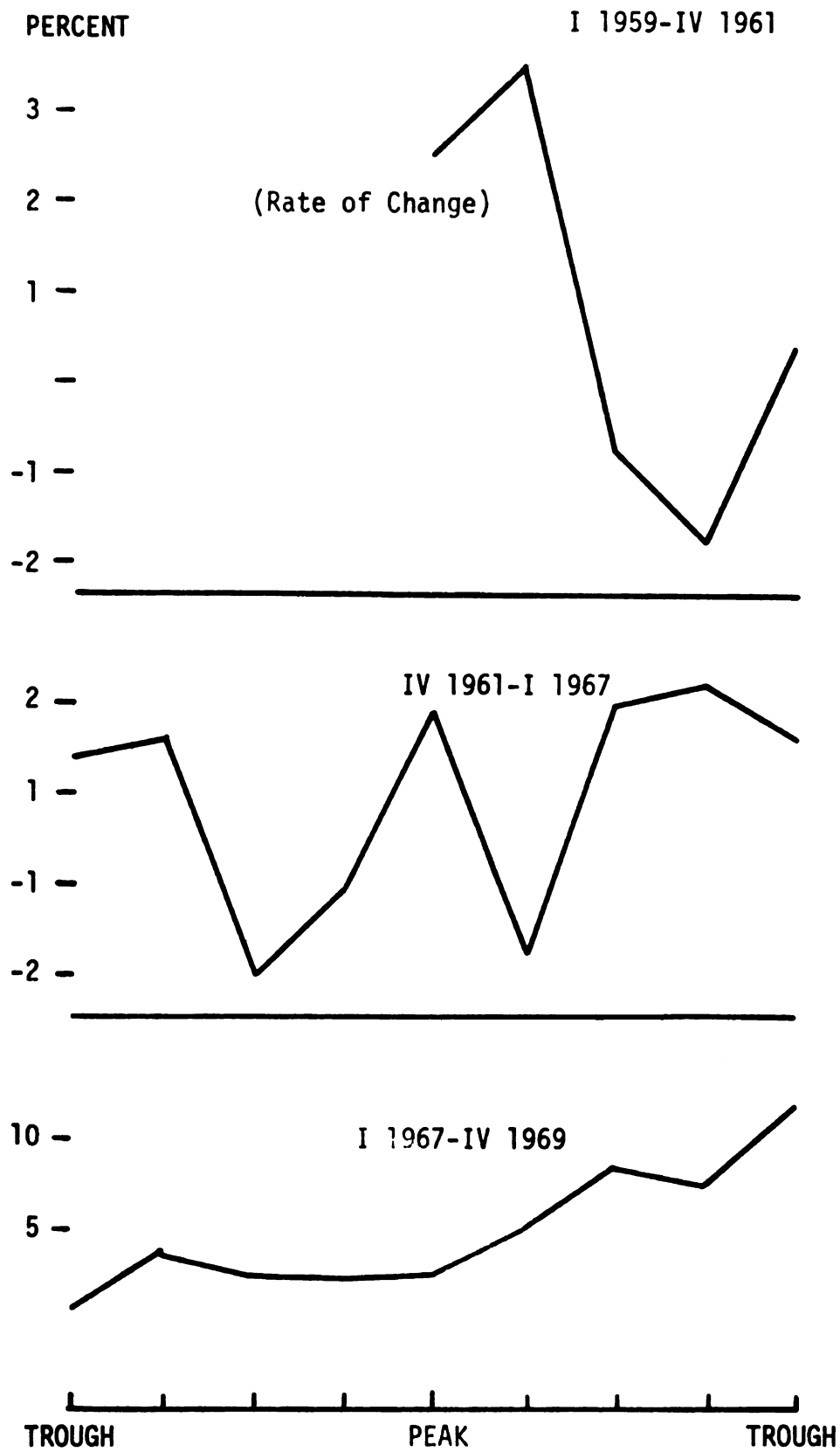


FIGURE 54

BEHAVIOR OF COMMERCIAL AND SAVINGS BANK CLAIMS ON GOVERNMENT
DURING UNEMPLOYMENT REFERENCE CYCLE

Anticyclical behavior of this variable with respect to unemployment would be represented by a U-shaped curve on the graphs, i.e., the private banking system would purchase fewer government securities when unemployment was high and more when it was low. In the first period, I 1959-IV 1961, which represents only the falling phase of unemployment, the pattern is contrary to that required for adjustment. During the second cycle, which lasted (trough to trough) from IV 1961 to I 1967, the policy variable did not exhibit a clear trend. During the final cycle, the variable remains steady during the period when unemployment is rising, is rising, but it does indicate an adjusting reaction during the phase when unemployment is falling. Out of the five phases examined, the commercial and savings bank lending to the government moved in an adjusting direction only once. The conclusion must be that this variable did not consistently react in an adjusting direction to the unemployment situation.

Figure 55 examined the behavior of the long-term interest rate during the unemployment cycle. Again an adjusting reaction of interest rates to the unemployment cycle would be represented by a U-shaped curve, i.e. interest rates would be low when unemployment is high and would rise as unemployment falls. This type of behavior does occur in the last cycle. Therefore in two of the five phases the interest rate tended to move anticyclically with respect to the unemployment variable. These results add more evidence to support the earlier conclusions that interest rate was not generally used as an anticyclical policy instrument.

Figure 56 examines the behavior of required bank reserves during the unemployment cycle. An adjusting pattern of this variable would

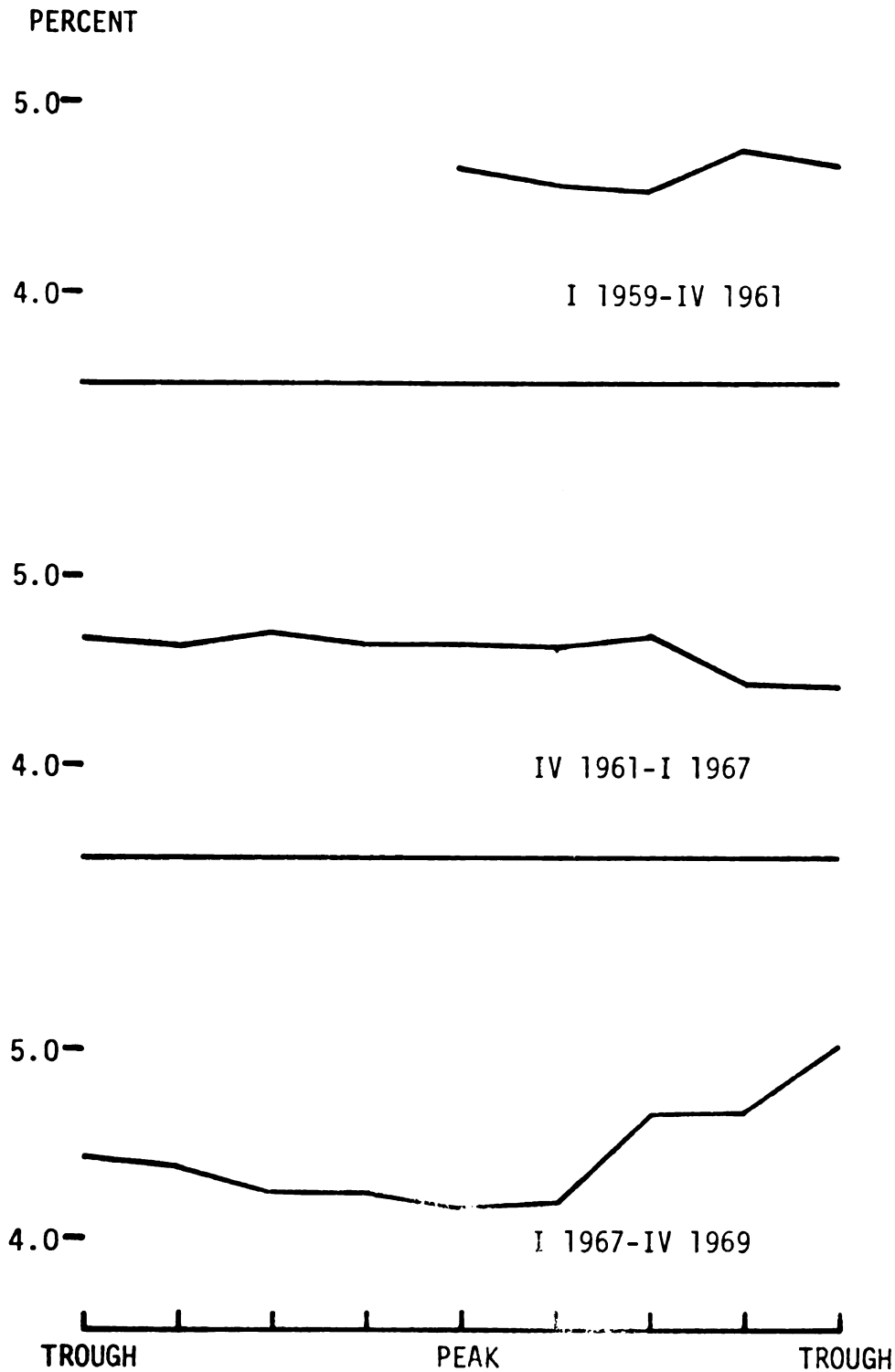


FIGURE 95

BEHAVIOR OF LONG-TERM GOVERNMENT BOND YIELD DURING
UNEMPLOYMENT REFERENCE CYCLE

PERCENT

.3-

.2-

.1-

I 1959-IV 1961

.3-

.2-

.1-

IV 1961-I 1967

.3-

.2-

.1-

I 1967-IV 1969

TROUGH

PEAK

TROUGH

FIGURE 56

BEHAVIOR OF REQUIRED RESERVES DURING UNEMPLOYMENT
REFERENCE CYCLE

also be indicated by a U-shaped curve, i.e., bank reserves fall when unemployment is high and rise when unemployment is low. Such a pattern did not occur in any of the phases.

Figure 57 examines commercial and savings bank lending to the private sector. An inverted U-shaped curve would represent adjusting behavior with respect to this variable, and again such a pattern is not evident in any of the cycles.

Finally, Figure 58 examines the behavior of the rate of change in the money supply with respect to unemployment. An inverted U pattern would indicate an adjusting reaction for this variable. Such a reaction does occur while unemployment is rising during the last cycle. Still the conclusion must be that the rate of growth of the money supply did not generally move in an adjusting direction with respect to unemployment.

At this stage of the analysis in the studies of Finland and Denmark, the behavior of the policy variables with respect to the external situation was again examined using reference cycle analysis. The Norwegian time-series of international reserves, because of its strong secular trend, does not lend itself to this analytical technique. Even when fluctuations around the time trend are examined, a longer cycle with well-defined peaks and troughs does not appear. The deviations from the trend are generally short and abrupt do not lend themselves to the averaging techniques used in reference cycle analysis.

Regression Analysis

The preceding analysis failed to establish a consistent link between the behavior of the money supply and the target variables. In

PERCENT

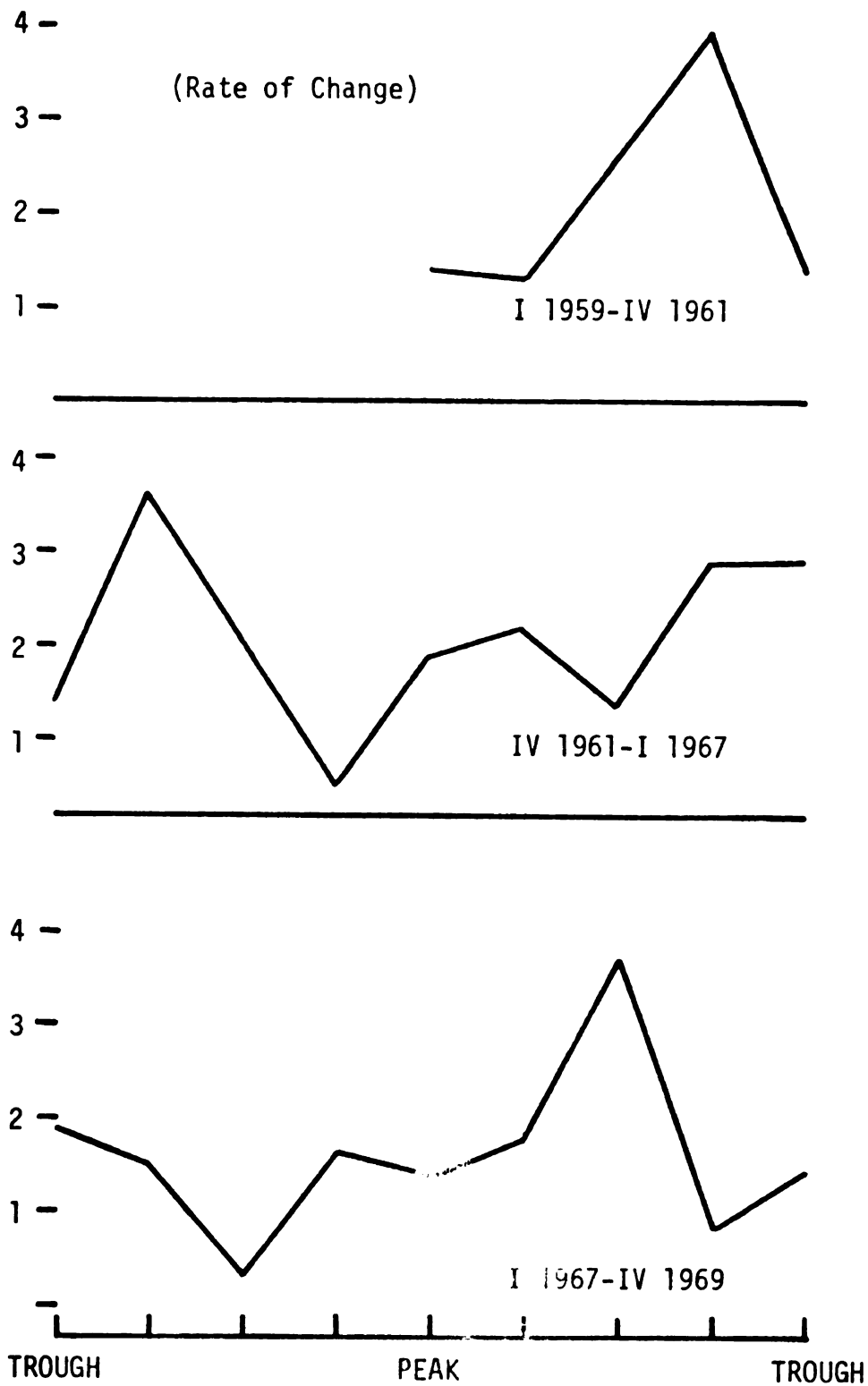


FIGURE 57

BEHAVIOR OF COMMERCIAL AND SAVINGS BANK CLAIMS ON PRIVATE SECTOR
DURING UNEMPLOYMENT REFERENCE CYCLE

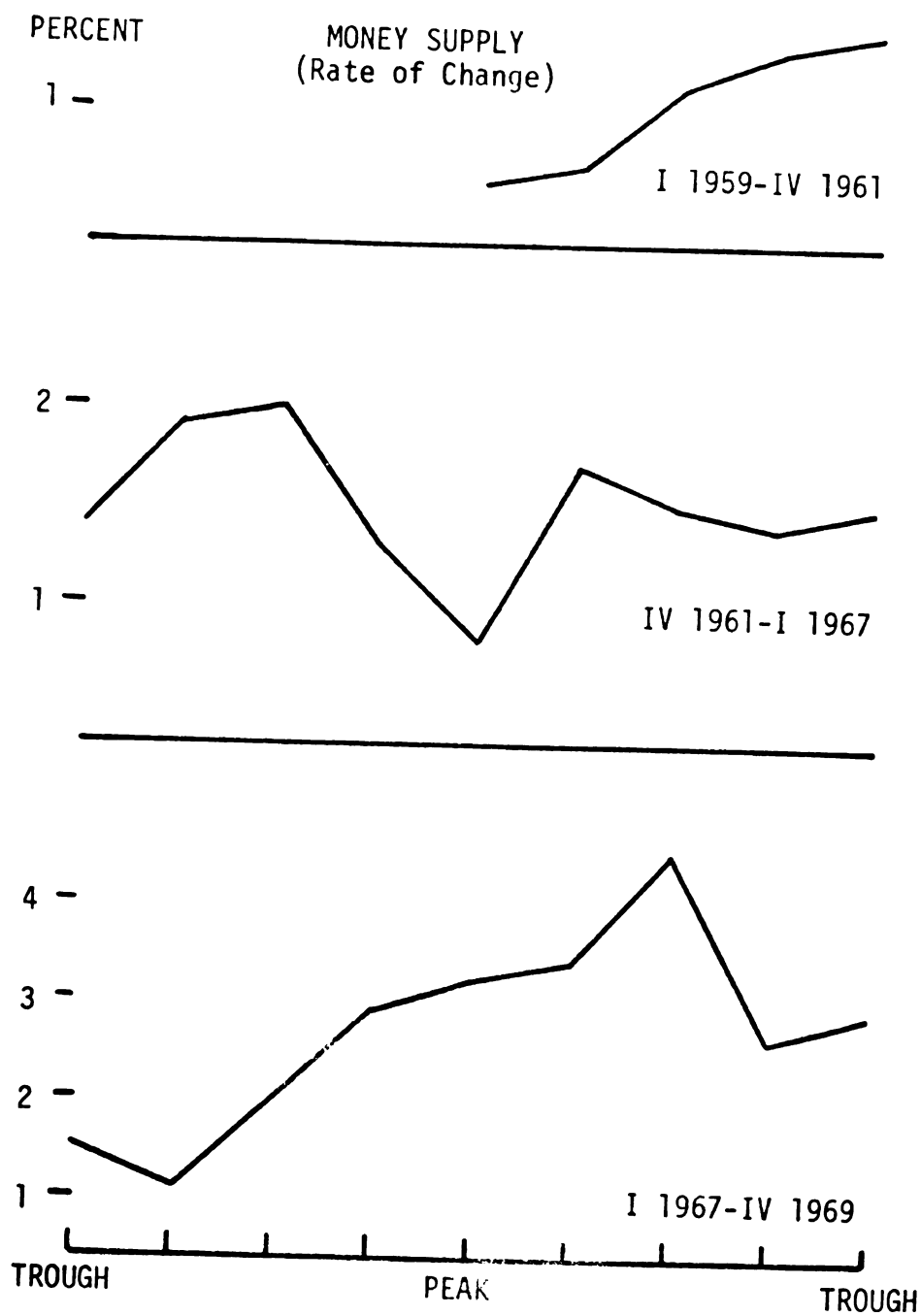


FIGURE 58

BEHAVIOR OF MONEY SUPPLY DURING
UNEMPLOYMENT REFERENCE CYCLE

this section the relationship between the money supply and the targets is again investigated using the polynomial distributed lag model described in Chapter 3, pages 144-46. Although Norwegian interest rates were kept low during the years of the study, they were administered rates. Domestic liquidity, as a consequence, did not have to be aimed at maintaining low market interest rates, but was free to respond to other economic needs. Perhaps multiple regression analysis will give a clearer picture of this response than the earlier analysis.

In the first equation, Norway's money in millions of kroner was regressed against the industrial production index, the wholesale price index, unemployment measured in thousands of laborers, and the level of international reserves measured in millions of U.S. dollars. The results of the regression are shown in Table 41. Only the estimates associated with an industrial production variable are all significant at the .05 probability level. The weights constructed from these estimates appear in Table 42, and are plotted in Figure 59. Only the time profile of the weights associated with the industrial production variable are constructed from significant estimates. They indicate that on a one point increase in the production index in period t will increase the money supply by 33.9 million kroner in period t , by 9.7 million in period $t+1$.¹⁵ In period $t+2$, the weights become negative and remain so for the next three quarters. After a two quarter lag, therefore, the money supply would appear to apply anticyclical pressure on the production variable.

¹⁵The period t effect on the dependent variable of a period $t-1$ change in an explanatory variable is the equivalent of the $t+1$ effect on the dependent variable of a period t change in the explanatory variable.

TABLE 41

**RESULTS OF REGRESSING MONEY SUPPLY AGAINST INDUSTRIAL
PRODUCTION, WHOLESALE PRICES, UNEMPLOYMENT,
AND INTERNATIONAL RESERVES**

	Regression Coefficients				
	Industrial Production	Wholesale Prices	Unemployment	International Reserves	Regression Constant
i	λ_i	α_i	δ_i	η_i	B
0	33.935859 ^a (6.257138)	42.547772 ^a (18.831728)	-6.341617 (8.999240)	1.856823 (1.511009)	1197.659026 (3137.741187)
1	-31.421153 ^a (6.535687)	-30.194137 (23.098983)	27.028612 ^a (7.803465)	-2.709363 (1.839109)	
2	7.778191 ^a (1.813001)	4.726732 (6.291903)	-8.501368 ^a (2.014738)	.842867 (.512346)	
3	-.562837 ^a (.132804)	-.192704 (.456527)	.603062 ^a (.146455)	-.059099 (.038470)	

^aEstimate is significant at the .05 probability level. Standard errors appear in parentheses below estimates.

Coefficient of determination (R^2): .9873

Coefficient of autocorrelation (ρ): .2

TABLE 42

WEIGHTS CONSTRUCTED FROM FIRST

REGRESSION EQUATION: NORWAY

	Industrial Production	Wholesale Prices	Unemployment	International Reserves
Period	W_1	W_2	W_3	W_4
t	33.9359	42.5478	-6.3416	1.8568
t-1	9.7309	16.8877	12.7887	-.0688
t-2	-2.2961	-.4752	18.5348	-.6632
t-3	-5.5195	-10.6971	14.5153	-.2810
t-4	-3.3169	-14.9342	4.3488	.7232
t-5	.9349	-14.3427	-8.3461	1.9948
t-6	3.8591	-10.0788	-19.9508	3.1792
t-7	2.0789	-3.2987	-26.8467	3.9218
t-8	-7.7825	4.8414	-25.4152	3.8680
t-9	29.1019	13.1853	-12.0377	2.6632

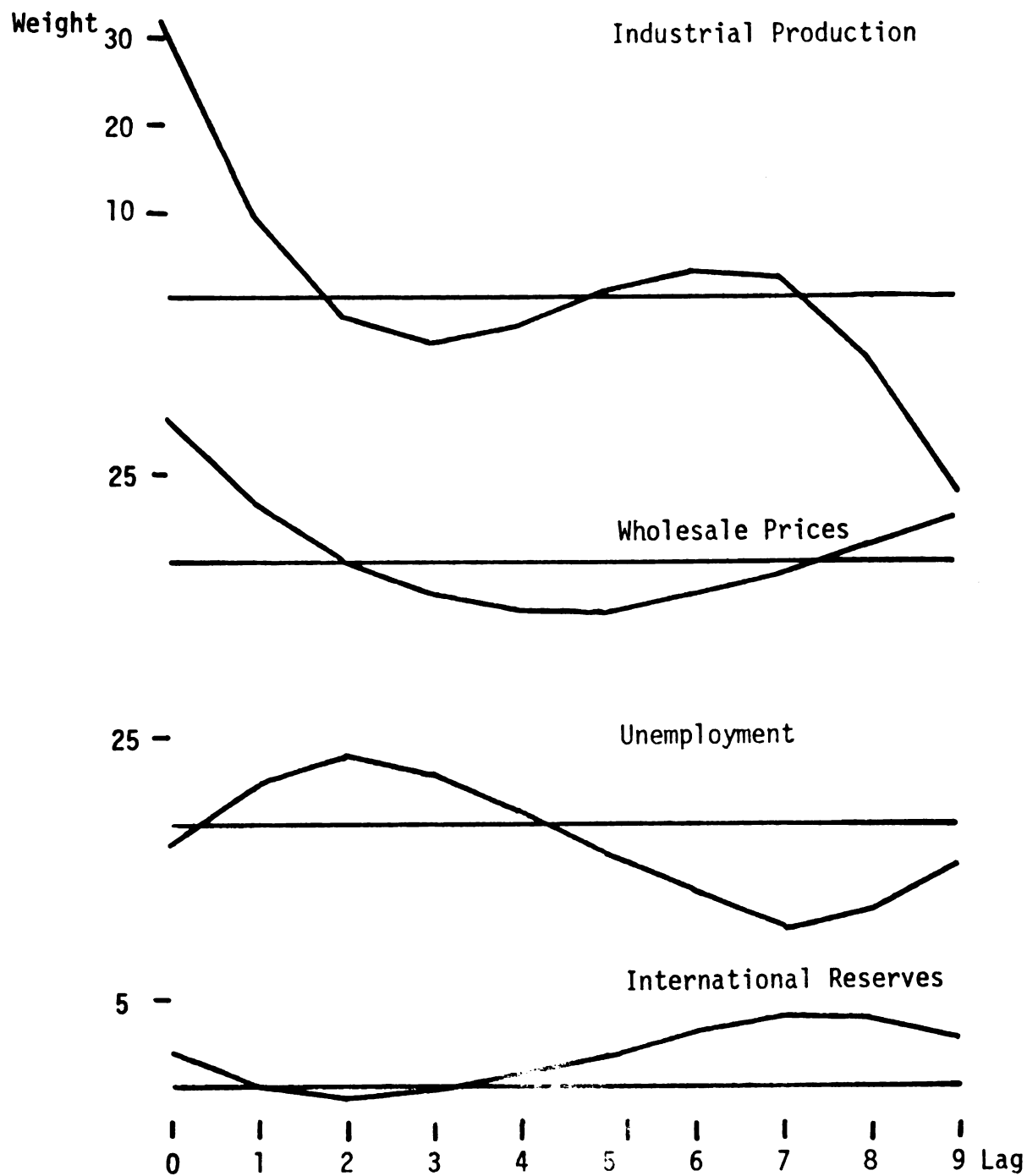


FIGURE 59

TIME-PROFILES FOR FIRST REGRESSION
EQUATION: NORWAY

Examining the time-profile of the weights associated with wholesale prices, it would appear that the money supply moves in an adjusting direction after a two quarter lag. These weights, however, were not constructed from statistically significant estimates.

The situation with respect to the unemployment variable reveals that the money supply moves in an adjusting direction to an increase in unemployment after a one quarter lag. Again the time-profile was not constructed from significant estimates.

The time-profile of the weights associated with the level of international reserves is also statistically unreliable. The weight in period t is positive, meaning that an increase in the level of international reserves in period t will increase the money supply in period t . In period $t+1$, the weights become negative and remain so until period $t+4$. During this period the original increase in the money supply caused by the increase in reserves is being reduced. From $t+4$ to the end of the lag the weights are again positive.

The results of this first equation must be that the money supply responded primarily to the production variable. Although the time-profiles of all the explanatory variables have been examined, those associated with prices, unemployment, and international reserves are statistically reliable.

A second equation which divided the international reserve variable into rising and falling periods was also estimated. The results of this regression appear in Table 43. The weights constructed from the estimates are shown in Table 44, and the time profiles of the weights appear in Figure 60. None of the time-profiles obtained from this equation, however, can be considered statistically reliable. The

TABLE 43

RESULTS OF REGRESSING MONEY SUPPLY AGAINST INDUSTRIAL PRODUCTION, PRICES, UNEMPLOYMENT,
 RISING INTERNATIONAL RESERVES AND FALLING INTERNATIONAL RESERVES

i	Regression Coefficients					Stable or Falling International Reserves	Regression Constant
	Industrial Production	Wholesale Prices	Unemployment	Rising International Reserves			
	λ_i	α_i	δ_i	θ_i	ϕ_i	B	
0	14.571714 (7.505623)	67.63995 (17.982567)	-.788946 (8.649768)	3.627013 ^a (1.431853)	-1.269367 (.808108)	3706.255233 (2732.802347)	
1	-12.872706 ^a (6.241524)	-47.613000 ^a (21.715833)	6.899524 (7.579218)	-2.828528 (1.774568)	.547485 (.625086)		
2	3.167449 (1.736556)	6.712137 (5.875506)	-3.210297 (2.033588)	.862223 (.485919)	-.358003 ^a (.175473)		
3	-0.242523 (.129149)	-.213130 (.425195)	.268578 (.143390)	-.056697 (.036403)	.036292 ^a (.012798)		

^aEstimate significant at the .05 or greater level. Standard errors appear in parentheses below the estimates.
 Coefficient of determination (R^2): .9918
 Coefficient of autocorrelation (ρ): .4
 The F statistic computed for the Chow test is 1.99 and is distributed as $F_{17,44}$.
 The periods of rising and falling reserves are significantly different at the .05 level.

TABLE 44

WEIGHTS CONSTRUCTED FROM SECOND

REGRESSION EQUATION: NORWAY

	Industrial Production	Wholesale Prices	Unemployment	Rising International Reserves	Stable or Falling International Reserves
Period	W_1	W_2	W_3	W_4	W_5
t	14.5717	67.6400	-.7889	3.6270	-1.2694
t-1	4.6239	26.5260	3.1689	1.6040	-1.0436
t-2	-.4441	-2.4434	2.3177	.9652	-1.3160
t-3	-2.0873	-20.5438	-1.7309	1.3704	-1.8690
t-4	-1.7607	-29.0568	-7.3653	2.4794	-2.4842
t-5	-.9193	-29.2600	-12.9739	3.9520	-2.9444
t-6	-1.0181	-22.4320	-16.9451	5.4480	-3.0316
t-7	-3.5121	-9.8514	-17.6673	6.6372	-2.5280
t-8	-9.8563	7.2032	-13.5289	7.1494	-1.2158
t-9	-21.5057	27.4532	-2.9183	6.6744	1.1228

Weights

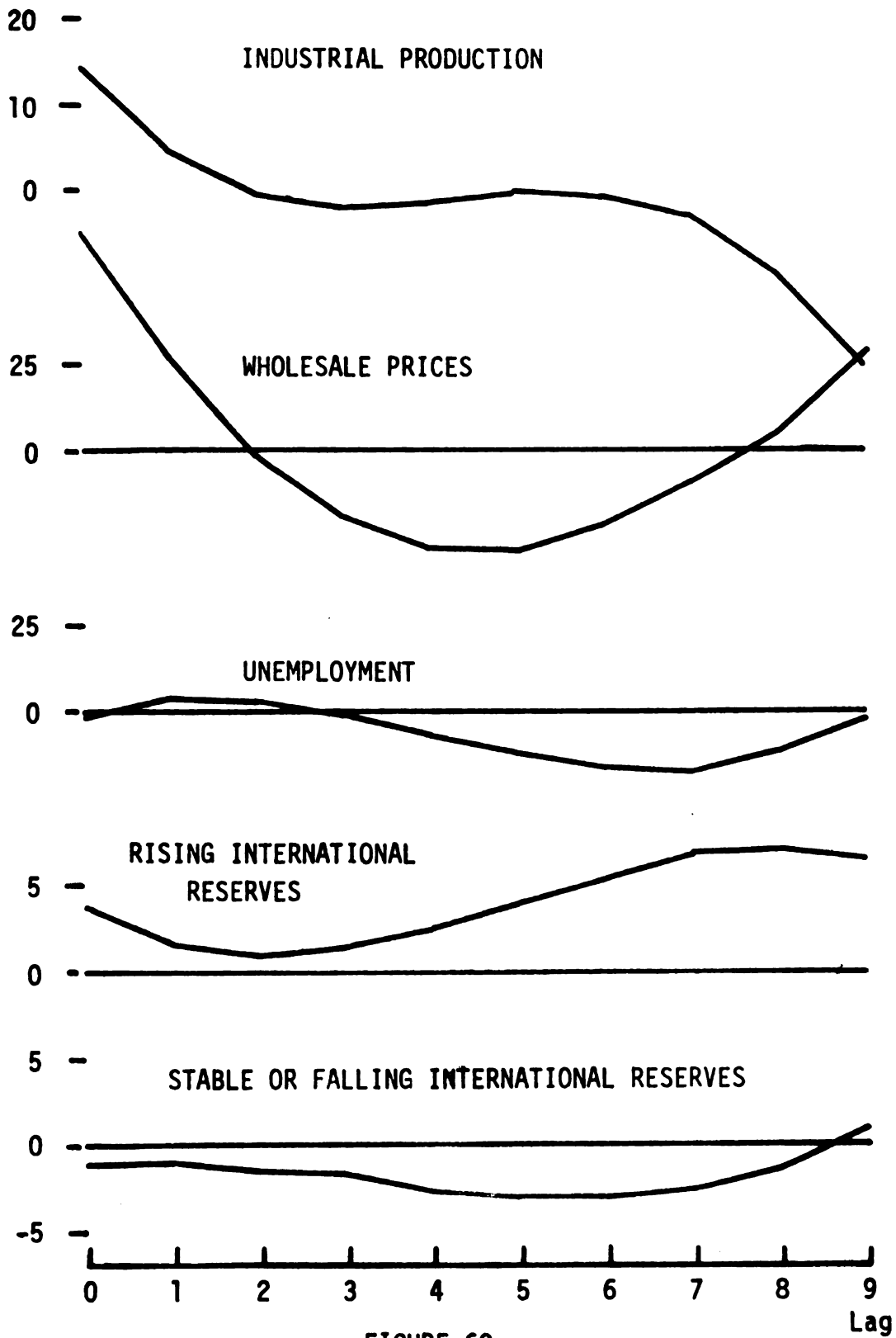


FIGURE 60

TIME-PROFILES FOR SECOND REGRESSION
EQUATION: NORWAY

The analysis therefore will focus only on the time-profiles for the international reserve variables because they show a curious pattern. The Chow test indicated that the periods of rising and falling reserves are significantly different at the .05 probability level. The weights associated with a rising level of reserves are all positive, meaning that a rising level of international reserves will increase the money supply. At the same time, all but the last weights associated with a stable or falling level of reserves are negative, indicating that a falling level of reserves will also increase the money supply. Such behavior would indicate that the authorities would not allow a falling level of reserves to decrease domestic liquidity. A falling level of reserves (ignoring capital flows) implies a decrease in net exports, which is deflationary. Perhaps to offset this negative affect on employment and production, the Norwegians accompanied a falling level of reserves with an expansion of the money supply. Unfortunately, nothing conclusive concerning this behavior can be said, since the null hypothesis that the weights associated with the international reserve variable are equal to zero cannot be rejected.¹⁶

Summary

An assessment of Norwegian economic strategy should begin with the recognition of its success. To quote from the 1972 OECD Survey of Norway, "the broad objectives which have guided Norwegian economic policy during the post-war (World War II) period have not been different

¹⁶ When the θ_i and ϕ_i , ($i=1,2,3,4$) from Table 43 are tested simultaneously, the null hypothesis $\theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$ is rejected as is the null hypothesis that $\phi_1 = \phi_2 = \phi_3 = \phi_4 = 0$.

from those pursued in other countries: full employment, rising living standards, social equity, balanced regional and sectoral development, external financial equilibrium, and a reasonable degree of cost/price stability . . ."¹⁷ Viewed against the background of the main policy objects and considering the inherent trade-offs between the various objectives, the authorities can certainly claim to have had a large measure of success. Since World War II there has never been a prolonged period of industrial stagnation nor unemployment on any considerable scale. The expansion of power production, infrastructural investment and of public services has been realized according to longer-term programs and targets. The development of costs and prices has generally been kept in line with trends abroad, . . .¹⁸ and the external financial position of Norway has been remarkably stable throughout the post-war period."¹⁹

The policy variable found in this study to be most responsive to the external situation was net government spending. During 15 of the 20 years investigated, fiscal policy tended to move in a direction consistent with the remedy called for by Norway's external financial position. Moreover, evidenced both by the fact that there was a strong upward trend over time in Norway's international reserves and by the statements of the Norwegian authorities, the country viewed the accumulation of reserves as desirable. Table 45 shows the level of international reserves as a percentage of the annual import bill for

¹⁷OECE, January 1972, op. cit., p. 6.

¹⁸Ibid., p. 8.

¹⁹Ibid., p. 14.

TABLE 45

INTERNATIONAL RESERVES AS PERCENTAGE OF IMPORTS

Year	Reserves/Imports (Percent)
1959	19.39
1960	19.33
1961	17.16
1962	16.72
1963	18.03
1964	18.28
1965	20.42
1966	20.20
1967	22.78
1968	23.26
1969	21.25

Source: Compiled from data contained in OECD, Main Economic Indicators.

the years 1959-1969. Although the ratio dips slightly in the early 1960s, the table shows that on the average Norway's international reserves increased at a faster rate than the value of her imports. Since Norway is a small country, the impact that this behavior has on world liquidity is minimal. When larger economies behave in this manner, however, it raises the criticism that surplus countries generally do not adjust their external position, thus placing most of the adjustment burden on deficit countries.

Another major factor in Norway's maintenance of a strong external position has been the country's effective control of inflation. Price stability in the country was achieved primarily through the extensive use of incomes policy rather than through monetary and fiscal policy, the traditional tools of demand management.

Finally, with fiscal policy responding to the external situation, incomes policy controlling price inflation and maintaining orderly employment through the prevention of strikes, monetary policy was left to achieve the goals of steady growth.

Two major elements appear in Norwegian monetary policy during the period under study. The first is that long-term interest rates were kept inflexibly low to stimulate investment. The second is that the money supply, after a two quarter lag, tended to apply anticyclical pressure to the production cycle. The fact that interest rates in Norway are administered rather than market determined allowed the country to maintain low interest rates while at the same time reducing domestic liquidity.

In conclusion, the Norwegian authorities followed an unorthodox but effective policy strategy in pursuit of their economic objectives.

It is not a strategy that could be expected to have universal application, since it depends to a large extent on peculiarities of the Norwegian economy. Much of its success hinges on the efficaciousness of the government's suasion with management, labor and the banking system. The strategy could not be expected to work as well in countries where economic decision making is more decentralized and atomized.

Chapter 7

SUMMARY AND CONCLUSIONS

The study of the balance-of-payments adjustment policies of three small open countries situated on the periphery of the major western trading nations has now been concluded. Together the countries studied account for approximately 5 per cent of OECD trade. From 20 to 35 per cent of their GNP is traded. Because of their small size and openness, each of the economies is strongly influenced by external economic factors, and each has had a different degree of success in achieving internal stability and external balance. Finland appears to have had the least success in achieving its goals. In the years investigated it has at various times been troubled with economic stagnation, prices which have risen considerably faster than the OECD average, and chronic balance-of-payments deficits. Finland followed an economic strategy which usually directed monetary policy at the external situation. The discount rate and the money supply were the variables which consistently moved in an adjusting direction with respect to external disequilibria. Moreover, there appeared to be asymmetrical behavior with respect to balance-of-payments surpluses and deficits. The domestic liquidity effects of a balance-of-payments

surplus were usually offset, while the reduction of liquidity brought about by an external deficit was usually not offset. The net result of Finland's balance-of-payments policy, with respect to the money supply, was therefore to impart a deflationary bias to the economy. The adjustment of the economy to external deficits, however, was not complete, and the country twice devalued its currency during the period of the study. The 1967 devaluation achieved its success partly because a small country can change the par value of its currency by a large amount without causing serious foreign repercussions (a 26 per cent effective devaluation, in Finland's case), partly because the country adopted a strict incomes policy to reduce its rate of price inflation, and partly because increased foreign demand boosted the country's exports during the devaluation period.

Denmark, on the other hand, was a degree more successful in its pursuit of internal stability and external balance. The Danish model of reaction to external disturbances was similar to the Finnish. The discount rate and the money supply consistently moved in an adjusting direction with respect to the balance-of-payments. Again, however, there was asymmetrical behavior with respect to balance-of-payments surpluses and deficits. As with Finland, the liquidity effects of a balance-of-payments surplus were offset, while a balance-of-payments deficit was allowed to reduce domestic liquidity. The net effect of Denmark's balance-of-payments policy, with respect to the money supply, was to impart a deflationary bias on the economy. Denmark's adjustment to the external situation was sufficient to prevent undue pressure on the country's exchange rate. The country devalued once in the period under study. The devaluation occurred in 1967 and was to maintain

parity with the pound sterling which had just been devalued by the United Kingdom. The Danish devaluation was a modest 8 per cent.

Of the three countries, Norway was the most successful in achieving its internal and external goals. At the heart of the Norwegian strategy is the role played by the government as leader and arbitrator in a pervasive and on-going program of incomes policy. Along with incomes policy to control inflation, Norway directed monetary policy toward the growth and production variables, while fiscal policy responded to the external situation. The adjustment of the external situation, moreover, did not appear to impart a deflationary bias to the Norwegian economy. Much of the credit for this fact must go to the country's successful control of inflation. Norway's competitive international position did not deteriorate during the period of investigation, and as a consequence, the country did not face any serious balance-of-payments deficits. As a surplus country, Norway did not inflate its economy or revalue its currency, but allowed its international reserves to increase, generally at a faster rate than the value of its imports.

Finally, most of the criticisms directed at the "adjustable peg" system of international finance are true in microcosm for the three countries studied. The burden of adjustment was placed on the deficit countries. Deficit countries in turn suffered economic stagnation as they attempted to adjust by decreasing domestic income and prices through the traditional use of monetary and fiscal policies. Devaluation appears to come late, after the country has suffered the economic losses of unemployment and a reduced growth rate, and then it is considered an admission of economic and political failure.

Moreover, with the exception of Norway, the country's followed a model of behavior similar to the one found by Michaely to be most common in the Group of Ten.²⁰ His finding was that the discount rate and the money supply were the variables which most often responded in an adjusting manner to external disequilibria. Of the ten countries studied, the United Kingdom, Japan, France, Belgium, the Netherlands, and Italy often appeared to be following this model. On the other hand the United States, Germany, and Sweden did not appear to direct monetary policy toward the external situation. As was found in this study to be the case with Finland, Michaely observed that fiscal policy did not generally respond to the needs of any major objectives. He attributes this fact to the institutional inflexibility of fiscal policy and the adherence to the principle of a balanced budget by many countries.²¹

As might be expected, none of the countries he studied exhibited a reaction model similar to Norway's. He did observe, however, that surplus countries like Norway did not appear to regard the accumulation of international reserves as a disequilibrium situation.

Finally, the lags involved in the trade of these three small, open economies appear to be rather short. Judging from Denmark and Finland, offsetting policy usually occurs within one or two quarters for an increase in the level of international reserves, while a reduction in liquidity due to a net loss of reserves begins to be felt almost immediately. If, in addition, it is fair to generalize from the Finnish

²⁰Michaely, op. cit., p. 62.

²¹Ibid., p. 63.

experience, it can be said that a reduction in the volume of imports will follow very quickly behind a change in their price, with, in Finland's case, approximately 88 per cent of the total change occurring in two quarters. The domestic effects of the Finnish devaluation also occurred with very little lag. In this case, 97 per cent of the total effect of devaluation on domestic import prices had occurred within two quarters. One may speculate that domestic prices would not adjust as quickly in the case of a floating exchange rate. The basis for this hypothesis is that the average lag in the change of domestic import prices behind a change in international import prices was three times as long as the average lag computed for the devaluation.

In conclusion, the three countries studied did not appear to have more acute balance-of-payments problems than their larger trading partners. They were generally as successful in meeting their economic objectives as their Group of Ten counterparts. Moreover, because of their small size, they have more latitude in their policy actions. Finland was not accused of beggar-thy-neighbor policy when it devalued its currency by 31.25 per cent, nor have Norway's trading partners pressured her to revalue her currency. For these countries, the Bretton Woods system of international finance has met with reasonable success, and in a world of floating exchange rates, they will probably do best by tying their currencies to their major trading partners and floating in bloc.

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APPENDIX A

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APPENDIX A

REFERENCE CYCLE ANALYSIS

Reference cycle analysis is an analytical technique used to compare the time-series of various economic variables when the time-series exhibit cyclical movements. The technique was originated by Wesley C. Mitchell,¹ and was later developed by Mitchell and Arthur F. Burns.² The use of the technique in this study parallels its use by Michaely in his investigation of the balance-of-payments policies of the Group of Ten.³

Application of the technique involved taking the time-series of a policy target, such as the level of international reserves or the level of production, and determining if it exhibited cyclical behavior. If a cycle was evident in the time-series, the turning points were identified and the series was divided into periods running from trough through peak to trough. Each such period is known as a reference cycle. The behavior of other variables would now be examined "in reference" to this cycle, hence the name. The variables examined with respect to the

¹Wesley C. Mitchell, Business Cycles: The Problem and Its Setting (National Bureau of Economic Research, 1927), p. 468.

²Arthur F. Burns and Wesley C. Mitchell, Measuring Business Cycles (National Bureau of Economic Research, 1946), Chapter 2.

³Michael Michaely, The Responsiveness of Demand Policies to Balance of Payments: Postwar Patterns (National Bureau of Economic Research, 1971).

reference cycle of the target variable were both policy instruments, such as the money supply, and other targets, such as the rate of change of production.

Figure 61 shows a hypothetical time-series of the level of a country's international reserves based on quarterly data. The reference dates for this data would be:

	Trough	Peak	Trough
Time	I 1957	IV 1959	IV 1961

Suppose now that we wish to examine the behavior of the short-term interest rates during this international reserve reference cycle. Table 46 is a hypothetical time-series of short-term rates for this period. To plot the interest rates, the reference cycle is divided into nine parts (Figure 62). Part 1 represents the initial trough, 5 the peak, and 9 the trough at the end of the cycle. Parts 1 through 5, therefore, represent the expansionary phase and parts 5 through 9 the contractionary phase.

The value of the interest rate entered for part one is the average of the three values centered on I 1957, i.e., IV 1956, I 1957, and II 1957. The value of the interest rate entered at 5 is the average of the three centered around the peak, IV 1959, and the value entered at point 9 is the average of three centered around IV 1961. The interest rate entered at 2 is the average of the first third of the expansionary phase, 3 the second third, and 4 the last third. Similarly, the value entered at 6 is the average of the first third of the contractionary period, 7 in the second third, and 8 the final third. The averaging technique tends to smooth out the time-series. The results of this

Millions
of U.S.
Dollars

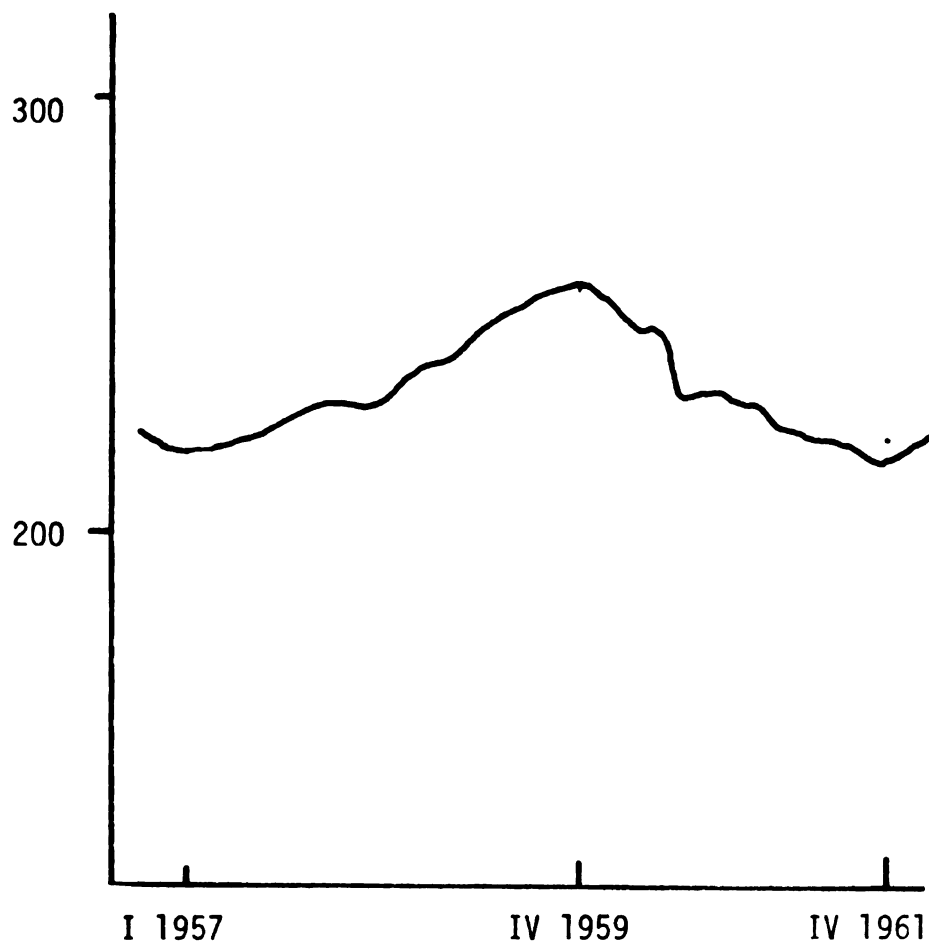


FIGURE 61
INTERNATIONAL RESERVES

example indicate that the short-term interest rate fell during the expansionary phase of the international reserve cycle, and rose during the contractionary phase.

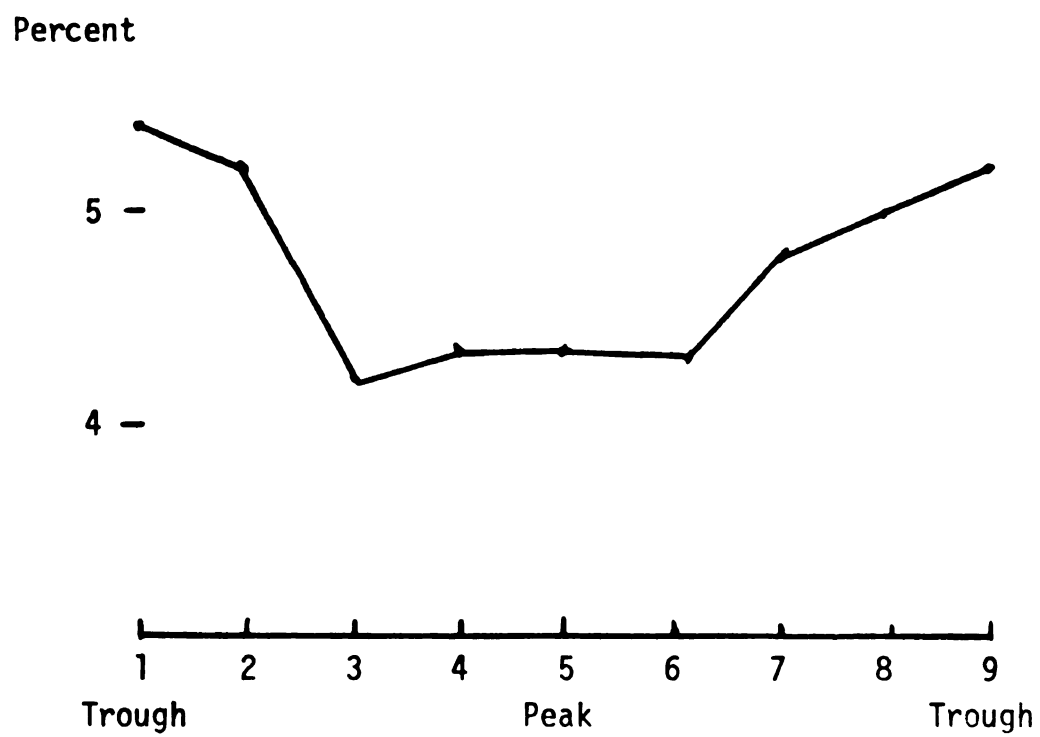


FIGURE 62

BEHAVIOR OF SHORT-TERM INTEREST RATE DURING
INTERNATIONAL RESERVES REFERENCE CYCLE

TABLE 46

TIME-SERIES OF SHORT-TERM INTEREST RATES

Year	Quarter	Percent
1956	IV	5.5
1957	I	5.5
	II	5.2
	III	5.0
	IV	5.1
1958	I	4.3
	II	4.3
	III	4.2
	IV	4.0
1959	I	4.2
	II	4.4
	III	4.3
	IV	4.5
1960	I	4.3
	II	4.2
	III	4.5
	IV	5.0
1961	I	5.0
	II	4.8
	III	5.2
	IV	5.2
1962	I	5.2

APPENDIX B

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APPENDIX B

On the basis of the hypothesis that Finnish income and the finnmark price of imports would each have its own distributed lag effect on the Finnish demand for imports, the following equation was estimated using quarterly data for the 1967 to 1971 period:

$$\log QM_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PM_t + B_5 \log PM_{t-1} + B_6 \log YD_t + B_7 \log YD_{t-1} + B_8 \log QM_{t-1} + U_t$$

where QM_t is the volume of Finnish imports in period t , B_1 , B_2 , and B_3 are seasonal dummies, PM_t is the ratio of the finnmark price of imports to the wholesale price-level in period t , YD_t is the level of Finnish production in period t , and u_t is the disturbance term.

The results of the regression are:

$$\begin{aligned} \log QM_t = & 2.46160 + \begin{matrix} .04983 \\ (.02782) \end{matrix} + \begin{matrix} .10539 \\ (.04142) \end{matrix} + \begin{matrix} .09057 \\ (.02766) \end{matrix} - \begin{matrix} .17186 \\ (.48218) \end{matrix} \\ & \log PM_t + \begin{matrix} 1.50836 \\ (.55065) \end{matrix} \log PM_{t-1} - \begin{matrix} 1.62518 \\ (2.01818) \end{matrix} \log YD_t + \\ & \begin{matrix} .02336 \\ (.03065) \end{matrix} \log YD_{t-1} + \begin{matrix} .36276 \\ (.20079) \end{matrix} \log QM_t + e_t \end{aligned}$$

$$R^2 = .9168$$

The standard errors are in parentheses below the estimates. Since B_1 , B_4 , B_5 , B_6 , B_7 were not significant at the .05 probability level, the model was discarded.

Several export supply equations were also estimated with very limited success. Using quarterly data from the 1959 to 1967 period, the following equation gave perhaps the best results:

$$\log QX_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PX_t + B_5 \log T_t + u_t$$

where QX_t is the volume of exports in period t , B_1 , B_2 , and B_3 are seasonal dummies, PX_t is the finnmark export price index in period t , and T is a trend variable as a proxy for growth and increased productivity.

The results of the regression are:

$$\begin{aligned} \log QX_t = & -2.40001 + \frac{.10065}{(.01464)} + \frac{.12221}{(.01462)} + \frac{.13382}{(.01467)} + \\ & \frac{.58404}{(.19474)} \log PX_t + \frac{2.02073}{(.11790)} \log T_t + e_t \end{aligned}$$

$$R^2 = .91623$$

All the estimates are significant at the .05 probability level. The elasticity of export supply, B_5 , is estimated to be .58. Experimentation with other explanatory variables, such as adding the wage index as a proxy for the costs of productive inputs, invariably led to insignificant estimates and wrong signs.

Finally, using quarterly data for the 1959 to 1967 period, the following export demand equation was estimated for Finland:

$$\log QX_t = B_0 + B_1 + B_2 + B_3 + B_4 \log PF_t + B_5 YF_t + u_t$$

where QX_t is the volume of Finnish exports in period t , B_1 , B_2 , and B_3 are seasonal dummies, PF_t is an index of the relative foreign price of Finnish exports (see Chapter 4 for computation) in period t , and YF_t is an index of foreign income in period t and u_t is the disturbance. The results of the regression are:

$$\begin{aligned} \log QX_t = & 1.59516 + \frac{.10880}{(.01738)} + \frac{.19142}{(.02190)} + \frac{.14013}{(.01799)} - \\ & \frac{.59708}{(.78949)} \log PF_t + \frac{1.22422}{(.22790)} \log YF_t + e_t \end{aligned}$$

$$R^2 = .8705$$

Only B_5 , the price elasticity of demand for Finnish exports, is insignificant at the .05 probability level. The estimate of the income elasticity of demand for Finnish exports is 1.22.

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