8020711

JENICKE, LAWRENCE OLIVER

SIMULATING THE EFFECT OF ALTERATIONS TO THE UNEMPLOYMENT INSURANCE SYSTEM IN MICHIGAN

Michigan State University PH.D. 1980

PLEASE NOTE:

In all cases this material has been filmed in the best possible way from the available copy. Problems encountered with this document have been identified here with a check mark ✓.

1. Glossy photographs ______
2. Colored illustrations ______
3. Photographs with dark background ______
4. Illustrations are poor copy ______
5. Print shows through as there is text on both sides of page ______
6. Indistinct, broken or small print on several pages ✓ throughout ______
7. Tightly bound copy with print lost in spine ______
8. Computer printout pages with indistinct print ✓
9. Page(s) ______ lacking when material received, and not available from school or author ______
10. Page(s) ______ seem to be missing in numbering only as text follows ______
11. Poor carbon copy ______
12. Not original copy, several pages with blurred type ______
13. Appendix pages are poor copy ______
14. Original copy with light type ______
15. Curling and wrinkled pages ______
16. Other ______

SIMULATING THE EFFECT OF ALTERATIONS TO THE UNEMPLOYMENT INSURANCE SYSTEM IN MICHIGAN

By

Lawrence O. Jenicke

A DISSERTATION

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

DOCTOR OF PHILOSOPHY

Department of Management

1978

ABSTRACT

SIMULATING THE EFFECT OF ALTERATIONS TO THE
UNEMPLOYMENT INSURANCE SYSTEM IN MICHIGAN

by

Lawrence O. Jenicke

This dissertation documents two simulation models of components of the labor force system in Michigan and explains their use in the design and evaluation of an alternative structure for the unemployment insurance system. The revised structure, referred to as the three-tier unemployment insurance system, was designed as a program which would replace the existing unemployment insurance system. A set of design and evaluation criteria were identified to assist in the construction of the three-tier unemployment insurance system model and to assess the effectiveness of the three-tier concept relative to the existing unemployment insurance system. The effectiveness of the three-tier system was demonstrated by operating models of the three-tier and the existing unemployment insurance system in a changing unemployment environment. A series of hypothetical unemployment rate profiles as well as historical exogenous inputs were imposed on both models. In general the model of the three-tier system met the evaluation criteria better than the model of the current system. The experimental results indicated that the three-tier system provided the same level of client support as the current system during times of high unemployment and over extended periods of time it would cost less than the current system.

To my wife Alice

and my parents, Oliver and Dorothy

Support for this research was provided by a grant
from the Bureau of Employment and Training,
Michigan Department of Labor

ACKNOWLEDGMENTS

Many people have given me assistance and support in conducting the research upon which this dissertation is based. I would like to thank Richard Donahue formerly of the Bureau of Employment and Training, Michigan Department of Labor for his continued support of this research. I am also indebted to Mark Sisco of the Bureau of Employment and Training, Michigan Department of Labor and Bill Woodland of Michigan State University for their help in performing this research. Much information was also provided by E. Earl Wright and Saul Blaustein of the Upjohn Institute for Employment Research. The comments and criticisms provided by Professors Phillip Carter, Gerald Park, and Richard Gonzalez were very helpful in editing this manuscript. I also owe a special word of thanks to Professor Kenneth White for his continued guidance and encouragement.

Finally, I want to acknowledge the contribution of my wife, Alice who read, criticized and typed (at least twice) this dissertation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION TO MANPOWER AND GENERAL PROBLEM STATEMENT

Introduction and Overview

This dissertation has two major objectives. The first is to document and explain a simulation model of the labor force system in Michigan. This model was intended to be a tool for evaluating and assessing the effectiveness of manpower policies and programs in the State. Since the development effort was a fairly large undertaking (requiring approximately two years), a substantial portion of this dissertation will be concerned with recording and explaining the model. The second objective of the dissertation is to use the model in the design and evaluation of an alternative structure for the unemployment insurance system. The revised structure, referred to as the three-tier unemployment insurance system was viewed as a program which would replace the existing unemployment insurance (UI) system. The three-tier UI structure was proposed in its current form by Saul Blaustein of the Upjohn Institute for Employment Research as part of a larger Job Security System.[1] A key fact which must be kept in mind is that many assumptions had to be made concerning the exact form that the three-tier structure would assume. This was necessary since the new structure existed in a general proposal form only without the specifications required for implementation and/or detailed modeling. For this reason the results and conclusions set forth in this dissertation must be limited to the specific form presented and not attributed to the three-tier concept in general.

The design and evaluation of the proposed UI system necessitated the construction of a second simulation model. By operating both the unemployment insurance portion of the labor force simulation model and the three-tier simulation model with identical inputs, a comparison of the effectiveness of the current and proposed systems was made. The following discussion will explain the origins of this research, introduce the reader to manpower issues, and assist in understanding the usefulness of a simulation model.

The research on which this dissertation is based had its origins in the unemployment crisis that followed the oil embargo and resultant recession beginning in the Fall of 1974. In response to this situation, numerous proposals were introduced into the legislature for programs such as large scale public works, extended and expanded unemployment insurance, heavy reliance on temporary public service employment, and various employment stimulating incentives for the private sector. However little information was available on the costs of these programs and their relative usefulness for alleviating unemployment and the attendant social and financial problems. In response to this situation and the continuing need to evaluate manpower programs, it was decided to develop a simulation model of the labor force in Michigan.

One problem faced by state manpower planners is the allocation of the state's resources to various programs and agencies to aid in matching the supply of and demand for labor. This involves improving and coordinating state policies, programs and legislation to provide people with opportunities for suitable employment and to provide employers with qualified personnel. The simulation model of the labor force system was intended to furnish manpower planners with a tool for examining the effect of changes to existing policies and programs as well as evaluating proposed policies and programs.

The simulation model of the labor force which was developed reflects the new interest of economists and manpower planners in flows of people within the labor force. The traditional emphasis has been on the size or level of various labor force categories and net changes in these levels. However, understanding the dynamics of manpower requires ascertaining the gross flows to and from each category which are often much more dynamic than one might expect from the net changes in a level. For example, in a typical month, the State of Michigan unemployment rate might increase from 8.0 to 8.1 percent representing a net increase in the number of unemployed people of approximately 4000. This figure typically represents the difference between 142,000 persons becoming unemployed and 138,000 leaving the ranks of the unemployed. The model simulates these gross flows and the resultant changes in levels for the various categories within the labor force.

The current version of the labor force simulation model is general in nature and provides an aggregate view of the labor force and its components. In addition to this, the lack of accurate data in some areas has limited the development and validation of certain portions of the model. This means that a specific problem or policy change to be investigated could require further development and validation efforts of the relevant portions of the model.

For these reasons the focus of this dissertation will be on the unemployment insurance system. The entire simulation model will be documented and explained but experimentation will be limited to the unemployment insurance (UI) subsystem. This portion of the model has had the most effort in tuning and refinement and the historical data used in assessing the correspondence between the model and the existing UI system has been accurate and timely. Also the UI subsystem has had a financial burden component added to its output so that the cost implications of policy changes may be explored. The experience gained in understanding flows and estimating parameters for the model of the current system has been of great help in constructing the model of the proposed three-tier UI system. This had enhanced the validity of the three-tier model and provides a stronger basis for drawing conclusions about the relative effectiveness of the current and three-tier UI systems.

The remainder of this chapter will explain state level manpower planning, the labor force system and the operation of the unemployment insurance system. This is intended to assist the reader not familiar with the manpower area in gaining some understanding of the field. Finally a problem statement is presented which focuses on the weaknesses of the current unemployment insurance system and lists several design and evaluation criteria for the proposed three-tier UI system. The second chapter discusses the appropriateness of simulation modeling for addressing the problem and presents a brief summary of other similar simulation research efforts. The third chapter documents in detail the simulation model of the current labor force system in Michigan with an emphasis on the unemployment insurance portion of the model. The fourth chapter discusses in detail the proposed three-tier structure and simulation model for the unemployment insurance system. The fifth chapter presents the results of comparing the response of both models to a series of hypothetical and historical inputs. The sixth and last chapter is a summary and conclusion of the research efforts and experimental results.

Manpower Planning

In the State of Michigan the large increase in the number of unemployed workers has made manpower planning a major concern. Manpower planning is concerned with matching the supply of labor (people) with the demand for labor (positions). Specifically it is the coordination and improvement of state policies, programs and legislation to provide Michigan residents with opportunities for suitable employment and to provide employers with qualified personnel. Any mismatch between the supply and demand for labor in geographic areas and/or demographic, occupational or industry groups results in financial and social costs to the state. Surplus manpower yields financial costs in the form of increased transfer payments such as welfare and unemployment insurance benefits.

Surplus manpower also results in the social cost of unemployment. Similarly, manpower shortages may contribute to a lost tax base as employers decide to locate elsewhere. Shortages may also contribute to the major social cost of inflation as employers bid up wages for scarce manpower. It is not difficult to find some areas with high unemployment and corresponding transfer payments while in other areas labor shortages are contributing to low production and inflation. The need for better manpower planning is clearly apparent.[2]

There are several important activities in manpower planning. Manpower planning must identify the manpower needs of the state. This involves determining the number of people both in and out of the labor force who could benefit from manpower assistance in some form. Such individuals are those who have encountered difficulty in the labor market such as those working part time because they could not find full time employment, the working poor, employable welfare recipients, discouraged workers who withdrew from the labor force and unemployment insurance recipients. The design of manpower programs is another important activity of manpower planning. This includes determining the relationship between and coordinating the manpower system with other state systems such as welfare and education. The design activity must also consider the legal, political and social environment within which manpower programs and policies must operate. The resulting programs, policies and legislation resulting from the design endeavor usually give rise to four basic approaches to solving manpower problems. These are the creation of jobs such as public works programs, income support such as unemployment insurance, job search assistance and vocational training programs.[3]

Since manpower planning is closely related to state level economic and financial planning there is a need for good coordination between these activities. An important factor in the planning coordination effort is the unemployment insurance system. The unemployment insurance system is viewed as a manpower program to provide income support for unemployed workers. Its purpose is to give the individual time to search for new employment consistent with his or her experience by removing the personal financial pressure which could cause the acceptance of unsuitable employment. Unemployment insurance is also a major economic force in cushioning the effect of recessions in the state. Benefits paid to unemployed workers prevent a drastic drop in buying power during periods of high unemployment. Financial planning to ensure the solvency of unemployment insurance funds is currently (as of this writing) an important concern for the State of Michigan. The significance of this is that effective manpower economic and financial planning cannot be accomplished without close consideration of the unemployment insurance system.

The Labor Force System

The state unemployment insurance program may be viewed as one component of a large labor force system. The labor force system consists of the labor force with its two categories of employment and unemployment. The labor force is defined as all members of the population who are age 16 or over and either employed or actively seeking work (unemployed). The remainder of the population is referred to as the non labor force. The portion of the labor force referred to as unemployed may be further subdivided into the unemployment insurance category, the employable welfare category and the "without benefits category". Note that this view of the labor force is somewhat artificial since it is possible for individuals to be in two categories simultaneously. For example a person can receive welfare benefits and also be employed. The distortion due to this category overlap is assumed to be small since there appears to be few such cases. This assumption is most open to question in the area of public assistance or welfare. Since little data is available to estimate the magnitude of the welfare overlap with other categories, the assumption is a potential source of error.

This viewpoint of the labor force and its categories in relation to the total population is diagrammed in Figure 1. Unemployment insurance is the segment of the pool of unemployed who are receiving unemployment insurance benefits. The employable welfare category refers to individuals who are in the labor force (actively seeking work) and receiving welfare benefits. The without benefits category, which will be referred to as the WOB category, is a residual classification that shows the number of unemployed individuals having no discernable means of public financial support.

This breakdown of the labor force focuses on unemployment and reflects the state's interest in minimizing the financial and

TOTAL POPULATION				
NON LABOR FORCE	LABOR FORCE			
	EMPLOYMENT	UNEMPLOYMENT		
		WITHOUT BENEFITS (WOB)	EMPLOYABLE WELFARE	UNEMPLOYMENT INSURANCE

FIGURE I.--LABOR FORCE SYSTEM

social cost of unemployment. Individuals in the labor force receiving welfare or unemployment insurance benefits result in a financial cost to the state. Unemployed individuals also represent an opportunity cost to the state in the form of lost tax revenues. There is also a social cost to unemployment. People who have lost or are unable to find employment consistent with their past training or experience may be forced into accepting jobs which they are unsuited for. Unemployment forced upon heads of households may necessitate that other family members enter the job market to assist in maintaining the family income. Regardless of the measures of cost used, the relationship between all components of the labor force must be considered. A proposed change in one component such as unemployment insurance will affect the entire system. The usefulness of any manpower planning tool dealing with the employment insurance system will be enhanced if it considers the relationship to the rest of the labor force.

The Unemployment Insurance System

The unemployment insurance system was created in 1935 as part of the Social Security Act. It is viewed as an income maintenance program that provides insurance against a portion of lost wages for workers that become unemployed. Like any insurance program funds are accumulated over time to be paid out when the event insured against occurs. Unemployment insurance funds are built up by employer contributions in the form of payroll taxes that will be paid to workers as weekly benefits when unemployment occurs.

Unemployment insurance benefits are paid as a right of the insured worker. This is in contrast to other forms of income maintenance, such as public assistance (welfare), which require a demonstration of financial need before benefits will be paid. Unemployment insurance also does not require a case by case judgment of individual need. Benefit amounts and duration are determined by law so that workers know in advance what they will receive and for how long in the event that they become unemployed.

The main objective of unemployment insurance is to provide assistance to the individual worker during periods of involuntary unemployment. This allows the worker to maintain his or her current standard of living to a substantial degree and provide the time needed to find new employment consistent with the worker's previous employment and training. A secondary objective of unemployment insurance is to promote economic efficiency and stability. Benefit levels which do not completely replace former wages encourage workers to return to employment as soon as possible. Benefits paid to workers prevent a serious drop in purchasing power and the resulting depressing effect on the national or local economy. By basing employer payroll taxes on a layoff "experience rating" employers are encouraged to stabilize employment. Employers with a history of layoffs bear a larger payroll tax than those employers with a relatively stable workforce.[4]

There are several programs under the unemployment insurance (UI) system: the regular or permanent unemployment insurance program, the federal-state extended benefits program and the federally funded Federal Supplemental Benefits (FSB) program. The FSB program was created by a Congressional act as a temporary addition to the UI system and has since expired. These programs differ from one another in the duration of benefits and how they are financed. The combined coverage of these programs ensures that nearly everyone with some labor force attachment is eligible for some form of unemployment compensation. The extended benefits program acts as an extension to the regular program allowing some workers to collect up to 39 weeks of benefits. Unlike the regular program, the extended program only operates during periods of high unemployment. The regular program is financed by employers through the payroll tax and the extended program is financed by 50% state funds (payroll tax) and 50% federal funds.

The unemployment insurance system is a product of both state and federal legislation with some uniformity from state to state. This is accomplished by federal control over each state's UI legislation via the federal government's taxing power. However, each state has considerable latitude in determining the relationship between the tax rate and experience rating as well as determining the taxable base for payroll. Thus state level government has some control over the size of its UI fund reserves. One question facing state planners and lawmakers is what is an appropriate reserve? This is a difficult question because the demand for UI benefits fluctuates widely. The flow of people into the UI system increases during periods of rising unemployment which raises the demand for benefits. The State of Michigan is a good illustration of the severity of the problem. During 1975 and 1976 Michigan faced very high levels of unemployment, at times approaching 15%, which necessitated the borrowing of $570 million from the federal loan fund. A method of estimating this demand on the state UI fund would have assisted state planners and lawmakers in anticipating the problem and acting to increase the fund balance.

The drain on the state UI fund balance will also increase when the extended benefits program is operating. Any lengthening of the duration of time that UI recipients may draw benefits will increase the total amount of benefits paid. The extended benefits program acts as a 13 week extension to the regular program raising the maximum benefit duration to 39 weeks. Individuals who have exhausted their regular benefits are eligible to receive benefits under the extended program. This program may operate in either a state or the country as a whole depending on the state or national insured unemployment rate. The insured unemployment rate is essentially an unemployment rate calculated for the portion of the labor force covered by UI legislation. The extended benefits program is activated through a system of "on" and "off" triggers which are based on the state or national insured unemployment rate.

Unlike the extended benefits program which is financed equally from state and federal funds, the Federal Supplemental Benefits (FSB) program was financed entirely by federal funds. The

FSB program provided an additional 26 week extension to the regular and extended programs raising the maximum benefit duration to 65 weeks. The FSB program operated on a state by state basis with the insured unemployment rate providing the input to the "on" and "off" triggering system. The FSB program differed from the extended program in that it is not a permanent portion of the UI system. It was created by a special act of Congress in 1974 with a recent act reducing the program to 13 weeks in March, 1977 and eliminating the program in December, 1977.

There are several additional programs in the UI system which are relatively small in magnitude compared to the three major programs just described. The Special Unemployment Assistance (SUA) program provides benefits to unemployed workers who are not covered under the state or federal unemployment insurance programs. There are also several programs to cover ex-servicemen, federal workers and other special groups. These programs are all federally financed and usually administered at the state level.

Problem Statement

The current unemployment insurance system has imposed a significant financial burden on the State of Michigan during periods of high unemployment. As mentioned earlier the state was forced into borrowing $570 million from the federal loan fund because of high unemployment levels during 1975 and 1976. Since this debt has to be repaid there is the possibility that Michigan's employer payroll tax may be increased. The resistance of employers to high UI payroll taxes may manifest itself by inducing employers to move to other states or preventing prospective employers from locating in the state. The burden of the UI system on industries in the state also provides an incentive to utilize less labor intensive production methods.

The financial burden of the unemployment insurance system may in part be attributed to several identifiable weaknesses of the current UI system. (In discussing the problems and weaknesses of the current unemployment insurance system all references to the current system include the regular program operating in conjunction with the extended program and its triggering mechanism.) The first weakness of the current UI system is that is has a relatively slow response to improving economic conditions. Assuming a recipient has full entitlement, the maximum stay in the system is 26 weeks plus an additional 13 weeks if the extended program is triggered. During this period the economy and job availability could have improved significantly yet the system is still providing a maximum of 26 or 39 weeks of support.

This problem is aggravated by the manner in which the extended triggering mechanism works. The trigger is based on the insured unemployment rate which is essentially calculated by dividing the number of recipients in the regular <u>and</u> extended programs by the size of covered employment. When the extended program is off then the insured unemployment rate is the number of regular recipients over covered employment since the number of extended recipients is zero. If the insured unemployment rate causes the extended program to operate then the insured unemployment rate will rise due to the addition of extended recipients in the numerator. This creates a latching effect since once the program is on, it tends to remain on.

Another problem with the current system is that it does not provide a positive means of forcing recipients to leave the system during an economic recovery. Even though the availability of jobs has increased, recipients on the system may simply elect to use all their entitlement. An improvement in the economy does not change the benefits entitlement. This problem is compounded by the latching effect associated with the extended program triggering mechanism. The current system does provide incentives for recipients to leave and return to work. Benefit levels which are less than former wages and the requirement that recipients be available and seeking work provide inducements to return to employment. However the effectiveness of these incentives depends on the behavioral responses of individuals rather than limitations imposed by the system itself.

An additional difficulty with the current system is that it provides stimulation to the economy after economic conditions have improved. This problem stems from the slow response of the system and the lack of a mechanism to remove recipients from the system during improving economic conditions. Benefits paid to workers maintain their purchasing power and provide a stimulus to the economy. The current system allows this economic stimulus to exist during times when it is potentially unnecessary.

Finally, the current system has a limited flexibility to adapt itself to changing economic conditions. Although the current system does vary the amount of support for unemployed workers in response to the state of the economy or job availability, the difficulty lies in the manner of varying the support. The present system adapts itself by triggering the 13 week extended benefits program on or off in response to the insured unemployment rate. This discrete or step adaptation does not permit the system to respond to in-between conditions of the economy. An unemployed worker with full entitlement may receive a maximum of 26 or 39 weeks of benefits under the present system. A possible alternative would be to have the system vary the maximum entitlement from 13 to 39 weeks on a continuous basis in response to economic conditions. The current system makes available large amounts of subsidized job search and economic stimulation when only moderate or small amounts may be necessary.

The particular problem to be investigated concerns the revision of the current unemployment insurance system. As discussed earlier the present UI system operates as a 26 week program with various extensions (the extended and FSB programs) added to the regular program during economic downturns. These extensions are available to all individuals eligible for the regular program. The revision to the existing UI system was proposed in its current form by Saul Blaustein of the Upjohn Institute for Employment Research.[5] It consists of a structural change involving 3 programs (tiers) of

13 weeks each which operate all the time providing a maximum of 39 weeks of benefits (the same as the current UI program exclusive of federal extensions). The main difference with the revised system is that more stringent eligibility requirements would be imposed on individuals moving from the first to the second tier and also from the second to the third tier.

The main hypothesis of interest is that an alternative structure for the unemployment insurance system can be designed that is an improvement over the current structure. To determine if the proposed structure for the UI system is an improvement over the current system some evaluation criteria are needed. Based on the objectives of the UI system the followign design objective and constraints were developed to evaluate the proposed UI system:

Design objective:

A new system should respond to changing economic conditions faster than the current UI system.

Design constraints:

1. During times of high unemployment (such as the first three quarters of 1975) a new system must provide at least the same level of support as the current system.
2. The total cost of a new system over a long period of time including periods of high and low unemployment (i.e., 1970-1977) should cost no more than the current system.

The design objective reflects the desirability of having an unemployment insurance system that rapidly and continuously adapts itself to changing conditions of unemployment. Such a system would be a closer match to the aggregate need of the unemployed as well as the need of the economy for stimulation. During declining economic conditions, support is provided as needed. A rapid response to improving conditions assists in reducing the financial burden of the UI system. The first design constraint contains an assumption that increasing the amount of support over what is provided by the current system (the regular and extended programs) during periods of high unemployment would add little to the UI system's effectiveness. The addition of the 26 week FSB program appears to be a deviation from an insurance concept to a long term income maintenance program. The second design constraint addresses the issue of the financial burden of the current UI system. It is doubtful if any system that only replaces the current system will be politically feasible if it results in a cost increase. This second constraint assumes that the revised UI system would be a stand alone replacement for the current system with no additional functions beyond what the current system provides.

CHAPTER II

SIMULATION AS AN APPROACH TO MODELING THE UNEMPLOYMENT INSURANCE SYSTEM AND PREVIOUS RESEARCH

The Use of a Simulation Model

One method of determining the effectiveness of a revised structure for the unemployment insurance system is to utilize simulation modeling. Experimentation with simulation models of the current and proposed system can provide useful insights about the relative utility of each system under a variety of economic conditions.

A simulation model is an operating model of a real system that can replicate to some degree the behavior of the real system over time.[6] A good model should capture the important elements and structural relationships of the system being modeled without being unduly complicated or overly simplified. The degree of correspondence between the model and the real system depends to a great extent on the uses which will be made of the model. A simulation model intended to faithfully reproduce the effect of minute influences in the form of changes in input or structure on a large and complex system would require extreme detail in construction, be expensive or impossible to build and operate, and would suffer from difficulty in interpreting the outputs. On the other hand a model designed to reproduce gross changes in a small system with few components would be inexpensive to build and operate but would be unable to track the effect of realistic inputs. A useful simulation model should lie between these extremes.

The data collection and analysis required for construction of a simulation model of the labor force system provides a logical framework for discovering interactions and processes. Data that could be used for manpower purposes is collected and maintained by various state agencies for widely differing reasons and is usually not comparable. The analysis required for the modeling effort assists in the conversion of data to a form facilitating the exposure of relationships between components of the labor force. Thus the actual process of building and validating the model results in an increased knowledge of the system. Information about the system is also gained by observing the response of the model as it is operated and experimented with.

Simulation models may aid in decision making by serving as a vehicle for experimentation. Inputs and policies to be evaluated are imposed upon a simulation model and the resulting changes in the simulated system are observed. In this way alternate inputs and policies may be selected according to some criterion and implemented in the real system with predictable results. Simulation models are particularly useful where manipulation of and experimentation with the real system is impossible or impractical due to time, cost, inaccessibility and political or moral considerations.[7] Most of these considerations are present to some degree in manpower systems which would preclude experimentation with the real system as an aid in decision making.

Although a simulation model would be generally useful, there are several distinct advantages and disadvantages to the technique. One advantage which has already been mentioned is that simulation provides an instrument for experimentation in an environment free of real world complications. Another advantage of simulation is that it allows the modeling of very complex systems. Manpower systems are complex and highly interrelated with other areas such as the economic system. Simulation also allows the time involved to be speeded up or slowed down. The entire time horizon of the model which could be many years is available in the time needed for one computer run (assuming a computer simulation).

There are also several disadvantages to using simulation models. One is that each simulation run yields specific results for the given model inputs. In other words many model runs may be needed with varying inputs and parameters before the results can be generalized to the real system. Another disadvantage of simulation is, compared to other approaches, a greater effort is required in constructing and validating the model. Simulation models also suffer from the danger of confusing the model with reality. Outputs and responses that appear to be realistic make it easy to forget the limitations of the model. This is particularly true if the model has been poorly validated. Validation refers to the extent of the correspondence between the model and the system being modeled. A model that has been validated for one situation could easily be applied to another situation where there is little correspondence between the behavior of the model and the real system.[8]

Besides simulation there are several other approaches which could be used to satisfy the need for an experimental and predictive tool. These are qualitative techniques, time series analysis and causal models.[9] Qualitative techniques rely to a great extent on human judgment and may consist of committees of people and staff analysts assigned to research certain UI and labor force related problems and predict future states of the system. Such techniques readily permit the discovery and input of policy alternatives but the predictive outputs are general in nature and lack the quantitive form often needed for manpower planning purposes.

Time series analysis such as exponential smoothing offers good forecasting possibilities but no ability to handle policy alternatives in an experimental framework. Experimental inputs in the form of structural modifications to the system are difficult, if not impossible, to impose on time series models. Time series analysis also suffers from the fact that in some manpower areas there is little or no historical data with which to develop forecasting equations.

A causal model such as least square regression is another technique that is comparable to simulation in its usefulness in providing a predictive tool. Techniques such as regression analysis yield quantitative outputs and can also be useful in experimenting with policy alternatives. As with time series models, the disadvantage of causal models is that there is no structural similarity to the system under consideration. This makes it more difficult to determine the form of policy inputs particularly when such inputs are related to the structure of the system.

This discussion does not mean to imply that these other approaches cannot be used in conjunction with simulation modeling. Certainly the use of a simulation model requires qualitative judgment in determining inputs and interpretation of results. Regression analysis is well suited to providing forecasted exogenous inputs and parameters for simulation models as well as conversion of certain model outputs to different forms. These techniques can assist in the development of a simulation model as well as enhance various applications.

A National Labor Force Model

To gain an insight into other research activities it will be helpful to review two simulation studies of labor force components comparable to the Michigan manpower simulation model which is the basis for this thesis. Although the Michigan model will be described in detail later, comparisons will be drawn to assist in introducing the model and to place it in context with other research.

The first is a simulation model of the demographic composition of employment, unemployment and the nonlabor force for the country as a whole. This model simulates the six possible flows between these three stock categories for sixteen demographic groups. For each demographic or age-race-sex group, the monthly flow from one labor force stock to another is the product of a transition probability and the size of the stock from which the flow originates. The transition probabilities or parameters of this model are functions of exogenous variables such as indices of labor market tightness, time trends and seasonal factors. The functional relationship of these parameters with the exogenous variable was estimated using regression analysis on unpublished U.S. gross flow data collected by the Current Population Survey. This gross flow data contains historical estimates of the stocks and related flows for demographic groups in the nation's population.[10] This brief discussion presents the general nature of this model but the reader should consult reference (10) if a more comprehensive discussion is desired.

There are several noteworthy differences between this model and the Michigan manpower simulation model. The model just described focuses on demographic breakdown of the national population whereas the Michigan model simulates the aggregate of the state labor force. The lack of state level demographic data has precluded the development of a model capable of simulating demographic components. Another important difference besides the demographic breakdown is that the national model simulates the levels of the population consisting of the categories of employment, unemployment and nonlabor force. The Michigan model simulates the state labor force consisting of the category of employment and a refined breakdown of the category of unemployment. The stock of unemployment is modeled as three stocks which are unemployment insurance, employable welfare and a residual stock of individuals without benefits. The modeling of the unemployment category as three stocks permits a more accurate assignment of the cost of unemployment to the state.

Both of these models are similar in that they model stock categories and the flows which give rise to the changes in the stock categories. However they differ in their treatment of stock and flow variables. The national model treats stock and flow variables on a discrete basis. This means that the model stocks will be updated at discrete intervals of time with flow variables that represent the accumulated flow over the time interval. In other words the model changes state only at certain times. This is different from the approach used in the Michigan model. Here the stock and flow variables are related to each other on a continuous basis with the flow variables continually changing the stock variables.

Another major difference between the model of the national labor force and the Michigan model is in the area of major external or exogenous variables. Both models use certain exogenous variables as independent variables in equations yielding values for the model parameters. However major stock and flow variables which are exogenous in one model are generated endogenously in the other. For example in the national model the population and the aggregate job stock (employment plus job vacanies) are fed into the model as a time series. This means that only the remaining stock of unemployment is generated endogenously. The effect is that possible errors in the stocks of population or jobs due to inaccuracies in flow variables are reset to zero at each update of the model. In the Michigan model all stock variables are generated endogenously. There are two exogenous flow variables: the rate entering the labor force and rate entering the unemployment insurance system. Using these two exogenous flows, the model traces the behavior over time of all stock variables and all endogenous flow variables.

A Markov Unemployment Insurance Model

The second study to be reviewed is a Markov model of the 26 week regular unemployment insurance program in Detroit, Michigan. This is a stochastic model that bears little resemblance to the stock and flow structure of the Michigan model. It is included in this review because is may be the only other simulation model related to Michigan's unemployment insurance system. Also this will help to introduce the reader to the modeling of unemployment insurance variables.

The model basically consists of 26 cascaded Markov transition matrices with three origin and three destination states. The 26 transition matrices represent the possible 26 week duration of regular unemployment insurance benefits. For any week t (t = 1, 2, . . . 26) there are three destination states: (1) make another UI claim and remain in the system, (2) return to employment and (3) exhaust benefits. There is really only one origin state and that is making another UI claim. For this reason the transition matrix for any week t will have either two rows or two columns of zeroes depending on which axis is origin or destination. By multiplying the successive transition matrices together for week t - i to week t the i-step transition matrix for individuals starting in week t - i is generated. This transition matrix can be multiplied by a vector of the number of individuals in the three origin states to determine the number of individuals in the destination states after the i - week period.[11] This is a very simplified view of the process used to model the progression of individuals through the unemployment insurance system. The reader should refer to reference (11) for a complete discussion of this model and its development.

The Markov structure of this model does not treat the flows of people in the UI system explicitly. Although this model does a good job of prediction, the absence of explicit flow variables would make it difficult to interface this model with other models of components of the labor force system unless they were also Markov models. The creation and validation of a Markov model of the employment or public assistance sector would be a difficult task and require detailed data which is currently not available in these areas. The Markov UI model also requires fairly sophisticated estimation techniques for the transition probabilities.

Urban Dynamics

The two simulation studies just reviewed and the Michigan model are similar in their attempts to model the dynamic behavior of the labor force or components of the labor force. These studies limit themselves to labor force variables which are well defined and usually observable. A considerably different approach has been set forth in Urban Dynamics[12] by Jay W. Forrester. This study is much broader in scope since it models an entire social system and includes many variables not directly related to labor force behavior. The model depicts the interaction of housing, business enterprise and social variables to produce the growth, decline, and stagnation of a city. Many assumptions are made about these urban components inlcuding their structural relationships and effect on one another to build the model. The simulation results provide a view of the dynamic behavior of these components.

There are several important differences between the Michigan model and the Urban Dynamics model. The Urban Dynamics model generates the values of all model variables endogenously. Other than disturbance or test inputs, there are no outside influences on the model variables or parameters. In the Michigan model, historical time series data is used to drive the model. This means that operating the model in future time periods requires forecasts of certain exogenous variables.

Another difference between these models is the time horizon involved. The Michigan model has a time horizon of 13 years with the last 5 years being an extension into the future. Time spans of this magnitude are suited to testing and understanding the implications of relatively short range policy and legislative changes. The Urban Dynamics model extends to a maximum of 250 years into the future. This time span provides a long term view of the behavior of the existing system and any structural changes imposed on it. The difference in time horizons of these two models reflects a difference in their intended uses. The Michigan model was designed to predict specific values of labor force variables in the model in response to policy changes. The Urban Dynamics model was designed to provide a long term view of the response patterns and relationships between components of an urban system.

The real value of the method used in the Urban Dynamics model lies in providing a logical framework to view the effect of the structural relationships in an urban system. The Urban Dynamics approach can lead to a greater understanding of the forces that influence urban systems and the manpower implications of those forces. The reader may wish to consult reference (13) for further discussion along these lines.

CHAPTER III

SIMULATION MODEL OF THE CURRENT MICHIGAN MANPOWER SYSTEM

Model Description

The simulation model which has been developed for use as an experimental tool is of the continuous flow variety in which changes in the flows into and out of a stock category produce changes in the magnitude of that stock. A continuous flow model is one in which the flows are continuous over time rather than discrete.[14] For example a monthly flows may be treated as a daily or hourly flow in a continuous flow model. In a discrete model a monthly flow would allow changes in the stocks of the model to occur only at monthly intervals. The continuous modeling of flows permits the use of a type of delay function, called a distributed delay, which is a realistic representation of many types of aggregate delay phenomena.

There are five stock categories in the model. They are labor force, employment, unemployment insurance, employable welfare clients (those defined as the labor force), and unemployed individuals without benefits (hereafter referred to as the WOB category). Unemployment insurance, employable welfare and the WOB categories represent a refined breakdown of the level of unemployment which is not treated explicitly in this model. Since statistics are not kept on the WOB category it is treated as a residual stock in the model. It is determined by subtracting from the labor force the sum of employment, unemployment insurance and employable welfare.

A simplified view of the structure of the model is presented in Appendix A. The five stock categories are shown as well as the possible flows between them (represented by arrows). Note that a flow into the labor force must increase one or more of the stocks comprising the labor force. Similarly a flow from one or more of the component categories to the nonlabor force will decrease the size of the labor force. It is also possible for flows to occur between any of the stocks comprising the labor force. Thus migration may occur between the categories of the labor force without changing the size of the labor force.

Before discussing in detail the structure of the model and the model diagram which appears in Appendix B it would be useful to review some of the symbolism and notation used in the diagram. It is recommended that the reader become familiar with the contents of the appendices to avoid questions concerning abbreviations and parameter symbols. To avoid confusion the reader should note that the terms rate and flow are used synonymously as are the terms stock and level. Table 1 presents a listing of all of the model variables and their corresponding description. The table found in Appendix C presents the symbols used in the model and the equivalent mathematical operation. Appendix D presents a listing of all the

TABLE 1.--Model Variables and Description.

LF:	level of labor force
E:	level of employment
U:	level of unemployment
UI:	level of unemployment insurance
WOB:	level of without benefits category
ADCR:	level of ADC regular program (in labor force)
ADCU:	level of ADC for unemployed fathers program (in labor force
GA:	level of general assistance program (in labor force)
PA:	level of total public assistance (sum of ADCR, ADCU and GA)
REG:	level of regular unemployment insurance program
EXT:	level of extended unemployment insurance program
FSB:	level of FSB unemployment insurance program
UIEXRE:	rate of UI exhaustees entering employment
UILVRE:	rate of UI leavers entering employment
ERNLF:	rate leaving employment and entering non labor force
NLFRE:	rate leaving non labor force and entering employment
PARE:	rate leaving public assistance and entering employment
ERPA:	rate leaving employment and entering public assistance
ERUI:	rate leaving employment and entering unemployment insurance
WOBRE:	rate leaving WOB and entering employment
ERWOB:	rate leaving employment and entering WOB
ENET:	net rate of employment change

TABLE 1.--Continued

WOBRNLF:	rate leaving WOB and entering non labor force
NLFR:	rate entering labor force
UIEXRNLF:	rate of UI exhaustees entering non labor force
UILVRNLF:	rate of UI leavers entering non labor force
PARNLF:	rate leaving public assistance and entering non labor force
LFNET:	net rate of labor force change
UIEXR:	rate exhausting UI
UILVR:	rate leaving UI
NLFRADCR:	rate leaving non labor force and entering ADCR
NLFRADCU:	rate leaving non labor force and entering ADCU
ERGA:	rate leaving employment and entering general assistance
WOBRADCR:	rate leaving WOB and entering ADCR
WOBRADCU:	rate leaving WOB and entering ADCU
WOBRGA:	rate leaving WOB and entering general assistance
NLFRUI:	rate leaving non labor force and entering unemployment insurance
WOBRUI:	rate leaving WOB and entering unemployment insurance
RUI:	rate entering unemployment insurance
PARUI:	rate leaving public assistance and entering unemployment insurance
ADCRRNLF:	rate leaving ADCR and entering non labor force
ADCRE:	rate leaving ADCR and entering employment
ADCRRUI:	rate leaving ADCR and entering unemployment insurance
ADCRRWOB:	rate leaving ADCR and entering WOB
ADCRNET:	net rate of ADCR change

TABLE 1.--Continued

UILVRADCR:	rate of UI leavers entering ADCR
UIEXRADCR:	rate of UI exhaustees entering ADCR
ADCURNLF:	rate leaving ADCU and entering non labor force
ADCURE:	rate leaving ADCU and entering employment
ADCURUI:	rate leaving ADCU and entering unemployment insurance
ADCURWOB:	rate leaving ADCU and entering WOB
ADCUNET:	net rate of ADCU change
UILVRADCU:	rate of UI leavers entering ADCU
UIEXRADCU:	rate of UI exhaustees entering ADCU
GARNLF:	rate leaving general assistance and entering non labor force
GARE:	rate leaving general assistance and entering employment
GARUI:	rate leaving general assistance and entering unemployment insurance
GARWOB:	rate leaving general assistance and entering WOB
GANET:	net rate of general assistance change
UILVRGA:	rate of UI leavers entering general assistance
UIEXRGA:	rate of UI exhaustees entering general assistance
RREGA:	rate entering regular UI program (A delay block)
REGAR:	rate leaving A delay block
RREGB:	rate entering B delay block
REGBR:	rate leaving B delay block
REXT:	rate entering extended UI program
EXTR:	rate leaving extended UI program (not EXT leavers)
RFSB:	rate entering FSB UI program
FSBR:	rate leaving FSB UI program (not FSB leavers)

TABLE 1.--Continued

REGLVR:	rate leaving regular UI program
REGEXR:	rate exhausting regular UI program
EXTLVR:	rate leaving extended UI program
EXTEXR:	rate exhausting extended UI program
FSBLVR:	rate leaving FSB UI program
FSBEXR:	rate exhausting FSB UI program
EREXT:	rate leaving employment and reentering extended UI program
ERFSB:	rate leaving employment and reentering FSB UI program

multiplier parameters used in the model and the corresponding equations.

By referring to the model diagram (Appendix B) it may be seen that the levels of labor force, employment, ADCR, ADCU and general assistance (GA) are modeled by integrating over time the net flow into the category. Note that the employable welfare category is modeled by its three components: ADCR, ADCU and GA. This was necessary because welfare data is maintained according to three programs (ADCR, ADCU and GA). The net flow for these five categories is calculated by summing all of the flows into and out of each category. In general, flows out of a category are produced by multiplying the level or stock by a parameter value. Flows into a stock result from flows leaving other stocks with the exception that migration directly between the three classes of welfare is not permitted. As an example, ERGA is the flow of individuals who leave employment and go to the general assistance category of welfare. ERGA is generated by multiplying the level of employment by the parameter π17C. ERGA then subtracts from the net flow into employment and adds to the net flow into general assistance.

The preceding was an example of a flow leaving one stock and adding to another. Flows that leave a category to go out of the labor force will simultaneuously decrease that category and the labor force. For example, GARNLF is the flow of individuals who leave general assistance to go out of the labor force. GARNLF is produced by multiplying the level of general assistance by π18C.

GARNLF is subtracted from the net flows of both general assistance and the labor force. In a similar manner, flows from the non labor force to a stock within the labor force will simultaneously increase the size of the stock and the labor force. There is a slight difference here because the flow into the labor force (NLRF) begins as a total flow and is divided up by the model parameters to flows which add to each of the labor force categories.

Since the WOB stock is calculated as a residual, flows into the WOB level are treated somewhat differently. The WOB stock is accounted for by subtracting from the labor force the sum of the welfare stocks, unemployment insurance and employment. This means that a flow into the WOB category can be produced by generating a flow out of another category and only subtracting that flow from that category. To clarify this, an example may be helpful. Consider the flow of individuals from employment to the WOB category. This flow (ERWOB) is produced by multiplying the level of employment by $\pi 14$. Note that ERWOB only subtracts from the net flow into employment and does not go directly to the WOB stock. Since employment has decreased and the labor force, public assistance and unemployment insurance are unchanged, the WOB level will increase. Flows out of the WOB stock are treated in the same manner with such flows increasing the size of other stocks (except the labor force) which decreases the WOB stock via the subtraction process.

The representation of the unemployment insurance system is somewhat different from the integration approach used elsewhere in the model. Since individuals entering the UI system have a known maximum length of benefit entitlement, it was logical to model the UI system with delay functions. The rate entering each program is delayed for a time period approximating the mean length of time recipients stay in the program. The level of recipients in each program is accounted for by integrating the difference between the rate entering and the rate leaving the delay function representing each program.

The delay functions used to represent the UI system are called distributed delays.[15] The term distributed refers to the property of distributing the output rate about the mean time delay of the function. For example, the response of a distributed delay to a spike input rate at time zero would be an output rate having an approximately symmetric, bell shaped curve with its mode at the mean time delay of the function. This type of delay is appropriate in modeling the aggregate response of UI programs because UI recipients enter the system with varying entitlement periods. The delay functions in the model also have the property that they are flow conserving. This means that whatever is input to the delay will eventually come out. In other words, flows are not created or lost during the delay operation. The delay functions are completely specified by two parameters, the mean time of the delay and the order of the delay. The order of the delay specifies the shape of the output response (to a hypothetical spike input), the higher the order the more peaked the response.

The regular UI program is modeled using two delay functions, REGA and REGB. Two delay functions were used because a large percentage of regular UI entrants will leave to return to work rather than exhaust their benefits. All regular entrants pass through the REGA delay. The output of this delay is divided up into two flows, one of which represents those leaving and the other represents those who will exhaust. π22A determines the portion of the flow who leave and π22B determines the portion of the flow who enter the REGB delay and exhaust. The output of the REGB delay is the exhaustion rate for the regular program. When the extended UI program is operating, the regular exhaustion rate becomes a portion of the rate entering the extended delay.

Only one delay function was used to represent the extended UI program. The output rate of this delay is divided up by the parameters Π23A, Π23B and Π23C to generate the leaving rate, exhausting rate, and reentering rate. In reality recipients who leave the extended program will do so before they exhaust. The use of one delay rather than two delays as in the regular program causes the mean delay of leavers and exhaustees to be the same. However, the extended leaving rate (EXTLVR) is small in comparison with the regular leaving rate (REGLVR) so the effect on the total system of the timing error of EXTLVR is small. This error is also minimized by the use of a distributed delay with its mean delay set between estimates of actual leaving and exhaustion delay time. Note that the extended reentering rate (EREXT) is a function of the output rate of the extended UI delay so that reentrants will be generated only when the program is operating. The FSB program operates (when on) in a similar manner to the extended program with the rate exhausting the extended program becoming the input rate to the FSB program. Here the leaving rate of the FSB program (determined by π24A) is a small portion of the flow out of the FSB delay.

Program Description

The computer program used to model the labor force system is divided into two parts. The first is an executive program which reads the input data, converts it to a useable form and allows the user to make certain assumptions about the environment that the model operates in. The second part is the model program which contains the structure of the model and computes all model variables. This description will focus first on the executive program and then on the model program and its associated subroutines.

The executive program was written to meet the needs of the Michigan Department of Labor. It allows users not familiar with Fortran computer language or the modeling technique to make changes or adjustments to assumptions about the model's operating environment. The executive program also converts data used for exogenous input variables and validation purposes into a format useable by the model program and writes it, along with the operator's environmental assumptions, on a local file which is used as an input for the model program. For a complete description of the operator assumptions and operation of the executive program see reference (16). A program listing is presented in Appendix E.

A block diagram illustrating the operation of the model program for the current system is shown in Figure 2. The first function of the program is to read in the operator made assumptions that have been generated in the executive program. Next the program reads the exogenous variable data and the validation data which have been converted by the executive program. Initial values are then assigned to the parameters of the model. Subroutine DUPCUT is used to calculate P1 through P21C and P22A through P24C are defined in the model program itself. The state variables XNLFR through FSBB are set to their initial values in the model program. The cost variables are initialized by calling subroutine COST. Initializing the rate variables and the printing of all initialized model variables completes the initialization phase of the program.

The program next follows a loop structure, completing the loop once for each month. Month number one represents January 1970, month two represents February 1970, and continuing on to month 156 which represents December 1980. Within the loop the model assumes that the portion of employment that is covered by the Unemployment Insurance System is 85.77 percent up through December 1977. Beginning in January 1978 the portion of covered employment grows at the rate of 1% per month to reflect recent state UI coverage legislation. The maximum level to which covered employment will grow is specified by the operator in the executive program. The program next

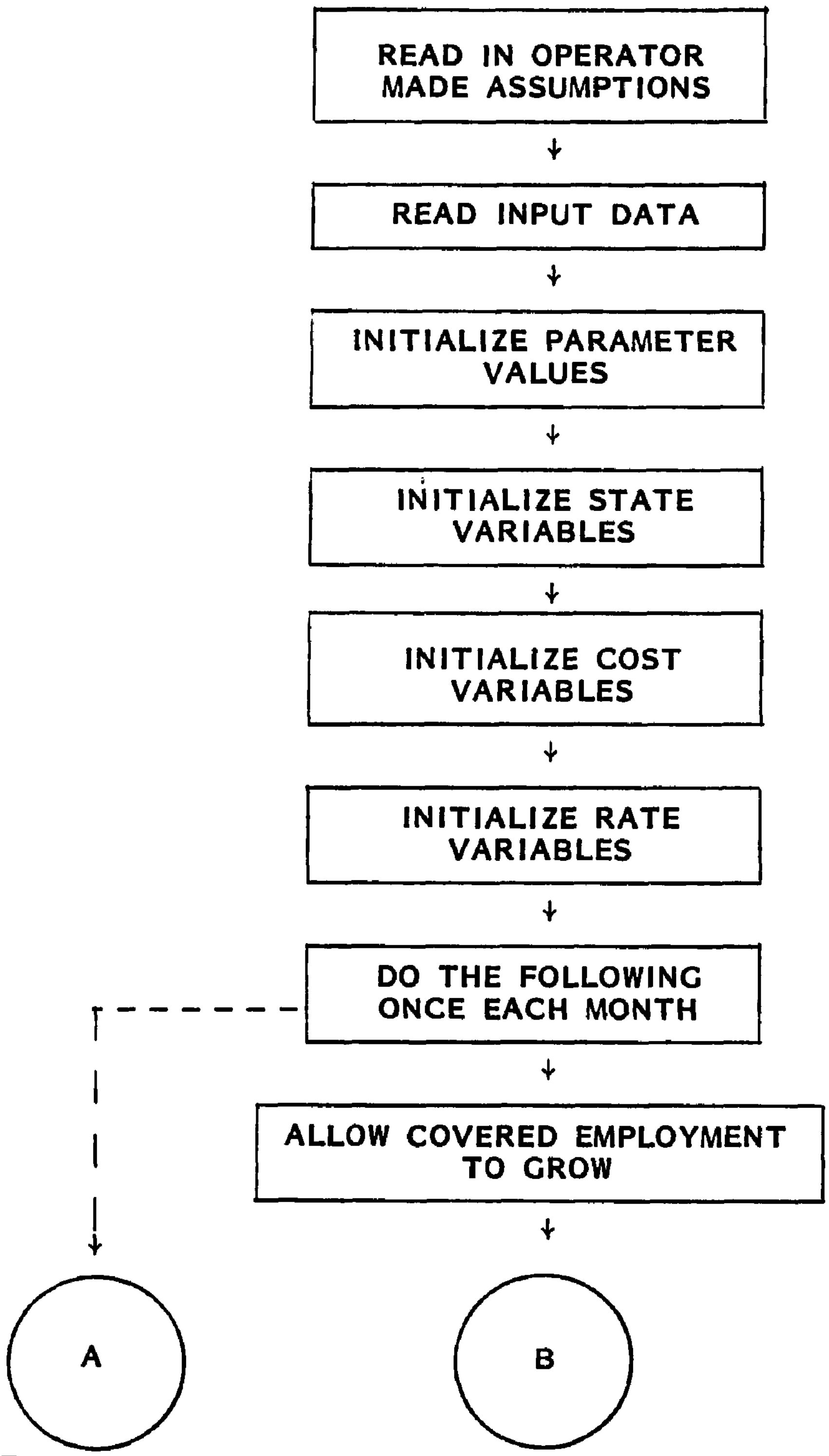
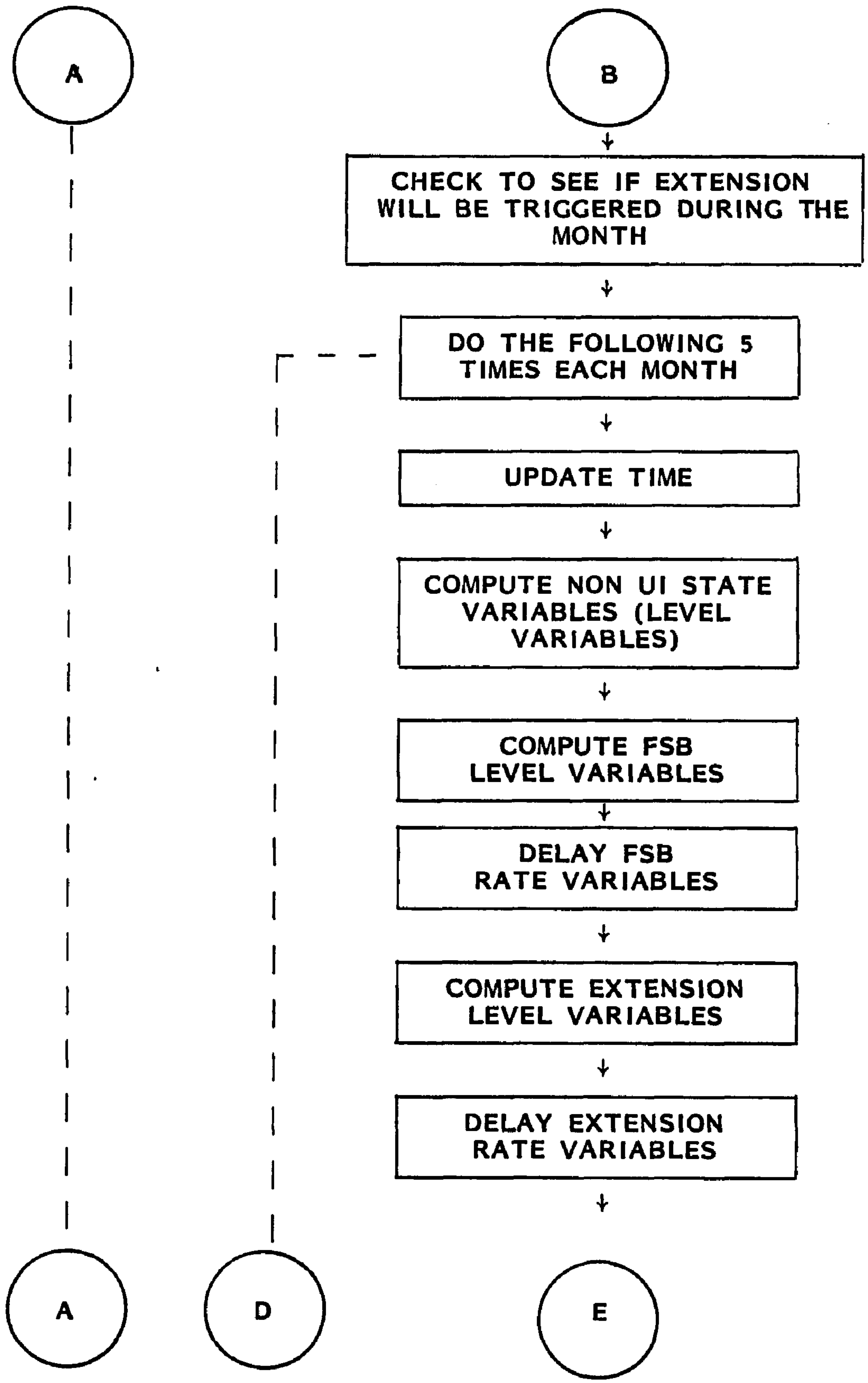
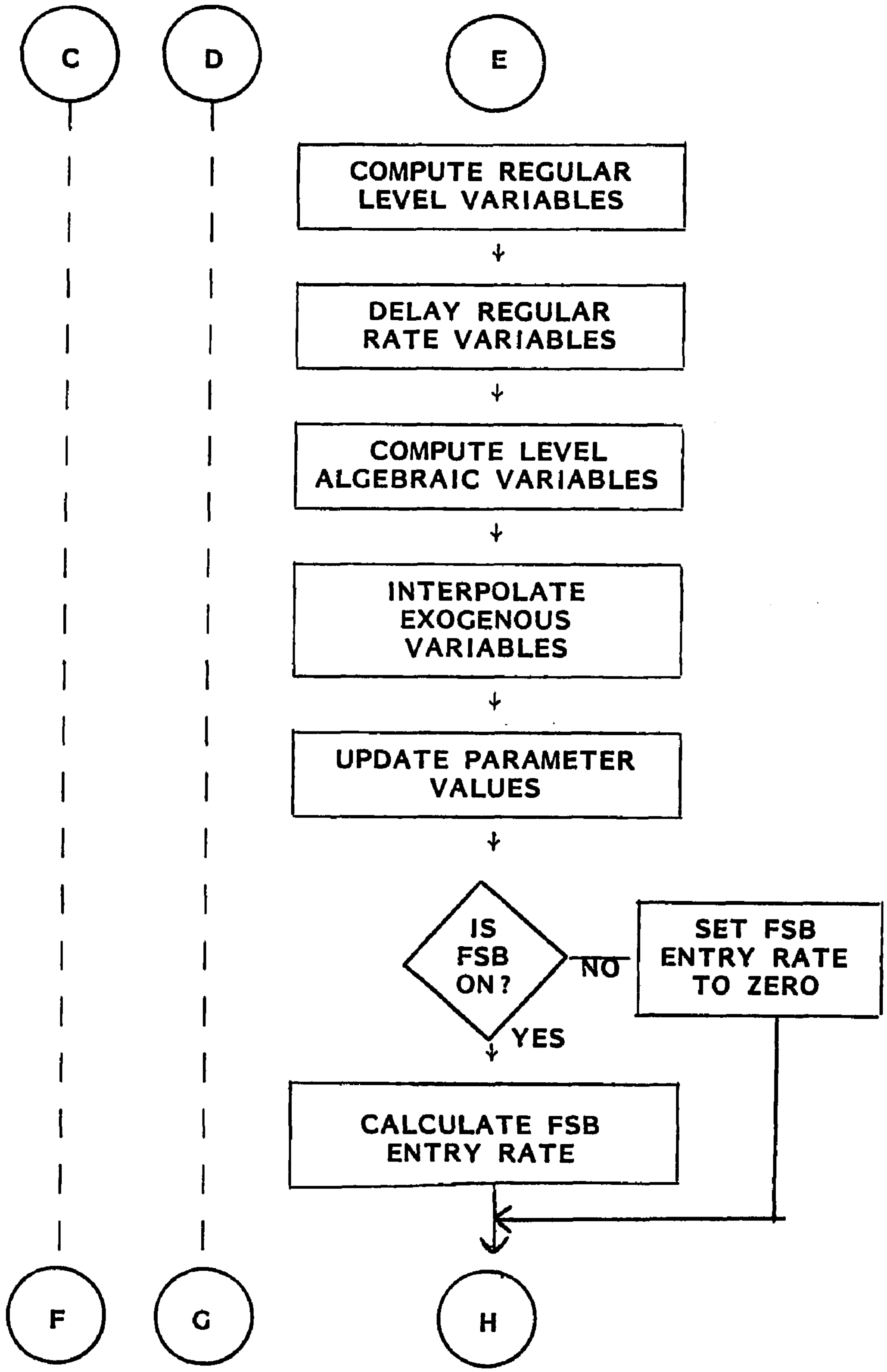
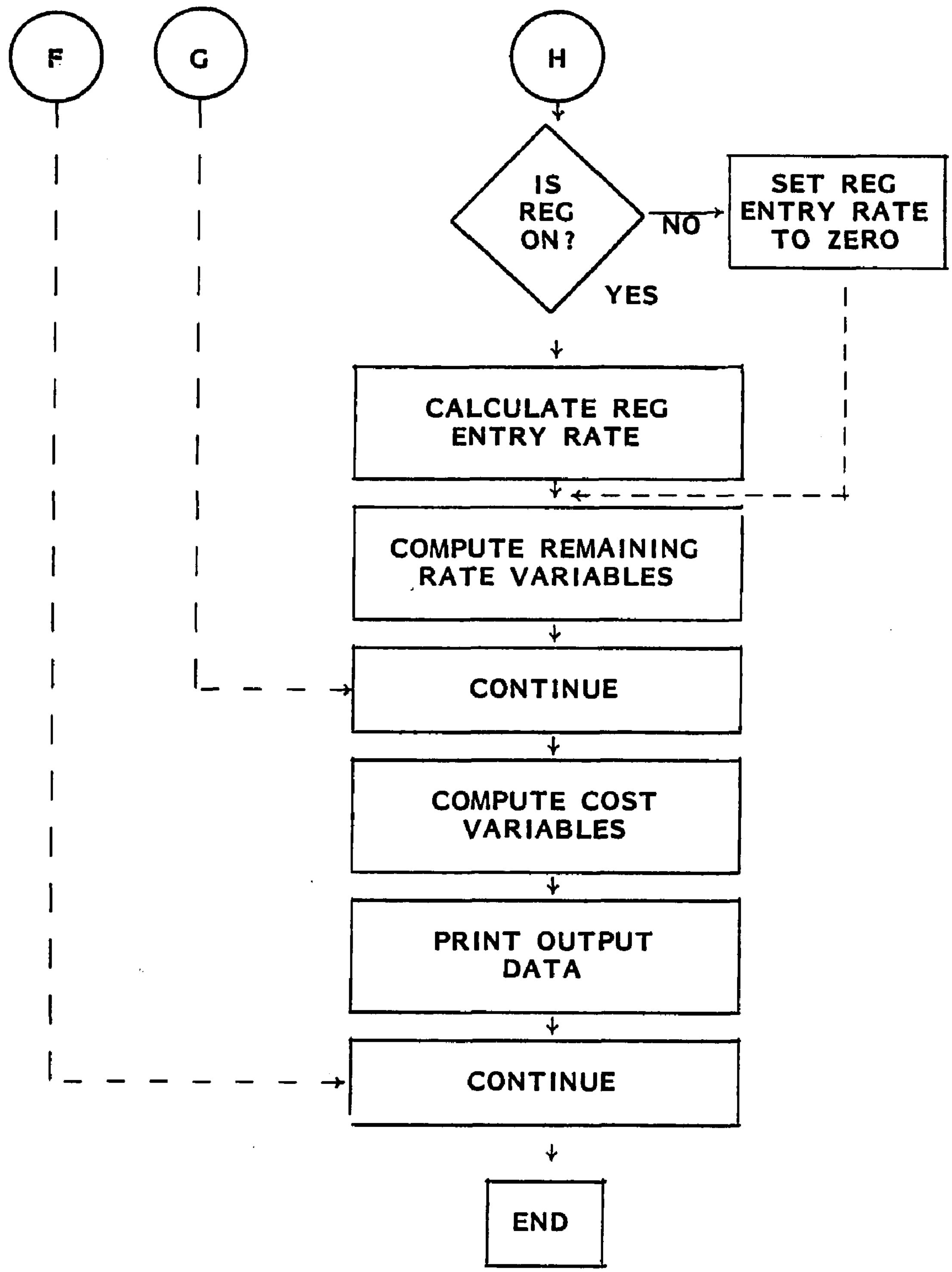


FIGURE 2.--PROGRAM FLOW CHART FOR MODEL OF LABOR FORCE AND CURRENT UNEMPLOYMENT INSURANCE SYSTEM.


A
B
CHECK TO SEE IF EXTENSION WILL BE TRIGGERED DURING THE MONTH
DO THE FOLLOWING 5 TIMES EACH MONTH
UPDATE TIME
COMPUTE NON UI STATE VARIABLES (LEVEL VARIABLES)
COMPUTE FSB LEVEL VARIABLES
DELAY FSB RATE VARIABLES
COMPUTE EXTENSION LEVEL VARIABLES
DELAY EXTENSION RATE VARIABLES
A
D
E


C
D
E
COMPUTE REGULAR LEVEL VARIABLES
DELAY REGULAR RATE VARIABLES
COMPUTE LEVEL ALGEBRAIC VARIABLES
INTERPOLATE EXOGENOUS VARIABLES
UPDATE PARAMETER VALUES
IS FSB ON?
NO
SET FSB ENTRY RATE TO ZERO
YES
CALCULATE FSB ENTRY RATE
F
G
H


F
G
H
IS REG ON?
NO
SET REG ENTRY RATE TO ZERO
YES
CALCULATE REG ENTRY RATE
COMPUTE REMAINING RATE VARIABLES
CONTINUE
COMPUTE COST VARIABLES
PRINT OUTPUT DATA
CONTINUE
END

determines if the extended UI program will be active based on criteria set by legislation.

The monthly time increments are divided into five equal increments by an inner loop so the flows and levels will be calculated and updated five times each month. Within the inner loop the time variable is first updated followed by the calculation of all model level variables. This includes the calculation of the non UI level variables such as employment and labor force. The program divides the FSB program into two parts, FSBA and FSBB, each of 13 weeks mean duration to simulate the Federal UI program. It is then possible to have the FSB program nonoperational (0 weeks delay), a 13 week program or the full 26 week program. For simplicity, the block diagram in Figure 2 shows only one delay block, but both delays operate in the same manner. If the FSB program is a 13 week program all people on the program are sent directly into the B delay block. If both programs are operational (26 weeks maximum entitlement) simulated recipients are allowed to enter the A delay block and then flow through the B delay block when they have exhausted the A block. The program determines if the FSB program is of 26 weeks duration and if so, calculates the number of recipients in the A delay block and then updates the A block rate variables by calling subroutine DELDT. The same process is used for the B FSB delay block.

The same operations are performed on the extended UI program which is represented by a single delay block. The level variables are calculated before the rate variables are calculated. The regular program is handled in a similar manner with two delay blocks used to more accurately represent the behavior of people on the program. The level of the regular program is determined by adding the number of recipients in both the A and B delay blocks. The rate variables for the B and A blocks are delayed by first calling subroutines DELDT for block B and VDEL for block A. After this all the remaining level and rate variables are calculated.

Since the model operates five times each month and the exogenous variables are read as monthly values, the variables must be interpolated to produce the needed intermediate values. This is accomplished by calling the interpolation function TABLI. Next the model parameters are updated by calling subroutine DUPCUT and a portion of the UI rate variables are computed. The program then determines if the FSB program is active during the current month in which the model is operating. If the FSB program is on the entry rate is calculated and if FSB is off the entry rate is set to zero. The same process is used for the extended UI program. The remaining rate variables are calculated by calling the VARCALC portion of subroutine DUPCUT and the inner loop (five times each month) is terminated. The monthly cost variables are then computed and printed by calling subroutine COST. The monthly or outer loop is terminated and the output is plotted by calling subroutine DATAPLOT. A complete listing of the model program and subroutines can be found in Appendix E.

The following is a brief description of the functions and subroutines used by the model:

Subroutine DELDT:[17] A Fordyn subroutine used for simulating fixed length distributed time delays.

Subroutine VDEL:[18] A Fortran subroutine used for simulating variable length distributed time delays.

Function TABLI:[19] A Fordyn look-up function for interpolating values in a tabled series of numbers.

Subroutine DUPCUT: The first section of subroutine DUPCUT contains equations for calculating some of the parameters of the model (P1 through P21C). The VARCALC entry point computes most of the rate variables used in the model.

Subroutine COST: Subroutine COST uses the number of recipients on each UI program to determine the cost of the benefits for each program. The subroutine first determines the average weekly payment for each program which is a function of historical legislative changes (which are represented by dummy variables) and the month (also represented by dummy variables). The user of the model can also specify the average weekly payment values through the executive program.

The number of people in each program is converted to the number of weeks compensated by using equations developed through regression analysis. The number of weeks compensated is multiplied by the average weekly payment value to determine the monthly benefit cost for each program. These costs are also accumulated for each year and a yearly table of costs by program is printed. An additional table of costs with a user supplied growth factor is printed for projections into the future.

Subroutine TITLE: The title and a user supplied run name are printed at the top of each page except pages used to display graphic output.

Subroutine MODPLT: This subroutine prints the model variables in both a tabular and graphic format. In the graphic format the model variables can also be plotted with historical data to aid in validation of the model. Although the interactive executive program limits the possible variables to be plotted to a maximum of 23, this subroutine has the capability of plotting all 82 model variables and the corresponding historical data if available. Correlation coefficients, coefficients of determination, and model and historical means are computed and printed on the line printer graphic output when historical data is plotted with the model variables.

Historical Data Conversion and Derivation

Historical data has been used in this model to assist in the refinement of the model, to aid in estimating parameters and also to validate its output. This section will describe the derivation and conversion of the historical data for these uses. The basic sources of historical data and tables showing conversion procedures are shown in Appendix F. Table 1 in Appendix F lists the basic sources of historical data series used either directly by the model for comparison purposes or as an input to the data conversion procedure.

Tables 2, 3 and 4 of Appendix F show the derivation of the monthly levels of recipients in the regular, extended and FSB programs respectively. The explanation of this derivation will refer to Table 2 for the regular program. The procedure followed in Tables 3 and 4 is identical. The two data elements used to derive the regular level are the number of Michigan liable continued weeks claimed compensable and Michigan agent continued weeks claimed. A week claimed is a request for a benefit payment for a week of total or partial unemployment. These elements which are found in columns B and C are added together to yield the total number of person-weeks in the month listed in column D. The number of person-weeks is the total number of weeks claimed during the month. By dividing this figure (column D) by the number of working weeks per month (column A) an approximate level of the regular program (column E) is arrived at. This is an approximation to the number of people in the system for one working month since two or more people could have resulted in a month claimed. The error due to this approximation is expected to be small and fairly constant over time.

Since the model operates with equal intervals of time, all months with respect to the model will be of equal length. The number of recipients in the regular program calculated by the foregoing procedure (column E) incorporates systematic month to month variation because each month contains a different number of working weeks. Thus the historical data must be standardized to compare with the model output. The assumption is made that the model operates with a 365 day year with 12 equal months of four weeks each. From this a conversion factor of the number of standardized weeks/standardized month is derived as follows:

$$\frac{365 \text{ days/year}}{12 \, \frac{\text{months}}{\text{year}} \times 7 \, \frac{\text{days}}{\text{week}}} = 4.345 \, \frac{\text{standardized weeks}}{\text{standardized month}}$$

The standardization of the monthly data is performed by multiplying the unstandardized level by the ratio of the conversion factor (4.345) to the number of working weeks per month. The results of this calculation yielding the standardized monthly level of the regular program is shown in column F.

Tables 5, 6 and 7 of Appendix F show the derivation of the monthly rate of UI recipients entering the regular, extended and FSB programs respectively. As before, the explanation will focus on the regular program (Table 5) with identical procedures followed in Tables 6 and 7 for the extended and FSB programs. The two data elements used to derive the rate entering the regular UI program (RUI) are first payments and initial additional claims. A first payment is the first check issued to a UI recipient during the first spell of unemployment. The number of first payments during a month is used to represent the rate of new entrants entering the regular program which is one component of RUI. The number of first payments is shown in column F. By dividing this figure by the number of working weeks per month (column A) the weekly average of first payments is derived (column G).

The second component of RUI is the number of reentrants to the system which is represented by the number of initial additional claims. An initial additional claim is filed by a UI recipient after his series of claims has been interrupted by returing to work. There are two categories of initial additional claims--Michigan liable and Michigan agent. Michigan liable initial additional claims (column B) are Michigan residents and Michigan agent initial additional claims (column C) are residents of other states using the Michigan UI facilities. Total initial additional claims are shown in column D and the results of dividing this figure by the number of working weeks per month (column A) to yield a weekly average is shown in column E. The addition of columns E and G together yields a weekly average per month of the rate entering the regular unemployment insurance program (RUI) which is shown in column H. By multiplying this figure by the number of standardized weeks per standardized month (4.345) the monthly RUI figure is derived which is shown in column I.

Tables 8, 9 and 10 of Appendix F show the derivation of the monthly rate of UI recipients who leave the regular, extended and FSB programs before exhausting. Once recipients enter a given program, they will either leave the program before exhausting benefits presumably to return to employment or remain in the program until the benefits are exhausted. Since statistics are not maintained on the number of recipients who leave each month, this figure must derived algebraically. The explanation of this procedure will be for the regular program (Table 8) with identical procedures followed in Tables 9 and 10 for the extended and FSB programs.

The standardized rate entering the regular program is listed in column B (from column I in Table 5). The number of recipients exhausting per month is listed in column C. The standardized rate exhausting per month (column D) is calculated by dividing by the number of working weeks per month (column A) and multiplying by the number of standardized weeks per standardized month (4.345). The standardized level of the regular program (from column F in Table 2) is listed in column E. The change in the level of the regular program is listed in column F (the current value in Column E minus the previous value in column E). The rate leaving the program is derived by making use of the following relationship:

$$\Delta \text{ level} = \text{rate entering} - \text{rate exhausting} - \text{rate leaving}$$

or

$$\text{rate leaving} = \text{rate entering} - \text{rate exhausting} - \Delta \text{ level}$$

The results of this calculation (column B - column D - column F) are shown in column G.

The reader will note that the figures in column G are fairly volatile with large changes from one month to the next. This is most likely due to variations in the data collection procedures for the elements used to derive the rate leaving. For example, first payments used in deriving the rate entering the system represents the number of first payment checks issued. These checks are issued by a computerized system and the information associated with them should be accurate and timely. On the other hand, the number of continued weeks claimed used in deriving the level of recipients in a program is largely the result of a manual accounting system with the possibility of errors and inconsistencies from one month to the next.

Column H in Table 8 is the ratio of the rate leaving the regular program to the sum of the rate leaving and rate exhausting. This ratio provides an estimate of the model parameter π22A (π23A for the extended program and π24A for the FSB program). By referring to the model diagram it may be seen that π22A determines the rate leaving the first delay block while 1 - π22A = π22B determines the flow into the second delay block which models those recipients who will ultimately exhaust.

Tables 11, 12 and 13 of Appendix F show the derivation of the levels and rates associated with the employable subsets of the ADC-R, ADC-U and General Assistance (GA) programs in the welfare portion of the model. In Table 11, which shows data for the ADC-R category, column A lists the total monthly caseload or total level.

The figures in columns A, C and E were obtained by linearly interpolating monthly averages for the quarterly figures that were available. Since the model simulates the aggregate behavior of people within the labor force, only the employable portion of the caseload is used to adjust and validate the model's output. Because information as to the employability of welfare recipients is not maintained by the Michigan Department of Social Services it was necessary to estimate the percentage of the caseload contained in the labor force. Based on an average of percentage employable figures in three reports published by Michigan Department of Social Services in cooperation with the Department of Health, Education and Welfare, this figure is estimated at 21.4% (see references 20, 21 and 22).

This percentage is applied to the figures in column A to give the approximate employable number of recipients listed in column B. Note that there is an implicit assumption here that there is one employable person per employable caseload. This assumption is necessary since the model simulates flows of individuals and not caseloads which are usually family units. Another assumption in this procedure is that the percent employable figure is constant over time. This is probably somewhat unrealistic since during an economic downturn more people may be on the welfare roles for employment related reasons than during economic good times. Unfortunately, there is no data available to estimate this effect.

The total rate leaving (case closings) and total rate entering (case openings) are listed in columns C and E respectively. Again the constant percent employable figure of 21.4 multiplies columns C and E to obtain the employable rate leaving and employable rate entering listed in columns D and F. In addition to the two previous assumptions, this calculation requires a third assumption that the employable subset of ADC-R is no more or no less dynamic than the total caseload. Again no data is available to estimate the flows associated with the employable subset.

Table 12 shows the estimated levels and rates for the ADC-U category of welfare. Since cases are admitted to this category on the basis of having an unemployed father as the head of the household the assumption is made that the entire caseload has one employable person. Thus, the monthly caseload, rate leaving and rate entering listed in columns A, B and C are totals for the entire category. These figures were obtained as before by linearly interpolating monthly averages for the quarterly figures that were available.

Table 13 shows the estimated levels and rates for the General Assistance category of welfare. The procedure and assumptions required for the estimations are identical to those followed in Table 11 with the exception that the employable percentage figure used is different. The percent employable figure was estimated at 40% in a survey of General Asssitance recipients published by the Michigan Department of Social Service.[23]

Parameter Estimation

The task of estimating parameters for this model was difficult due to the fact that there has been little historical data available with which to base the estimates on. This is especially true with rate or flow data and virtually all of the model's multiplier parameters produce a flow variable. For this reason many of the parameters are the result of a good deal of individual qualitative judgment as to what constitutes a reasonable estimate. This is particularly true with the welfare or public assistance subsystem. Also the lack of some state data has forced the use of a few parameters which have been estimated for the country as a whole. The reader should keep in mind that many of the model parameters represent a first cut "ball park" estimate of their true value.

Since all of the multiplier parameters produce a rate variable, the parameter estimation procedure actually involved estimating the rates first and then calculating the parameter from the estimated rate. For this reason the discussion will focus on the estimation of the rate variables. Estimation of the rate variables has the advantage that the estimates must be consistent from category to category within the labor force. In other words an estimated flow leaving one category must show up as an entering flow in the other remaining labor force categories (or a flow entering the non labor force). Thus it is possible to set up a series of gross flow tables for each category of the labor force showing where the flows originated from and their destination to assist in the estimation procedure. The use of this gross flow technique also permits the estimation of flows which are consistent with the growth or decline of a category over time. For example if the level of a category has been growing by a given amount per month then the estimatated <u>net</u> flow into that category should equal the growth per month.

The method just outlined works well if the flows from one category to another are expected to be constant but it must be modified slightly if the flows change. For example if the state is entering a period of declining economic activity then more people will flow from employment to unemployment insurance. Two sets of flows were estimated for the model with each representing an extreme condition of the state's economy. One set of flows corresponds to good economic conditions while the other represents poor economic conditions. Once the maximum and minimum values for each flow variable have been estimated, the corresponding extreme values for each parameter can be calculated. This yields a range of values for each parameter.

If a range for a parameter has been determined then some means must be devised to assign it a value within that range. Since flows vary with the state of the economy, many of the model parameters can be made a function of some indicator of economic good or bad times. The indicator chosen was a smoothed version (a five month moving average) of Michigan's unemployment rate. The state unemployment rate was used because it is a generally accepted gage of the employment status of the labor force and may also be used to indicate the general conditions of the state's economy. This varies from approximately 4% during good economic conditions to a high of close to 15% during poor economic conditions. The 4% figure corresponds to one extreme estimate of the parameter while the 15% figure corresponds to the other extreme estimate. A simple linear equation can be developed so that the parameter is a function of the smoothed unemployment rate.

Before discussing in detail the approximation of the flows it will be helpful to look at the historical levels of the labor force categories and their average growth rates over time. These values are shown in Table 2. All of the categories except the WOB

TABLE 2.--Approximate Range of Levels and Growth Rates.

Category	Range of Level	Average Growth Rate
LF	3,600,000 - 4,100,000	5200 per month
E	3,350,000 - 3,700,000	3650 per month
WOB	70,000 - 160,000	0
ADC-R	11,000 - 52,000	210 per month
ADC-U	7,500 - 12,000	70 per month
GA	12,800 - 22,000	350 per month

category have exhibited the approximate growth rates over time shown in the table (the figures represent 1970 through 1976 which is the period used for estimating parameters). The historical growth rates will be used as an aid in estimating the amount by which the rate entering must exceed the rate leaving (the net flow) so that modeled growth of the category will reflect the historical growth.

Another important point should be brought out at this time. The minimum and maximum figures in the gross flow tables which will be presented shortly also correspond roughly with the beginning and ending of the time period used in estimation. Nineteen seventy was a period of relatively good economic times while in 1975 - 1976 the state underwent the effects of the energy crisis induced by the oil embargo in the Fall of 1974. In the beginning of 1975 the state's unemployment rate approached 15% then gradually declined but remained high through 1976. Thus the minimum and maximum flow figures representing extreme states of the economy in the gross flow tables also contain an additive historical growth component. As the level of the category becomes larger it may be expected that its associated gross flows will also grow (note that it is a positive net flow which results in a growth of the level). In other words the latter figure in the gross flow tables will be larger due to economic hard times as well as the growth of the category. The fact that the parameters were estimated using a declining economic period may limit the validity of the overall model if it is applied to a period of economic growth.

The gross flow tables used to assist in the estimation of the model parameters are shown in Table 3. Note that for most of the categories the net flow for both the minimum and maximum gross

TABLE 3.--Gross Flow Tables (Monthly Flows).

FLOW INTO LF		FLOW OUT OF LF	
NLFRE	96728 - 122910	ERNLF	108900 - 139500
NLFRWOB	32712 - 55673	WOBRNLF	14938 - 29136
NLFRUI	1650 - 2280	UILVRNLF	1050 - 3300
		UIEXRNLF	700 - 2900
NLFRADCR	325 - 1072	ADCRRNLF	108 - 930
NLFRADCU	25 - 75	ADCURNLF	86 - 286
NLFRGA	360 - 540	GARNLF	820 - 1300
NLFR	131800 - 182550	RNLF	126602 - 177352

FLOW INTO E		FLOW OUT OF E	
NLFRE	96728 - 122910	ERNLF	108900 - 139500
WOBRE	21123 - 46076	ERWOB	3008 - 14172
UILVRE	34000 - 107000	ERUI	37650 - 136120
UIEXRE	420 - 1160		
ADCRRE	36 - 310	ERADCR	25 - 82
ADCURE	301 - 1001	ERADCU	75 - 225
GARE	820 - 1300	ERGA	120 - 180
RE	153428 - 279757	ER	149778 - 290279

FLOW INTO WOB		FLOW OUT OF WOB	
NLFRWOB	32712 - 55673	WOBRNLF	14938 - 29136
ERWOB	3008 - 14172	WOBRE	21123 - 46076
UILVRWOB	0 - 0	WOBRUI	700 - 1600
UIEXRWOB	1775 - 9337		
ADCRRWOB	36 - 310	WOBRADCR	125 - 413
ADCURWOB	43 - 143	WOBRADCU	300 - 900
GARWOB	410 - 650	WOBRGA	1440 - 2160
RWOB	37984 - 80285	WOBR	38626 - 80285

FLOW INTO ADC-R		FLOW OUT OF ADC-R	
NLFRADCR	325 - 1072	ADCRRNLF	108 - 930
WOBRADCR	125 - 413	ADCRRWOB	36 - 310
ERADCR	25 - 82	ADCRRE	36 - 310
UIEXRADCR	25 - 83	ADCRRUI	0 - 0
UILVRADCR	0 - 0		
RADCR	500 - 1650	ADCRR	180 - 1550

TABLE 3.--Continued.

FLOW INTO ADC-U		FLOW OUT OF ADC-U	
NLFRADCU	25 - 75	ADCURNLF	86 - 286
WOBRADCU	300 - 900	ADCURWOB	43 - 143
ERADCU	75 - 225	ADCURE	301 - 1001
UIEXRADCU	100 - 300	ADCURUI	0 - 0
UILVRADCU	0 - 0		
RADCU	500 - 1500	ADCUR	430 - 1430

FLOW INTO GA		FLOW OUT OF GA	
NLFRGA	360 - 540	GARNLF	820 - 1300
WOBRGA	1440 - 2160	GARWOB	410 - 650
ERGA	120 - 180	GARE	820 - 1300
UIEXRGA	480 - 720	GARUI	0 - 0
UILVRGA	0 - 0	GAR	2050 - 3250
RGA	2400 - 3600		

FLOW INTO UI		FLOW OUT OF UI	
NLFRUI	1650 - 2280	UILVRNLF	1050 - 3300
ERUI	37650 - 136120	UILVRE	34000 - 107000
WOBRUI	700 - 1600	UILVRWOB	0 - 0
ADCRRUI	0 - 0	UILVRADCR	0 - 0
ADCURUI	0 - 0	UILVRADCU	0 - 0
GARUI	0 - 0	UILVRGA	0 - 0
		UILVR	35050 - 110300
		UIEXRNLF	700 - 2900
		UIEXRE	420 - 1160
		UIEXRWOB	1775 - 9337
		UIEXRADCR	25 - 83
		UIEXRADCU	100 - 300
		UIEXRGA	480 - 720
		UIEXR	3500 - 14500

flows is equal to the average growth rate shown in Table 2. A list of the model parameter equations which were estimated using the gross flow data appears in Appendix D. The explanation of how these flow variables were derived will begin with the unemployment insurance system.

The model of the unemployment insurance system was developed before the development of the overall model so that the magnitude and behavior of the UI flow variables was known for the purposes of developing gross flow tables. Historical level and flow data for the UI system is presented in Tables 2 - 10 of Appendix F. These tables are the sources for the minimum and maximum UI flow variables listed in Table 3. These tables are also the sources for the UI parameter estimates (since the UI subsystem is modeled by delay functions rather than integrating net flows, the gross flow estimating technique is not appropriate). π22A and B, π23A and B and π24A and B, which determine the rate leaving and exhausting the UI subsystem were estimated using the calculated value of these parameters in column H of Tables 8, 9 and 10 of Appendix F. π23C and π24C which determine the reentering rate for the extended and FSB programs were selected by making initial estimates and then adjusting the estimates. These parameters were adjusted between repeated runs of the UI submodel until the rate exhausting the preceding program plus the reentering rate equaled the rate entering. This method was also used to fine tune all the UI parameters so that the UI model's levels and rates were close to the historical levels and rates.

The minimum and maximum flow variables for the welfare or public assistance subsystem (ADC-R, ADC-U and GA) were estimated using the historical flow data which appears in Tables 11, 12 and 13 of Appendix F. This flow data gives the total rate entering or leaving a category rather than the component flows for each of the possible sources and destinations within the labor force. These component flows were estimated by taking a constant percentage of the total flow. For example the total rate entering a category is divided up so that each portion represents a flow from one of the various sources within the labor force (or from the non labor force). These percentage estimates and the resulting estimated minimum and maximum flows are shown in Table 4 (the flows are also in Table 3).

TABLE 4.--Flows To and From the Employable Portion of Welfare.

	ADC-R	ADC-U	GA
TOTAL RATE ENTERING	500 - 1650	500 - 1500	2400 - 3600
FROM NLF	325 - 1072 (65%)	25 - 75 (5%)	360 - 540 (15%)
FROM WOB	125 - 413 (25%)	300 - 900 (60%)	1440 - 2160 (60%)
FROM E	25 - 82 (5%)	75 - 225 (15%)	120 - 180 (5%)
FROM UIEXR	25 - 83 (5%)	100 - 300 (20%)	480 - 720 (20%)
FROM UILVR	0 - 0 (0%)	0 - 0 (0%)	0 - 0 (0%)
TOTAL RATE LEAVING	180 - 1550	430 - 1430	2050 - 3250
TO NLF	108 - 930 (60%)	86 - 286 (20%)	820 - 1300 (40%)
TO WOB	36 - 310 (20%)	43 - 143 (10%)	410 - 650 (20%)
TO E	36 - 310 (20%)	300 - 1001 (70%)	820 - 1300 (40%)
TO UI	0 - 0 (0%)	0 - 0 (0%)	0 - 0 (0%)

The flows remaining to be discussed are those between the categories of labor force, non labor force, employment and those without benefits. The total rate leaving the labor force (RNLF) was initially estimated by multiplying the percentage of people in the labor force who leave the labor force each month by the average size of Michigan's labor force. This transition percentage (approximately 4.5%) was reported in a study of gross flow data for the country as a whole.[24] The lack of gross flow statistics for the state of Michigan has forced the use of several parameters based on national data. The initial estimate of RNLF was modified and a range of values determined by adding up the previously estimated components of RNLF and estimating the remaining components using parameters which were based on national data.

A similar process was also used to estimate the total rate entering the labor force (NLFR). The addition of flows based partly on historical data for the UI and welfare subsystems to flows based on national parameter estimates produced an initial estimate of NLFR. Since the rate entering the labor force (NLFR) should exceed the rate leaving (RNLF) by the average historical growth rate of 5200 per month shown in Table 2, adjustments were made to the components of both of these flows to achieve this growth rate. This estimation required several iterations to achieve the gross flow estimates shown in Table 3 which yields growth rates for the total labor force as well as its components consistent with the average historical growth rate.

It was previously mentioned that certain parameters used to determine flows in the model are based on national gross flow data. These parameters are $\pi 1$, $\pi 7$, $\pi 9$ and $\pi 15$ which are listed with their equations in Appendix D. Note that they are functions of the unemployment rate for the entire country (USUR). These parameters came from a study of the demographic components of national gross flow data.[25] Values of these parameters for each demographic component of the nation's labor force were listed in the study at national unemployment rates of 4% and 6%. These demographic component parameters were weighted according to the demographic composition of Michigan's labor force and added to produce parameters applicable to the total labor force in Michigan. Using the resulting parameter values at 4% and 6% a simple equation was derived to calculate the parameter values as a function of the national unemployment rate. Since there is reason to believe that Michigan's economy behaves differently than the nation's economy, using parameters that are a function of the national unemployment may impair the validity of some portions of the model.

Parameter $\pi 1$ determines the portion of the rate entering the labor force (NLFR) which goes to employment (NLFRE). Parameter $\pi 7$ determines the portion of the without benefits level (WOB) which flows to employment (WOBRE). Parameter $\pi 9$ determines the portion of the WOB category which flows to the non labor force (WOBRNLF). In the study used to estimate these parameters (reference 24) the flows which $\pi 7$ and $\pi 9$ determine were from the entire level of unemployment rather than the level of the WOB category which is a subset of unemployment. Thus there is an assumption in using the estimates of $\pi 7$ and $\pi 9$ that the WOB category exhibits the same dynamic behavior as the entire level of unemployment. Parameter $\pi 15$ determines the portion of the level of unemployment which flows to the non labor force (ERNLF).

The parameters remaining to be discussed are $\pi 2$ through $\pi 6$, $\pi 8$, $\pi 10$ through $\pi 14$ and $\pi 17$ through $\pi 21$. These parameters which also appear in Appendix D were estimated using the minimum and maximum gross flows which appear in Table 3. Many of them are functions of Michigan's unemployment rate with five month smoothing (SUR) and the remainder of them are constants. The flows which each of these parameters produce may easily be determined from the model diagram which appears in Appendix B. Rather than discuss how each equation defining these parameters was determined a representative example will be presented.

The example is $\pi 11$ which determines the flow of UI exhaustees (UIEXR) going to employment (UIEXRE). This parameter was assumed to be a function of the smoothed version of Michigan's unemployment rate (SUR) which has approximate extreme values of 4% to 15%. The extreme values of the flow variable UIEXR and UIEXRE which appear in Table 3 are shown below:

UIEXRE: 420 - 1160
UIEXR: 350 - 14500

The extreme value of $\pi 11$ which is the ratio of the extreme values of UIEXR is given below:

$$\pi 11 = \frac{UIEXRE}{UIEXR} : \quad .08 \quad - \quad .12$$

The slope and intercept of the equation for $\pi 11$ in the form $\pi 11$ = a + b x SUR would be calculated as follows:

$$b = \frac{.08 - .12}{.15 - .04} = -.3636$$

$$a = .12 + .3636 \times .04 = .13454$$

The resulting equation for $\pi 11$ is shown below:

$$\pi 11 = .13454 - .3636 \times SUR$$

The reader will notice that six parameter constraints appear in Appendix D. These constraints arise because the model is designed to accurately account for people once they enter the labor force. In other words people are not created or lost within the system. All of these constraints deal with parameters that take a portion of a flow variable and convert it to other flow variables. These constraints simply ensure that the fractions of a flow variable must sum to less than or equal to one. Constraints which sum to less than one indicate that a portion of the flow variable goes to the WOB category which is treated as a residual classification. Constraints which sum to one indicate that the total flow is completely accounted for by the flows produced by parameters in the constraint equation.

Appendix D also lists the parameters used in the delay functions used to represent the unemployment insurance system. Both the mean time and the order of the delay functions were determined by making initial estimates and then adjusting the estimates. These parameters were adjusted between repeated runs of the UI submodel until the model's output was approximately equal with the historical UI level and rate variables.

Conversion of UI Model Output to Cost

In order to use the model to determine the effects of simulated policy alternatives on program costs, it is necessary to establish the relationship between the number of people in each program and the costs of the respective programs. This was accomplished by the use of historical data to develop conversion equations. These equations were then applied to the model output, which is in the form of the monthly number of people on each UI program, to convert it to cost figures.

Since cost per person data is only kept in an average weekly benefit format, it was necessary to convert the number of people on each program to the corresponding number of weeks compensated. Figure 3 diagrams the procedure used in converting the number of continued months claimed (analogous to the number of people on a UI program) to the number of weeks compensated. Ultimately the total estimated number of weeks compensated (last block in Figure 3) will be multiplied by an "average weekly payment" factor in order to obtain the estimated UI benefit payments per month.

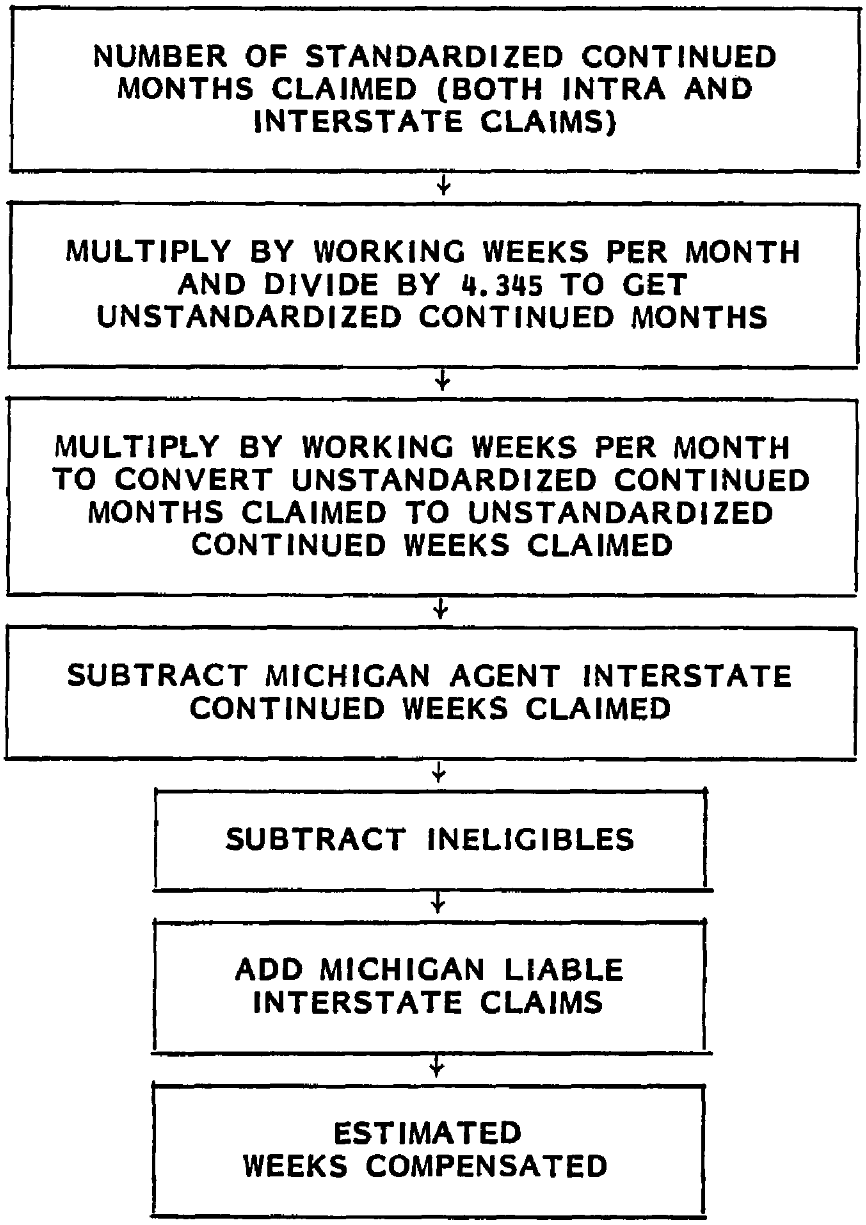


FIGURE 3.--DETERMINATION OF WEEKS COMPENSATED

The uppermost block in Figure 3 represents the number of standardized continued months claimed. This description is analogous to the number of persons per month claiming UI benefits. It is important to note that the model output has been standardized over each 12 month time period. Each month during a given year has been equally weighted. Since the model was designed to deal with uniform time increments, the standardization of monthly values was a necessity.

The next block in Figure 3 diagrams the adjustment procedure which, when applied to the number of standardized continued months claimed will provide the number of unstandardized months claimed. The adjustment procedure requires two constants: the number of working weeks per month and the number of standardized weeks per month (represented by the constant 4.345).

The first constant, number of working weeks per month, is derived by dividing the total number of working days in the month by five, the number of working days per week in a month. The second constant, number of standardized weeks per month, is derived by first dividing the total number of days in the year by the number of months in a year (12) and then dividing that result (days per month) by seven to obtain the number of standardized weeks per month. The conversion consists of multiplying the number of standardized continued months claimed by the ratio of standardized weeks per month to working weeks per month.

The third block in Figure 3 indicates that the number of working weeks per month is multiplied by the number of unstandardized continued months claimed in order to obtain unstandardized continued weeks claimed or total person weeks. This adjustment is crucial since it is ultimately weekly claim information that will be converted to dollar costs.

The fourth block in Figure 3 indicates that Michigan Agent Interstate Continued Weeks claimed is subtracted from total person weeks (unstandardized continued weeks claimed). The subtraction is required in order to separate from Michigan's continued weeks claimed the number of continued weeks claimed that other State's residents applied for while in Michigan. These out-of-state claims will not draw against Michigan's UI fund balance account. The remainder represents Michigan's liable continued weeks claimed intrastate.

The fifth block in Figure 3 illustrates the subtraction of ineligibles. Ineligibles refer to those continued weeks claimed for which individuals (Michigan residents) never received compensation due to failure of the applicants to comply with various MESC regulations.

The sixth block in Figure 3 shows the addition of Michigan liable interstate continued weeks claimed. This category represents those continued weeks claimed which Michigan residents applied for in other States (e.g., Florida) for work credit gained in Michigan. Since checks are forwarded to persons making claims outside the State, this category of claims has to be taken into account when estimating Michigan's total number of weeks compensated. The last block in Figure 3 represents the derived estimated weeks oompensated.

Figure 4 diagrams the development of the equations which convert the model output into cost figures. The development of the equation to predict historical average weekly payment is shown by the top two blocks of the flow chart in Figure 4. Using historical data, a monthly average weekly payment was calculated as the ratio of total monthly payments to total weeks compensated. Total monthly payments includes both full and half weekly payments and total weeks compensated includes both full and half weeks compensated. The result is an average figure which, when multiplied by estimated weeks compensated, yields an estimated monthly cost. For validation purposes an equation must be developed which predicts historical average weekly payment as a function of dummy variables to reflect legislative increases of benefit payments over time. The results of using multiple regression analysis to predict historical average weekly payments, by program, is shown in Table 5.

The development of an equation to predict estimated weeks compensated is shown by the third block in Figure 4. The development of this equation required the historical estimated weeks compensated derived by the procedure outlined in Figure 3 and discussed in detail earlier. The equation predicting estimated weeks compensated will be a function of the model output. The results of using multiple regression analysis to predict estimated weeks compensated for the regular, extended and FSB programs is shown in Table 6.

The procedure to determine the cost of the UI program is shown by the fourth block of Figure 4. Using the simulation model,

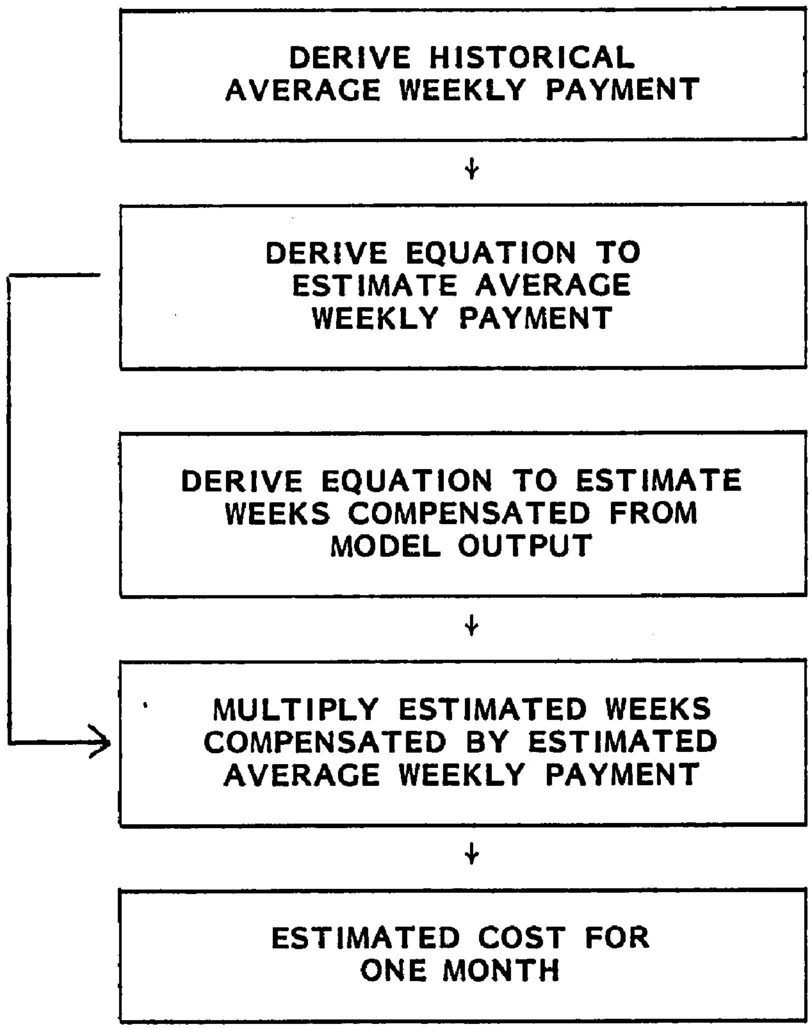


FIGURE 4.--DETERMINATION OF MONTHLY PROGRAM COSTS

TABLE 5.--Average Weekly Payment Equations.

1. Regular Program

REGAWP = LCDUM4 x 37.4 + LCDUM3 x 21.5 + LCDUM2 x 9.9 + LCDUM1 x 8.67 -DUM6 x 2.79 + DUM8 x 3.49 + DUM3 X 3.07 + DUM2 x 3.11 + DUM1 x 2.17 + 48.62

R^2 = .971

D.W. = 1.26 (Durbin Watson)

N = 91

2. Extended Program

EXTAWP = LCDUM4 x 31.22 + LCDUM3 x 7.68 - DUM6 x 5.48 + 54.71

R^2 = .966

D.W. = 1.89

N = 37

3. FSB Program

FSBAWP = $77.00*

<u>Definition of Variables</u>

If (month $\geq$ 4/70 and < 2/72) LCDUM1 = 1

If (month $\geq$ 2/72 and < 6/74) LCDUM2 = 1

If (month $\geq$ 6/74 and < 6/75) LCDUM3 = 1

If (month $\geq$ 6/76) LCDUM4 = 1

If (month = Jan) DUM1 = 1

If (month = Feb) DUM2 = 1

If (month = Mar) DUM3 = 1

If (month = Apr) DUM4 = 1

TABLE 5.--Continued

If (month = May) DUM5 = 1
If (month = Jun) DUM6 = 1
If (month = Jul) DUM7 = 1
If (month = Aug) DUM8 = 1
If (month = Sep) DUM9 = 1
If (month = Oct) DUM10 = 1
If (month = Nov) DUM11 = 1
If (month = Dec) DUM12 = 1

*An average value was used because of data problems and a small number of observations.

TABLE 6.--Estimated Weeks Compensated Equations.

1. Regular Program

   REGWC = 3.61 X STDREG - 11820.31

   R^2 = .95

   D.W. = 2.32 (Durbin Watson)

   N - 91

2. Extended Program

   EXTWC = 4.09 X STDEB + 7443

   R^2 = .95

   D.W. = 3.09

   N = 37

3. FSB Program

   FSBWC = 2.57 X STDFSB + 153887

   R^2 = .40

   D.W. = 2.74

   N = 13

a prediction of the level of recipients (the number of continued months claimed) in each UI program for each time period is obtained. The model output is then used as an independent variable in the equation to predict estimated weeks compensated for each UI program. Multiplying this result by the computed value of average weekly payment yields a prediction of the cost for the regular, extended and FSB programs. Since the model generates monthly predictions of the levels, the cost predictions will also be by month.

Model Validation

Validation of a simulation model refers to the extent of the correspondence between the behavior of the model and the behavior of the system being modeled. The model of the current system was intended to reproduce the behavior of the existing UI (and labor force) system over time. Hence the validation of the model has focused on the similarity between the model's output and historical data representing the behavior of the real system.

To assist in determining the validity of the model, descriptive statsitics as well as subjective judgment were used to assess the correspondence between the model and reality. The two descriptive statistics used were the coefficient of determination (R^2) and the mean or average. A high value of R^2 or a small difference between the model and historical means was used as an indicator of the model reproducing historical behavior. However considerable judgment is involved in interpreting these descriptive statistics. The model was designed to reproduce the aggregate response of the

Michigan UI system and lacks the detail necessary to capture the exact effect of certain types of shocks to the system. For example the model's response to strikes in the automobile industry or the aggregate effect on individual behavior of the 1975-1976 energy crisis may not follow reality accurately. In general coefficients of determination and means were used as an aid in the visual interpretation of the model's validity from plots of the model's response and historical behavior over time.

Line printer plots of historical data and the model output over time with means and coefficients of determination for the levels, exhaustion rates and costs for the regular, extended and FSB programs and the regular program leaving rate are shown in Figures 5 through 14. In the line printer plot one represents the model output and two represents historical data. For the regular and extended programs the levels and costs appear to follow historical data reasonably well. Note that the regular level (Figure 5) and cost (Figure 8) is overpredicted somewhat during the peak of the 1975-1976 energy crisis. This was a result of a tradeoff during the adjustment and refinement phase of the model development.

The choice was either having the model predict closely during good economic times or bad economic times. The results shown in the graphs represent a compromise between these extremes. The regular and extended exhaustion rates (Figures 11 and 12) are also reasonably close but some timing problems are evident. Further refinement and possibly the use of additional time varying rather than fixed length distributed delays could remedy this.

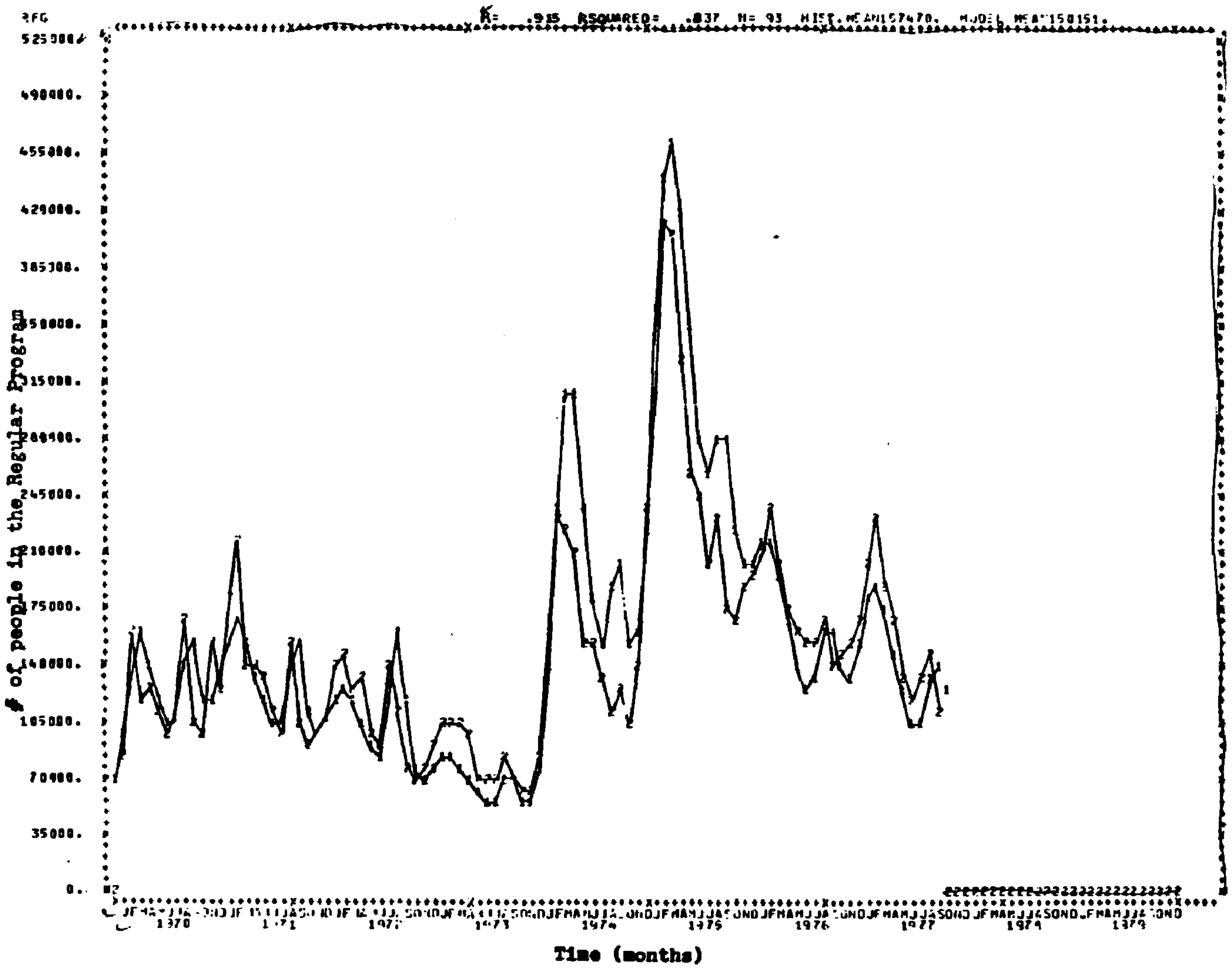


FIGURE 5.--Level of the Regular UI Program: Model Output (1) vs. Historical Data (2).

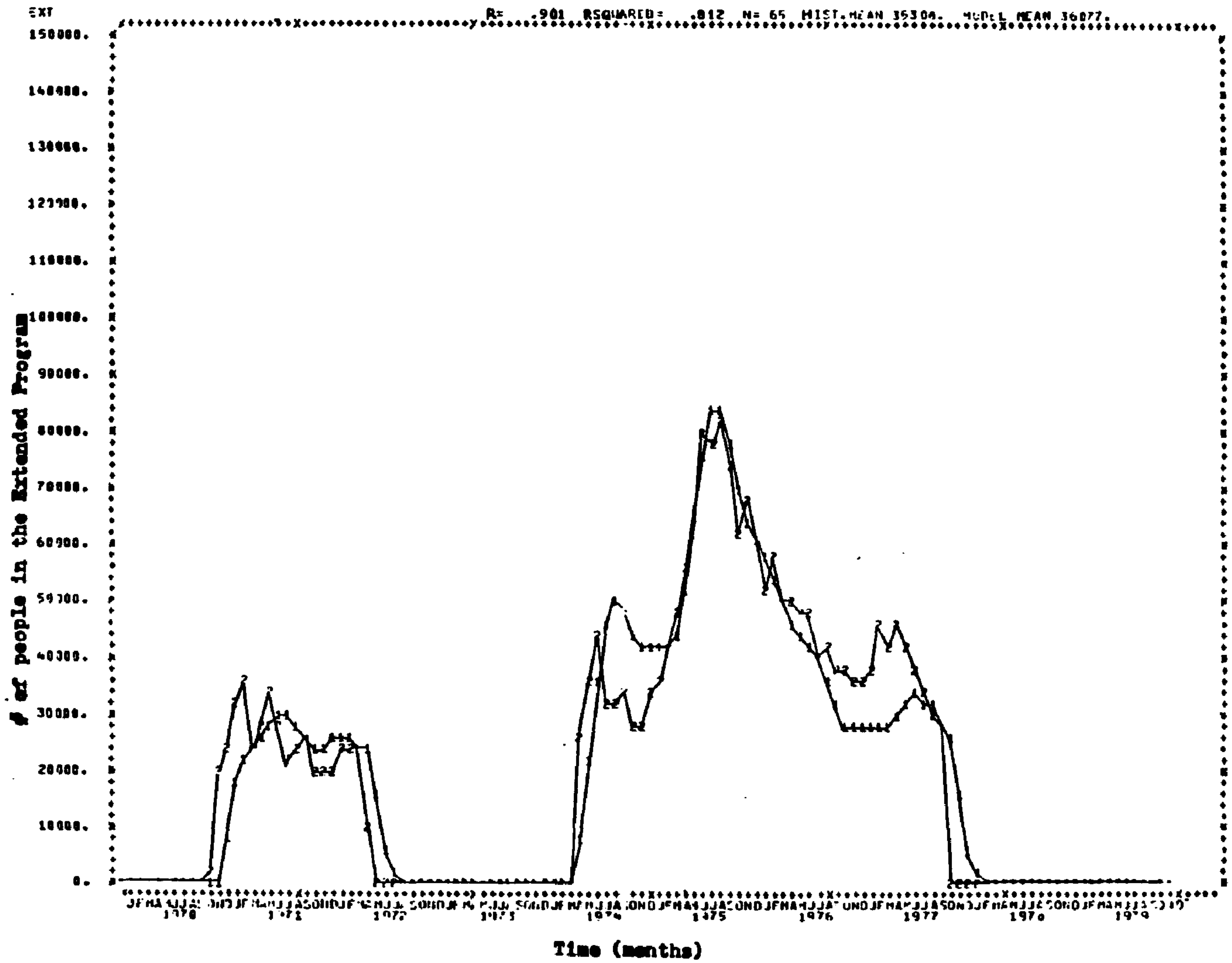


FIGURE 6.--Level of the Extended UI Program: Model Output (1) vs. Historical Data (2).

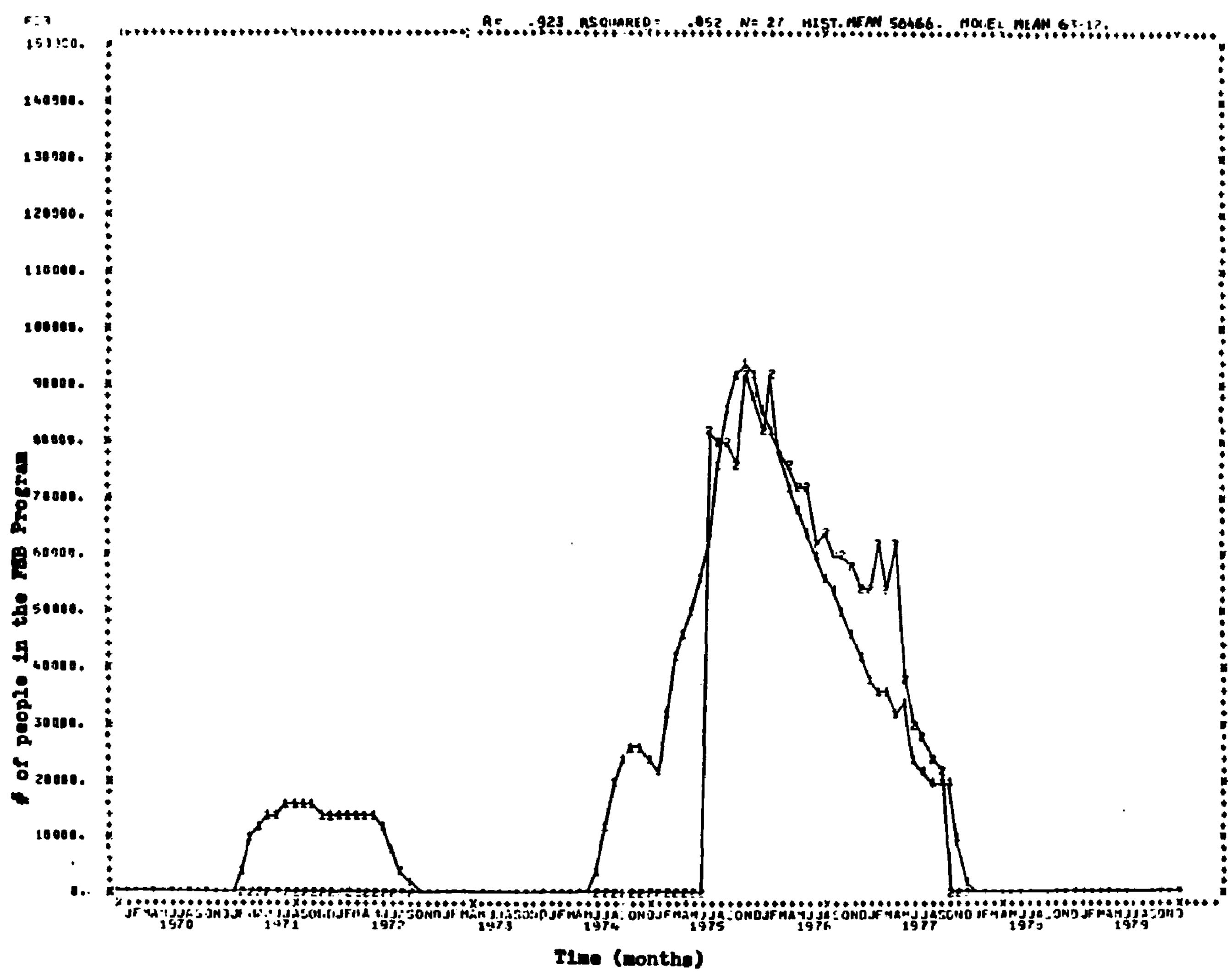


FIGURE 7.--Level of the FSB Program: Model Output (1) vs. Historical Data (2).

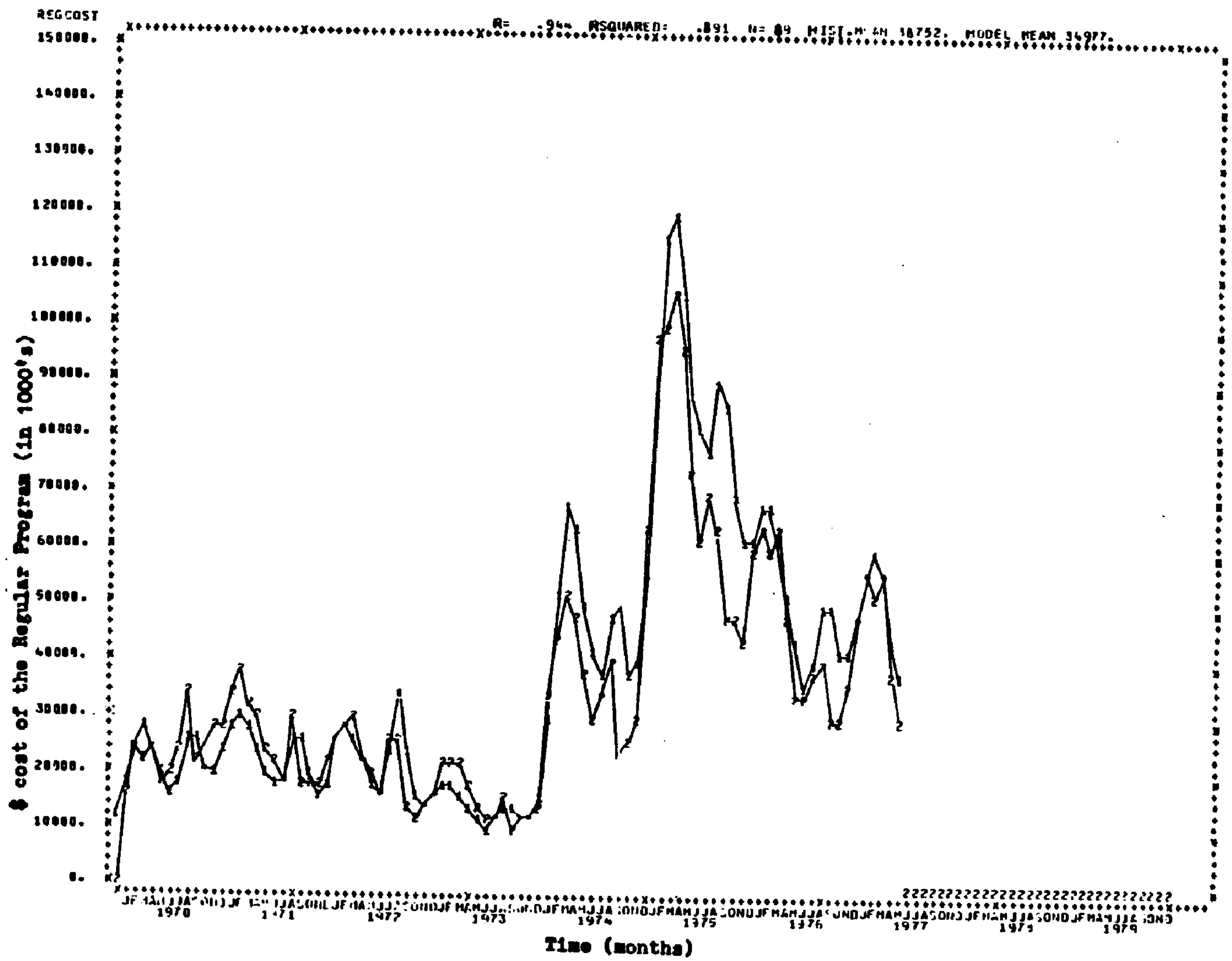


FIGURE 8.--Cost of the Regular Program: Model Output (1) vs. Historical Data (2).

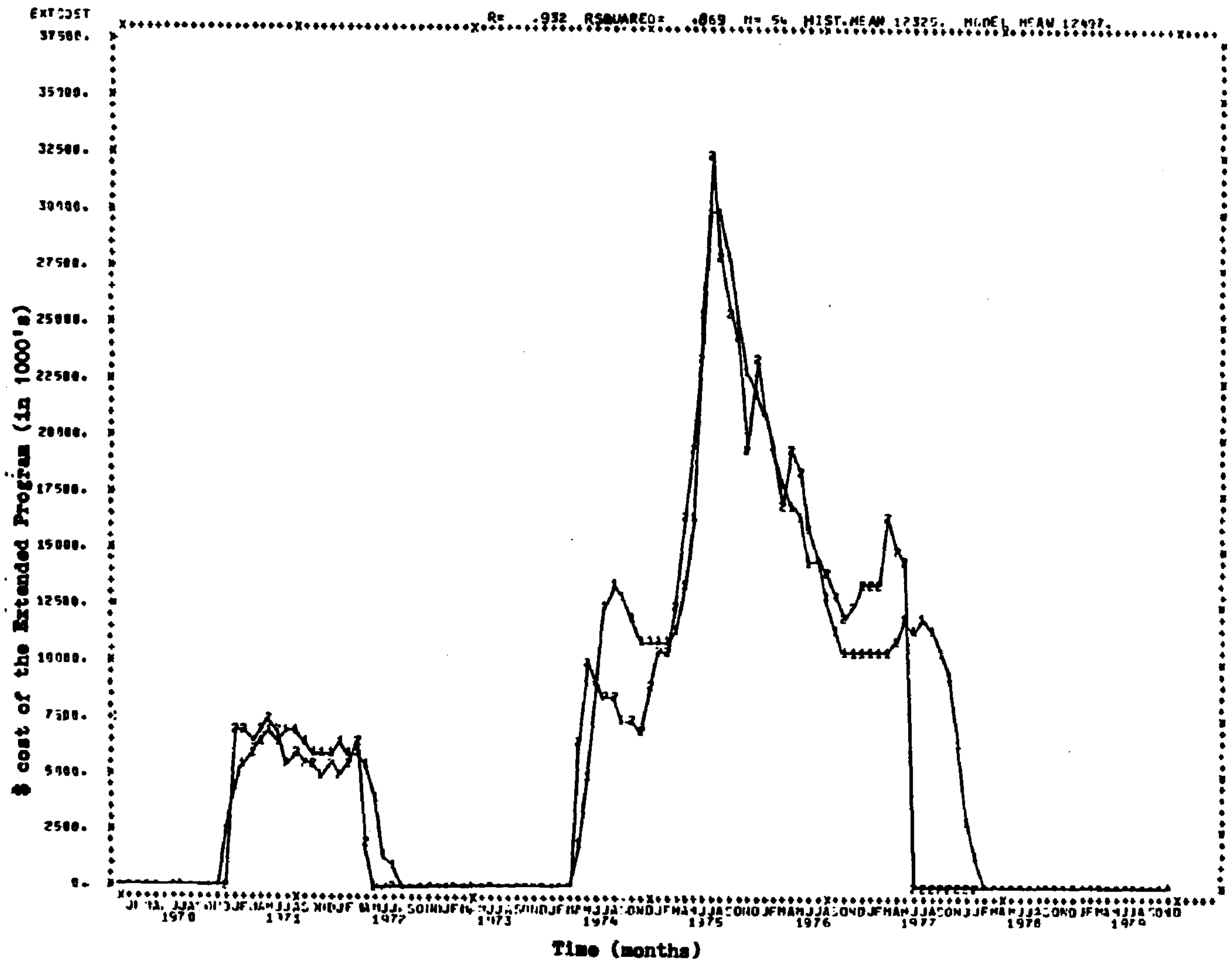


FIGURE 9.--Cost of the Extended Program: Model Output (1) vs. Historical Data (2).

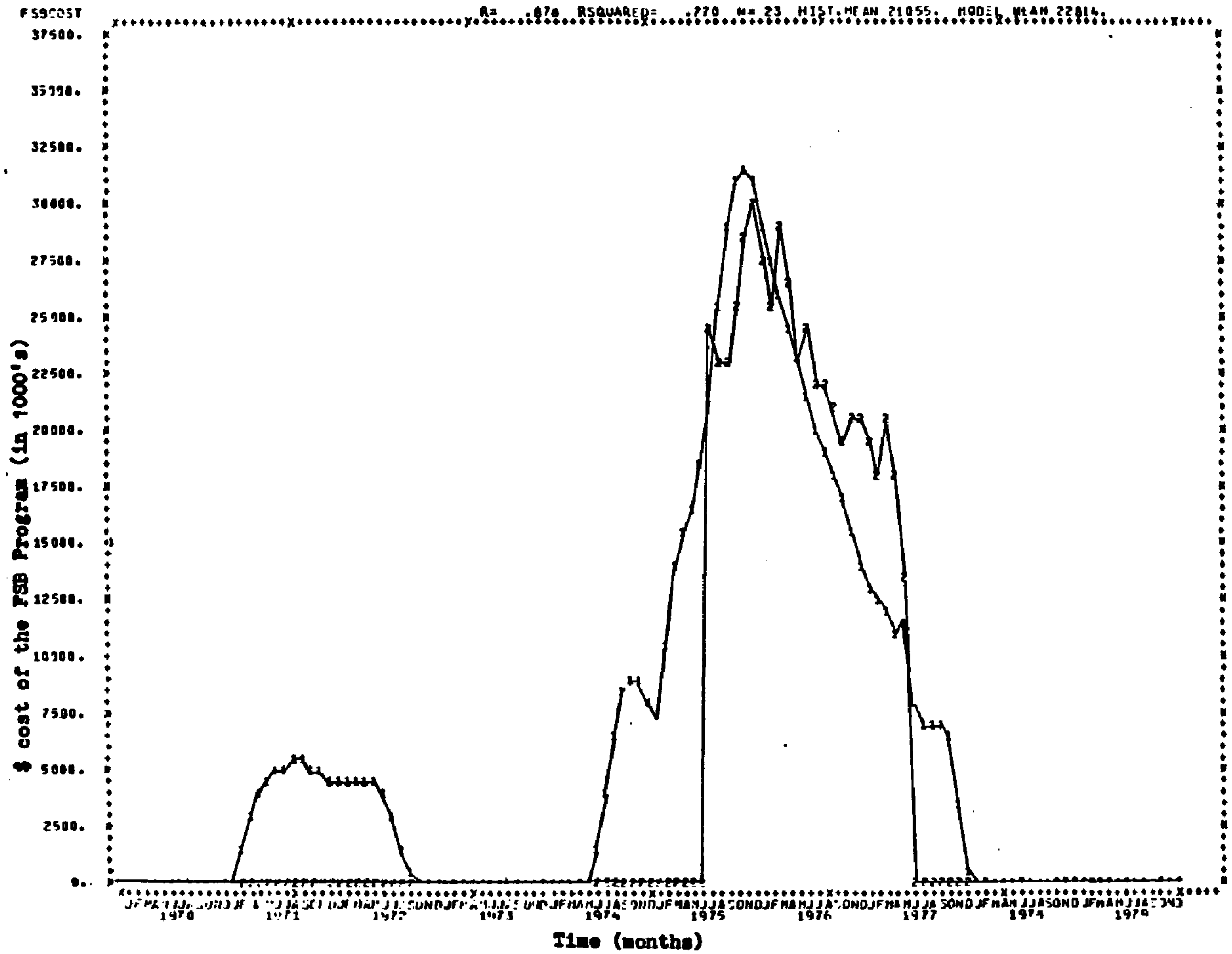


FIGURE 10.--Cost of the FSB Program: Model Output (1) vs. Historical Data (2).

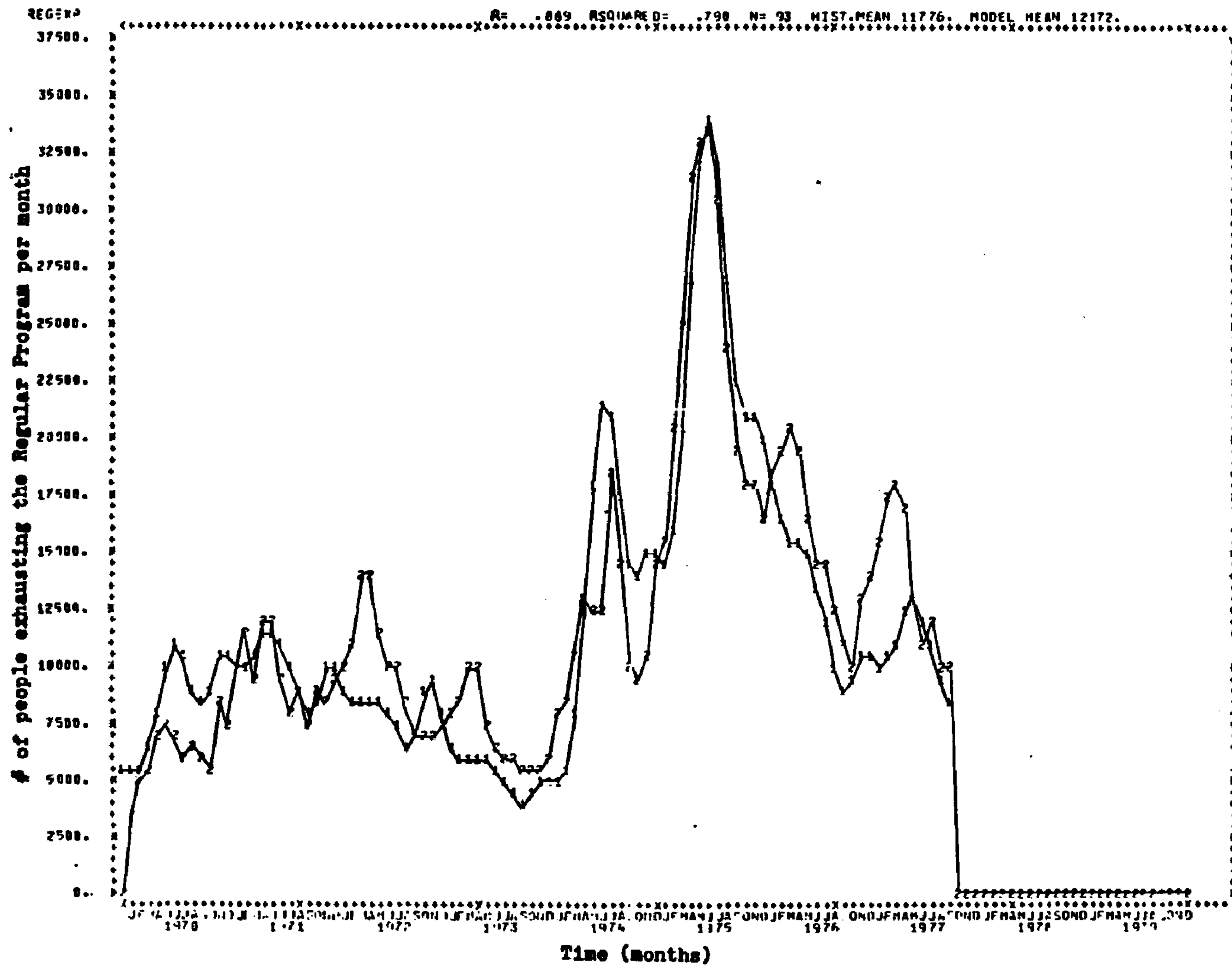


FIGURE 11.--Regular Program Exhaustion Rate: Model Output (1) vs. Historical Data (2).

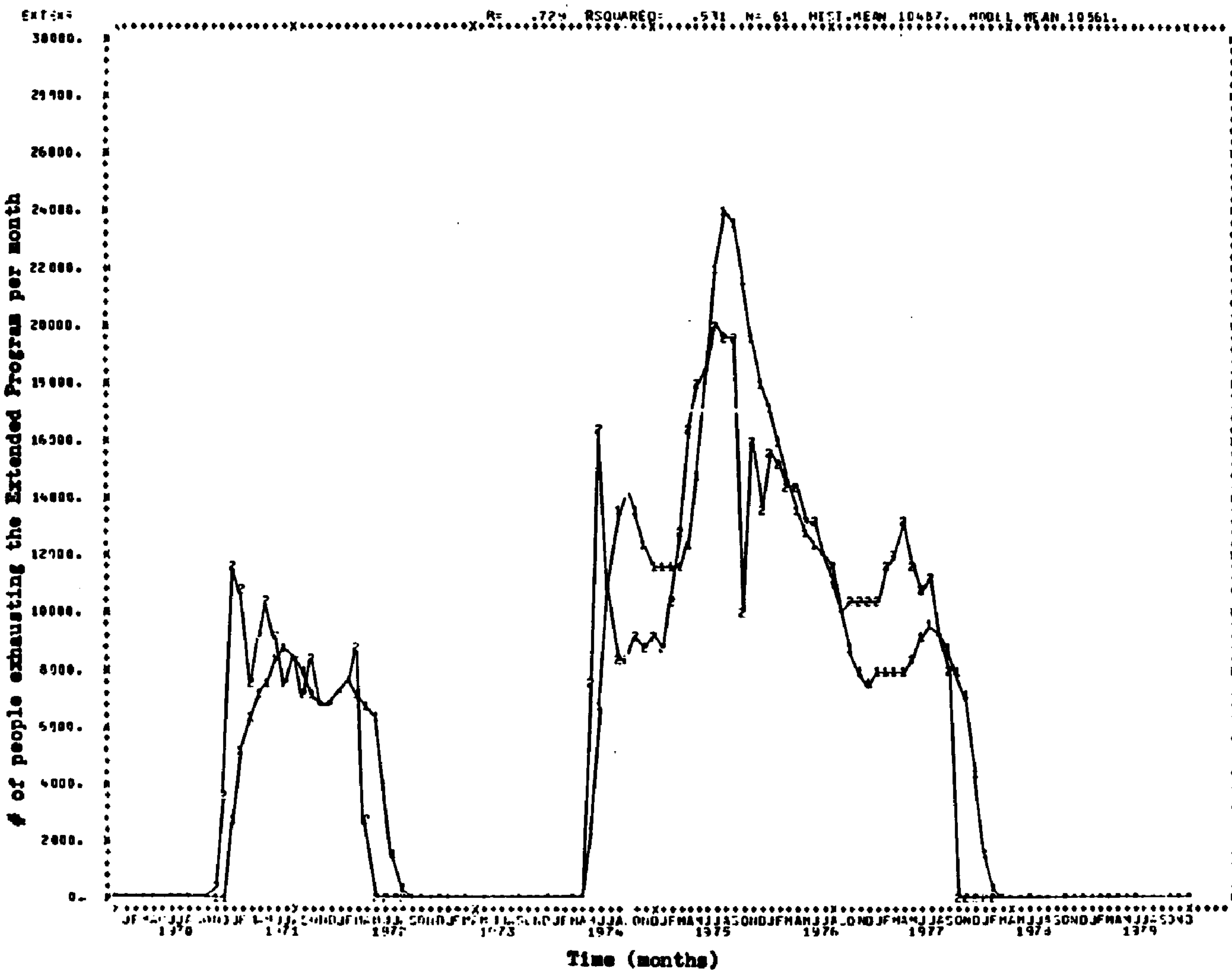


FIGURE 12.--Extended Program Exhaustion Rate: Model Output (1) vs. Historical Data (2).

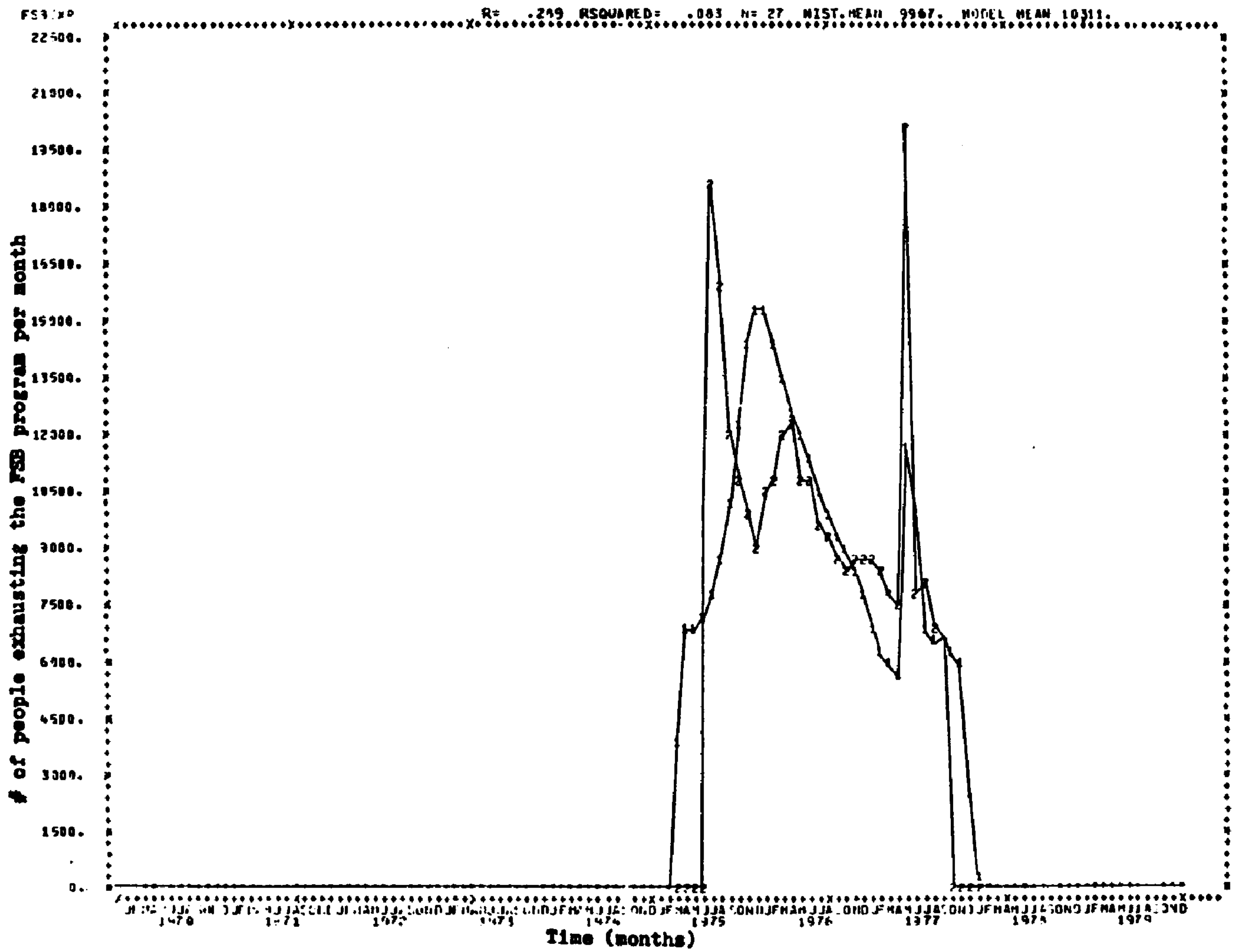


FIGURE 13.--FSB Exhaustion Rate: Model Output (1) vs. Historical Data (2).

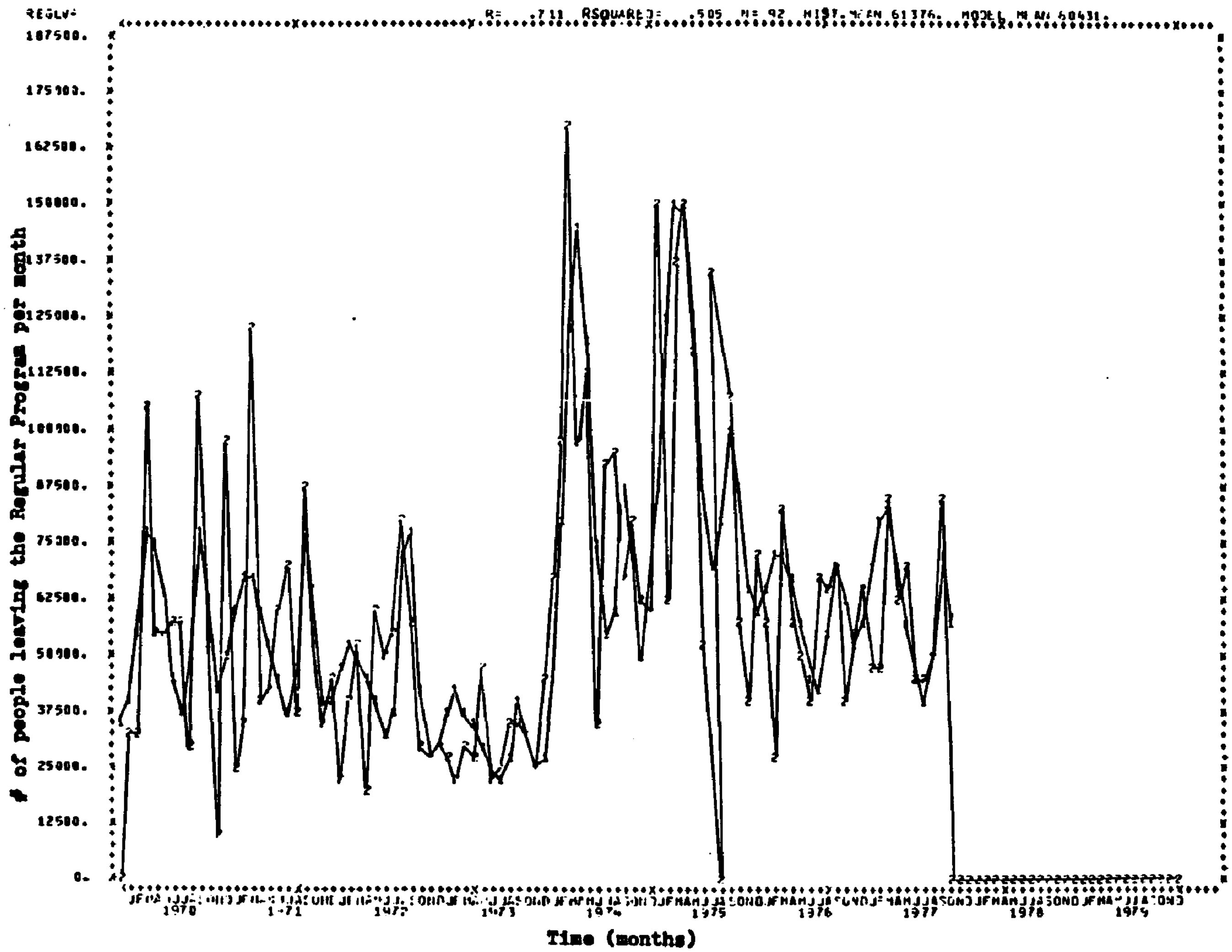


FIGURE 14.--Regular Program Leaving Rate: Model Output (1) vs. Historical Data (2).

The regular program leaving rate (Figure 14) obviously does not capture much of the variance shown by the historical data. This graph is presented to show the attempt at algebraically deriving the historical leaving rate since it is not maintained by the agency administering the UI program. In this case the model's leaving rate is probably more realistic than the derived historical leaving rate. The level, cost, and exhaustion rate of the FSB program (Figures 7, 10 and 13 respectively) are somewhat close to historical data. The lack of historical data during the first few months of the program's operation due to combining two FSB programs into one as well as the short life of the program have prevented adequate refinement efforts.

Conclusions drawn from graphs of historical data and the model output about the validity of the model must be qualified because much of the historical data was used to adjust and refine the model parameters. Historical data from January 1970 through December 1976 was used for tuning purposes with only the last nine months (January 1977 through September 1977) giving a true indication of the model's validity. However the historical time period used for validating the model represents fairly extreme economic conditions for the state of Michigan. The unemployment rate varied from about 4% to about 15% during the 1974-1975 energy crisis. The important point is that the model tracks these extreme conditions reasonably well with only one set of parameters.

Another important point that should be noted is the fact that the model has been validated only with a limited range of historical inputs. The model may not be valid for extreme ranges of RUI (the rate entering the UI system) such as less than 10,000 or more than 300,000 people per month. Extreme values of the unemployment rate such as less than 2% or more than 18% may also exceed the valid range of inputs for the model.

In discussing the validity of the model another factor which should be brought out concerns the quality of the historical data. Much of the historical data is the product of a manual accounting system and in some cases the result of a statistical sample (the unemployment rate). Time lags, reporting problems and inconsistencies from one data series to another raise questions as to the validity of the historical data. Validating of the model has assumed that exogenous input data such as RUI, which is derived from several data series, is consistent with the historical levels of the UI programs. Obviously a validation problem exists if integrating the derived historical rate data does not yield the historical level data.

The validation of a simulation model should take into account the purpose and use of the model. In essence the model should be able to do the job for which it was created. A model intended to reproduce only the general behavior of a system should be verified to the extent that it can reproduce general behavior. The validation of a model should also consider the utility of the model. If the behavioral response of a model indicates a possible lack of validity, the question should be asked as to whether or not the model is still useful. A model which is only partially valid may still be highly useful because it is the only available tool for answering certain kinds of questions.

In conclusion, the model of the current UI system is a generally valid and useful representation of the real system. Even though the model is subject to the limitations discussed previously it can still provide information about the dynamic behavior of the unemployment insurance system. The utility of the modeling technique demonstrated by the current model means that the construction of a model of the proposed three-tier UI system is feasible. The comparative experimentation between models of the current and three-tier system will provide useful information for those contemplating a redesign of the unemployment insurance system.

CHAPTER IV

SIMULATION MODEL OF PROPOSED (THREE-TIER) UNEMPLOYMENT INSURANCE SYSTEM

Description of Three-Tier UI System

The three-tier unemployment insurance system was proposed by Saul J. Blaustein of the W. E. Upjohn Institute for Employment Research as part of a comprehensive job security system.[26] The job security system is an overall integrated system for providing various employment related services and income support for both unemployed and underemployed workers. The three-tiered UI system is proposed as a replacement for the present Michigan UI system.

The three-tiered UI system basically consists of three sequential 13 week programs or tiers providing a maximum of 39 weeks of benefits. To qualify for succeeding tiers the worker must pass increasingly stringent qualifying requirements. For example, the qualifying requirements to move from the first to the second tier would be less strict than the requirements to move from the second to the third tier. The qualifying requirements would most likely be related to the number of weeks of employment in the base period of employment (52 weeks) preceding the first claim. The qualifying requirements could also involve a review and evaluation of each claimant's job outlook potential and job search activity. This could also permit the screening of those individuals "riding" the system or those less serious about finding employment. A simplified block diagram of the three-tiered system is shown in Figure 15.

The three-tiered system differs from the current system in several ways. First the three-tiered system uses fixed entitlement whereas the current system has variable entitlement. Under the proposed system any worker qualifying for the first tier would be eligible for a full 13 weeks of benefits. Similarly any worker passing the screening requirements for the second or third tier would be eligible for 13 weeks in each tier. Under the current variable entitlement system, the maximum length of benefits is a function of previous work experience. Benefit length is computed on the basis of three weeks of benefits for four weeks of employment subject to a minimum work experience requirement and the maximum length of benefits provided by the program.

Another difference between the current and proposed systems is maximum length of benefit duration. In the current system the maximum length of benefits is either 26 or 39 weeks depending on whether or not the extended benefits program has triggered on. The extended benefits program raises the maximum entitlement to 39 weeks. If the Federal Supplementary Benefits (FSB) program is activated the maximum length of benefits rises to 65 weeks. Under the proposed three-tier system all tiers are operating so that the maximum entitlement is 39 weeks. A comparison of the maximum length

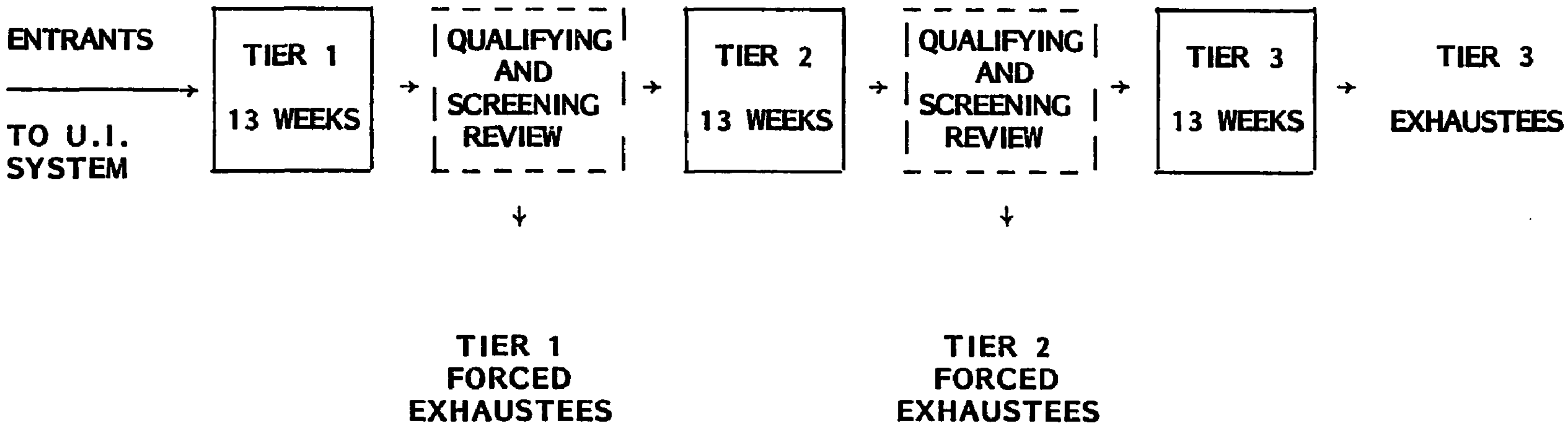


FIGURE 15.--BLOCK DIAGRAM OF THREE-TIER U.I. SYSTEM

of benefit duration between the current and the proposed UI systems is shown in Figure 16. Due to the fact that existing federal legislation provides for an extended benefits program it is not clear if an extended program would be used in conjunction with the three-tiered system if it were to be implemented. It is assumed in this discussion that the three-tiered system would replace the combination of the current regular and extended programs. The FSB program which was created by legislative action has since expired and is assumed to be inactive.

Under the current system the length of benefit entitlement is determined by the amount of previous employment in the base period of 52 weeks preceding the first claim. The benefit length is determined by law so that workers know in advance how long they can receive benefits. The three-tier system differs from the current system in that workers do not know the maximum benefit length ahead of time. The decision is made after the worker enters the system as to the maximum entitlement of benefits. At the transition points between tiers the recipient must pass a qualifying and screening review and the decision is made concerning eligibility for the second or third tiers.

Model of Three-Tier UI System

The model of the three-tier UI system represents one view of how the proposed system would be designed and operationalized. Modeling efforts of this nature require that the exact structure of the system and parameters be specified in detail. Several

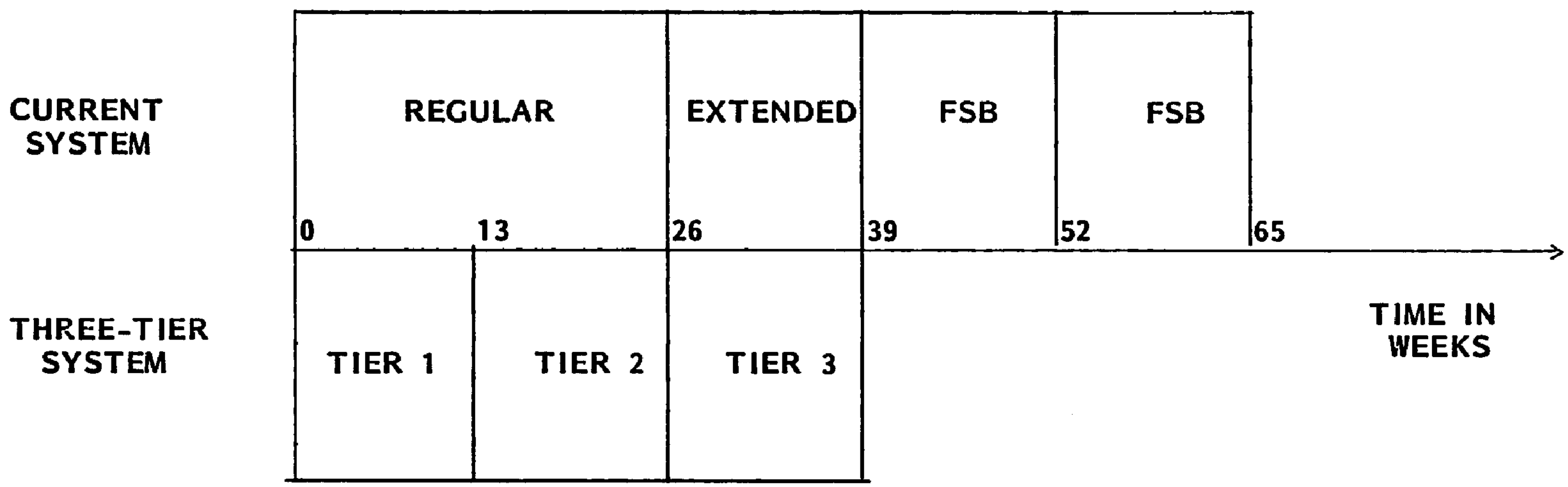


FIGURE 16.--COMPARATIVE DURATION OF BENEFITS

assumptions about the three-tier UI system have been made which may not reflect the original intent set forth in the Job Security System proposed by Saul J. Blaustein. A key difference is that the model of the three-tier UI system described in this section represents a stand alone replacement for the current UI system. The three-tier UI system proposed in the Job Security System concept was intended to operate in conjunction with training programs and other employment related services.

The three-tier UI system model is similar to the UI portion of the model of the current Michigan manpower system as described previously in Chapter III. It is also a continuous flow model in which changes in the flows into and out of a stock category produce changes in the magnitude of that stock. There are three stock categories in the model. They are the levels of tier 1, tier 2 and tier 3. Since individuals entering each tier of the system have a fixed length of benefit entitlement of 13 weeks, the tiers were modeled with delay functions. The rate entering each tier is delayed for a time period approximating the mean length of time recipients stay in each tier. The number of recipients in each tier is accounted for by integrating the difference between the rate entering and the rate leaving the delay functions representing each tier.

The delay functions used to represent the three-tier system are the same type as used in the model of the current Michigan manpower system. They are also flow conserving distributed delays.

As mentioned earlier the three-tier system uses fixed entitlement where a recipient qualifying for benefits in any tier would have a maximum entitlement of 13 weeks. The use of distributed delays to model the aggregate response of each tier rather than fixed length delays is still appropriate because many recipients will still leave each tier to return to employment before exhausting benefits. The fact that recipients will find employment after varying lengths of stay in a tier has the effect of distributing the output rate about the average time recipients stay in a tier. These average times were determined empirically and are listed in Appendix H.

The model diagram for the three-tier UI system appears in Appendix G. To prevent confusion in the discussion of the model the reader is urged to consult the following appendices. Appendix C presents the symbols used in the model and the equivalent mathematical operation. Table 7 presents a listing of the three-tier model variables and their corresponding description. Appendix H presents a listing of all the multiplier parameters used in the model and the corresponding equations or values. Appendix H also presents the parameters of the delay functions used to represent the three-tier system.

By referring to the model diagram (Appendix G) it may be seen that tier 1 is modeled using two delay functions, T1A and T1B. Two delay functions were used because it was felt that the first tier would behave similarly to the regular UI program. A large percentage of regular UI extrants leave to return to work before

TABLE 7.--Three-Tier Model Variables and Description.

T1:	level of tier 1
T2:	level of tier 2
T3:	level of tier 3
UI:	Level of three-tier UI system
RUI:	rate entering three-tier system
RT1A:	rate entering T1A delay
T1AR:	rate leaving T1A delay
T1LVR:	tier 1 leaving rate
RT1B:	rate entering T1B delay
T1BR:	rate leaving T1B delay
T1FEXR:	tier 1 forced exhaustion rate
T1EXR:	tier 1 exhaustion rate
RT2A:	rate entering T2A delay
T2AR:	rate leaving T2A delay
T2LVR:	tier 2 leaving rate
RT2B:	rate entering T2B delay
T2BR:	rate leaving T2B delay
T2FEXR:	tier 2 forced exhaustion rate
T2EXR:	tier 2 exhaustion rate
ERT2:	tier 2 reentering rate
RT3A:	rate entering T3A delay
T3AR:	rate leaving T3A delay
T3LVR:	tier 3 leaving rate
RT3B:	rate entering T3B delay
T3BR:	rate leaving T3B delay
T3EXR:	tier 3 exhaustion rate
UIEXR:	three-tier UI system exhaustion rate
UILVR:	three-tier UI system leaving rate

exhausting benefits. All tier 1 entrants pass through the T1A delay. The output of this delay is split into two flows: those who will leave and those who will continue into the next tier or exhaust. π25A determines the leaving rate (T1LVR) and π25B determines the portion of the flow entering the T1B delay. The output of the T1B delay is also split into two flows: those who are forced to exhaust after the first tier (T1FEXR) and those allowed to continue into tier 2 (T1EXR). The level in tier 1 is accounted for by integrating the rate entering the T1A delay (RT1A) less the rate leaving (T1LVR) and less the rate exiting the T1B delay (T1BR).

Both the second thd third tier were modeled using two delay functions as in the first tier. The only significant difference in the structure for the second and third tiers is the addition of a reentering flow to the number entering each tier. This reentering rate (ERT2 and ERT3) represents those who return to the UI system after leaving the second or third tier before their benefits were exhausted. These reentrants are assumed to have spent a short period of time in employment. In the second tier the reentering rate (ERT2) is determined by multiplying π27C by the rate exiting the T2A delay (T2AR). In the third tier π29C multiplies T3AR to produce the reentering rate for the third tier (ERT3). This structure introduces a slight timing error due to the fact that the time that the reentrants spent in employment is not accounted for. This error is minimized since the reentrants are a small portion of the total rate entering the second or third tier. A reentering rate is not generated for the first tier since the entering rate (RT1A) is assumed to contain a reentering component.

The level of recipients in each tier (T1, T2, and T3) are added to produce the number of recipients in the three-tier system (UI). The leaving rates for each tier (T1LVR, T2LVR, and T3LVR) are added to generate a total leaving rate (UILVR) and the exhaustion rates (T1FEXR, T2FEXR and T3EXR) are also added to generate a total exhaustion rate (UIEXR). Note that the block diagram shows that the rate entering the three-tier UI system (RUI) is identical to the rate entering the first tier (RT1A).

Three-Tier Program Description

The computer program used to model the three-tier UI system is similar to the program for the current UI and labor force system. Both programs are written in Fortran and both represent digital simulations of continuous flow systems. The major difference between the programs is that the three-tier program does not have an executive program to operate the model program. The three-tier model program operates by itself and has no provision to make changes or adjustments to the model's operating environment.

A block diagram showing the operation of the three-tier model program is shown in Figure 17. The first operation in the program is to read in the exogenous variable data used to drive the three-tier model (RUI and SUR). Next initial values are assigned to the time variables and parameters of the model. These parameters are the mean delay times and orders of the delay functions and the

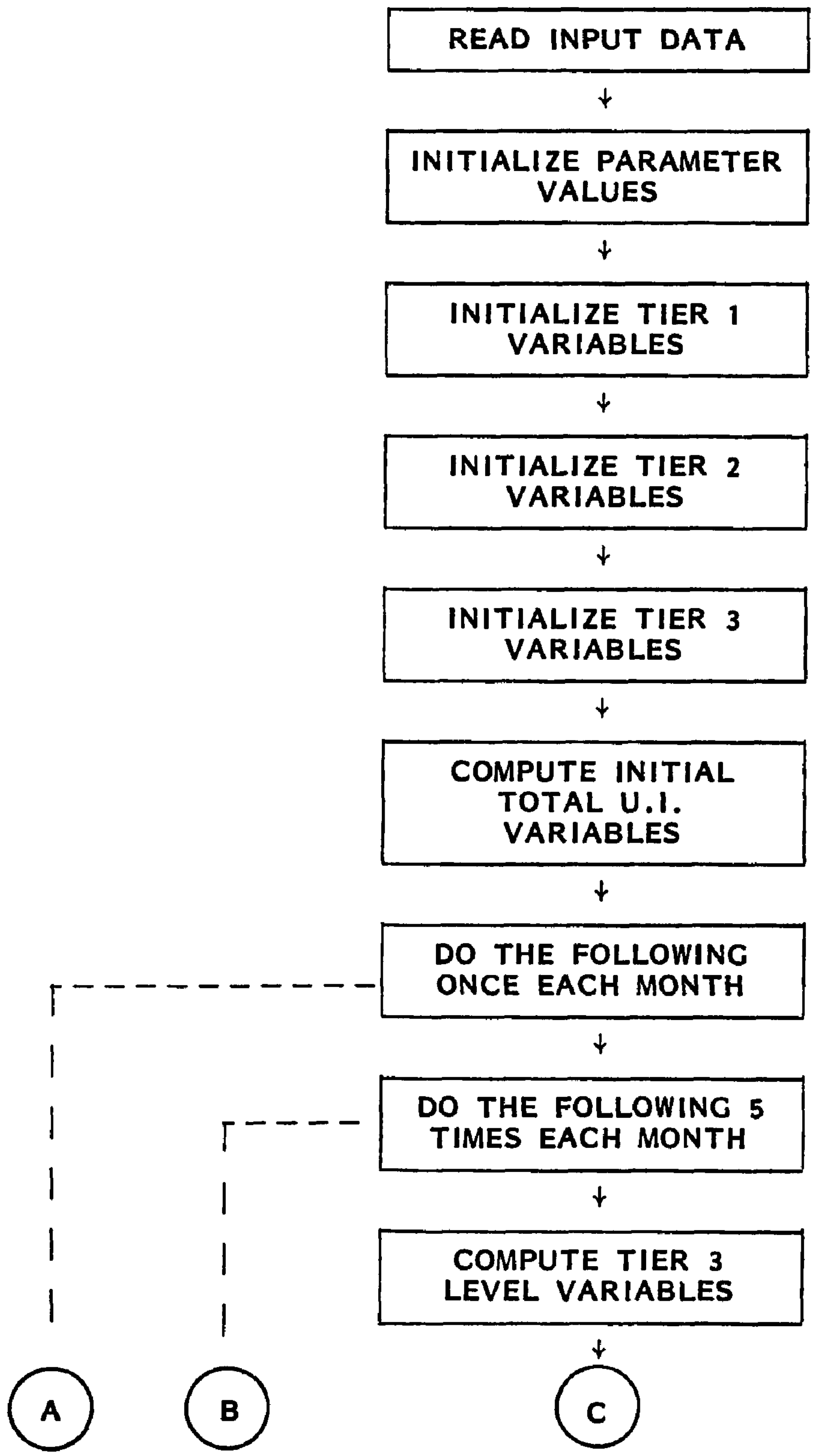
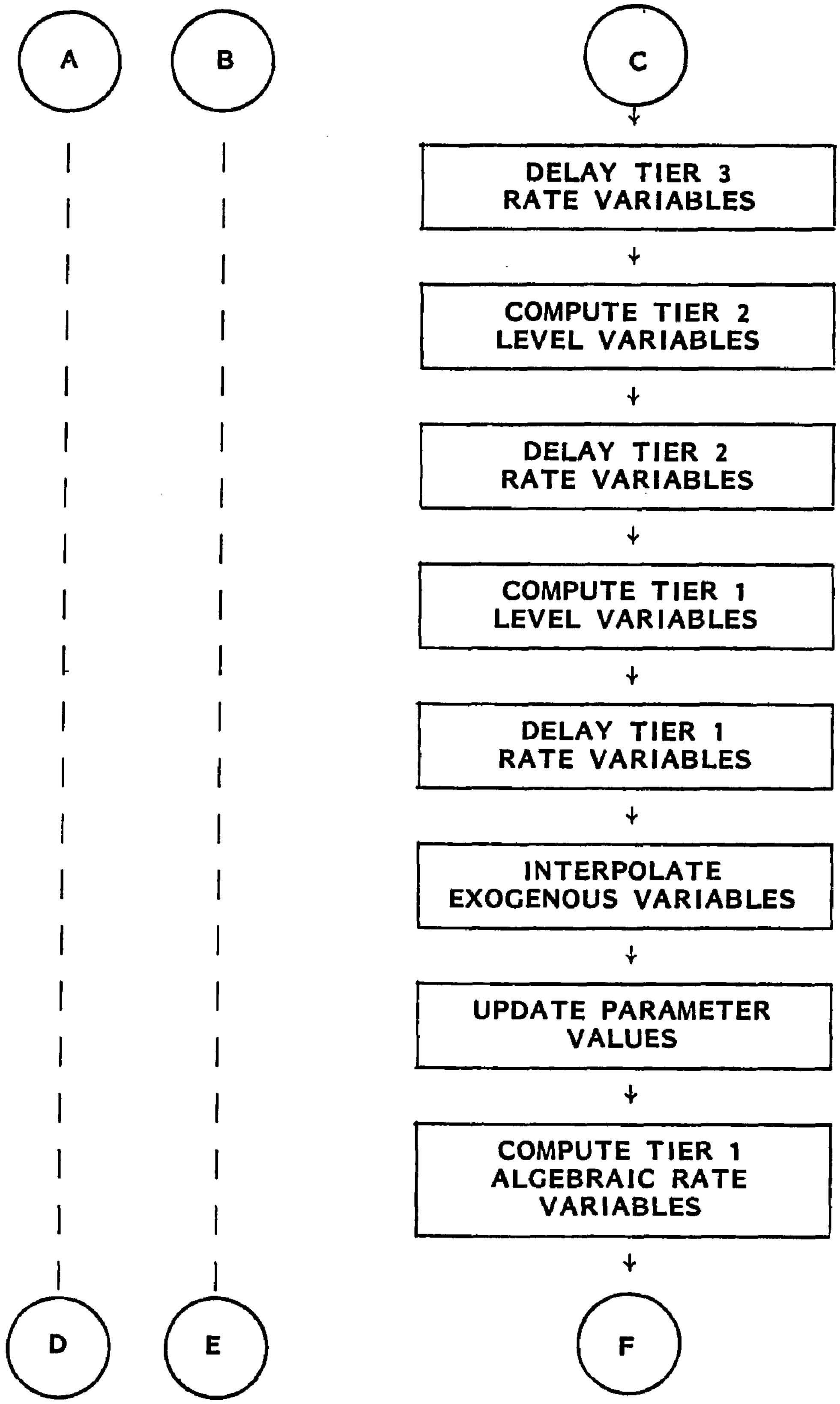
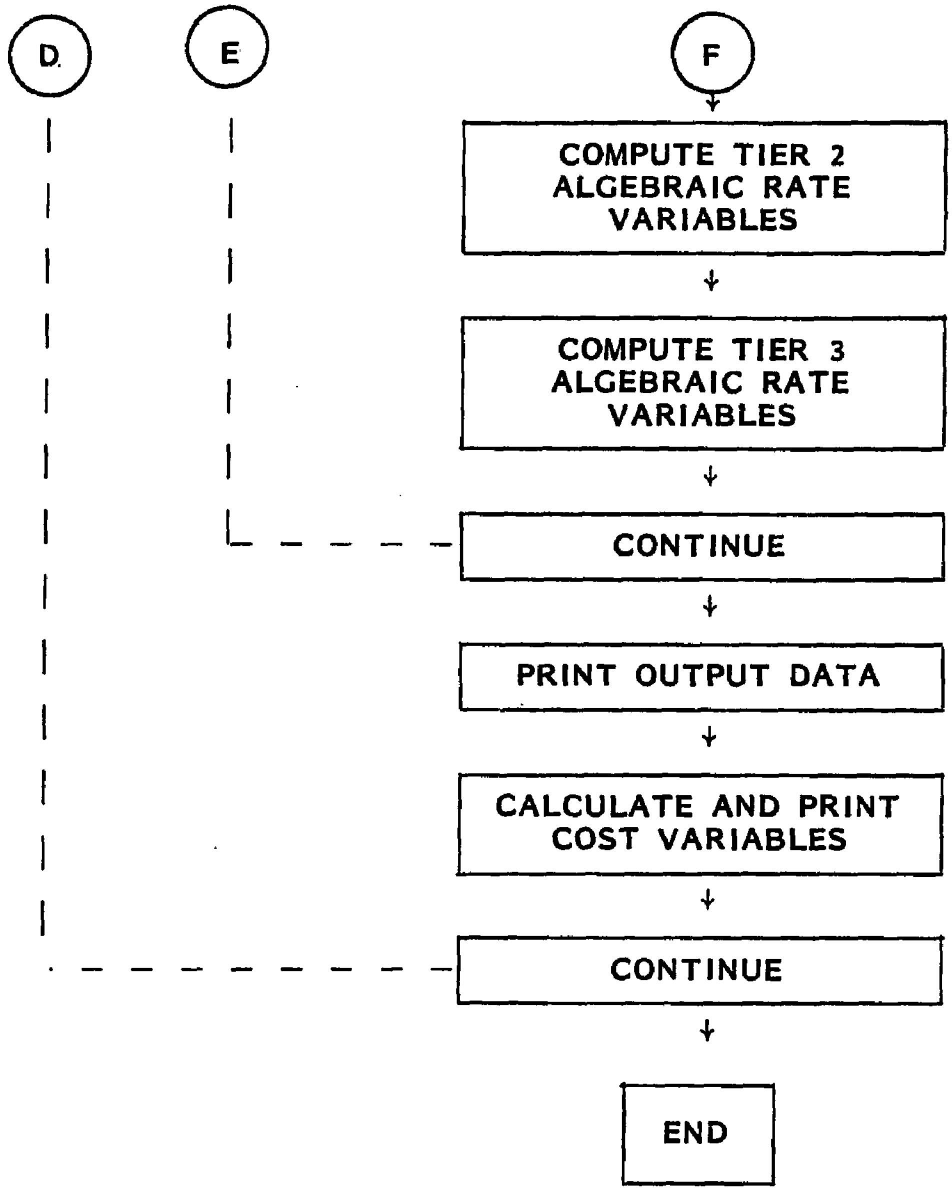


FIGURE 17.--PROGRAM FLOW CHART FOR MODEL OF THREE-TIER UI SYSTEM


A
B
C
DELAY TIER 3 RATE VARIABLES
COMPUTE TIER 2 LEVEL VARIABLES
DELAY TIER 2 RATE VARIABLES
COMPUTE TIER 1 LEVEL VARIABLES
DELAY TIER 1 RATE VARIABLES
INTERPOLATE EXOGENOUS VARIABLES
UPDATE PARAMETER VALUES
COMPUTE TIER 1 ALGEBRAIC RATE VARIABLES
D
E
F


D
E
F
COMPUTE TIER 2 ALGEBRAIC RATE VARIABLES
COMPUTE TIER 3 ALGEBRAIC RATE VARIABLES
CONTINUE
PRINT OUTPUT DATA
CALCULATE AND PRINT COST VARIABLES
CONTINUE
END

multiplier parameters $\pi 25A$ through $\pi 29C$. Next the variables associated with tier 1, tier 2 and tier 3 are assigned initial values. This includes the rate and level variables for each tier and the values of the internal arrays used in the delay functions. The calculation of the total three-tier variables, the printing of the initialized cost data via subroutine COSTA, and the printing of the initalized output data via subroutine ALFRED completes the initialization phase of the program.

The program next follows a loop structure with each completion of the loop representing one month. Month number one represents January 1970 and month number 156 represents December 1980 which is the last month in the model's time horizon. The monthly time increments are divided into five equal increments by an inner loop to permit the rates and levels to be calculated and updated five times each month. Within the inner loop the time variable is first updated followed by the state variables for tier 3. These state variables include the level of tier 3 and the outputs of the two delay functions representing tier 3. Next the state variables for tier 2 and tier 1 are updated in a similar fashion.

Since the model variables are updated five times during a month and the exogenous variables are read in as monthly values, the exogenous variables require interpolation to generate intermediate values. This is accomplished by using the interpolation function TABLI for the rate entering the system (RUI) and the smoothed unemployment rate (SUR). Next all of the model multiplier parameters are updated. The updated parameters are then used to update the tier 1, tier 2 and tier 3 algebtaic rate variables. These variables are referred to as algebraic variables to distinguish them from state variables which are the outputs of integrators or delay functions. Following this the total three-tier variables are calculated and the inner loop (five times each month) is terminated. The monthly output data is printed by calling subroutine ALFRED and the monthly cost data is printed by calling subroutine COSTA. The monthly or outer loop is terminated and selected output variables are plotted by calling subroutine TTYPLT. A complete Fortran listing of the three-tier model program and its subroutines may be found in Appendix J.

The following is a brief description of the functions and subroutines used by the three-tier model:

Subroutine DELDT (see Chapter III, pg. 48)

Subroutine VDEL (see Chapter III, pg. 48)

Function TABLI (see Chapter III, pg. 48)

Subroutine ALFRED

This subroutine prints the month number and all of the three-tier model output data (except for the cost data) each time it is called.

Subroutine COSTA

Subroutine COSTA uses the number of recipients in each tier to determine the cost of benefits for each tier. It is similar in operation to subroutine COST (see Chapter III, pg. 48). First the average weekly payment for each program is determined using the same equation developed for the regular program. This a function of historical legislative changes (which are represented by dummy variables) and the month (also represented by dummary variables). The number of weeks compensated for the first tier is calculated by using the same equation developed for the regular program. The number of weeks compensated for the second and third tiers is calculated by multiplying the level by 4.345 (the number of standardized weeks in a month). The cost for each tier is calculated by multiplying the average weekly payment by the number of weeks compensated.

Subroutine TTYPLT

This subroutine plots selected variables over time using a line printer or hard copy terminal. It includes an automatic scaling feature and allows multiple variables to be plotted with different symbols.

Function RANGE

This function is used to set upper and lower limits on the values of the model multiplier parameters of 1.0 and 0.0.

Parameter Estimation for Three-Tier UI System

The parameter estimation effort for the three-tier model differed from that of the model of the current UI system. This is due to the fact that the three-tier system existed in proposal form only. Parameter estimation was a system design effort rather than an attempt to capture parameters of an existing system.

There are several important assumptions about the three-tier system that have a bearing on the parameter estimates which should be discussed. The first is that the rate entering the three-tier system is assumed to be the same as the rate entering the current UI system (RUI). Implicit in this assumption is that the employment qualification requirements for eligibility to receive benefits is the same under both systems. Another important assumption concerns the flow of individuals in tier 1 returning to employment. The parameter determining this flow in the model of the current regular program (π22A) was empirically determined with the aid of historical data. Since it was difficult to estimate if this flow would behave differently in a 13 week fixed entitlement system, the assumption was made that the flow would behave the same as in the current system. The parameter governing this flow in tier 1 (π25A) was presumed equal to the parameter in the model of the regular program (π22A). Note that $\pi 25B = 1 - \pi 25A$ as in the model of the regular program.

Additional assumptions were also made in the conversion of the levels of the three-tier system to cost figures. Cost figures for the three-tier system are generated by converting the level to the number of weeks compensated and multiplying this by the average weekly payment. The relationship between the level and the number of weeks compensated is the same for tier 1 as for the regular program. Recall that this historical relationship for the regular program was estimated using regression analysis as described in the section on converting the current UI model output to costs (Chapter III, pg. 69). The relationship between the levels of tier 2 and tier 3 and the number of weeks compensated in each tier was assumed to be 4.345 times the level in each tier (4.345 is the number of standardized weeks in a month). Also the average weekly payment in all three tiers was presumed equal to the average weekly payment for the regular program. The average weekly payment figure for the regular program was estimated using regression analysis on historical data (Chapter III, pg. 69).

Estimates for the parameters determining the proportion of individuals who remain in tier 2 and tier 3 until exhausting benefits were provided by Saul J. Blaustein of the W. E. Upjohn Institute for Employment Research.[27] Point estimates of these parameters ($\pi27B$ for tier 2 and $\pi29B$ for tier 3) were given for both low and high unemployment conditions. It was assumed that 6% and 12% unemployment rates corresponded to the low and high unemployment conditions so that these parameters could be linear functions of the state unemployment rate. Since flows are conserved in the model the parameters determining the flow of individuals in tier 2 and tier 3 who leave before exhausting benefits are given by the relationship $\pi27A = 1 - \pi27B$ and $\pi29A = 1 - \pi29B$. The parameters governing the reentering rates for tier 2 and tier 3 ($\pi27C$ determines ERT2 and $\pi29C$ determines ERT3) were estimated to be similar in magnitude to the parameter determining the reentering rate for the model of the extended program.

The determination of the parameters representing the screening of individuals between tiers was treated as a design effort rather than an attempt to estimate parameters arising from the three-tier concept. It is in this area that the model of the three-tier system differs significantly from the system proposed by Saul J. Blaustein.[28] If the three-tier system is to be responsive to economic conditions then the screening process between tiers should also respond to economic conditions. This means that the ease of which claimants are able to pass from one tier to the next successive tier should be related to economic conditions. Unemployment rate was used to determine the transition proportion between tiers because it is an easily obtainable measure that is generally accepted as indicating the difficulty that the unemployed experience in finding employment. The design of the transition parameters (π26B and π28B) was based on two criteria:

1. During periods of low unemployment, very few people should qualify for tier 2 or tier 3 but at high unemployment rates most claimants would be eligible for tier 2 or tier 3.
2. The criteria for entrance to tier 3 should be stricter than that to enter tier 2.

The transition parameters which model the screening process are linear functions of the state unemployment rate. The proportion of the flow exiting the first and second tiers that is either forced to exhaust or able to continue into the next tier at unemployment rates varying from 3% to 18% is shown in Table 8. The figures under the columns labeled 'able to contine' correspond to the values of π26B and π28B while the figures under the column labeled 'forced exhaustees' correspond to the values of π26A and π28A. No one will be able to enter tier 2 at unemployment rates of under 5% and the cut off for entering tier 3 is 6.5% unemployment rate. At unemployment rates of 14% or higher all tier 1 exhaustees will be eligible for tier 2 and at unemployment rates of 16% or higher all tier 2 exhaustees are eligible for tier 3.

TABLE 8.--Status of UI Recipients at Tier Transition Points by Program.

Unemployment Rate	Tier 1 Forced Exhaustees	Tier 1 Able To Continue	Tier 2 Forced Exhaustees	Tier 2 Able To Continue
.030	1.000	0.000	1.000	0.000
.035	1.000	0.000	1.000	0.000
.040	1.000	0.000	1.000	0.000
.045	1.000	0.000	1.000	0.000
.050	1.000	.001	1.000	0.000
.055	.944	.056	1.000	0.000
.060	.888	.112	1.000	0.000
.065	.833	.167	1.000	0.000
.070	.777	.223	.999	.001
.075	.722	.278	.944	.056
.080	.666	.334	.888	.112
.085	.611	.389	.833	.167
.090	.555	.445	.777	.223
.095	.500	.500	.722	.278
.100	.444	.556	.666	.334
.105	.388	.612	.610	.390
.110	.333	.667	.555	.445
.115	.277	.723	.499	.501
.120	.222	.778	.444	.556
.125	.166	.834	.388	.612
.130	.111	.889	.333	.667
.135	.055	.945	.277	.723
.140	0.000	1.000	.222	.778
.145	0.000	1.000	.166	.834
.150	0.000	1.000	.111	.889
.155	0.000	1.000	.055	.945
.160	0.000	1.000	0.000	1.000
.165	0.000	1.000	0.000	1.000
.170	0.000	1.000	0.000	1.000
.175	0.000	1.000	0.000	1.000
.180	0.000	1.000	0.000	1.000

CHAPTER V

EXPERIMENT AND RESULTS

Perspective

Before presenting in detail the experimental results, the nature and objective of the experiment itself should be discussed. The experiment consists of operating both the model of the current UI system and the model of the proposed three-tier UI system with identical exogenous inputs and comparing the outputs. Both hypothetical and historical exogenous inputs were used to generate system responses. This appears to be a simple comparative experiment from which conclusions can be drawn about the relative response of each system. However it must be kept in mind that the three-tier modeling effort was a design endeavor. The three-tier structure was designed to be a stand alone replacement for the current UI system that would meet the evaluation criteria presented in the statement of the problem in Chapter I. The experiment should be viewed as a demonstration of how well the specific design of the three-tier system meets the evaluation criteria. Conclusions drawn about the three-tier system and its performance relative to the current system must be limited to the modeled version of the three-tier system and not the concept in general.

The comparison of the current and three-tier system model responses should be used to determine the design implications for a proposed three-tier system. If a replacement is desired for the current system that behaves similarly to the model then the new system should reflect the structure and parameters of the model. For example each tier should provide a fixed 13 weeks of benefits and the screening process between tiers should behave following conditions of unemployment as shown in Table 8 (Chapter IV). The three-tier model is intended to provide a useful tool for relating and comparing alternative designs and system responses with the behavior of the current UI system.

Comparative Response Analysis Using Hypothetical Inputs

To gain an insight into both the three-tier and the current UI system reponses to changing economic conditions, a series of hypothetical unemployment rate (UR) profiles were imposed on the models of both systems. To eliminate the effects of changes in the rate of people entering the UI system (RUI), a constant value of 60,000 entrants per month was used. This is a reasonable figure that approximates the historical average for RUI. Both models were operated with the same exogenous inputs (RUI and unemployment rate). These input conditions are somewhat artificial since in reality both RUI and the unemployment rate vary together. For example an increase in RUI usually occurs with a rise in the unemployment rate if this rise is due to workers leaving employment because of poor economic conditions. The model of the current UI system was operated with the extended program on at all times. The levels (number of people) of the regular and extended programs and their sum are available to assess the effect of the extended program operating at any time.

The first unemployment rate input used to drive the models was a series of step increases from 3 to 17 percent given by the following profile:

Month	Unemployment Rate
1 - 10	3%
11 - 20	4%
21 - 30	5%
31 - 40	6%
41 - 50	7%
51 - 60	8%
61 - 70	9%
71 - 80	10%
81 - 90	11%
91 - 100	12%
101 - 110	13%
111 - 120	14%
121 - 130	15%
131 - 140	16%
141 - 156	17%

The results of this are shown in Figure 18. The regular level, extended level and regular plus extended level of the model of the current UI system are represented by the 1's, 2's and 3's respectively. The 4's represent the level of the total three-tier system. Notice that at unemployment rates from 3 to 8 percent (months 1 - 60) the three-tier level is below that of the regular program and from 9 to 15 percent (months 61 - 130) the three-tier level is between the regular and regular plus extended levels. At

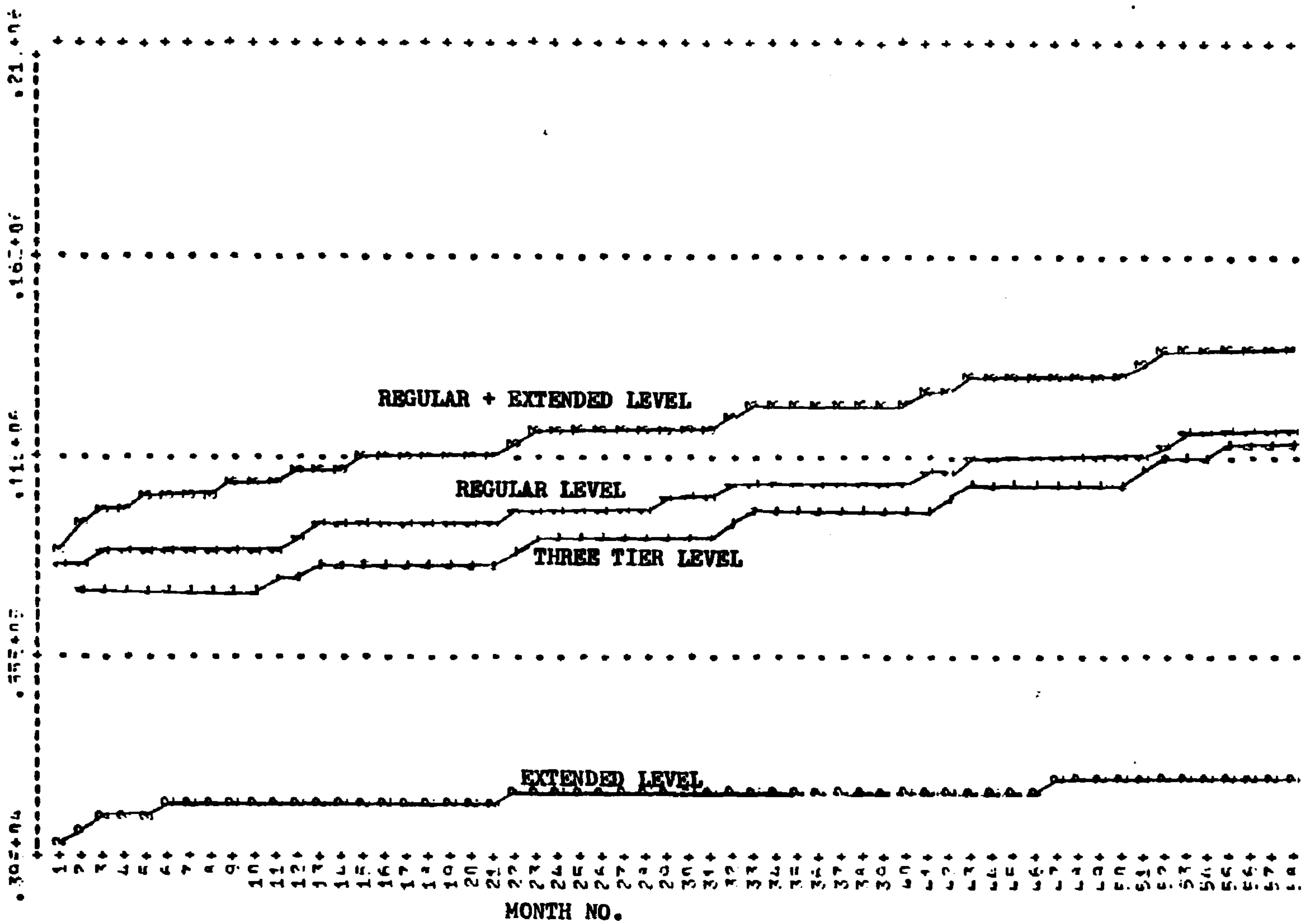


FIGURE 18.--Comparison of Three-Tier and Current Model Response to Step Increases in Unemployment Rate, Constant RUI.

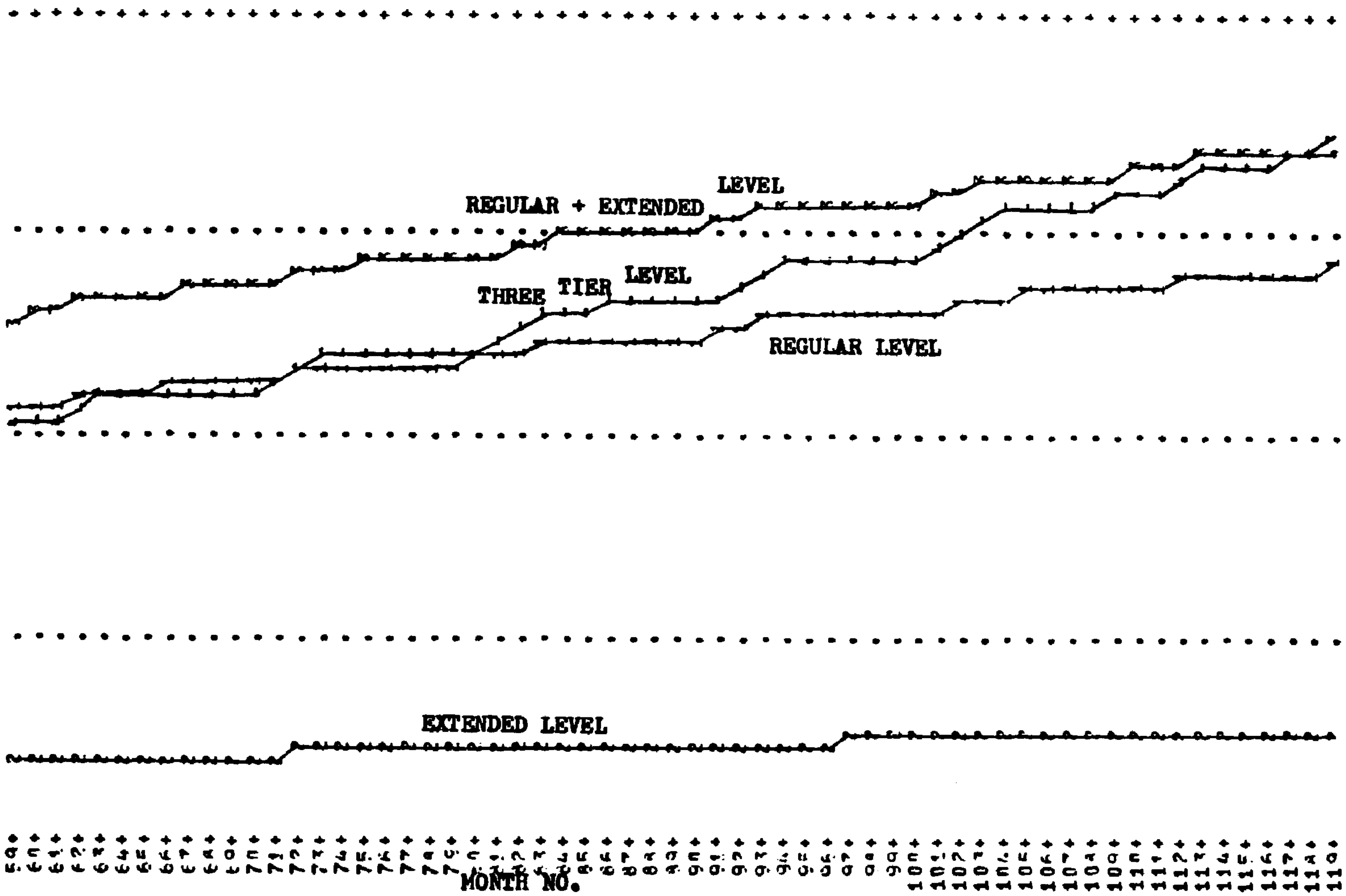


Figure 18.--Continued.

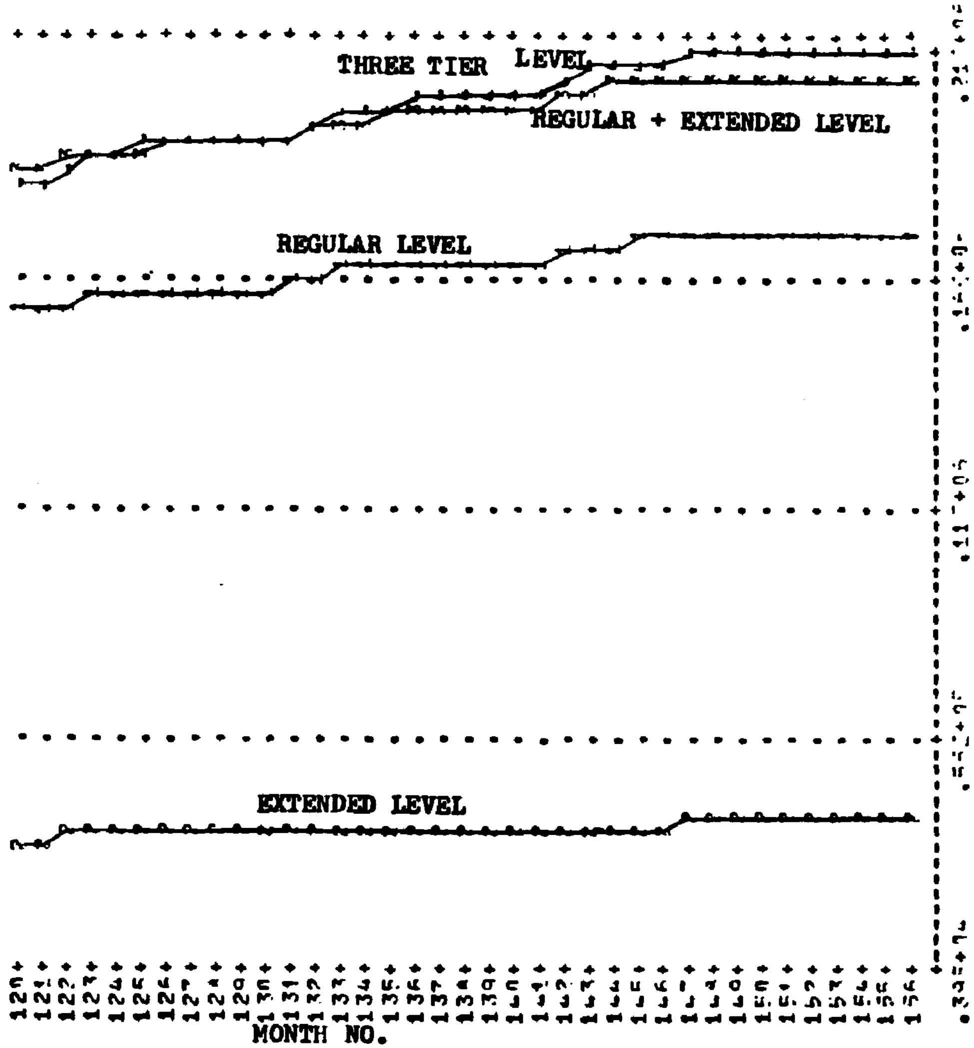


FIGURE 18.--Continued.

unemployment rates above 15 percent (months 131 - 156) the level of the three-tier system exceeds that of the regular plus extended programs. This shows the effect of the unemployment rate on the screening procedure between tiers in the three-tier system. As unemployment increases the three-tier system provides gradually increasing amounts of support. In contrast to this the current system would respond in a discrete manner by activating the extended program.

Figure 19 shows the response of both models to a series of spike and step changes in the unemployment rate. The numbers on the plot have the same meaning as before except that the level of the extended program by itself is not shown. To inject a degree of realism in the unemployment rate profile the changes have a slope of two percent per month. This was felt to be a reasonable maximum rate of change for unemployment conditions in the state. Section A of Figure 19 shows the response of the two models to a spike increase in the unemployment rate represented by the following profile:

Month	Unemployment Rate
10 - 15	6%
16	8%
17	10%
18	12%
19	10%
20	8%
21 - 29	6%

Notice that the output of the three-tier model peaks sooner (indicating a faster response) than the output of the regular

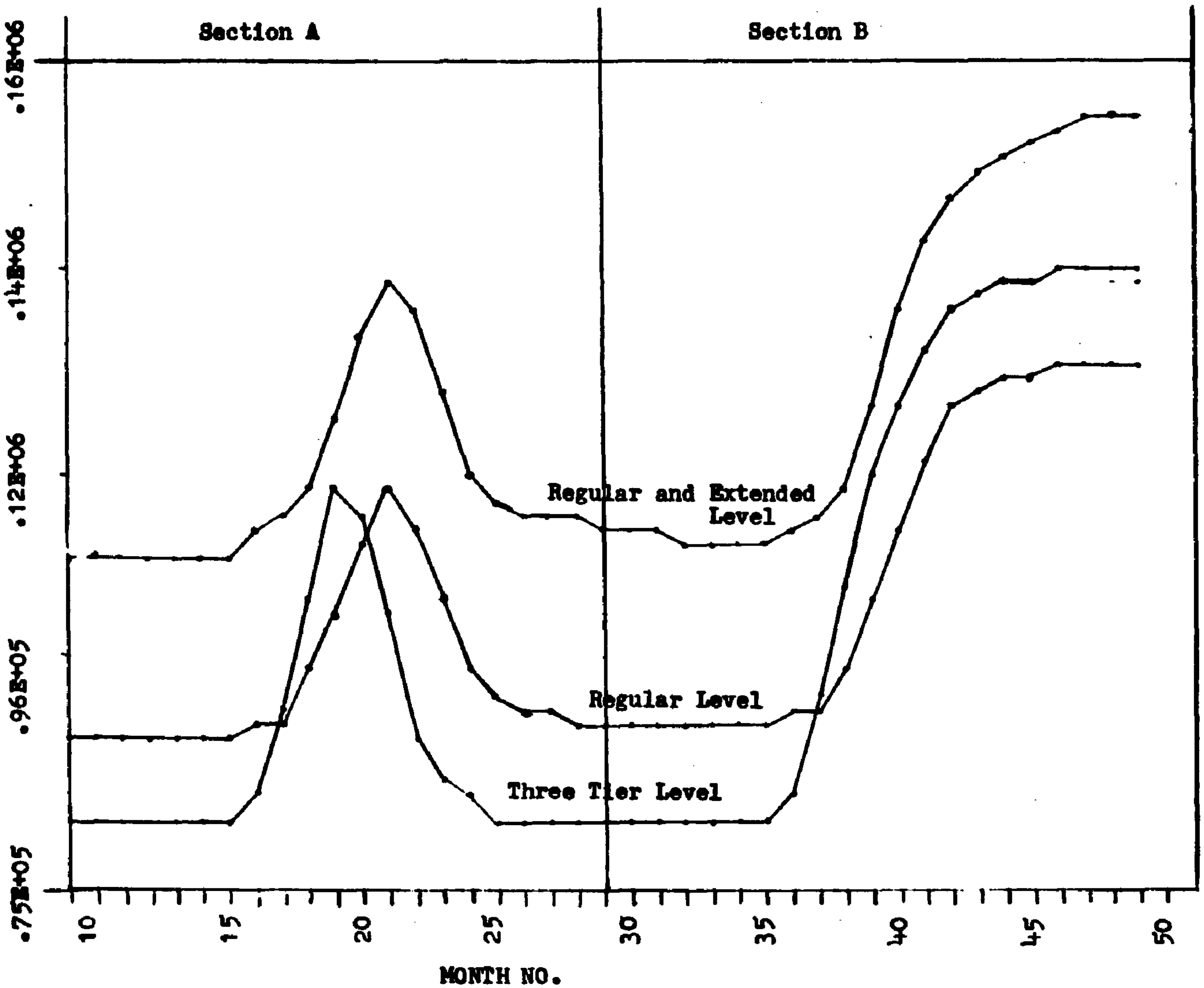


FIGURE 19.--Sensitivity Analysis of Changes in Unemployment Rates, Constant RUI.

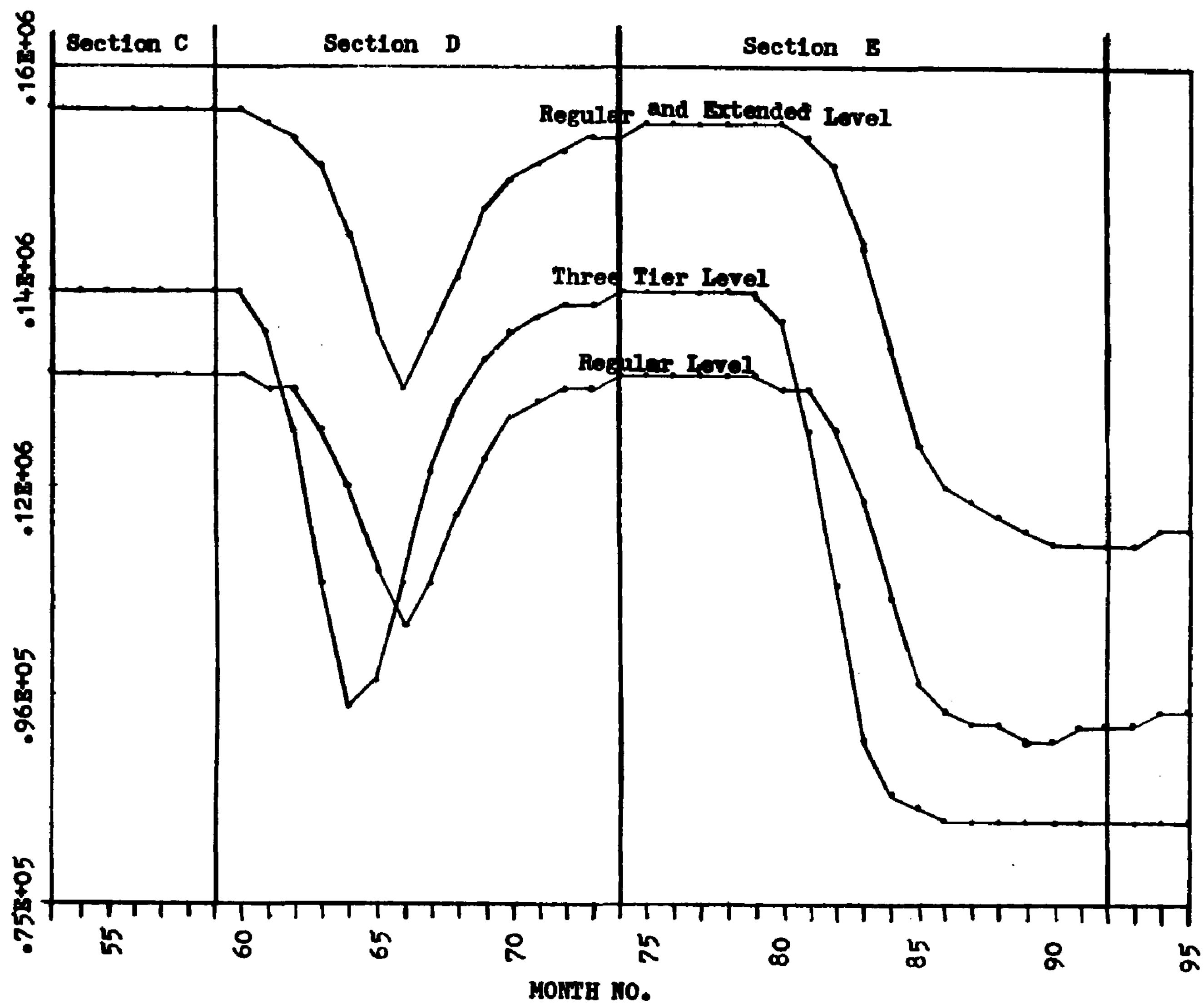


FIGURE 19.--Continued.

program and also the sum of the outputs of the regular and extended programs. A faster response is also indicated by a steeper slope of the rising portion of the three-tier output when compared to the regular or regular plus extended outputs.

A similar response is apparent in Section B of Figure 19 which shows the effect on both models of a step increase in the unemployment rate represented by the following profile:

Month	Unemployment Rate
30 - 35	6%
36	8%
37	10%
38 - 49	12%

The levels of both models at a constant unemployment rate of 12% from months 50 - 58 is shown in Section C of Figure 19. The regular program contains the fewest number of people (130,000) followed by the three-tier system (136,000) with the total of the regular and extended programs containing the most people (154,000).

Section D of Figure 19 shows the response of both models to a spike decrease in the unemployment rate represented by the following profile:

Month	Unemployment Rate
59 - 60	12%
61	10%
62	8%
63	6%
64	8%
65	10%
66 - 74	12%

The three-tier model is again more responsive (the trough appears earlier and the slope of a fall is greater) to the change in the unemployment rate than the current model's regular program and the sum of the regular and extended programs.

The same pattern of response is also apparent in Section E of Figure 19 which shows the effect of a step decrease in the unemployment rate given by the following profile:

Month	Unemployment Rate
75 - 79	12%
80	10%
81	8%
82 - 92	6%

Section E also shows the response of both models to a constant unemployment rate of 6%. Note that the level of the three-tier system (87,000) is below both the regular program (94,000) and the regular plus the extended programs (111,000) of the current system (measured at month 88 before a programmed increase occurs in RUI for the current model to compensate for the growth in covered employment).

Comparative Response Analysis Using Historical Inputs

The hypothetical exogenous inputs analyzed previously were useful in determining the relative responses of the two systems. It is also helpful to examine how the two systems compare under real world conditions. Recall that both the rate entering the UI system and the unemployment rate vary simultaneously in the actual operation of the UI system. To test how the two systems react with realistic inputs, historical values of the rate entering the current UI system (RUI) and the unemployment rate were used as the exogenous inputs for both models. For this experiment historical data from January, 1970 through May, 1977 (months 1 - 89) were used.

A comparison of the levels (number of people) of the three-tier and current UI systems is shown in Figure 20. The level of the regular, extended, regular plus extended, and the three-tier models are represented by the 1's, 2's, 3's and 4's respectively. The extended program was activated during the times it had triggered on historically. For this reason the relevant comparison should be between the regular plus extended level and the three-tier level.

A general conclusion is that the level of the three-tier system (4's) is lower than that of the current system (3's) except during periods when both systems experience consistently high levels (months 50 - 53 and 62 - 71). This indicates that the three-tier system provides slightly more support during periods of high unemployment. The average level by quarter for both systems is presented in Table 9 (note that the level of the current system is the regular plus the extended program when it was active historically).

In comparing the costs of the two systems, the average weekly benefit amount was assumed to be the same in the three-tier system as it had been historically in the current system. The relationship between the number of weeks compensated and the level

KEY
Regular plus Extended: 3 or *
Three Tier: 4

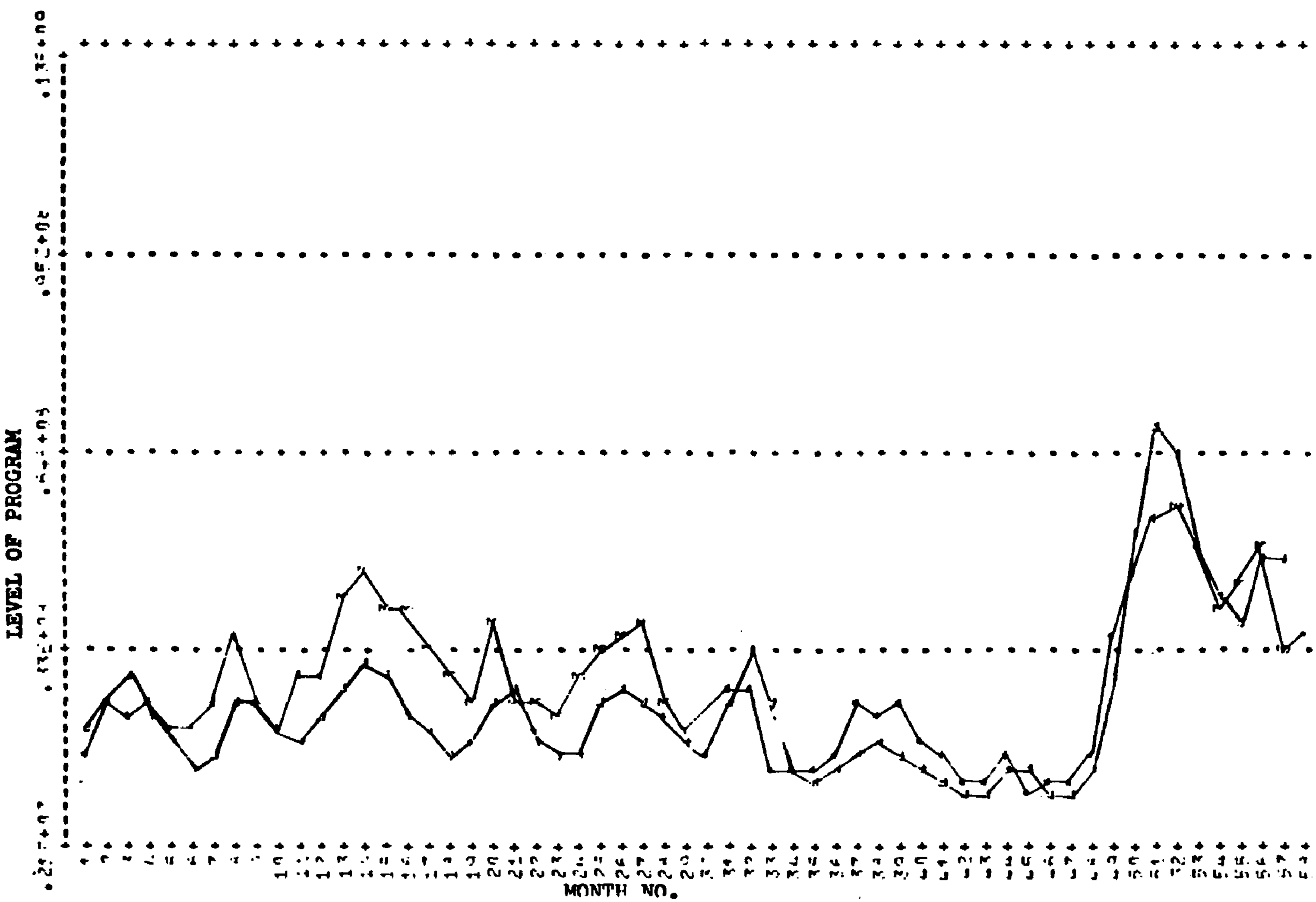


FIGURE 20.--Comparison of Three-Tier Model Level Output with Historical Level of Regular Plus Extended UI, January 1970 - June 1977.

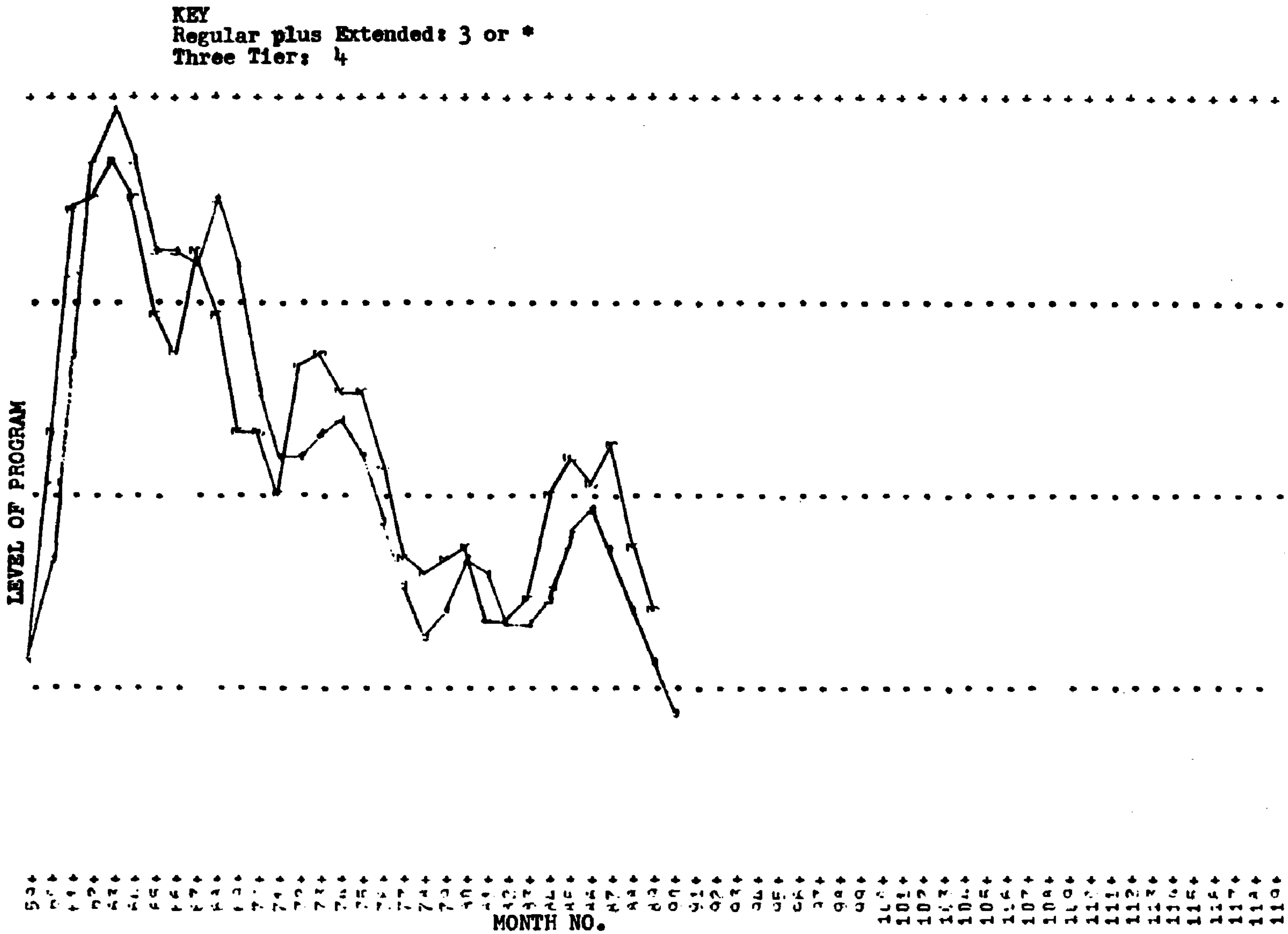


FIGURE 20.--Continued.

TABLE 9.--Level of UI by System.

Quarter	Current System	Three-Tier System	Difference (Current minus Three-Tier)
1970.1	121977.	129547.	-7570.
1970.2	112198.	109014.	3184.
1970.3	126205.	121820.	4385.
1970.4	142929.	112615.	30314.
1971.1	209748.	150379.	59369.
1971.2	158487.	113369.	45118.
1971.3	144107.	126929.	17178.
1971.4	116456.	94472.	21984.
1972.1	163473.	111337.	52136.
1972.2	109767.	86711.	23056.
1972.3	110039.	126121.	-16082.
1972.4	78337.	63493.	14844.
1973.1	105864.	75399.	30465.
1973.2	78121.	55944.	22177.
1973.3	74335.	60417.	13918.
1973.4	70214.	55968.	14246.
1974.1	206045.	220009.	-13964.
1974.2	208484.	233257.	-24774.
1974.3	156618.	169295.	-12677.
1974.4	191613.	164250.	27363.
1975.1	419681.	411900.	7781.
1975.2	345726.	387172.	-41447.
1975.3	280640.	318448.	-37808.
1975.4	246046.	229252.	16795.
1976.1	270334.	224009.	46325.
1976.2	211335.	157332.	54003.
1976.3	193764.	156198.	37567.
1976.4	193349.	142328.	51021.
1977.1	250281.	179588.	70692.

is assumed to be the same for tier 1 of the three-tier system as it is for the regular program. The number of weeks compensated for the second and third tiers is assumed to be 4.345 times the level in these tiers. Although these assumptions are reasonable they have a significant bearing on the cost output of the three-tier model. Conclusions about the relative costs of the two systems must be made with consideration of these assumptions.

Figure 21 shows a plot of the monthly costs, in dollars, of the two systems. In general this modeled version of the three-tier system exhibits a lower cost than the current system model since most of the three-tier plot (71 out of 93 points) was below or equal to the current system plot. This may also be seen by looking at Table 10 which presents the cost of each program by quarter. Note that the three-tier system exceeded the cost of the current system in only 7 of the 29 quarters. The total cost of the three-tier system was 93.7% of the total cost of the current system over this period.

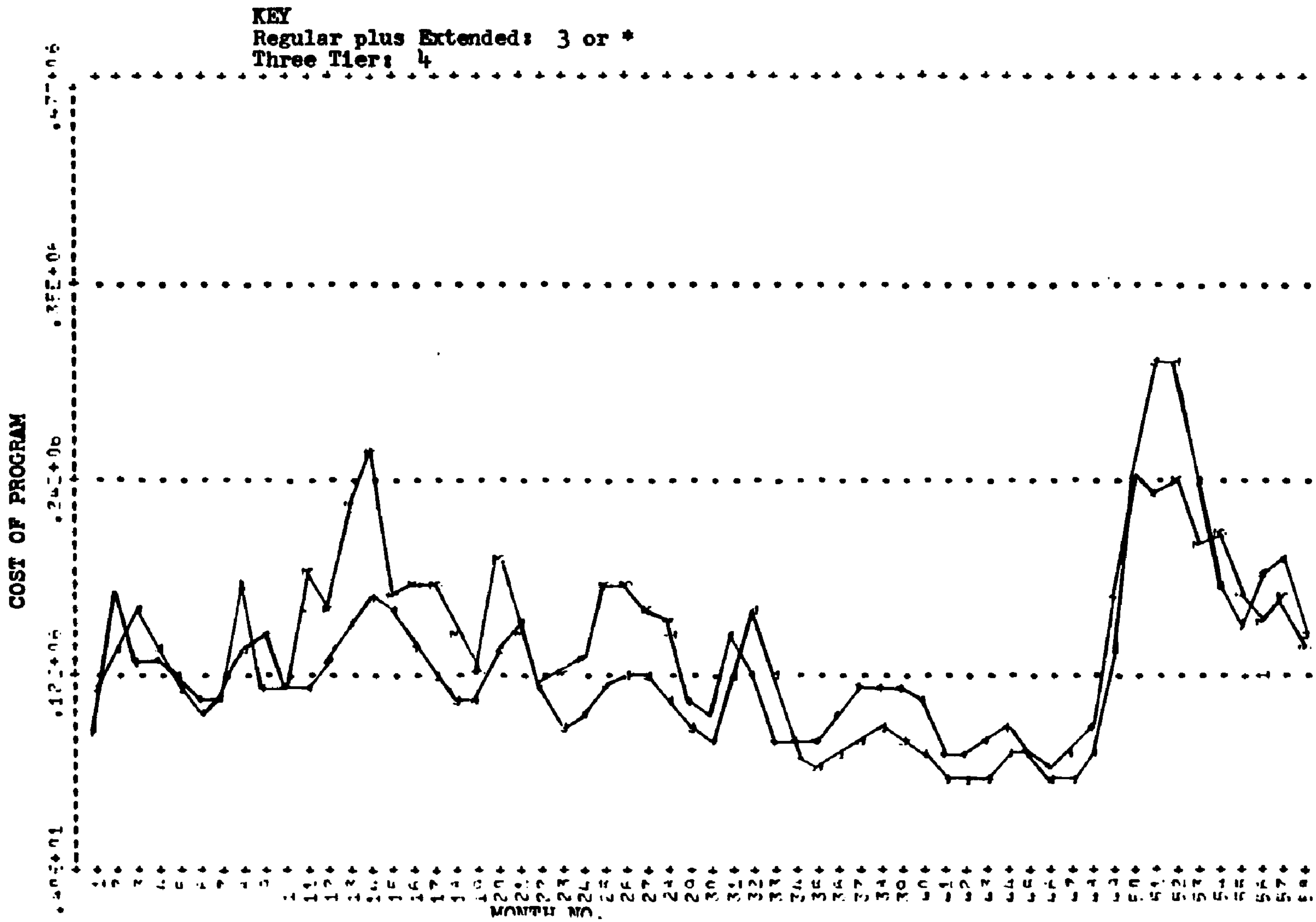


FIGURE 21.--Comparison of Three-Tier Model Cost Output With Historical Cost of Regular Plus Extended Program, January 1970 - June 1977.

KEY
Regular Plus Extended: 3 or *
Three Tier: 4

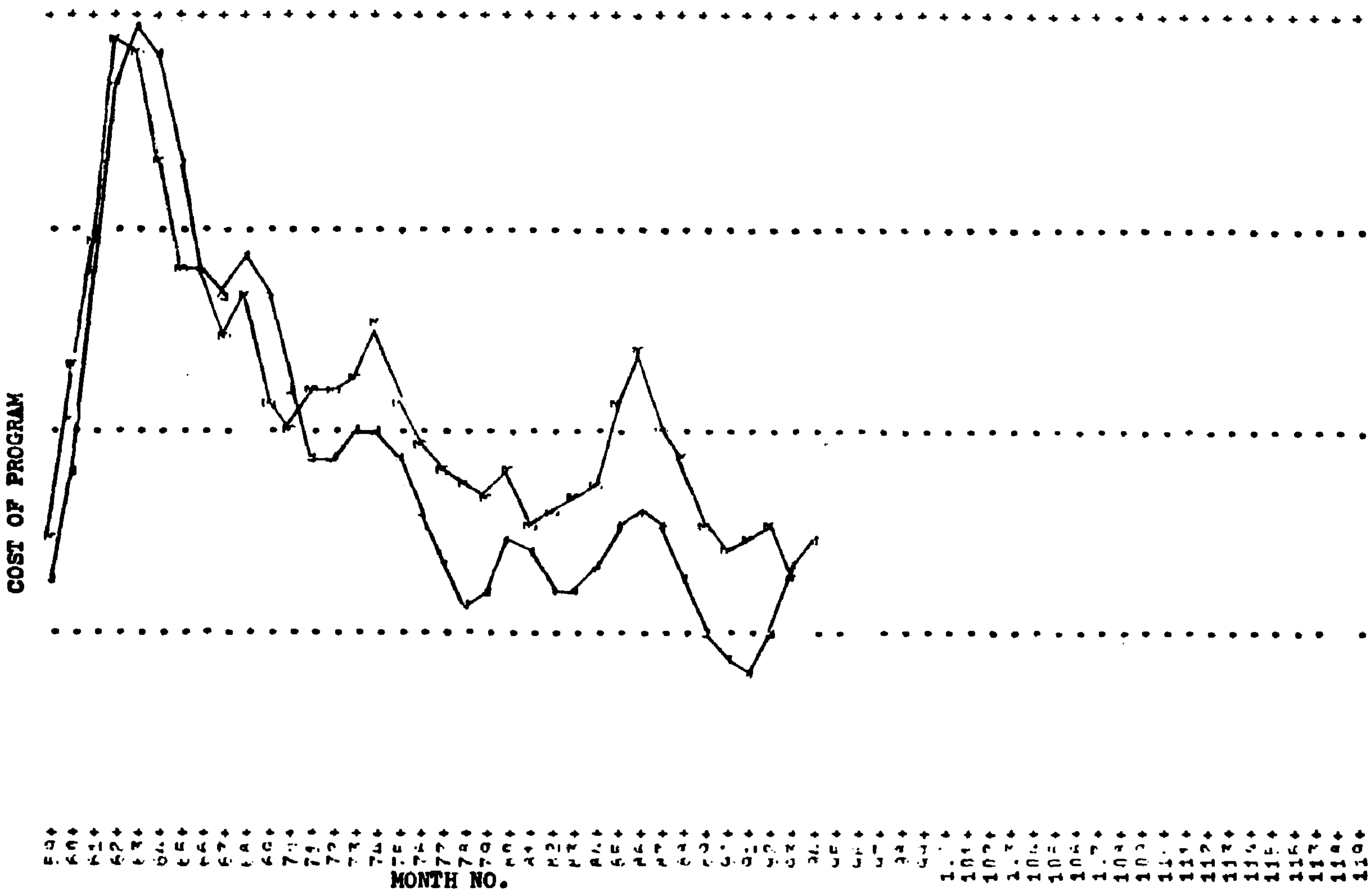


FIGURE 21.--Continued.

TABLE 10.--Cost of UI by System.

Quarter	Current System	Three-Tier System	Difference (Current Minus Three-Tier)
1970.1	61465000.	70382135.	-8917135.
1970.2	63465000.	55154653.	8310347.
1970.3	80577000.	64485195.	16091805.
1970.4	74792000.	58226671.	16565329.
1971.1	124215000.	83047774.	41167226.
1971.2	97857000.	58212340.	39644660.
1971.3	82502000.	67437466.	15064534.
1971.4	74489000.	48464755.	26024245.
1972.1	100537000.	72853571.	27683429.
1972.2	60001000.	53390157.	6610843.
1972.3	65279000.	79874107.	-14595107.
1972.4	42782000.	38747520.	4034480.
1973.1	66812000.	48690866.	18121134.
1973.2	44643000.	33720286.	10922714.
1973.3	37944000.	37533273.	410727.
1973.4	37974000.	33852852.	4121148.
1974.1	130365000.	144542325.	-14177325.
1974.2	141186000.	152706288.	-11520288.
1974.3	122953000.	129978989.	-7025989.
1974.4	142919000.	123643463.	19275537.
1975.1	336435000.	327809035.	8625965.
1975.2	289843000.	320143698.	-30300698.
1975.3	267194000.	313325607.	-46131607.
1975.4	220292000.	219877438.	414562.
1976.1	245425000.	220201277.	25223723.
1976.2	171093000.	148367032.	22725968.
1976.3	148495247.	148354719.	140528.
1976.4	151648285.	132454221.	19194064.
1977.1	206307742.	172462093.	33845649.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The simulation model of the labor force and unemployment insurance system was intended to be an experimental tool for evaluating and assessing the effectiveness of state level manpower programs and policies. A considerable amount of effort was spent in deriving and refining historical data for use as exogenous driving variables, to develop the cost conversion equations, and to use as a standard for refinement and validation of the unemployment insurance model. This facilitated the adjustment and refinement of the UI model so that it is able to reproduce historical behavior with reasonable accuracy. This was demonstrated in Chapter III, where the validation of the UI model was discussed and also presented graphically. A general conclusion is that the modeling technique works and the model of the UI system is a useful representation of the real system.

The three-tier UI system was originally proposed by Saul Blaustein as a component of an inclusive Job Security system designed to channel unemployed individuals through training, counseling and other employment related programs. In this dissertation the three-tier UI concept was modified to be a stand alone replacement for the existing UI system without employment related services or programs. The development and validation of the three-tier UI system was assisted by the knowledge gained in constructing the model of the existing UI system. The behavior and magnitude of the model parameters, the cost conversion methodology and the exogenous inputs were all adapted from the simulation model of the current UI system. Since historical data for the three-tier UI system is nonexistant, the validation of the three-tier model rests to a large extent on the experience transferred from the construction of the model of the existing UI system.

A set of design and evaluation criteria were identified to assist in the construction of the three-tier UI model and to assess the effectiveness of the three-tier UI concept relative to the existing UI system. The effectiveness of the three-tier UI system was demonstrated by operating both models in a changing unemployment environment. A series of hypothetical unemployment rate profiles as well as historical exogenous inputs were imposed on both models. As shown in Chapter V, the model of the three-tier system met the evaluation criteria better than the model of the current system. In response to a spike increase or decrease in the unemployment rate, a peak or trough will occur in the three-tier model's output before it occurs in the current system model's output. This indicates that the three-tier system responds to changing unemployment conditions faster than the current system. It was also shown that the three-tier system provides the same level of client support as the current system during times of high unemployment and over extended periods of time it will cost less than the current system. By operating both models with over seven years of historical exogenous inputs, the total cost of the three-tier system was 6.7% less than the total cost of the current system. It must be kept in mind that this experiment only shows the degree to which the particular version of the three-tier system as modeled meets the criteria.

The real significance of the comparative response analysis of the two systems lies in the design implications for the implementation of a three-tier replacement for the current system. A three-tier system could be implemented that performs similar to the modeled version provided that the parameters and structure of the model are translated into reality. Implementation of the basic structure of the three-tier system consisting of three serial programs with fixed entitlement should not pose major problems. However the current system does not have a screening procedure and some effort would be required in designing and implementing the process for the screening and review of claimants between tiers. The screening parameters reflecting this process were described previously in Chapter IV. If the three-tier system is to be implemented following the design reflected in the model, the actual screening procedures would have to closely approximate the screening effect in the model.

The preceding discussion points out a possible limitation of the three-tier approach. The screening process in the three-tier model is fairly flexible allowing from 0 to 100% of the claimants to pass on to the next tier depending on the unemployment rate. The question is how would such a process be implemented in an actual three-tier system? One possible method would be to make the eligibility for the next tier a function of both the work experience in the base period preceding the first claim and the unemployment rate. A screening and review process that is a function of the unemployment rate represents a deviation from the insurance concept of unemployment insurance. Workers would only know the minimum benefit duration and not the maximum length of benefits as in the current system (note that the triggering of the extended benefits program provides some uncertainty in the current system).

Areas For Additional Research

An extension of this research could proceed in two different areas. The first would be to continue the evaluation and design of the three-tier system. It was recognized that the responsiveness of the three-tier model depends on certain parameters; additional research could involve a sensitivity analysis of these parameters. If more information becomes available concerning the specific form of the three-tier system a sensitivity analysis could indicate areas for more detailed model development. For example, the parameters representing the screening process could be replaced by additional model structure. If the screening procedure consisted of an individual interview and evaluation, then the additional structure might represent the throughput characteristics of the interview, capacity limitations and any delays caused by the procedure. The model would also be a useful tool for evaluating refinements and modifications to the three-tier concept.

The preceeding discussion concerned research efforts in the area of investigating the three-tier system. Follow on efforts could also proceed in the direction of using the modeling technique and the experience gained in modeling UI systems to design and evaluate new systems. For example the current and the three-tier systems are both serial designs with the output of one program or tier becoming the input to the next. Another possibility would be a system utilizing two or three parallel programs with each having a different length and different requirements for entry. A parallel design would only require an initial screening to determine program eligibility and would eliminate the need for the triggering mechanism found in the current system. Models of various parallel and serial systems and possible combinations of the two approaches could be evaluated against the current system in an effort to select a better design for the UI system.

FOOTNOTES

FOOTNOTES

[1]Saul J. Blaustein, A New Job Security System for Michigan (Study of alternative strategies for the Michigan Unemployment Insurance Program; Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, November, 1977).

[2]J. Kenneth White and Lawrence Jenicke, Manpower Planning: A Macro Viewpoint (paper prepared for presentation at Midwest Academy of Management, November, 1976), pp. 2-3.

[3]First Annual Report to the President and the Congress of the National Commission for Manpower Policy: Toward a National Manpower Policy (report No. 3, October, 1975).

[4]For a discussion of the objectives of the unemployment insurance system see "Unemployment and Income Security: Goals for the 1970's" (The W.E. Upjohn Institute for Employment Research, July 1969), pp. 2-5 and "Unemployment Insurance Objective and Issues: An Agenda for Research and Evaluation" by Saul Blaustein (The W.E. Upjohn Institute for Employment Research, November 1968), pp.5-12.

[5]Blaustein, November, 1977.

[6]"Developments in Simulation in Social and Administrative Science" Schultz and Sullivan in Guetzkow, Kotler and Schultz, Simulation in Social and Administrative Science (Prentice Hall, 1972), pp. 3-47.

[7]Ibid.

[8]Ibid.

[9]John C. Chambers, Satinder K. Mullick, and Donald D. Smith, "How to choose the right forecasting technique" Harvard Business Review (July - August 1971):45-74.

[10]Ralph E. Smith, A Simulation Model of the Demographic Composition of Employment Composition of Employment, Unemployment, and Labor Force Participation: Status Report (The Urban Institute, July 1974).

[11]Stephen T. Marston, "An Unemployment Insurance Model" Appendix D of On the feasbility of a a labor market information system, volume 2 Malcolm S. Cohen (U.S. Department of Labor, Manpower Administration, June 1974), pp. 113-180.

[12]Jay W. Forrester, Urban Dynamics (Cambridge, Massachusetts: MIT Press, 1969).

[13]Collected Papers of Jay W. Forrester (Cambridge, Massachusetts: Wright-Allen Press, Inc., 1975).

[14]Thomas Manetsch and Gerald Park, System Analysis and Simulation With Applications to Economic and Social Systems (M.S.U Department of Engineering Research, November 1973), Chapter 9.

[15]Ibid., Chapter 10.

[16]Michigan Bureau of Employment and Training, Michigan Manpower Simulation Model, Operators Guide (version 1.1) (Lansing, Michigan Department of Labor, January 1978).

[17]Robert W. Llewellyn, Professor of Industrial Engineering, North Carolina State University, Fordyn, An Industrial Dynamics Simulator (Privately printed by Typing Service, Raleigh, North Carolina, 1965).

[18]Manetsch, chapter 10, p. 33.

[19]Llewellyn, pp. 4-22.

[20]U.S. Department of Health, Education and Welfare in cooperation with the Michigan Department of Social Services, Profile of the Michigan ADC Caseload, January, 1971 study--refer to Table A-16; January, 1973 study--refer to Table R-18.

[21]Ibid.

[22]Ibid.

[23]Sheryl Dahlhe and E. Lynn Savage, General Assistance in Michigan: A Profile of Program and Recipient Characteristics (Lansing: Michigan Department of Social Services, July, 1975), p. 46.

[24]Harvey J. Hilaski, The Status of Research on Gross Changes in the Labor Force (Division of Employment and Unemployment Analysis, U.S. Bureau of Labor Statistics).

[25] Ralph E. Smith, The Discouraged Worker in a full Employment Economy (Washington, D.C.: The Urban Institute, January 28, 1974), p. 12.

[26] Blaustein, November 1977.

[27] Saul J. Blaustein, A New Job Security System for Michigan, Draft Copy (Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, June 15, 1977), Appendix.

[28] Blaustein, November 1977.

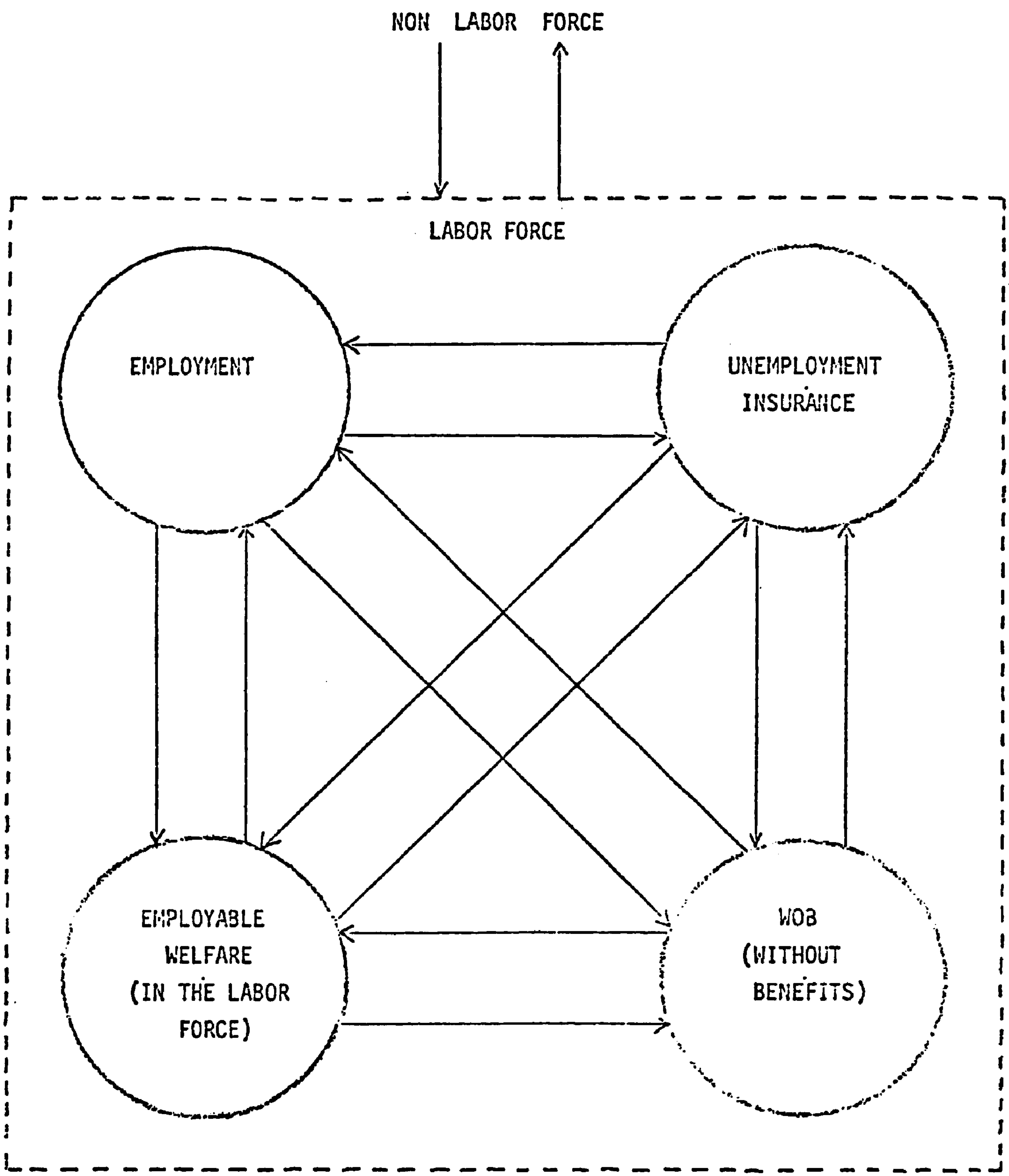
APPENDICES

APPENDIX A

SIMPLIFIED MODEL DIAGRAM

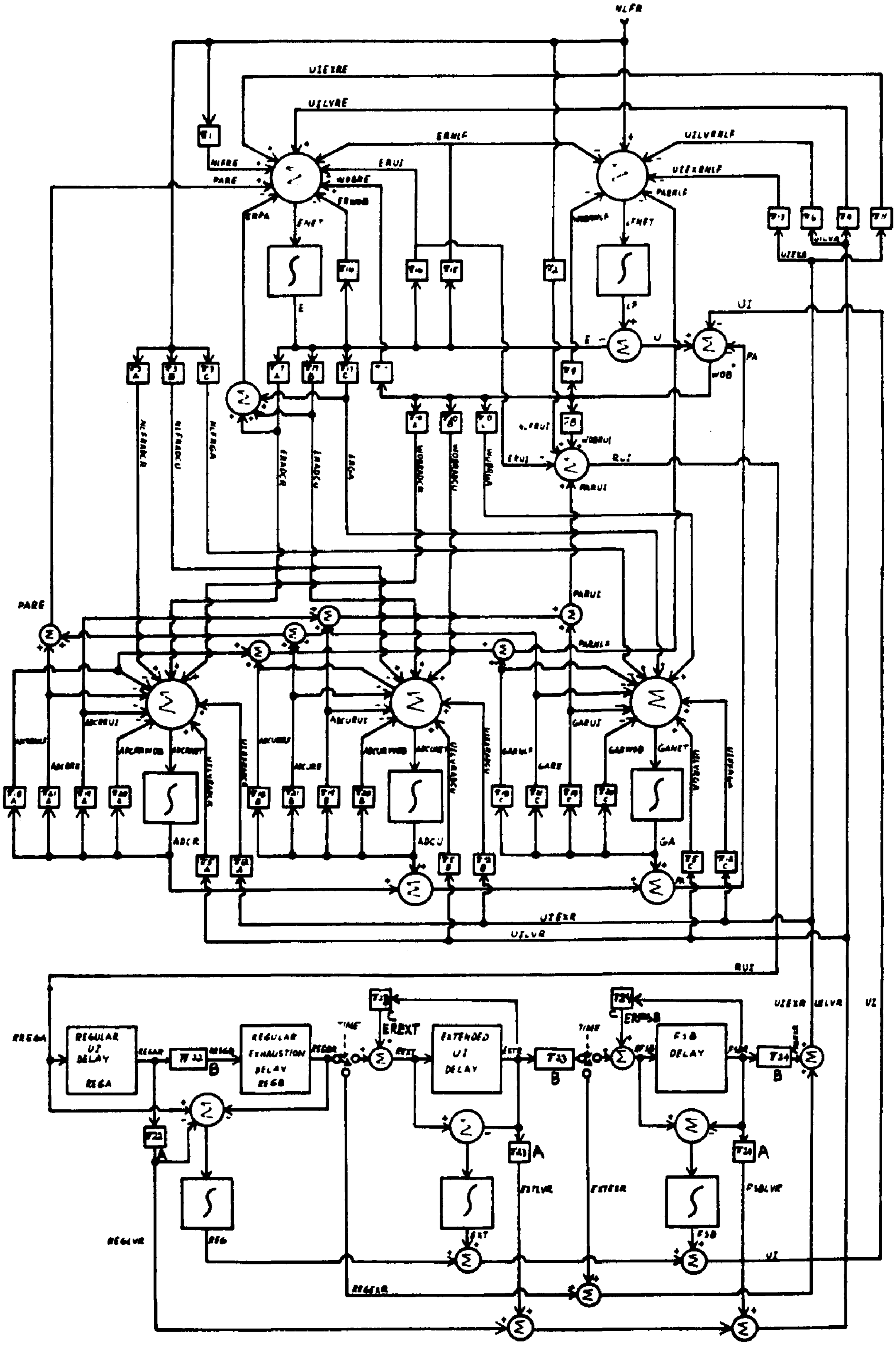
Appendix A

Simplified Model Diagram



APPENDIX B

MODEL DIAGRAM


NLFR
UIEXRE
UILVRE
ERNLF
UILVRNLF
UIEXRNLF
NLFRE
PARE
ERUI
WOBRE
ERWOB
ERPA
ENET
E
LF
U
UI
PA
WOB
PARUI
RUI
ERUI
PARE
ABCRUI
ABCURUI
GARUI
ADCR
ADCU
GA
UIEXR
UILVR
REGULAR UI DELAY REGA
REGULAR EXHAUSTION DELAY REGB
EXTENDED UI DELAY
FSB DELAY
EREXT
ERFSB
TIME
REG
EXT
FSB
REGLVR
REGEXR
EXTLVR
EXTEXR
FSBLVR

APPENDIX C

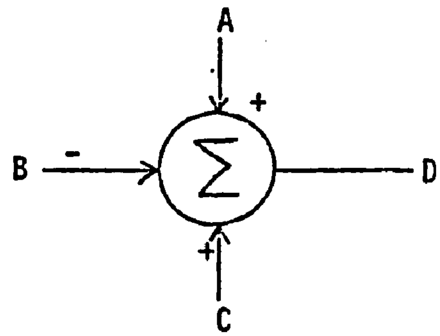
MODEL SYMBOLS AND THE EQUIVALENT

MATHEMATICAL OPERATION

Appendix C

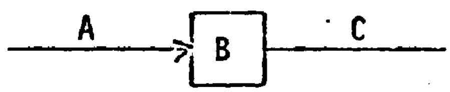
Model symbols and the equivalent mathematical operation

1) Summation



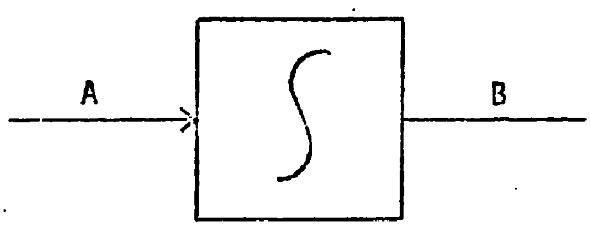
$$D = A - B + C$$

2) Multiplication



$$C = A \times B$$

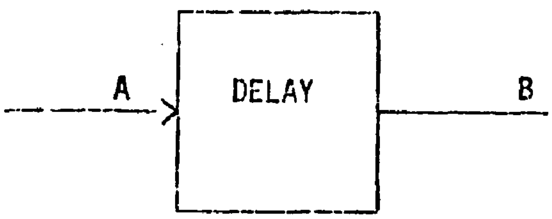
3) Integration



$$B = B_0 + \int_{T_0}^{T} A \, dt$$

B : stock or level variable
B_0: initial value of stock variable
T_0: initial value of time
T^0: current time
A : flow or rate variable

4) Delay (distributed)



$$B = f\ (A_{T-Del})$$

A: input rate variable
B: output rate variable
DEL: mean time of delay
T: current time

APPENDIX D

MODEL PARAMETERS

APPENDIX D.

Model Parameters

$\pi 1 = .8551 - 3.03 \times USUR$

$\pi 2 = .0125$

$\pi 3A = .001227 + .03096 \times SUR$

$\pi 3B = .0001093 + .00201 \times SUR$

$\pi 3C = .002648 + .002064 \times SUR$

$\pi 4 = .97$

$\pi 5A = 0.0$

$\pi 5B = 0.0$

$\pi 5C = 0.0$

$\pi 6 = .03$

$\pi 7 = .3294 - .69 \times USUR$

$\pi 8 = .01$

$\pi 9 = .276 - 1.565 \times USUR$

$\pi 10A = .001407 + .00723 \times SUR$

$\pi 10B = .003799 + .012173 \times SUR$

$\pi 10C = .01660 + .09936 \times SUR$

$\pi 11 = .13464 - .3636 \times SUR$

$\pi 12A = .006$

$\pi 12B = .022$

$\pi 12C = .16895 - .79527 \times SUR$

$\pi 13 = .20$

$\pi 14 = -.0001685 + .02666 \times SUR$

$\pi 15 = .0481 - .26 \times USUR$

$\pi 17A = .000002118 + .00013363 \times SUR$

$\pi 17B = .000008418 + .0003493 \times SUR$

$\pi 17C = .00003116 + .0001166 \times SUR$

$\pi 18A = .006885 + .07333 \times SUR$

$\pi 18B = .006973 + 11242 \times SUR$

$\pi 18C = .06587 - .04520 \times SUR$

$\pi 19A = 0.0$

$\pi 19B = 0.0$

$\pi 19C = 0.0$

$\pi 20A = .002295 + .02444 \times SUR$

$\pi 20B = .003485 + .05621 \times SUR$

$\pi 20C = .03293 - .02260 \times SUR$

$\pi 21A = .002295 + .02444 \times SUR$

$\pi 21B = .02439 + .3935 \times SUR$

$\pi 21C = .06587 - .04520 \times SUR$

$\pi 22A = .925 - SUR(T-2)$

$\pi 22B = 1 - \pi 22A$

$\pi 23A = .35$

$\pi 23B = .65$

$\pi 23C = .16$

$\pi 24A = .40$

$\pi 24B = .60$

$\pi 24C = .13$

USUR = U.S. unemployment rate

SUR = Michigan unemployment rate (5 month smoothing)

Parameter Constraints

$\pi 1 + \pi 2 + \pi 3A + \pi 3B + \pi 3C \leq 1$

$\pi 4 + \pi 5A + \pi 5B + \pi 5C + \pi 6 \leq 1$

$\pi 11 + \pi 12A + \pi 12B + \pi 12C + \pi 13 \leq 1$

$\pi 22A + \pi 22B = 1$

$\pi 23A + \pi 23B = 1$

$\pi 24A + \pi 24B = 1$

Delay Parameters

Program	Mean Time (Months)	Order
Regular (A)	1.47	3
Regular (B)	2.8	3
Extended	2.3	4
FSB	3.8	6

APPENDIX E

FORTRAN PROGRAM LISTING

```
WHITE,L100,T50,CM150000,PN4511964,PG3,JC500.
FTN.
HAL,LGO=AXIT,GPID.
LOAD,LGO.
NOGO.
REWIND,LGO.
CATALOG,LGO,BTTMSHMODEL,RP=999,CN=WPW,MD=BET.
*EOR
      PROGRAM TTMODEL(INPUT,OUTPUT,TAPE1,TAPE2=OUTPUT,TAPE5,TAPE6)
       COMMON/PLTDATA/T,REEGA,REGAR,REXT,EXTR,RFSB,FSBR,RUI,REGLVR,
      1REGEXP,EXTLVR,EXTEXP,FSBLVR,FSBEXR,UILVR,UIEXR,REG,EXT,FSB,UI,
      2XNLFER,UIEXRE,UILVRE,ERNLF,ERUI,WORRE,ERWOB,ENET,ERPA,PARE,XNLFRE,
      3UILRNL,UIXRNL,PARNLF,XLFNET,WORRNL,E,XLF,U,WOB,PA,XNLRADR,XNLRADU,
      4XNLFRGA,ERADOR,ERADOU,ERGA,WORADR,WORADU,WOBRGA,XNLFRUI,WOBRUI,
      +PARUI,ADRRNL,ADORRE,ADRRUI,ADRRWO,ADRNET,ULRADR,UXRADR,ADOR,
      6ADURNL,ADOURE,ADURUI,ADURWO,ADUNET,ULRADU,UXRADU,ADOU,GARNLF,
      +GARE,GARUI,GARWOB,GANET,UILRGA,UIXRGA,GA,EREXT,ERFSB,
      +REGCOST,EXTCOST,FSBCOST,UICOST,DT,DATAOUT,RN,NAME,NMON
       COMMON/PEP/USUR,SUR,UR,P1,P2,P3A,P3B,P3C,P4,P5A,P5B,
      9P5C,P6,P7,P8,P9,P10A,P10B,P10C,P11,P12A,P12B,
      1P12C,P13,P14,P15,P17A,P17B,P17C,P18A,P18B,P18C,
      2P19A,P19B,P19C,P20A,P20B,P20C,P21A,P21B,P21C
       DIMENSION REGA1(5),REGB1(3),EXT1(4),FSBA1(6),FSBB1(6)
       DIMENSION RUI1(156),TIME1(156),UR1(156),SUR1(156),USUR1(156),E1(15
      +6),RRENE(156),ERENE(156),QE(24),QUR(24)
       INTEGER PROGRAM(156),IPROG(12),RN(7),NAME(15)
       INTEGER FSBOFF,DATAOUT
       REAL IUR(156)
       DO 10 I=1,156
   10  TIME1(I)=FLOAT(I)
       READ(1,241)(RN(K),K=1,7)
241    FORMAT(7A10)
C NMON IS THE NUMBER OF MONTHS THAT CONTAIN UPDATED DATA
11     READ(1,8)NMON
C RUI IS THE NUMBER OF PEOPLE ENTERING THE UI SYSTEM
8      FORMAT(I5)
       READ(1,20) ( RUI1(J),J=1,NMON)
       MM=NMON+1
C NAME IS THE NAME OF THE FORCAST USED (OPTOMESTIC OR PESEMESTIC)
       READ(1,125)NAME1,NAME2
125    FORMAT(2A10)
       READ(1,20)(RUI1(J),J=MM,156)
20     FORMAT(6F10.3)
C IAUTO IS SET TO 1 IF THEIR IS AUTOMATIC TRIGGERING OF THE EXT
C PROGRAM AND 2 IF THE USER WILL TRIGGER THE PROGRAM.
       READ(1,8)IAUTO
C PROGRAM IS AN ARRAY WITH A VALUE FOR EACH MONTH.  IF THE VALUE
C IS 1, ONLY THE REG PROGRAM IS ON, IF A 2 REG+EXT
C PROGRAMS ARE ON AND IF THE VALUE IS 3, THE REG+EXT+FSB
C PROGRAMS ARE ON.
       READ(1,120)(PROGRAM(K),K=1,156)
120    FORMAT(40(I1,1X))
C FSB CONTAINS THE MONTH NUMBER THAT FSB IS SET TO A 13 WEEK PROGRAM
       READ(1,8)FSBOFF
C IGROW IS THE MAXIMUM THAT IUR WILL BE ALLOWED TO GROW
       READ(1,8)IGROW
       GROWMAX=IGROW/100.0
       EGROW=0.4577
       RUIGROW=1.0
C DATA OUT IS SET TO 1 IF THE TABULAR OUTPUT IS TO BE SUPPRESSED.
       READ(1,8)DATAOUT
```

```
      DO 105 K=1,156
      RBENE(K)=0.0
C RBENE AND EBENE ARE ARRAYS CONTAINING BENEFIT LEVELS FOR THE
C REG AND EXT PROGRAMS.
105   EBENE(K)=0.0
C DOL=THE DOLLAR INCREASE PER MONTH.
C PERC=PERCENT INCREASE PER MONTH.
      DOL=0.0
      PERC=1.0
      READ(1,8)NAWB
      GO TO (50,50,51,51,52)NAWB
50    READ(1,121)DOL
      GO TO 60
51    READ(1,121)PERC
      GO TO 60
52    READ(1,122)(RBENE(I),I=1,156)
122   FORMAT(10F6.2)
      READ(1,122)(EBENE(I),I=1,156)
121   FORMAT(F10.5)
60    READ(1,21)(UR1(J),J=1,NMON)
      READ(1,21)(UR1(J),J=MM,156)
      READ(1,21)(SUR1(J),J=1,NMON)
      READ(1,21)(SUR1(J),J=MM,156)
      DO 333 K=1,156
333   USUR1(K)=SUR1(K)-.035
C QUR AND QE ARE ARRAYS CONTAINING QUARTERLY E AND UR DATA
      READ(1,21)(E1(J),J=1,NMON)
      READ(1,21)(E1(J),J=MM,156)
   21 FORMAT(6F10.6)
      READ(1,20)(QE(I),I=1,24)
      READ(1,20)(QUR(I),I=1,24)
C ASSUMPTIONS
      CALL TITLE(RN)
      PRINT 350
350   FORMAT(* THE FOLLOWING ARE THE OPERATOR MADE ASSUMPTIONS ON WH*
     +*ICH THE MODEL IS OPERATING.*)
      PRINT 355,NMON
355   FORMAT(*-THE LAST MONTH WITH UPDATED DATA IS*I5,1H.)
       PRINT 360,NAME1,NAME2
360    FORMAT(*-*2A10*FORCASTS ARE USED*//* THE FOLLOWING IS A LIST O*
      +*F THE QUARTLY FORCASTS USED*/)
       IC=0
       DO 361 K=1977,1982
       DO 361 J=1,4
       IC=IC+1
       PRINT 365,K,J,QE(IC),QUR(IC),IC
361    CONTINUE
365    FORMAT(I5,1H.,I1,*  EMPLOYMENT= *F8.0*  UNEMPLOYMENT*
      +* RATE=*F8.4*  QTR. NO.*I3)
       IF(IAUTO.NE.1)GO TO 367
       PRINT 366
366    FORMAT(/* THE EXTENDED BENEFIT PROGRAM IS TRIGGERED*
      +* BY THE INSURED UNEMPLOYMENT RATE.*)
       GO TO 375
367    PRINT 368
368    FORMAT(//7X,*JAN  FEB  MAR  APR  MAY  JUN  JUL*
      +*  AUG  SEP  OCT  NOV  DEC*)
       DO 369 J=1,13
       DO 370 K=1,12
       IYR=1969+J
       MO=((J-1)*12)+K
```

```
      IF(PROGRAM(MO).EQ.1)IPROG(K)=3HREG
      IF(PROGRAM(MO).EQ.2)IPROG(K)=3HEXT
      IF(PROGRAM(MO).EQ.3)IPROG(K)=3HFSB
370   CONTINUE
      WRITE(2,371)IYR,(IPROG(I),I=1,12)
371   FORMAT(I5,12(2X,A3))
369   CONTINUE
375   PRINT 377,FSBOFF
377   FORMAT(*0FSB WILL BE CHANGED TO A 13 WEEK PROGRAM STARTING*
     +* WITH MONTH NUMBER*I4,1H.)
      GROW=IGROW/100.
      PRINT 378,GROW
378   FORMAT(*0COVERED EMPLOYMENT WILL GROW TO A MAXIMUM OF*
     +F5.2* OF TOTAL EMPLOYMENT.*)
      PRINT 379,DOL,PERC
379   FORMAT(*0THE FOLLOWING INFORMATION REFERS TO THE AVERAGE*
     +* WEEKLY BENEFIT AMOUNTS*//7X,*DOLLAR INCREASE*
     +* PER MONTH=*F5.2/,7X*PERCENTAGE INCREASE OF BENEFITS*
     +* FACTOR=   *F8.6)
      IF(NAWB.NE.5)GO TO 390
      PRINT 382
382   FORMAT(///* THE FOLLOWING IS A PROFILE OF THE USER SUPPLIED*
     +* AVERAGE WEEKLY BENEFITS BY PROGRAM*)
      START=RBENE(1)
      NUMF=1
      DO 380 K=1,156
      IF(RBENE(K).EQ.START)GO TO 380
      PRINT 381,NUMF,K,START
381   FORMAT(7X,*FROM MONTH*I4*  TO MONTH*I4* REGULAR BENEFIT*
     +* LEVEL=*F6.2)
      START=RBENE(K)
      NUMF=K
380   CONTINUE
      START=EBENE(1)
      NUMF=1
      DO 385 K=1,156
      IF(EBENE(K).EQ.START) GO TO 385
      PRINT 383,NUMF,K,START
383   FORMAT(7X,*FROM MONTH*I4*  TO MONTH*I4
     +*   EXTENDED BENEFIT LEVEL=*F6.2)
      START=EBENE(K)  $  NUMF=K
385   CONTINUE
390   CONTINUE
      T=0.0
      TM2=T+2.0
C READ SMOOTHED MICHIGAN AND .S. UNEMP. RATES.
      SUR=TABLI(SUR1,TIME1,T,156)
      USUR=TABLI(USUR1,TIME1,T,156)
      UR=TABLI(UR1,TIME1,T,156)
      RUI=TABLI(RUI1,TIME1,T,156)
C SET TIME INCREMENT.
      DT=0.2
      IDT=1
C SET MEAN DELAY TIMES.
      DEL1=DELP=1.3
      DEL2=2.8
      DEL3=2.3
      DEL4=1.9
      DEL5=1.9
C SET ORDER OF DELAYS.
      K1=4
```

```
      K2=3
      K3=4
      K4=5
      K5=6
C SET INITIAL PARAMETER VALUES.
      CALL DUPOUT
C SET INITIAL PARAMETER VALUES.
      P22A=.925-TABLI(SUR1,TIME1,TM2,156)
      IF(P22A.GT.0.9)P22A=0.9
      P22B=1.0-P22A
      P23A=0.35
      P23B=0.65
      P23C=0.16
      P24A=0.40
      P24B=0.60
      P24C=0.13
C SET INITIAL VALUES OF STATE VARIABLES.
      XNLFP=179000.-287500*UR
      E=3350000.0
      XLF=3500000.0
      ADCR=13000.0
      ADCU=9000.0
      GA=10000.0
      REG=67940.0
      EXT=0.0
      FSBA=0.0
      FSBB=0.0
      FSB=FSBA+FSBB
      I=1
C COMPUTE INITIAL COST VARIABLES.
      CALL COST(I,REG,EXT,FSB,REGCOST,EXTCOST,FSBCOST,UICOST,RBENE,EBENE
     +,PERC,DOL,PN,NAWB)
C INITIALIZE INTERNAL ARRAYS FOR FSB DELAYS.
      DO 4 IZ=1,K4
    4 FSBA1(IZ)=0.0
      DO5 IZ=1,K5
5     FSBB1(IZ)=0.0
C INITIALIZE INTERNAL ARRAYS FOR EXT DELAY.
      DO 3 IZ=1,K3
    3 EXT1(IZ)=0.0
C COMPUTE INITIAL INTERNAL ARRAY VALUE FOR REGA DELAY.
      REGA1(1)=REG/(DEL1+DEL2-P22A*DEL2)
C COMPUTE INITIAL INTERNAL ARRAY VALUE FOR REGB DELAY.
      REGB1(1)=REGA1(1)-P22A*REGA1(1)
C  INITIALIZE INTERNAL ARRAYS FOR REGB DELAY.
      DO 2 IZ=2,K2
    2 REGB1(IZ)=REGB1(1)
C INITIALIZE INTERNAL ARRAYS FOR REGA DELAY.
      DO 1 IZ=2,K1
    1 REGA1(IZ)=REGA1(1)
C COMPUTE INTIAL LEVEL VARIABLES.
      UI=REG+EXT+FSB
      PA=ADCR+ADCU+GA
      U=XLF-E
      WOB=U-UI-PA
C INITIALIZE UI RATE VARIABLES.
      FSBR=FSBB1(6)
      RFSBB=0.0
      IDECAY=0
      FSBAR=FSBA1(6)
      EXTR=EXT1(4)
```

```
      REGBR=REGB1(3)
      REGAR=REGA1(3)
      REGA=RUI
      REGLVR=P22A*REGAR
      REGBR=P22B*REGAR
      REGEXR=REGBR
      UILVR=REGLVR
      UIEXR=REGEXR
      REXT=0.0
      ERREXT=0.0
      EXTLVR=0.0
      EXTEXR=0.0
      RFSB=0.0
      ERFSB=0.0
      FSBLVR=0.0
      FSBEXR=0.0
C INITIALIZE RATE VARIABLES.
      CALL VARCALC
C PRINT INITIALIZED OUTPUT DATA.
      CALL DATAPR
C INCREMENT TIME BY MONTH.
      DO 510 K=1,156
      I=K
C GROW=THE RATE OF GROWTH OF COVERED EMPLOYMENT.  IT WILL INCREASE FROM
C 1 IN MONTH 87 TO A MAXIMUM OF GROWMAX.
      IF(K.GT.87)EGROW=EGROW+(GROWMAX-.8577)/10.0
      IF(EGROW.GT.GROWMAX)EGROW=GROWMAX
      COVEMP=E1(K)*EGROW
      IF(K.LE.87)GO TO 195
      RUIGROW=RUIGROW+((1.0-GROWMAX)/0.8577)/10.0
      IF(RUIGROW.GT.GROWMAX/.8577)RUIGROW=GROWMAX/.8577
      RUI1(K)=RUI1(K)*RUIGROW
195   IUR(K)=(REG+EXT)/COVEMP
      AVGIUR=AVGIUR1=AVGIUR2=CUMIUR=CUMIUR1=CUMIUR2=0.0
      IF(IAUTO.NE.1)GO TO 300
      IF(K.LT.95)GO TO 300
C THIS SECTION IS TO ALLOW THE INSURED UNEMPLOYMENT RATE TO TURN THE EXT
C PROGRAM ON AND OFF.
      KK=K-2
      DO 200 M=KK,K
C CUMIUR = CUMULATIVE INSURED UNEMPLOYMENT RATE FOR THE LAST 3 MONTHS IN
C THE CURRENT YEAR.
C CUMIUR1 = CUMULATIVE INSURED UNEMPLOYMENT RATE FOR THE LAST 3 MONTHS
C OF 1 YEARS PRIOR TO CURRENT YEAR.
C CUMIUR2= CUMULATIVE INSURED UNEMPLOYMENT RATE FOR THE LAST 3 MONTHS OF
C 2 YEARS PRIOR TO CURRENT YEAR.
C THE AVGIUR = THE AVERAGE OF THE CUMIURS.
      CUMIUR=CUMIUR+IUR(M)
      CUMIUR1=CUMIUR1+IUR(M-12)
      CUMIUR2=CUMIUR2+IUR(M-24)
200   CONTINUE
      AVGIUR=CUMIUR/3
      AVGIUR1=((CUMIUR1/3)+(CUMIUR2/3))/2
      AVGIUR2=AVGIUR1
      PROGRAM(K)=1
C I DECAY IS SET TO FORCE THE PROGRAM TO STAY ON FOR A MINIMUM OF 3
C MONTHS.
      IF(IDECAY.GT.0)GO TO 220
      IF(AVGIUR.GT..04.AND.AVGIUR.GE.(AVGIUR1*1.2).AND.AVGIUR.GE.
     +(AVGIUR2*1.2).AND.PROGRAM(K).NE.2)IDECAY=4
      IF(PROGRAM(K).NE.2.AND.AVGIUR.GE.0.05)IDECAY=4
```

```
220   IDECAY=IDECAY-1
      IF(IDECAY.GT.0)PROGRAM(K)=2
      IF(PROGRAM(K).EQ.2.AND.AVGIUP.GE..05.OR.AVGIUR.GE..04.AND.
     +AVGIUP.GE.(AVGIUP1*1.2).AND.AVGIUP.GE.(AVGIUP2*1.2))PROGRAM(K)=2
300   CONTINUE
C INCREMENT TIME BY DT.
      DO 500 J=1,5
C UPDATE TIME.
      T=T+DT
C COMPUTE STATE VARIABLES.
      E=E+DT*ENET
      XLF=XLF+DT*XLFNET
      ADCP=ADCP+DT*ADCPNET
      ADCU=ADCU+DT*ADCUNET
      GA=GA+DT*GANET
C COMPUTE FSBB STATE VARIABLE.
      FSBB=FSBB+DT*(RFSBB-FSBBR)
C CHECK FOR 13 WEEK FSB PROGRAM.
      IF(I.GE.FSBOFF)GO TO 450
C COMPUTE FSBA STATE VARIABLE.
      FSBA=FSBA+DT*(RFSB-FSBAR)
C DELAY FSBA RATE VARIABLES.
      CALL DELDT(RFSB,FSBAR,FSBA1,DEL4,IDT,DT,K4)
450   CONTINUE
C DELAY FSBB RATE VARIABLES.
      CALL DELDT(RFSBB,FSBBR,FSBB1,DEL5,IDT,DT,K5)
C COMPUTE EXT STATE VARIABLE.
      EXT=EXT+DT*(REXT-EXTR)
C DELAY EXT RATE VARIABLES.
      CALL DELDT(REXT,EXTR,EXT1,DEL3,IDT,DT,K3)
C COMPUTE REG STATE VARIABLE.
      REG=REG+DT*(RREGA-REGLVR-REGBR)
C DELAY REG RATE VARIABLES.
      CALL DELDT(RREGB,REGBR,REGB1,DEL2,IDT,DT,K2)
      CALL VDEL(RREGA,REGAR,REGA1,DEL1,DELP,DT,K1)
C COMPUTE TOTAL FSB.
      FSB=FSBA+FSBB
C IF FSB IS A 13 WEEK PROGRAM, FSB IS REPRESENTED BY FSBB DELAY BLOCK.
      IF(I.GE.FSBOFF)FSB=FSBB
C COMPUTE TOTAL UI
      UI=REG+EXT+FSB
C COMPUTE TOTAL PA.
      PA=ADCP+ADCU+GA
C COMPUTE UNEMPLOYMENT LEVEL.
      U=XLF-E
C COMPUTE WOB LEVEL.
      WOB=U-UI-PA
C INTERPOLATE RUI, SMOOTHED MICHIGAN UNEMPLOYMENT RATE, AND U.S.
C UNEMPLOYMENT RATE FROM TABLED VALUES.
      RUI=TABLI(RUI1,TIME1,T,156)
      SUR=TABLI(SUR1,TIME1,T,156)
      USUR=TABLI(USUR1,TIME1,T,156)
      UR=TABLI(UR1,TIME1,T,156)
      TM2=T+2.0
C UPDATE PARAMETER VALUES.
      CALL OURCUT
      P22A=.925-TABLI(SUR1,TIME1,TM2,156)
      IF(P22A.GT.0.9)P22A=0.9
      DEL1=(UR/ALOG(RUI))*100.+.9
      P22B=1.0-P22A
C COMPUTE RATE ENTERING REGA DELAY BLOCK.
```

```
      RETGA=RUI
C COMPUTE REGULAR PROGRAM LEAVING RATE.
      REGLVR=P22A*REGAR
C COMPUTE RATE ENTERING REGR DELAY BLOCK.
      RREGR=P22B*REGAR
C COMPUTE REGULAR PROGRAM EXHAUSTION RATE.
      REGEXR=REGAR
C COMPUTE REENTERING RATE FOR EXTENDED PROGRAM.
      EREXT=P23C*EXTR
C COMPUTE RATE ENTERING EXTENDED PROGRAM.
      REXT=REGRB+EREXT
C COMPUTE EXTENDED PROGRAM LEAVING RATE.
      EXTLVR=P23A*EXTR
C COMPUTE EXTENDED PROGRAM EXHAUSTION RATE.
      EXTEXR=P23B*EXTR
C COMPUTE REENTERING RATE FOR FSB PROGRAM.
      ERFSB=P24C*FSBR
C COMPUTE RATE ENTERING FSB PROGRAM.
      RFSB=P23B*EXTR+ERFSB
C COMPUTE RATE ENTERING FSBB DELAY BLOCK.
      RFSBB=FSBAR
C IF TIME EQUALS THE PERIOD WHEN FSB TURNS TO A 13 WEEK PROGRAM, THEN
C THE RATE ENTERING THE FSBB DELAY BLOCK USED TO REPRESENT THE 13 WEEK
C PROGRAM EQUALS THE RATE ENTERING FSB PLUS THE LEVEL OF THE FSBA DELAY
C BLOCK ( ALL RECIPIENTS IN THE FSB PROGRAM HAVE A MAXIMUM OF 13 WEEKS
C AFTER THE TRANSITION PERIOD).
      IF(I.EQ.FSBOFF)RFSBB=RFSB+FSBA
C AFTER THE TRANSITION PERIOD THE RATE ENTERING THE FSBB DELAY
C BLOCK EQUALS THE RATE ENTERING FSB ( THE FSBA DELAY BLOCK IS BYPASSED)
      IF(I.GT.FSBOFF)RFSBB=RFSB
C COMPUTE THE FSB PROGRAM LEAVING RATE.
      FSBLVR=P24A*FSBR
C COMPUTE THE FSB PROGRAM EXHAUSTION RATE.
      FSBEXR=P24B*FSBR
C COMPUTE THE TOTAL UI LEAVING RATE.
      UILVR=REGLVR+EXTLVR+FSBLVR
C IF ONLY THE REGULAR PROGRAM IS OPERATING SET THE RATE ENTERING THE
C EXTENDED AND FSB PROGRAMS TO ZERO AND COMPUTE THE TOTAL UI EXHAUSTION
C RATE.
      IF(PROGRAM(K).NE.1) GO TO 90
      RFSB=REXT=0.0
      UIEXR=REGEXR+EXTEXR+FSBEXR
C IF THE REGULAR AND EXTENDED PROGRAMS ARE OPERATING SET THE RATE
C ENTERING THE FSB PROGRAM TO ZERO AND COMPUTE THE TOTAL UI EXHAUSTION
C RATE.
90    IF(PROGRAM(K).NE.2) GO TO 91
      RFSB=0.0
      UIEXR=EXTEXR+FSBEXR
C IF ALL PROGRAMS ARE OPERATING COMPUTE THE TOTAL UI EXHAUSTION RATE.
91    IF(PROGRAM(K).NE.3)GO TO 92
      UIEXR=FSBEXR
92    CONTINUE
C COMPUTE ALGEBRAIC RATE VARIABLES.
      CALL VARCALC
500   CONTINUE
C COMPUTE UI COST VARIABLES.
      CALL COST(I,REG,EXT,FSB,REGCOST,EXTCOST,FSBCOST,UICOST,RBENE,EBENE
     +,PERC,DCL,RN,MAWB)
C PRINT MONTHLY OUTPUT DATA.
      CALL DATAPR
510   CONTINUE
```

```
C PRINT ARRAY OF INSURED UNEMPLOYMENT RATES.
      CALL TITLE(RN)
      PRINT 601
601   FORMAT(//1X,*INSURED UNEMPLOYMENT RATE*//7X,3HJAN,2X,
     +3HFEB,2X,3HMAR,2X,3HAPR,2X,3HMAY,2X,3HJUN,2X,3HJUL,2X,3HAUG,
     +2X,3HSEP,2X,3HOCT,2X,3HNOV,2X,3HDEC)
      DO 650 L=1970,1982
      MF=1+((L-1970)*12)
      ML=MF+11
      WRITE(2,610)L,(IUR(LL),LL=MF,ML)
610   FORMAT(I5,12(F5.3))
650   CONTINUE
      CALL DATAPLT
      END

      SUBROUTINE DELDT(RINR,ROUTR,CROUTR,DEL,IDT,DT,K)
C THIS IS A FORDYN SUBROUTINE FOR SIMULATING DISTRIBUTED TIME DELAYS.
C FOR A DESCRIPTION SEE FORDYN, AN INDUSTRIAL DYNAMICS SIMULATOR PAGE
C 6  TO 44 BY ROBERT W. LLEWELLYN, PROFESSOR OF INDUSTRIAL ENGINEERING,
C NORTH CAROLINA STATE UNIVERSITY,  PRIVATELY PRINTED BY TYPING SERVICE,
C RALEIGH, NORTH CAROLINA, 1965.
      DIMENSION CROUTR(3)
      DELI=(DEL*FLOAT(IDT))/(FLOAT(K)*DT)
      ROUTR=0.0
      DO 2 J=1,IDT
      RIN=RINR/FLOAT(IDT)
      DO 1 I=1,K
      ABC=CROUTR(I)
      CROUTR(I)=ABC+(RIN-ABC)/DELI
1     RIN=ABC
2     ROUTR=ROUTR+CROUTR(K)
      RETURN
      END
      SUBROUTINE VDEL(VIN,VOUT,P,DEL,DELP,DT,K)
      DIMENSION P(1)
      FK=FLOAT(K)
      A=DT*FK/DEL
      DELD=(DELP-DEL)/(DT*FK)
      DELP=DEL
      DO 1 I=1,K
      DP=P(I)
      P(I)=DP+A*(VIN-DP*(1.-DELD))
      VIN=DP
1     VOUT=P(K)
      RETURN
      END
      FUNCTION TABLI(VAL,ARG,DUMMY,K)
C THIS IS A FORDYN TABLE LOOK-UP FUNCTION FOR INTERPOLATING VALUES IN A
C TABLED SERIES OF NUMBERS9  FOR A DESCRIPTION SEE FORDYN- AN INDUSTRIAL
C DYNAMICS SIMULATOR, PAGE 4 - 22 BY ROBERT W. LLEWELLYN, PROFESSOR OF
C INDUSTRIAL ENGINEERING, NORTH CAROLINA STATE UNIVERSITY,  PRIVATELY
C PRINTED BY TYPING SERVICE, RALEIGH, NORTH CAROLINA, 1965.
      DIMENSION VAL(K),ARG(K)
      DUM=AMAX1(AMIN1(DUMMY,ARG(K)),ARG(1))
      DO 1 I=2,K
      IF(DUM.GT.ARG(I)) GO TO 1
      TABLI=(DUM-ARG(I-1))*(VAL(I)-VAL(I-1))/(ARG(I)-ARG(I-1))
     +  +VAL(I-1)
      RETURN
1     CONTINUE
      RETURN
```

```
      END
      SUBROUTINE DUPCUT
      COMMON/PLTDATA/T,RREGA,REGAR,REXT,EXTR,RFSB,FSBR,RUI,REGLVP,
     1REGEXP,EXTLVP,EXTEXP,FSBLVP,FSBEXP,UILVP,UIEXP,REG,EXT,FSB,UI,
     2XNLFR,UIEXPR,UILVPR,ERNLF,ERUI,WORRE,ERWOR,ENET,ERPA,PARE,XNLFRE,
     3UILRNL,UIXRNL,PARNLF,XLFNET,WORENL,E,XLF,U,WOR,PA,XNLPADR,XNLPADU,
     4XNLFRGA,ERADCR,ERADCU,ERGA,WORADR,WORADU,WORRGA,XNLFRUI,WORRUI,
     5RARUI,ADRRNL,ADCRRE,ADRRUI,ADRRWO,ADRNET,ULRADR,UXRADR,ADCR,
     6ADURNL,ADCURE,ADURUI,ADURWO,ADUNET,ULRADU,UXRADU,ADCU,GARNLF,
     7GARE,GARUI,GARWOR,GANET,UILRGA,UIXRGA,GA,RREXT,RRFSB,DT
      COMMON/PEF/USUR,SUR,UR,P1,P2,P3A,P3B,P3C,P4,P5A,P5B,
     9P5C,P6,P7,P8,P9,P10A,P10B,P10C,P11,P12A,P12B,
     1P12C,P13,P14,P15,P17A,P17B,P17C,P18A,P18B,P18C,
     2P19A,P19B,P19C,P20A,P20B,P20C,P21A,P21B,P21C
C THE FOLLOWING VARIABLES (PRECEDED BY A P) ARE THE PARAMETERS OF THE
C MODEL.
C THEY ARE MULTIPLIED BY CERTAIN RATE OR LEVEL VARIABLES IN THE MODEL
C TO PRODUCE OTHER RATE VARIABLES.
      P1=0.7
      P2=.0125
      P3A=.001227+.030156*SUR
      P3B=.0001093+.00201*SUR
      P3C=.002648+.002064*SUR
      P4=.97
      P5A=0.0
      P5B=0.0
      P5C=0.0
      P6=.03
      P7=.4975-3.125*UR
      P8=.01
      P9=.276-1.565*USUR
      P10A=.001497+.00723*SUR
      P10B=.003793+.012173*SUR
      P10C=.01650+.09936*SUR
      P11=.13454-.3636*SUR
      P12A=.056
      P12B=.022
      P12C=.16955-.79527*SUR
      P13=.20
      P14=-.0001695+.02666*SUR
      P15=.33948-.309*UR
      P17A=.000002118+.00013363*SUR
      P17B=.000039418+.0003493*SUR
      P17C=.00003116+.0001166*SUR
      P18A=.006895+.07333*SUR
      P18B=.006973+.11242*SUR
      P18C=.06587-.04523*SUR
      P19A=0.0
      P19B=0.0
      P19C=0.0
      P20A=.002295+.02444*SUR
      P20B=.003485+.05621*SUR
      P20C=.03293-.02263*SUR
      P21A=.002295+.02444*SUR
      P21B=.02439+.3935*SUR
      P21C=.06597-.04523*SUR
      RETURN
      ENTRY VARCALC
      XNLFR1=178000.-287500*UR
      XNLFR=XNLFR1+(269.7*T)
C XNLFR IS THE RATE ENTERING THE LABOR FORCE.
```

```
C COMPUTE PORTION OF XNLFR GOING TO EMPLOYMENT.
      XNLFRE=P1*XNLFR
C COMPUTE PORTION OF XNLFR GOING TO UI.
      XNLFRUI=P2*XNLFR
C COMPUTE PORTION OF XNLFR GOING TO ADC - R.
      XNLFADR=P3A*XNLFR
C COMPUTE PORTION OF XNLFR GOING TO ADC - U.
      XNLFADU=P3B*XNLFR
C COMPUTE PORTION OF XNLFR GOING TO GENERAL ASSISTANCE.
      XNLFRGA=P3C*XNLFR
C UILVR IS THE RATE LEAVING UNEMPLOYMENT INSURANCE.
C COMPUTE PORTION OF UILVR GOING TO EMPLOYMENT.
      UILVRE=P4*UILVR
C COMPUTE PORTION OF UILVR GOING TO ADC-R.
      ULRADR=P5A*UILVR
C COMPUTE PORTION OF UILVR GOING TO ADC-U.
      ULRADU=P5B*UILVR
C COMPUTE PORTION OF UILVR GOING TO GENERAL ASSISTANCE.
      UILRGA=P5C*UILVR
C COMPUTE PORTION OF UILVR GOING TO NON LABOR FORCE.
      UILRNL=P6*UILVR
C WOB IS THE LEVEL OF THE WITHOUT BENEFITS CATEGORY.
C COMPUTE RATE FROM WOB TO EMPLOYMENT.
      WOBRE=P7*WOB
C COMPUTE RATE FROM WOB TO UNEMPLOYMENT INSURANCE.
      WOBRUI=P8*WOB
C COMPUTE RATE FROM WOB TO NON LABOR FORCE.
      WOBRNL=P9*WOB
C COMPUTE RATE FROM WOB TO ADC-R.
      WOBADR=P10A*WOB
C COMPUTE RATE FROM WOB TO ADC-U.
      WOBADU=P10B*WOB
C COMPUTE RATE FROM WOB TO GENERAL ASSISTANCE.
      WOBRGA=P10C*WOB
C UIEXR IS THE RATE EXHAUSTING UNEMPLOYMENT INSURANCE.
C COMPUTE PORTION OF UIEXR GOING TO EMPLOYMENT.
      UIEXRE=P11*UIEXR
C COMPUTE PORTION OF UIEXR GOING TO ADC-R.
      UXRADR=P12A*UIEXR
C COMPUTE PORTION OF UIEXR GOING TO ADC-U.
      UXRADU=P12B*UIEXR
C COMPUTE PORTION OF UIEXR GOING TO GENERAL ASSISTANCE.
      UIXRGA=P12C*UIEXR
C COMPUTE PORTION OF UIEXR GOING TO NON LABOR FORCE.
      UIXRNL=P13*UIEXR
C E IS THE LEVEL OF EMPLOYMENT.
C COMPUTE RATE FROM E TO WITHOUT BENEFITS CATEGORY.
      ERWOB=P14*E
C COMPUTE RATE FROM E TO NON LABOR FORCE.
      ERNLF=P15*E
C COMPUTE RATE FROM E TO ADC-R.
      ERADCR=P17A*E
C COMPUTE RATE FROM E TO ADC-U.
      ERADCU=P17B*E
C COMPUTE RATE FROM E TO GENERAL ASSISTANCE.
      ERGA=P17C*E
C ADCR IS THE LEVEL OF THE AID TO DEPENDENT CHILDREN - REGULAR
C CATEGORY OF WELFARE COMPUTE RATE FROM ADCR TO NON LABOR FORCE.
      ADRRNL=P18A*ADCR
C ADCU IS THE LEVEL OF THE AID TO DEPENDENT CHILDREN-UNEMPLOYED
C FATHERS CATEGORY OF WELFARE.
```

```
C COMPUTE RATE FROM ADCU TO NON LABOR FORCE.
      ADURNL=P19B*ADCU
C GA IS THE LEVLE OF THE GENERAL ASSISTANCE CATEGORY OF WELFARE.
C COMPUTE RATE FROM GA TO NON LABOR FORCE.
      GARNLF=P19C*GA
C COMPUTE RATE FROM ADCR TO UNEMPLOYMENT INSURANCE.
      ADRRUI=P19A*ADCR
C COMPUTE RATE FROM ADCU TO UNEMPLOYMENT INSURANCE.
      ADURUI=P19B*ADCU
C COMPUTE RATE FROM GA TO UNEMPLOYMENT INSURANCE.
      GARUI=P19C*GA
C COMPUTE RATE FROM ADCR TO WITHOUT BENEFITS CATEGORY.
      ADRRWO=P20A*ADCR
C COMPUTE RATE FROM ADCU TO WITHOUT BENEFITS CATEGORY.
      ADURWO=P20B*ADCU
C COMPUTE RATE FROM GA TO WITHOUT BENEFITS CATEGORY.
      GARWOB=P20C*GA
C COMPUTE RATE FROM ADCR TO EMPLOYMENT.
      ADCRPE=P21A*ADCR
C COMPUTE RATE FROM ADCU TO EMPLOYMENT.
      ADCURE=P21B*ADCU
C COMPUTE RATE FROM GA TO EMPLOYMENT.
      GARE=P21C*GA
C PA IS THE LEVEL OF PUBLIC ASSISTANCE (THE TOTAL EMPLOYABLE WELFARE
C CATEGORY).
C COMPUTE RATE FROM PA TO EMPLOYMENT.
      PARE=ADCRPE+ADCURE+GARE
C COMPUTE RATE FROM PA TO UNEMPLOYMENT INSURANCE.
      PARUI=ADRRUI+ADURUI+GARUI
C COMPUTE RATE FROM PA TO NON LABOR FORCE.
      PARNLF=ADRRNL+ADURNL+GARNLF
C COMPUTE RATE FROM E TO PUBLIC ASSISTANCE.
      ERPA=ERADCR+ERADCU+ERGA
C COMPUTE RATE FROM E TO UI (SINCE THE RATE ENTERING THE UNEMPLOYMENT
C INSURANCE SYSTEM, RUI, IS AN EXOGENOUS VARIABLE, ERUI IS CALCULATED
C AS A RESIDUAL).
      ERUI=RUI-WORRUI-PARUI-XNLFRUI
C COMPUTE THE NET RATE AFFECTING EMPLOYMENT.
      ENET=PARE+XNLFRE+UIEXPE+UILVPE+WORPE
      ENET=ENET-ERPA-ERNLF-ERUI-ERWOB
C COMPUTE THE NET RATE AFFECTING THE LABOR FORCE.
      XLFNET=XNLFER-WORRNL-ERNLF-UILRNL-UIXRNL-PARNLF
C COMPUTE THE NET RATE AFFECTING ADC-R.
      ADRNET=XNLRADR+ERADCR+WORACR+UXRADR+ULRADR
      ADRNET=ADRNET-ADRRWO-ADRRUI-ADCRPE-ADRRNL
C COMPUTE THE NET RATE AFFECTING ADC-U.
      ADUNET=XNLFADU+ERADCU+WORACU+UXRADU+ULRADU
      ADUNET=ADUNET-ADURWO-ADURUI-ADCURE-ADURNL
C COMPUTE THE NET RATE AFFECTING GENERAL ASSISTANCE.
      GANET=XNLFRGA+ERGA+WORRGA+UIXRGA+UILRGA
      GANET=GANET-GARWOB-GARUI-GARE-GARNLF
      RETURN
      END
      SUBROUTINE COST(I,REG,EXT,FSB,REGCOST,EXTCOST,FSBCOST,UICCST,RBENE
     +,EBENE,PERC,DCL,FN,NAWB)
C THIS SUBROUTINE CONVERTS THE NUMBER OF PEOPLE ON EACH OF THE UI
C SUBSYSTEMS INTO THE TOTAL COST FOR EACH OF THE SUBSYSTEMS EACH MONTH.
      DIMENSION RCOST(13),ECOST(13),FCOST(13),TCOST(13)
      DIMENSION RCOSTG(13),ECOSTG(13),FCOSTG(13),TCOSTG(13)
C THE PROGRAM MONTH NUMBER (1-156) ARE CONVERTED TO YEARLY MONTH
C NUMBERS (ALL JANUARYS ARE MONTH NUMBER 1, FEB. ARE ALL 2, ECT.).
```

```
      MONTH=I
      IF(NANB.EQ.5)GO TO 12
10    IF(MONTH.GT.12)MONTH=MONTH-12
      IF(MONTH.GT.12) GO TO 10
      DUM1=DUM2=DUM3=DUM4=DUM5=DUM6=DUM7=DUM8=DUM9=DUM10=DUM11=DUM12=0.0
      LCDUM1=LCDUM2=LCDUM3=LCDUM4=0.0
C THE MONTHS ARE SET TO DUMMY VALUES.
      IF(MONTH.EQ.1)DUM1=1
      IF(MONTH.EQ.2)DUM2=1
      IF(MONTH.EQ.3)DUM3=1
      IF(MONTH.EQ.4)DUM4=1
      IF(MONTH.EQ.5)DUM5=1
      IF(MONTH.EQ.6)DUM6=1
      IF(MONTH.EQ.7)DUM7=1
      IF(MONTH.EQ.8)DUM8=1
      IF(MONTH.EQ.9)DUM9=1
      IF(MONTH.EQ.10)DUM10=1
      IF(MONTH.EQ.11)DUM11=1
      IF(MONTH.EQ.12)DUM12=1
      IF(I.GE.4.AND.I.LT.25)LCDUUM1=1
C THE LEGISLATIVE CHANGE DUMMIES ARE SET.
      IF(I.GE.25.AND.I.LT.54)LCDUM2=1
      IF(I.GE.54.AND.I.LT.66)LCDUM3=1
      IF(I.GE.66)LCDUM4=1
C THE AVERAGE WEEKLY BENEFITS ARE DETERMINED BY REGRESSION EQUATIONS.
      REGAWP=LCDUM4*37.4+LCDUM3*21.5+LCDUM2*9.9+LCDUM1*6.67
     +-DUM6*2.79+DUM8*3.49+DUM2*3.11+DUM1*2.17+48.62+DUM3*3.02
      EXTAWP=LCDUM4*31.22+LCDUM3*7.68-DUM6*5.48+54.71
      FSBAWP=77.57
C GROW IS THE GROWTH FACTOR OF BENEFITS.
      GO TO 14
12    REGAWP=FBENE(I)
      EXTAWP=FBENE(I)
      FSBAWP=77.57
C THE WEEKS COMPENSATED ARE CALCULATED BY REGRESSION EQUATIONS.
14    REGWC=(3.61*REG-11820)
      EXTWC=(4.09*EXT+7443)
C THE COST IS CALCUATED BY MULTIPLYING THE NUMBER OF WEEKS COMPENSATED
C BY THE AVERAGE WEEKLY BENEFIT FOR THE MONTH.
      REGCOST=(REGWC*REGAWP)/1000
      EXTCOST=(EXTWC*EXTAWP)/1000
      FSBCOST=FSB*336.78/1000
C THE COSTS ARE SET TO ZERO IF THE NUMBER OF PEOPLE ON THE SYSTEM DROP
C BELOW A SET LIMIT.
      IF(REG.EQ.0.0)REGCOST=0.0
      IF(EXT.LT.1000.)EXTCOST=0.0
      IF(FSB.LT.1000.)FSBCOST=0.0
      UICOST=REGCOST+EXTCOST+FSBCOST
C THE COST FOR EACH YEAR IS CALCULATED AND PRINTED.
      K=I
      N=1
15    IF(K.LE.12)GO TO 20
C THIS SUBROUTINE PRINTS THE TABULAR OUTPUT AND CONVERTS THE MONTHLY
C DATA INTO A LINE PRINTER GRAPH OR IN A FORMAT USED BY THE CALCOMP.
      N=N+1
      K=K-12
      GO TO 15
20    CONTINUE
      IF(K.NE.1)GO TO 25
C THIS SECTION CALCULATES MONTHLY BENEFIT,CUMULATES THEM BY
C YEAR AND PRINTS THEM ON THE OUTPUT.
```

```
      IF(K.GE.87)GROW=(1+((K-87)*.01))
      DOLGROW=0.0
      PERGROW=0.0
      IF(I.LT.84)GO TO 144
      DOLGROW=DOL*(I-84)
      PERGROW=PERC**(I-84)
144   CONTINUE
      RCUM=ECUM=FCUM=TCUM=0.0
      RCUMG=ECUMG=FCUMG=TCUMG=0.0
25    RCUM=RCUM+REGCOST
      ECUM=ECUM+EXTCOST
      FCUM=FCUM+FSBCOST
      TCUM=TCUM+UICOST
      RCUMG=RCUMG+REGCOST
      ECUMG=ECUMG+EXTCOST
      FCUMG=FCUMG+FSBCOST
      TCUMG=TCUMG+UICOST
      IF(K.NE.12)GO TO 30
      RCOSTG(N)=RCUMG*(PERGROW+DOLGROW)
      ECOSTG(N)=ECUMG*(PERGROW+DOLGROW)
      FCOSTG(N)=FCUMG*(PERGROW+DOLGROW)
      TCOSTG(N)=TCUMG*(PERGROW+DOLGROW)
      RCOST(N)=RCUM
      ECOST(N)=ECUM
      FCOST(N)=FCUM
      TCOST(N)=TCUM
30    CONTINUE
      IF(I.NE.156)GO TO 40
      CALL TITLE(RN)
      PRINT 31
31    FORMAT(* ANNUAL COST BY PROGRAM IN THOUSANDS OF DOLLARS WITHOUT GR
     +OWTH FACTOR*
     +/5H YEAR,10X,3HREG,11X,3HEXT,11X,3HFSB,10X,5HTOTAL)
      DO 35 M=1,13
      IYR=M+1969
      PRINT 32,IYR,RCOST(M),ECOST(M),FCOST(M),TCOST(M)
32    FORMAT(1H ,I4,2X,4(4X,F10.2))
35    CONTINUE
      CALL TITLE(RN)
      PRINT 36
36    FORMAT(*  ANNUAL COST BY PROGRAM IN THOUSANDS OF DOLLARS  WITH GROW
     +TH FACTOR*//
     +5H YEAR,10X,3HREG,11X,3HEXT,11X,3HFSB,10X,5HTOTAL)
      DO 39 MM=1,13
      IYR=1969+MM
      PRINT 32,IYR,RCOSTG(MM),ECOSTG(MM),FCOSTG(MM),TCOSTG(MM)
39    CONTINUE
40    CONTINUE
      RETURN
      END
      SUBROUTINE TITLE(RN)
      INTEGER RN(7)
      WRITE(2,10)(RN(K),K=1,7)
10    FORMAT(*1MANPOWER SIMULATION MODEL   VERSION 1.1   JUNE,1977*/
     +*   DEVELOPED BY MICHIGAN STATE UNIVERSITY UNDER A CONTRACT WITH*/
     +* THE BUREAU OF*
     +* EMPLOYMENT AND TRAINING,MICHIGAN DEPARTMENT OF LABOR*,
     +/1H ,133(1H-)/20X,7A10/)
      RETURN
      END
      SUBROUTINE MOCPLT
```

```
      COMMON/PLTDATA/T,A(82),DT,DATAOUT,RN
      INTEGER DATAOUT
      DIMENSION RBUF(157,82),CBUF(157,82)
C THE MODEL GENERATED DATA IS STORED IN THE RBUF ARRAY AND COMPARISON
C DATA IN THE CBUFF ARRAY.
      DIMENSION IP(2,157),IPL(121)
      DIMENSION XP(159),YPA(159),YPB(159),IPLOT(1665)
      DATA CBUF/12874*0/
      DATA INT/0/
      DATA PLM/0/
C THE TABULAR OUTPUT IS STORED IN THE A ARRAY AND PRINTED EACH MONTH.
      ENTRY DATAPR
      IT=IFIX(T+(DT/2.))+1
      DO 1 I=1,82
 1    RBUF(IT,I)=A(I)
      IT=IT-1
      IF(DATAOUT.EQ.1)GO TO 444
      IF(IT.EQ.((IT/3)*3))CALL TITLE(RN)
      PRINT 1000,IT,A(1),A(2),A(8),A(9),A(16)
      PRINT 1001,A(3),A(4),A(10),A(11),A(17)
      PRINT 1002,A(5),A(6),A(12),A(13),A(18)
      PRINT 1003,A(7),A(14),A(15),A(19)
      PRINT 1004,A(20),A(21),A(22),A(23),A(24)
      PRINT 1005,A(25),A(26),A(27),A(28),A(29)
      PRINT 1006,A(30),A(31),A(32),A(33),A(34)
      PRINT 1007,A(35),A(36),A(37),A(38),A(39)
      PRINT 1008,A(40),A(41),A(42),A(43),A(44)
      PRINT 1009,A(45),A(46),A(47),A(48),A(49)
      PRINT 1010,A(50),A(51),A(52),A(53),A(54)
      PRINT 1011,A(55),A(56),A(57),A(58),A(59)
      PRINT 1012,A(60),A(61),A(62),A(63),A(64)
      PRINT 1013,A(65),A(66),A(67),A(68),A(69)
      PRINT 1014,A(70),A(71),A(72),A(73),A(74)
      PRINT 1015,A(75),A(76),A(77),A(78)
      PRINT 1016,A(79),A(80),A(81),A(82)
 1000 FORMAT (1H0,5HTIME ,I3,2X,5HPREGA,6X,F10.0,4X,5HPEGAR,6X,F10.0,4X,
     A6HPEGLVR,5X,F10.0,4X,6HREGEXR,5X,F10.0,4X,3HPEG,8X,F10.0)
 1001 FORMAT (11X,4HPEXT,7X,F10.0,4X,4HEXTR,7X,F10.0,4X,6HEXTLVR,5X,
     AF10.0,4X,6HEXTEXR,5X,F10.0,4X,3HEXT,8X,F10.0)
 1002 FORMAT (11X,4HPFSB,7X,F10.0,4X,4HFSBR,7X,F10.0,4X,6HFSBLVR,5X,
     AF10.0,4X,6HFSBEXR,5X,F10.0,4X,3HFSB,8X,F10.0)
 1003 FORMAT (11X,3HPUI,8X,F10.0,29X,5HUILVR,6X,F10.0,4X,5HUIEXR,6X,
     AF10.0,4X,2HUI,9X,F10.0)
 1004 FORMAT(11X,5HXNLFR,6X,F10.0,4X,6HUIEXRE,5X,F10.0,4X,6HUILVRE,5X,
     AF10.0,4X,5HERNLF,6X,F10.0,4X,4HERUI,7X,F10.0)
 1005 FORMAT(11X,5HWOBRE,6X,F10.0,4X,5HERWOB,6X,F10.0,4X,4HENET,7X,
     AF10.0,4X,4HERFA,7X,F10.0,4X,4HPARE,7X,F10.0)
 1006 FORMAT(11X,6HXNLFRE,5X,F10.0,4X,5HUIRNL,6X,F10.0,4X,6HUIXRNL,5X,
     AF10.0,4X,6HPARNLF,5X,F10.0,4X,6HXLFNET,5X,F10.0)
 1007 FORMAT(11X,6HWOBRNL,5X,F10.0,4X1HF,10X,F10.0,4X,3HXLF,8X,
     AF10.0,4X,1HU,10X,F10.0,4X,3HWOB,8X,F10.0)
 1008 FORMAT(11X,2HPA,9X,F10.0,4X,7HXNLFADP,4X,F10.0,4X,7HXNLPADU,4X,
     AF10.0,4X,7HXNLFRGA,4X,F10.0,4X,6HERADCP,5X,F10.0)
 1009 FORMAT(11X,6HERADCU,5X,F10.0,4X,4HERGA,7X,F10.0,4X,6HWOBACR,5X,
     AF10.0,4X,6HWOBADU,5X,F10.0,4X,6HWOBRGA,5X,F10.0)
 1010 FORMAT(11X,7HXNLFRUI,4X,F10.0,4X,6HWOBRUI,5X,F10.0,4X,5HPARUI,6X,
     AF10.0,4X,6HADPRNL,5X,F10.0,4X,6HADCRPE,5X,F10.0)
 1011 FORMAT(11X,6HADPRUI,5X,F10.0,4X,6HADRFWO,5X,F10.0,4X,6HADFNET,5X,
     AF10.0,4X,6HULFADP,5X,F10.0,4X,6HUXPADP,5X,F10.0)
 1012 FORMAT(11X,4HADCR,7X,F10.0,4X,6HADCURNL,5X,F10.0,4X,6HADCUFE,5X,
     AF10.0,4X,6HADURUI,5X,F10.0,4X,6HADURWO,5X,F10.0)
```

```
 1013 FORMAT(11X,6HADUNET,5X,F10.0,4X,6HULRADU,5X,F10.0,4X,6HUXRADU,5X,
     AF10.0,4X,4HADCU,7X,F10.0,4X,6HGARNLF,5X,F10.0)
 1014 FORMAT(11X,4HGAPE,7X,F10.0,4X,5HGARUI,6X,F10.0,4X,6HGARWOB,5X,
     AF10.0,4X,5HGANET,6X,F10.0,4X,6HUILRGA,5X,F10.0)
 1015 FORMAT(11X,6HUIXRGA,5X,F10.0,4X,2HGA,9X,F10.0,4X,5HEPEXT,6X,
     +F10.0,4X,5HEPFSB,6X,F10.0)
 1016 FORMAT(11X,7HPEGCOST,4X,F10.3,4X,7HEXTCOST,4X,F10.3,4X,7HFSBCOST,
     +4X,F10.3,4X,6HUICOST,5X,F10.3)
  444 CONTINUE
      RETURN
      ENTRY DATAPLT
      DO 30 I=1,157
   30 XP(I)=FLOAT(I-1)
      XP(158)=0.0
      XP(159)=6.0
C THE COMPARISON DATA IS READ INTO C BUF.  ALL C BUF VALUES NOT READ IN
C ARE SET TO 0.0 IN THE DATA STATEMENTS.
      READ (1,101)(CBUF(I, 8),I=2,97)
      READ (1,101)(CBUF(I, 9),I=2,97)
      READ (1,101)(CBUF(I,10),I=2,97)
      READ (1,101)(CBUF(I,11),I=2,97)
      READ (1,101)(CBUF(I,12),I=2,97)
      READ (1,101)(CBUF(I,13),I=2,97)
      READ (1,101)(CBUF(I,16),I=2,97)
      READ (1,101)(CBUF(I,17),I=2,97)
      READ (1,101)(CBUF(I,18),I=2,97)
      READ (1,101) (CBUF(I,15),I=2,97)
      READ (1,101) (CBUF(I,14),I=2,97)
      READ (1,101) (CBUF(I,40),I=2,97)
      READ (1,101) (CBUF(I,63),I=2,97)
      READ (1,101) (CBUF(I,68),I=2,97)
      READ (1,101) (CBUF(I,76),I=2,97)
      READ (1,101) (CBUF(I,37),I=2,97)
      READ (1,101) (CBUF(I,36),I=2,97)
      READ (1,101) (CBUF(I,38),I=2,97)
      READ (1,101) (CBUF(I,39),I=2,97)
      READ (1,101) (CBUF(I,19),I=2,97)
      READ (1,101) (CBUF(I,79),I=2,97)
      READ (1,101) (CBUF(I,80),I=2,97)
      READ (1,101) (CBUF(I,81),I=2,97)
  101 FORMAT(6F10.0)
C THE NAMES OF THE VARIABLES ARE READ IN AND SET TO 1 FOR A LINE PRINT
C AND 2 FOR A CALCOMP PLOT.  ANY OTHER VALUE SUPPRESSES THE OUTPUT.
  200 READ (1,102)NAME,IPC
  102 FORMAT (A10,I5)
      IF(NAME.EQ.5HSTEND) GO TO 99
      IF(IPC.LT.1.OR.IPC.GT.3) GO TO 901
      IC=0
      IF(NAME.EQ.6HREFGA  ) IC=1
      IF(NAME.EQ.6HREGAP  ) IC=2
      IF(NAME.EQ.6HREXT   ) IC=3
      IF(NAME.EQ.6HEXTP   ) IC=4
      IF(NAME.EQ.6HPFSB   ) IC=5
      IF(NAME.EQ.6HFSBP   ) IC=6
      IF(NAME.EQ.6HPUI    ) IC=7
      IF(NAME.EQ.6HPEGLVR ) IC=8
      IF(NAME.EQ.6HPEGEXR ) IC=9
      IF(NAME.EQ.6HEXTLVR ) IC=10
      IF(NAME.EQ.6HEXTEXR ) IC=11
      IF(NAME.EQ.6HFSBLVR ) IC=12
      IF(NAME.EQ.6HFSBEXR ) IC=13
```

```
      IF(NAME.EQ.6HUILVP  ) IC=14
      IF(NAME.EQ.6HUIEXP  ) IC=15
      IF(NAME.EQ.6HREG    ) IC=16
      IF(NAME.EQ.6HEXT    ) IC=17
      IF(NAME.EQ.6HESB    ) IC=18
      IF(NAME.EQ.6HUI     ) IC=19
      IF(NAME.EQ.5HXNLFR  ) IC=20
      IF(NAME.EQ.6HUIEXRE ) IC=21
      IF(NAME.EQ.6HUILVRE ) IC=22
      IF(NAME.EQ.5HTRNLF  ) IC=23
      IF(NAME.EQ.4HFRUI   ) IC=24
      IF(NAME.EQ.5HWOBRE  ) IC=25
      IF(NAME.EQ.5HFRWOB  ) IC=26
      IF(NAME.EQ.4HFNET   ) IC=27
      IF(NAME.EQ.4HFRPA   ) IC=28
      IF(NAME.EQ.4HFARE   ) IC=29
      IF(NAME.EQ.6HXNLFRE ) IC=30
      IF(NAME.EQ.6HUILRNL ) IC=31
      IF(NAME.EQ.6HUIXRNL ) IC=32
      IF(NAME.EQ.6HFARNLF ) IC=33
      IF(NAME.EQ.6HXLFNET ) IC=34
      IF(NAME.EQ.6HWOBRNL ) IC=35
      IF(NAME.EQ.1HF      ) IC=36
      IF(NAME.EQ.3HXLF    ) IC=37
      IF(NAME.EQ.1HU      ) IC=38
      IF(NAME.EQ.3HWOB    ) IC=39
      IF(NAME.EQ.2HRA     ) IC=40
      IF(NAME.EQ.7HXNLFADR) IC=41
      IF(NAME.EQ.7HXNLRADU) IC=42
      IF(NAME.EQ.7HXNLFRGA) IC=43
      IF(NAME.EQ.6HFRADCR ) IC=44
      IF(NAME.EQ.7HFRADCU ) IC=45
      IF(NAME.EQ.4HFRGA   ) IC=46
      IF(NAME.EQ.6HWORADR ) IC=47
      IF(NAME.EQ.6HWORADU ) IC=48
      IF(NAME.EQ.6HWOBRGA ) IC=49
      IF(NAME.EQ.7HXNLFRUI) IC=50
      IF(NAME.EQ.6HWOBRUI ) IC=51
      IF(NAME.EQ.5HRAFUI  ) IC=52
      IF(NAME.EQ.6HADRRNL ) IC=53
      IF(NAME.EQ.6HADCRRE ) IC=54
      IF(NAME.EQ.6HADRFUI ) IC=55
      IF(NAME.EQ.6HADRFWO ) IC=56
      IF(NAME.EQ.6HADRNET ) IC=57
      IF(NAME.EQ.6HADRNET ) IC=58
      IF(NAME.EQ.6HUXRADR ) IC=59
      IF(NAME.EQ.4HADCR   ) IC=60
      IF(NAME.EQ.6HADURNL ) IC=61
      IF(NAME.EQ.6HADCURE ) IC=62
      IF(NAME.EQ.6HADURUI ) IC=63
      IF(NAME.EQ.6HADURWO ) IC=64
      IF(NAME.EQ.6HADUNET ) IC=65
      IF(NAME.EQ.6HULRADU ) IC=66
      IF(NAME.EQ.6HUXRADU ) IC=67
      IF(NAME.EQ.4HADCU   ) IC=68
      IF(NAME.EQ.6HGARNLF ) IC=69
      IF(NAME.EQ.4HGARE   ) IC=70
      IF(NAME.EQ.5HGARUI  ) IC=71
      IF(NAME.EQ.6HGARWOB ) IC=72
      IF(NAME.EQ.5HGANET  ) IC=73
      IF(NAME.EQ.6HUILFGA ) IC=74
```

```
      IF(NAME.EQ.6HUIXPGA ) IC=75
      IF(NAME.EQ.2HGA     ) IC=76
      IF(NAME .EQ. 5HFREXT)IC=77
      IF(NAME .EQ. 5HFFFSB)IC=78
      IF(NAME.EQ.7HFEGCOST) IC=79
      IF(NAME.EQ.7HEXTCOST) IC=80
      IF(NAME.EQ.7HFSBCOST) IC=81
      IF(NAME.EQ.6HUICOST ) IC=82
      IF(IC.EQ.0) GO TO 900
      IF(IPC.EQ.2) GO TO 530
      IFLG=0
      MAXA=0.
      MAXB=0.
C LARGE VALUES ARE DIVIDED BY 10 OR 1000 TO ALLOW THEM TO AUTOMATICLY
C SCALE.
      DO 10 I=1,157
       IF(IC.EQ.36.OR.IC.EQ.37)RBUF(I,IC)=RBUF(I,IC)/10.
       IF(IC.EQ.36.OR.IC.EQ.37)CBUF(I,IC)=CBUF(I,IC)/10.
      IF(IC.GT.78.AND.IC.LE.82)CBUF(I,IC)=CBUF(I,IC)/1000.
      IF(RBUF(I,IC).GT.MAXA) MAXA=RBUF(I,IC)
      IF(CBUF(I,IC).GT.MAXB) MAXB=CBUF(I,IC)
   10 CONTINUE
      IF(MAXB.EQ.0.0) IFLG=1
       IF(MAXB.GT.MAXA) MAXA=MAXB
C THE AUTO SCALING FEATURE SETS THE SCALE TO THE LARGEST THAT WILL FIT
C ON THE PAGE.
       MAX=MAXA/76.
       DY=20000.
       IF(MAX.LE.10000.) DY=10000.
       IF(MAX.LE. 9000.) DY=9000.
       IF(MAX.LE. 8000.) DY=8000.
       IF(MAX.LE. 7500.) DY=7500.
       IF(MAX.LE. 7000.) DY=7000.
       IF(MAX.LE. 6000.) DY=6000.
       IF(MAX.LE. 5000.) DY=5000.
       IF(MAX.LE. 4000.) DY=4000.
       IF(MAX.LE. 3000.) DY=3000.
       IF(MAX.LE. 2500.) DY=2500.
       IF(MAX.LE. 2000.) DY=2000.
       IF(MAX.LE. 1000.) DY=1000.
       IF(MAX.LE.  900.) DY=900.
       IF(MAX.LE.  800.) DY=800.
       IF(MAX.LE.  750.) DY=750.
       IF(MAX.LE.  700.) DY=700.
       IF(MAX.LE.  600.) DY=600.
       IF(MAX.LE.  500.) DY=500.
       IF(MAX.LE.  400.) DY=400.
       IF(MAX.LE.  300.) DY=300.
       IF(MAX.LE.  250.) DY=250.
       IF(MAX.LE.  200.) DY=200.
       IF(MAX.LE.  100.) DY=100.
       IF(MAX.LE.   75.) DY=75.
       IF(MAX.LE.   50.) DY=50.
       IF(MAX.LE.   25.) DY=25.
       SUMAASQ=SUMBSQ=SUMAAB=N=SUMAA=SUMB=0.0
       RSQ=P=999999999
C THE FOLLOWING SECTION CALCULATES THE R-SQUARE AND MEAN STATISTICS.
       DO 20 I=1,157
       IYA=IFIX((RBUF(I,IC)/DY)+0.5)+1
      IF(IFLG.EQ.1) GO TO 21
       IYB=IFIX((CBUF(I,IC)/DY)+0.5)+1
```

```
 21   CONTINUE
      IP(1,I)=IYA
      IF(IFLG.EQ.1) GO TO 20
      IP(2,I)=IYB
       AA=ABUF(I,IC)
       B=CBUF(I,IC)
       IF(B.EQ.0.OR.AA.EQ.0)GO TO 20
       AAB=AA*B
       N=N+1
       SUMAAB=SUMAAB+AAB
       SUMAA=SUMAA+AA
       SUMB=SUMB+B
       SUMAASQ=SUMAASQ+AA**2
       SUMBSQ=SUMBSQ+B**2
 20   CONTINUE
      IF(IFLG.EQ.1)GO TO 26
      RSQ=((N*SUMAAB-(SUMAA*SUMB))**2)/((N*SUMAASQ-(SUMAA**2))
     +*(N*SUMBSQ-(SUMB**2)))
      AMEAN=SUMAA/N
      BMEAN=SUMB/N
      R=SQRT(RSQ)
26    PRINT 103,NAME,R,RSQ,N,AMEAN,BMEAN
       IF(IC.EQ.36.OR.IC.EQ.37)PRINT 109
109    FORMAT(1H+,5X,*MULTIPLY Y-AXIS VALUE BY 10 FOR ACTUAL FIGURE*)
 103  FORMAT (1H1,A10,42X,2HR=,F7.3,*  RSQUARED=*,F7.3,*  N=*,I3,
     +*  HIST.MEAN*,F7.0,*  MODEL MEAN*,F7.0)
C THE TOP LABLES ARE PRINTED ON THE LINE PRINTER PLOTS.
      PRINT 104
 104  FORMAT (11X,1HX,6(20H+++++++++++++++++++X),4H++++)
      DO 50 I=1,76
C THE SIDE BOARDER AND DATA POINTS ARE PLOTED ON THE LINE PRINTER PLOTS.
      IP=77-I
      DO 51 J=1,121
      IPL(J)=1H
      IF(IP(1,J).NE.IP) GO TO 60
      IPL(J)=1H1
 60   IF(IFLG.EQ.1) GO TO 51
      IF(IP(2,J).NE.IP) GO TO 51
      IF(IPL(J).NE.1H  ) IPL(J)=1H*
      IF(IPL(J).EQ.1H  ) IPL(J)=1H2
 51   CONTINUE
      PRINT 105,IPL
 105  FORMAT (10X,1H+,121A1,4X,1H+)
      IT=IP-1
      IF((IT-(IT/5)*5).NE.0) GO TO 50
      AY=DY*FLOAT(IT)
      PRINT 106,AY
 106  FORMAT (1H+,F7.0,2X,1HX,125X,1HX)
 50   CONTINUE
C THE BOTTOM AXIS IS PRINTED ON LINE PRINTER PLOTS.
      PRINT 104
      PRINT 107
107   FORMAT(12X,10(*JFMAMJJASOND*))
      PRINT 209
209   FORMAT(1H0,15X,4H1970,8X,4H1971,8X,4H1972,8X,4H1973,8X,
     +4H1974,8X,4H1975,8X,4H1976,8X,4H1977,8X,4H1978,8X,4H1979)
      IF(IPC.EQ.1) GO TO 200
 500  IF(INT.EQ.1) GO TO 501
C THE FOLLOWING ARE CONTROL CARDS FOR THE CALCOMP PLOTTING ROUTINE.  SEE
C M.S.U. COMPUTER LAB USERS GUIDE, VOL. VII FOR MORE INFORMATION.
      CALL PLOTS (IPLOT,1665,0)
```

```
      INT=1
      CALL PLOT (0.0,0.0,-3)
501   PLM=PLM+29.0
      CALL PLIMIT (PLM)
      YPA(1)=0.0
      YPB(1)=0.0
      IFLG=1
      DO 502 I=2,157
      YPA(I)=RAUF(I,IC)
      YPB(I)=SAUF(I,IC)
      IF(YPB(I).NE.0.0) IFLG=0
502   CONTINUE
      CALL SCALE (YPA,11.0,157,1)
      IF(IFLG.EQ.1) GO TO 503
      CALL SCALE (YPB,11.0,157,1)
      IF(YPA(157).LT.YPB(157)) YPA(157)=YPB(157)
      IF(YPA(157).GT.YPB(157)) YPB(157)=YPA(157)
503   CALL AXIS (0.0,0.0,NAME,10,11.0,90.0,YPA(98),YPA(157))
      CALL AXIT (0.0,0.0,1H ,-1,6.0,0.0,1,3,156,3,0.07,0.0,0.1,3,1970)
      IF(IFLG.EQ.1) GO TO 504
      CALL LINE (XP(2),YPB(2),156,1,0,0)
504   CALL NEWPEN (3)
      CALL GRID (0.0,0.0,26.0,11.0,2.0,1.0)
      CALL NEWPEN (2)
      CALL LINE (XP(2),YPA(2),156,1,0,0)
      CALL NEWPEN (1)
      CALL PLOT (28.0,0.0,-3)
      GO TO 200
900   GO TO 200
901   GO TO 200
99    PRINT 104
104   FORMAT (1H1)
      IF(INT.EQ.0) GO TO 505
      CALL PLOT (0.0,0.0,999)
505   CONTINUE
      END
```

```
WHITE,PN-511964,R33.
FTN.
COPIES,OUTPUT,1.
CATALOG,LGO,EFTMS(EXEC,MD=GET,ON=WRW,RP=999.
*EOR
      PROGRAM EXEC(INPUT,OUTPUT,TAPE1,TAPE99)
      DIMENSION VEC(156),E(24),UR(24),MO(12),EBENE(156),RBENE(156)
     +,PLOT(23),RN(7)
C THIS PROGRAM READS DATA FROM TAPE99 AND ALLOWS THE USER TO
      REWIND 99
C TRANSFORM IT BY SELECTING THE DESIRED OPTIONS.  THE DATA IS THEN
C WRITTEN ON TAPE1 IN A FORMAT USEABLE BY THE MODEL.
      REWIND 1
      PRINT 900
900   FORMAT(////* FOR ALL ENTRIES, TYPE A Y TO ANSWER YES AND A N TO AN
     +SWER NO*/
     +*      ALL ENTRIES MUST BE FOLLOWED BY A CARRIAGE RETURN*/
     +* TO TERMINATE THE RUN, DEPRESS THE ESCAPE KEY.*   )
      PRINT 901
901   FORMAT(* ENTER RUN NAME.THE NAME MAY BE UP TO 70 CHARACTERS LONG*
     +/* AND IS USED TO HELP IDENTIFY THE OUTPUT*)
      READ 902,RN(1),RN(2),RN(3),RN(4),RN(5),RN(6),RN(7)
902   FORMAT(7A10)
      WRITE(1,902)(RN(L),L=1,7)
C THIS OPTION PRINTS THE MONTH NUMBERS BY YEAR
      PRINT 910
910   FORMAT(* DO YOU WANT A CALENDAR PRINTED= *)
C IYN IS THE RESULT OF CALLING SUBROUTINE YORN.  IYN IS A Y FOR
C YES AND A N FOR NO.
      CALL YORN(IYN)
      IF(IYN.EQ.1HN) GO TO 10
      PRINT 904
904   FORMAT(*-        JAN   FEB   MAR   APR   MAY   JUN   JUL   AUG   SEP   OCT*
     +*   NOV   DEC*)
      DO 4 J=1,13
      DO 5 K=1,12
      IYR=1969+J
      MO(K)=((J-1)*12)+K
5     CONTINUE
      PRINT 905,IYR,MO
905   FORMAT(I5,12(2X,I3))
4     CONTINUE
C NMOS IS THE LAST MONTH NUMBER THAT CONTAINS UPDATED DATA
10    NMOS=84
      PRINT 930,NMOS
930   FORMAT(* HAS HISTORICAL DATA BEEN UPDATED PAST MONTH NUMBER*I4,
     +*=*)
      CALL YORN(IYN)
      IF(IYN.EQ.1HN) GO TO 13
12    PRINT 940
940   FORMAT(* THROUGH WHICH MONTH NUMBER HAS THE DATA BEEN UPDATED=*)
      READ *,NMOS
      IF(NMOS.GT.84 .AND. NMOS.LT. 156) GO TO 13
      PRINT 944
944   FORMAT(* INVALID ENTRY.  TRY AGAIN*)
      GO TO 12
C VEC IS AN ARRAY IN WHICH DATA IS STORED BEFORE IT IS
C WRITTEN ON TAPE1.
13    READ(99,950)(VEC(I),I=1,NMOS)
950   FORMAT(6F10.0)
      WRITE(1,945)NMOS
```

```
945     FORMAT (I5)
        WRITE(1,951)(VEC(I),I=1,NMOS)
        PRINT 960
960     FORMAT(* DO YOU WANT TO USE OPTIMISTIC FORECASTS (ENTER Y )OR PESS
       +IMISTIC*/* FORECASTS(ENTER N )OF EMPLOYMENT AND UNEMPLOYMENT RATES
       +E*)
        CALL YORN(IYN)
        IF(IYN.EQ.1HN)GO TO 14
        WRITE(1,961)
961     FORMAT(*OPTIMISTIC*)
        GO TO 11
14      WRITE(1,962)
962     FORMAT(*PESSIMISTIC*)
11      IF(IYN.EQ.1HN) GO TO 20
C IF OPTIMISTIC FORCASTS ARE USED,EMPLOYMENT AND UNEMPLOYMENT
C ARE READ FROM THE FIRST 8 CARDS.THE NEXT 8 CARDS CONTAINING
C PESSIMISTIC DATA ARE THEN SKIPPED.  THING IS USED AS A
C PLACEHOLDER ONLY.
        READ(99,951)( E(I),I=1,24)
        READ(99,951)(UR(I),I=1,24)
        READ (99,965)THING
965     FORMAT(F3. ,////////)
        GO TO 25
C IF PESSIMISTIC VALUES ARE USED,THE FIRST 8 CARDS ARE SKIPPED.
C SCRAP IS USED AS A PLACEHOLDER ONLY.  THEN EMP. AND UR.
C DATA IS READ FROM THE NEXT 8 CARDS.
20      READ (99,965)SCRAP
        READ(99,951)( E(I),I=1,24)
        READ(99,951)(UR(I),I=1,24)
C THIS SECTION ALLOWS THE USER TO MAKE CHANGES IN QUARTERLY
C EMPLOYMENT AND UNEMPLOYMENT FORCASTS.
25        PRINT 970
970     FORMAT(* DO YOU WISH A LISTING OF EMPLOYMENT AND UNEMPLOYMENT DATA
       + */* FOR POSSIBLE CHANGES=*)
        CALL YORN(IYN)
        IF(IYN.EQ.1HN) GO TO 35
        IC=0
        DO 29 K=1977,1982
         DO 29 J=1,4
         IC=IC+1
         PRINT 975,K,J,E(IC),UR(IC),IC
29       CONTINUE
975      FORMAT(I5,1H.,I1,*  EMPLOYMENT= *,F8.0,*  UNEMPLOYMENT RATE=*,F8.4
        +*  QTR NO.= *,I3)
         PRINT 800
800      FORMAT(* DO YOU WISH TO ALTER ANY EMPLOYMENT OR UNEMPLOYMENT VALUE
        +S=*)
         CALL YORN(IYN)
         IF(IYN.EQ.1HN) GO TO 35
         PRINT 985
985      FORMAT(* FOR EACH VALUE TO BE ALTERED ENTER 1 IF IT IS AN EMPLOY*
        +*MENT FIGURE*/
        +*OR 2 IF IT IS AN UNEMPLOYMENT RATE . ENTER THE QUARTER NUMBER*/
        +* (BETWEEN 1 AND 24) AND THE NEW VALUES. ENTRIES ARE SEPARATED BY
        +ONE COMMA.*/* WHEN ALL CORRECTIONS HAVE BEEN ENTERED,TYPE 9,9,9
        +*/*.  THE FOLLOWING IS A SAMPLE *//* 1,12,3907000*//* ONLY ONE COR
        +RECTION PER LINE IS PERMITTED.   COMMAS MUST */* INSERTED ONLY AFT
        +ER THE 1 OR 2 AND THE QUARTER NUMBER.*)
30       READ *, IT,NO, VAL
         IF(IT .EQ. 9) GO TO 35
         IF(IT.EQ.1.AND.VAL.LT.2400000.OR.IT.EQ.1.AND.VAL.GT.4500000)
```

```
     +GO TO 31
      GO TO 32
31    PRINT 986,VAL
986   FORMAT(F10.1*IS AN INVALID ENTRY. TRY AGAIN*)
      GO TO 30
32    IF(IT.EQ.2.AND.VAL.GT.0.2)GO TO 33
      GO TO 34
33    PRINT 987,VAL
987   FORMAT(F10.5*IS AN INVALID ENTRY.  UNEMPLOYMENT RATE*/
     +* SHOULD BE IN DECIMAL FORM.  TRY AGAIN*)
      GO TO 30
34    CONTINUE
      IF(IT .EQ. 1) E(NO)=VAL
      IF(IT .EQ. 2) UR(NO)=VAL
      GO TO 30
35    CONTINUE
C SUBROUTINE INTERP INTERPOLATES THE QUARTERLY DATA AND
C MAKES RUI FORCASTS.
45    CALL INTERP (E,UR,NMOS,INT,1)
      DO 50 I=1,156
50    VEC(I)=1.0
      PRINT 1000
1000  FORMAT(* DO YOU WANT TO HAVE THE INSURED UNEMPLOYMENT RATE TRIGGER
     + THE */* EXTENDED PROGRAM? Y OR N?*)
      CALL YORN(IYN)
      IF(IYN .EQ. 1HY) GO TO 55
C IAUTO IS SET TO 1 IF THERE IS TO BE AUTOMATIC TRIGGERING
C OF THE EXTENDED PROGRAM AND IS SET TO 2 IF THE USER IS
C IS GOING TO TRIGGER THE PROGRAMS.
      IAUTO=2
      GO TO 60
55    IAUTO=1
60    WRITE (1,945) IAUTO
      IF(IAUTO .EQ. 1) GO TO 90
C THIS SECTION ALLOWS THE USER TO SET WHEN THE EXTENDED
C AND FSB PROGRAMS TURN ON AND OFF.
      PRINT 1010
1010  FORMAT (* THE REGULAR BENEFITS PROGRAM IS THE DEFAULT OPTION. YOU
     +CAN */* CHANGE TO EXTENDED BY ENTERING 1, STARTING MONTH NUMBER,
     +ENDING */  MONTH NUMBER, OR FEDERAL SUPPLEMENTARY BENEFITS BY
     +ENTERING */* 2, STARTING MONTH NUMBER, ENDING MONTH NUMBER. SAM*
     +*PLE INPUT */* WOULD BE *//* 1, 87, 91, *//* OR *//* 2, 84,101
     +*//* EACH ENTRY IS ONE LINE, ENTRIES ARE SEPARATED BY COMMAS. TYPE
     +*/* 9,9,9, WHEN ALL ENTRIES ARE COMPLETE.*)
65    READ *, IPROG, M1, ML
      IF(IPROG .EQ. 9 ) GO TO 101
      IF (IPROG .EQ. 1 ) GO TO 70
      IF (IPROG .EQ. 2) GO TO 80
      GO TO 65
70    DO 75 I=M1, ML
75    VEC (I)=2
      GO TO 65
80    DO 85 I= M1, ML
85    VEC(I)=3
      GO TO 65
90    DO 95 I=1,11
95    VEC(I)=1
      DO 96 I=12,28
96    VEC(I)=2
      DO 97 I=29,51
97    VEC(I)=1
```

```
      DO 98 I=52, 156
98    VEC(I)=2
      DO 99 I=62, 94
      VEC(I)=3
99    CONTINUE
101   CONTINUE
      WRITE(1,1020)(VEC(I),I=1,156)
1020  FORMAT(40F2.0)
      PRINT 1025
C THE USER CAN SET FSB TO A 13 WEEK PROGRAM.
1025  FORMAT(* DO YOU WANT TO CHANGE FSB TO A 13 WEEK PROGRAM ANYTIME IN
     + THE FUTURE*/* (THE DEFALT VALUE IS 58)*)
      CALL YORN(IYN)
      IF(IYN .EQ. 1HN)GO TO 100
      PRINT 1030
1030  FORMAT(* ENTER THE MONTH NUMBER OF THE CHANGE TO 13 WEEK *)
      READ *, NFSB
100   WRITE (1, 1034)
1034  FORMAT(3X*58*)
      PRINT 1035
C THE USER CAN SET THE RATE OF COVERED EMPLOYMENT.
1035  FORMAT(* THE DEFAULT VALUE FOR COVERED UNEMPLOYMENT IN THE*/
     +* FUTURE IS 95 PER CENT. DO YOU WANT TO ALTER THIS VALUE ?*)
      CALL YORN (IYN)
      IF(IYN.EQ.1HN)GO TO 105
      PRINT 1040
1040  FORMAT(* ENTER THE PER CENT COVERED EMPLOYMENT AS A TWO DIGIT*/
     +* VALUE WITHOUT A DECIMAL.*)
1039  READ *,NCE
      IF(NCE.LE.100.AND.NCE.GE.70)GO TO 102
103   PRINT 1041,NCE
1041  FORMAT(I5*IS AN INVALID ENTRY.  TRY AGAIN*)
      GO TO 1039
102   CONTINUE
      WRITE(1,945)NCE
      GO TO 110
105   NCE=95
      WRITE(1,945)NCE
110   CONTINUE
      PRINT 1045
C 0 IS WRITTEN ON TAPE1 IF THE TABULAR LISTING IS TO BE
C SUPPRESSED.  1 IS WRITTEN ON TAPE1 IF THE LISTING IS NOT
C TO BE SUPPRESSED.
1045  FORMAT(* DO YOU WISH TO SUPPRESS THE TABULAR LISTING*
     +* OF THE*/* MONTHLY VALUES FOR ALL VARIABLES?*)
      CALL YORN (IYN)
      IF(IYN.EQ.1HY)GO TO 115
      WRITE(1,1050)
1050  FORMAT(4X,*0*)
      GO TO 120
115   WRITE(1,1055)
1055  FORMAT(4X,*1*)
120   CONTINUE
121   PRINT 1060
C THIS SECTION ALLOWS THE USER TO SET THE GROWTH OF AVERAGE
C WEEKLY BENEFITS
1060  FORMAT(* THERE ARE FIVE POSSIBLE WAYS TO CONTROL THE GROWTH OF*/
     +* AVERAGE WEEKLY BENEFITS.*/* TYPE 1 TO HOLD THE RATE CONSTANT*
     +* OVER TIME.*/* TYPE 2 TO ALLOW FOR A CERTAIN DOLLAR INCREASE*/
     +*      PER MONTH WHICH YOU WILL THEN BE ASKED TO SPECIFY.*/
     +* TYPE 3 TO ALLOW FOR BENEFIT LEVEL GROWTH BY A FIXED*/
```

```
     +*      PERCENTAGE PER MONTH WHICH YOU CAN ALSO SPECIFY.*/
     +* TYPE 4 TO ALLOW THE HISTORICAL PER CENT INCREASE*/
     +*      PER MONTH OF .00541 TO OPERATE INTO THE FUTURE.*/
     +* TYPE 5 TO ALLOW FOR STEP INCREASES OF AVERAGE WEEKLY*
     +/*     BENEFIT LEVEL*)
      READ  ,NAWB
      IF(NAWB.LT.1.OR.NAWB.GT.5)GO TO 125
      GO TO 130
125   PRINT 944
      GO TO 121
C NAWB IS THE USER OPTION SELECTED(1-5).
130   WRITE(1,945)NAWB
1065  FORMAT(F10.5)
      GO TO (135,145,155,165,166)NAWB
135   WRITE(1,1066)
1066  FORMAT(*0.000*)
      GO TO 170
145   PRINT 1072
1072  FORMAT (* ENTER THE DOLLAR INCREASE PER MONTH WITH A DECIMAL .*/
     +* FOR EXAMPLE * - 00.15    *)
C DOL IS THE DOLLAR INCREASE PER MONTH.
      READ *,DOL
      WRITE(1,1065)DOL
      GO TO 170
155   PRINT 1075
1075  FORMAT(* ENTER THE PERCENT LEVEL OF GROWTH PER MONTH WITH A */
     +/* FOR EXAMPLE.005  WOULD MEAN HALF OF ONE PER CENT PER MONTH.*)
      READ *,PERC
C PERC IS THE PERCENTAGE GROWTH PER MONTH.
      IF(PERC.LT.0.1)GO TO 156
      PRINT 1076,PERC
1076  FORMAT(F10.5* IS OUT OF BOUNDS.  TRY AGAIN*)
      GO TO 155
156   CONTINUE
      WRITE(1,1065) PERC
      GO TO 170
165   WRITE(1,1080)
C THE HISTORICAL GROWTH RATE(1.00541) IS WRITTEN ON TAPE1.
1080  FORMAT(*    1.00541*)
      GO TO 170
166   PRINT 1081
C THIS SECTION ALLOWS THE USER TO BUILD A PROFILE OF REG. AND
C EXT. BENEFIT LEVELS.
1081  FORMAT(* FOR THE REGULAR PROGRAM ENTER THE MONTH,A *
     +* COMMA, AND THE */* DOLLAR AMOUNT OF THE STEP INCREASE FOR EACH*
     +* STEP.  EXAMPLE*//*44,51.42*//* THE DEFAULT VALUE IS 48.62.  TYPE
     + 999,999 TO END*)
      DO 167 K=1,156
C RBENE IS AN ARRAY CONTAINING BENEFIT LEVELS FOR THE REG PROGRAM.
167   RBENE(K)=48.62
1769  READ *,MOX,AMT
      IF(MOX.GT.156)GO TO 169
      DO 168 K=MOX,156
168   RBENE(K)=AMT
      GO TO 1769
169   PRINT 1082
1082  FORMAT(* ENTER THE MONTH, A COMMA, AND THE DOLLAR AMOUNT FOR THE*
     +* EXTENDED*/* PROGRAM.  ENTER 999,999 TO END*)
      DO 1770 K=1,156
C     EBENE IS AN ARRAY CONTAINING BENEFIT LEVELS FOR THE EXT PROGRAM.
1770  EBENE(K)=54.71
```

```
9999    READ *,MOX,AMT
        IF(MOX.GT.156)GO TO 1775
        DO 1771 K=MOX,156
1771    EBENE(K)=AMT
        GO TO 9999
1775    PRINT 1873
1873    FORMAT(* DO YOU WISH A PROFILE OF REGULAR AND EXTENDED BENEFIT*
       +* LEVELS? Y OR N?*)
        CALL YORN(IYN)
        IF(IYN.EQ.1HN)GO TO 170
        START=RBENE(1)
        NUMF=1
        DO 171 K=1,156
        IF(RBENE(K).EQ.START)GO TO 171
        PRINT 1894,NUMF,K,START
1894    FORMAT(* FROM MONTH*I4*  TO MONTH*I4* REGULAR BENEFIT LEVEL=*F6.2)
        START=RBENE(K)
        NUMF=K+1
171     CONTINUE
        K=156
        PRINT 1894,NUMF,K,START
        START=EBENE(1)
        NUMF=1
        DO 172 K=1,156
        IF(EBENE(K).EQ.START)GO TO 172
        PRINT 1895,NUMF,K,START
1895    FORMAT(* FROM MONTH*I4*  TO MONTH*I4,
       +* EXTENDED BENEFIT LEVEL=*F6.2)
        START=EBENE(K)
        NUMF=K+1
172     CONTINUE
        K=156
        PRINT 1895,NUMF,K,START
        PRINT 1893
1893    FORMAT(* DO YOU WISH TO SCRATCH THIS PROFILE AND START AGAIN?*)
        CALL YORN(IYN)
        IF(IYN.EQ.1HY)GO TO 166
C THE ARRAYS CONTAINING BENEFIT LEVELS ARE WRITTEN ON TAPE1.
        WRITE(1,1089)(RBENE(I),I=1,156)
        WRITE(1,1089)(EBENE(I),I=1,156)
170     CONTINUE
1089    FORMAT(10F6.2)
C DATA UPDATED TO NMOS IS WRITTEN FROM TAPE99 TO TAPE1.
C DATA FROM MONTH NMOS+1 TO 156 IS WRITTEN ON TAPE1 FROM INTERP.
        READ(99,950)(VEC(I),I=1,NMOS)
        WRITE(1,1085)(VEC(I),I=1,NMOS)
1085    FORMAT(6F10.4)
        CALL INTERP (E,UR,NMOS,INT,2)
        READ(99,950)(VEC(I),I=1,NMOS)
        WRITE(1,1085)(VEC(I),I=1,NMOS)
        CALL INTERP (E,UR,NMOS,INT,3)
        READ(99,950)(VEC(I),I=1,NMOS)
        WRITE(1,950)(VEC(I),I=1,NMOS)
        CALL INTERP (E,UR,NMOS,INT,4)
        WRITE(1,950)(E(I),I=1,24)
        WRITE(1,1085)(UR(I),I=1,24)
        DO 176 J=1,23
        READ(99,950)(VEC(I),I=1,96)
        WRITE(1,950)(VEC(I),I=1,96)
176     CONTINUE
        READ(99,1090)(PLOT(K),K=1,23)
```

```
1090  FORMAT(A10)
      PRINT 1091
1091  FORMAT(* THE FOLLOWING IS A LIST OF VARIABLES AND THEIR CODE
     +  NUMBERS*)
      DO 200 K=1,23
      PRINT 1092,PLOT(K),K
200   CONTINUE
1092  FORMAT(1H ,A10,I3)
      PRINT 1093
1093  FORMAT(* ENTER THE CODE NUMBERS OF THE VARIABLES YOU WISH TO HAVE*
     +* PLOTTED ON THE*/* LINE PRINTER.  ONE ENTRY PER LINE.  TYPE 999
     + TO END*)
205   READ*,N
      IF(N.GT.23)GO TO 210
      WRITE(1,1094)PLOT(N)
1094  FORMAT(A10,4X,1H1)
      GO TO 205
210   PRINT 1095
1095  FORMAT(* ENTER THE CODE NUMBERS OF THE VARIABLES YOU WISH TO PLOT*
     +* ON THE */* CALCOMP. ONE ENTRY PER LINE.  TYPE 999 TO END*)
215   READ*,N
      IF(N.GT.23)GO TO 220
C THE PLOT NAMES AND DIRECTIONS(1 FOR LINE PRINTER, 2 FOR
C CAL COMP)ARE WRITTEN ON TAPE1.
      WRITE(1,1096)PLOT(N)
1096  FORMAT(A10,4X,1H2)
      GO TO 215
220   WRITE(1,1105)
1105  FORMAT(*S END*)
      PRINT 2000
2000  FORMAT(* THIS RUN IS COMPLETED.  IF YOU DO NOT*
     +* WISH AN ADDITIONAL RUN*/*  WAIT UNTIL THE PROGRAM*
     +* ASKS FOR THE RUN NAME BEFORE YOU USE THE ESCAPE KEY*)
      STOP
      END
      SUBROUTINE YORN (IYN)
C SUBROUTINE YORN IS CALLED EACH TIME A YES OR
C NO QUESTION IS ASKED.  IYN=Y FOR YES AND N FOR NO.
5     READ 900,IYN
900   FORMAT(A1)
      IF(IYN.EQ.1HY.OR.IYN.EQ.1HN)RETURN
      PRINT 910
910   FORMAT(* Y OR N =*)
      GO TO 5
      END
      SUBROUTINE INTERP(E,UR,NMOS,INT,NUM)
C THIS SUBROUTINE INTERPOLATES THE QUARTLY DATA, ADJUSTS THE
C RESULTS OF THE INTERPOLATION, CALCULATES FIRST PAYMENTS, INITIAL
C ADDITIONALS, AND RUI AND WRITES THE RESULTS ON TAPE 1.
      REAL INFAC,LAGAIN,IN
      DIMENSION PUR(72), PE(72), UR(24), E(24), RUI(72),APUR(72),APE(72)
      GO TO (1,400,500,600)NUM
1     DO 5 K=1, 24
      IF(K.EQ.24)GO TO 3
      URDIF=(UR(K+1)-UR(K))/3
      EDIF=(E(K+1)-E(K))/3
3     J=((K*3)-1)
      PUR(J)=UR(K)+0.0
      PUR(J-1)=PUR(J)-URDIF
      PUR(J+1)=PUR(J)+URDIF
      PE(J)=E(K)
```

```
         PF(J-1)=PF(J)-EDIF
         PF(J+1)=PF(J)+EDIF
5        CONTINUE
C THE MONTH NUMBER CALCULATED BY THE PROGRAM (1*156) IS
C CONVERTED TO CALENDAR MONTH NUMBER (1*12).
50       DO 65 K=1, 72
         MONTH=K
52       IF(MONTH .LE. 12) GO TO 55
         MONTH=MONTH-12
         GO TO 52
C UNEMP., EMPLOY., FIRST PAYMENT, AND INITIAL ADDITION FACTORS
C ARE DETERMINED BASED ON THEIR MONTH NUMBERS.
55       GO TO (130,140,150,160,170,180,190,200,210,220,230,240) MONTH
130      UNFAC=1.072
         FFFAC=1.616
         INFAC=1.329
         GO TO 250
140      UNFAC=1.1[illegible]8
         FFFAC=1.525
         INFAC=1.4[illegible]2
         GO TO 250
150      UNFAC=1.159
         FFFAC=1.0[illegible]4
         INFAC=1.123
         GO TO 250
160      UNFAC=1.073
         FFFAC=.86[illegible]
         INFAC=1.034
         GO TO 250
170      UNFAC=.942
         FFFAC=.79[illegible]
         INFAC=.76[illegible]
         GO TO 250
180      UNFAC=1.0[illegible]5
         FFFAC=.65[illegible]
         INFAC=.854
         GO TO 250
190      UNFAC=1.171
         FFFAC=1.115
         INFAC=1.658
         GO TO 250
200      UNFAC=1.064
         FFFAC=2.349
         INFAC=.394
         GO TO 250
210      UNFAC=.812
         FFFAC=.671
         INFAC=.633
         GO TO 250
220      UNFAC=.796
         FFFAC=.611
         INFAC=.65[illegible]
         GO TO 250
230      UNFAC=.655
         FFFAC=.724
         INFAC=.86[illegible]
         GO TO 250
240      UNFAC=.895
         FFFAC=1.052
         INFAC=1.178
250      CONTINUE
```

```
C ADJUSTED EMPLOYMENT AND ADJUSTED UNEMPLOY. RATE ARE CALCULATED.
C AIN= ADJUSTED INITIAL ADDITIONALS.
C AFP= ADJUSTED FIRST PAYMENTS.
      APUR(K)=PUR(K)/URFAC
      INRHO=0.775
      FPRHO=0.642
      IF(K .LE. 1) GO TO 260
C TAF= TRANSFORMED ADJUSTED FIRST PAYMENT.
C TUR= TRANSFORMED ADJUSTED INITIAL ADDITIONAL.
      TUR1=APUR(K)-INRHO*APUR(K-1)
      TUR2=APUR(K)-FPRHO*APUR(K-1)
      TIA=TUR1*116392-1323
      TFP=TUR2*112956-1265
      AIN=TIA+INRHO*LAGAIN
      AFP=TFP+FPRHO*LAGAFP
      LAGAIN=AIN
      LAGAFP=AFP
      IN=AIN/INFAC
      FP=AFP/FPFAC
      RUI(K)=(IN+FP)*4.345
      GO TO 65
260   LAGAIN=39725
      LAGAFP=61116
      RUI(1)=100891
65    CONTINUE
      MM=MONS-67
C RUI IS WRITTEN ON TAPE 1.
      WRITE(1,900)(RUI(I),I=MM,72)
900   FORMAT(6F10.0)
      RETURN
C PREDICTED UNEMPLOYMENT RATE IS WRITTEN ON TAPE 1.
400   WRITE(1,910)(PUR(I),I=MM,72)
910   FORMAT(6F10.6)
      RETURN
500   WRITE(1,910)(PUR(I),I=MM,72)
      RETURN
C PREDICTED EMPLOYMENT RATE IS WRITTEN ON TAPE 1.
600   WRITE(1,910)(PE(I),I=MM,72)
      RETURN
      END
```

71031,	112184,	67451,	[illegible]	48181,	50444,	RUI	1
66931,	103320,	51799,	50587,	72975,	76558,	RUI	2
90981,	78139,	55330,	54189,	50648,	44611,	RUI	3
63034,	108710,	46305,	[illegible]	51495,	63334,		4
69592,	54613,	47799,	37923,	33841,	50256,	RUI	5
116667,	63147,	29168,	29197,	38201,	49549,	RUI	6
51425,	39539,	36889,	31195,	26814,	27126,	RUI	7
34653,	53371,	25602,	[illegible]	34192,	71794,	RUI	8
149833,	178597,	168613,	95915,	69279,	48454,	RUI	9
84936,	134346,	50318,	[illegible]	103203,	176300,	RUI	10
232759,	190456,	151553,	107224,	79308,	72819,	RUI	11
122916,	135189,	67612,	69195,	79568,	94990,	RUI	12
94851,	74565,	65062,	51760,	48507,	49951,	RUI	13
82387,	88966,	52073,	50182,	74526,	93850,	RUI	14
99485,	90547,	61332,	50097,	47840,	41557,	RUI	14,1
66736,	89695,	45478,	0,	0,	0,	RUI	14,2
3672850,	3827900,	3870150,	3930530,	3865460,	3980010,	OPT EMP	15
3976620,	4012470,	3926210,	4042760,	4058600,	4110300,	OPT EMP	16
4034570,	4154530,	4172340,	4221630,	4048200,	4147300,	OPT EMP	17
4145500,	4184400,	4192300,	4195000,	4181600,	4209100,	OPT EMP	18
,08900000	,07500000	,07400000	,06000000	,07100000	,06800000	OPT UR	19
,07300000	,06300000	,07300000	,06700000	,06900000	,05700000	OPT UR	20
,06500000	,06200000	,06400000	,05200000	,05800000	,05800000	OPT UR	21
,06100000	,05000000	,05500000	,05500000	,06100000	,05000000	OPT UR	22
3672960,	3811700,	3644250,	3906210,	3820840,	3929420,	PES EMP	23
3920940,	3942470,	3816220,	3927440,	3844190,	3907310,	PES EMP	24
3821340,	3951900,	3967800,	4012830,	3904400,	4009900,	PES EMP	25
4002030,	4044100,	3949300,	4052000,	4047200,	4083600,	PES EMP	26
,08900000	,07900000	,07900000	,06200000	,07700000	,07400000	PES UR	27
,07800000	,07100000	,08700000	,06000000	,08900000	,07900000	PES UR	28
,08800000	,07600000	,08000000	,06800000	,07500000	,07300000	PES UR	29
,07800000	,06601000	,07500000	,07200000	,07600000	,06400000	PES UR	30
0,056	0,070	0,064	0,059	0,054	0,066	UR	31
0,083	0,073	0,061	0,066	0,076	0,076	UR	32
0,086	0,087	0,087	0,078	0,070	0,079	UR	33
0,089	0,082	0,061	0,061	0,064	0,070	UR	34
0,076	0,084	0,088	0,081	0,067	0,074	UR	35
0,082	0,068	0,054	0,053	0,055	0,056	UR	36
0,064	0,064	0,066	0,060	0,055	0,066	UR	37
0,063	0,059	0,050	0,051	0,051	0,056	UR	38
0,078	0,099	0,096	0,087	0,079	0,088	UR	39
0,081	0,081	0,071	0,073	0,084	0,109	UR	40
0,132	0,144	0,142	0,139	0,118	0,135	UR	41
0,129	0,118	0,109	0,112	0,111	0,114	UR	42
0,122	0,117	0,114	0,102	0,097	0,102	UR	43
0,116	0,094	0,089	0,086	0,088	0,090	UR	44
0,091	0,087	0,081	0,072	0,066	0,068	UR	44,1
0,070	0,070	0,058	0,	0,	0,	UR	44,2
,060600	,060600	,060600	,062600	,065200	,06700	US UR	45
,067400	,069800	,071800	,070400	,073000	,07820	US UR	46
,082400	,082800	,081600	,080200	,080600	,07950	US UR	47
,076200	,074400	,071400	,067600	,066400	,07100	US UR	48
,076400	,079800	,079200	,078800	,078400	,07440	US UR	49
,069300	,065200	,062400	,057200	,056400	,05840	US UR	50
,061000	,062000	,061800	,062200	,062000	,06050	US UR	51
,053600	,057800	,054800	,055400	,057200	,06700	US UR	52
,076000	,083200	,087800	,089800	,086200	,08320	US UR	53
,080000	,074800	,078000	,085600	,093800	,10840	US UR	54
,122200	,132400	,134200	,134800	,131800	,12700	US UR	55
,121200	,121600	,115800	,112800	,113600	,11520	US UR	56
,115400	,113800	,110400	,106400	,104200	,08000	US UR	57
,078000	,076000	,074000	,072000	,074000	,07400	US UR	58
,073000	,075000	,073000	,070000	,069000	,07100	US UR	58,1
,069000	,071000	,069000				US UR	58,2

3320100	3283900	3305800	3333300	3377900	3397100	E1P	59
3312500	3314400	2376400	3376200	3340800	3344300	E1P	60
3283400	3280600	3298800	3329400	3403300	3425300	E1P	61
3342300	3354500	3357700	3406600	3385700	3396700	E1P	62
3332100	3339100	3362100	3481300	3418300	3490000	E1P	63
3403200	3468200	3511600	3535200	3531600	3532400	E1P	64
3473500	3491300	3513000	[illegible]	3574800	3600500	E1P	65
3573900	3555200	3635200	3641000	3670700	3664900	E1P	66
3552000	3520300	3533400	3577400	3623100	3668800	E1P	67
3633100	3626700	3659600	3662800	3614700	3516500	E1P	68
3403200	3348400	3361000	3376100	3435900	3451000	E1P	69
3427300	3434700	3471300	3487400	3495600	3485800	E1P	70
3397300	3396400	3411100	3448100	3492600	3513900	E1P	71
3458700	3505900	3540800	3559200	3573300	3569700	E1P	72
3651000	3646500	3691200	3715900	3811200	3843900	E1P	72,1
3793300	3798300	3655100	0	0	0	E1P	72,2
33474	32436	104060	54441	53801	56603	RE:LVR	73
58331	29447	107308	54502	10775	96318	RE:LVR	74
24321	35164	122072	[illegible]	43690	61035	RE:LVR	75
69269	38275	87764	53102	35898	45026	RE:LVR	76
21758	38715	51453	19018	59775	48754	RE:LVR	77
55738	79972	57287	29553	27514	29349	RE:LVR	78
26555	22791	30781	28440	46886	21753	RE:LVR	79
25103	35595	34823	32207	24866	43991	RE:LVR	80
67331	96727	167633	97727	112602	33856	RE:LVR	81
92730	94909	68387	78837	61370	59225	RE:LVR	82
149233	62761	136472	150868	118205	52041	RE:LVR	83
134662	0	107769	56243	39655	72907	RE:LVR	84
58724	27325	83478	57433	49067	39439	RE:LVR	85
66397	64205	71095	39294	55403	64527	RE:LVR	86
46640	47448	85612	6159	68909	44838	RE:LVR	87
43972	49530	84946	0	0	0	R:GLVR	88
3614	5140	5295	7215	7350	7020	R:GEXR	89
6174	6495	6167	5977	8309	7456	R:GEXR	90
9784	11488	9704	11019	12231	9709	R:GEXR	91
7797	8735	7382	9180	8275	9412	R:GEXR	92
9966	11346	14226	14003	11602	9758	R:GEXR	93
10203	8585	6996	6890	7156	7346	R:GEXR	94
7975	8386	10171	10049	7642	6546	R:GEXR	95
6177	6179	5590	5599	5607	6039	R:GEXR	96
7772	8695	10615	12750	12726	12678	R:GEXR	97
18405	14530	10018	9474	10436	14370	R:GEXR	98
15380	20282	24840	31643	33075	33500	R:GEXR	99
30568	23981	19598	18026	18145	16374	R:GEXR	100
18267	19561	20514	[illegible]	16337	14354	R:GEXR	101
14427	12610	11031	10123	13351	14230	R:GEXR	102
15500	17586	18240	16913	13029	10851	R:GEXR	103
12164	10242	9777	0	0	0	R:GEXR	104
0	0	0	0	0	0	E(TLVR	105
0	0	0	0	0	0	E(TLVR	106
0	480	15882	0	5	7938	EX(LVR	107
8946	1580	1395	8042	3302	4644	EX(LVR	108
0	3098	4435	16160	10388	653	EX(LVR	109
0	0	0	0	0	0	E(TLVR	110
0	0	0	0	0	0	E(TLVR	111
0	0	0	0	0	0	E(TLVR	112
0	0	0	0	0	0	E(TLVR	113
19634	8183	3053	10473	5101	2856	EX(LVR	114
5726	5383	5591	5236	8198	558	EX(LVR	115
17958	6382	14891	27305	4407	18595	EX(LVR	116
15116	1139	14802	8403	7191	5531	EX(LVR	117

12809,	3568,	8345,	4472,	7266,	8370,	EXTLVR	118
4732,	24,	10343,	8701,	9599,	6972,	EXTLVR	119
6978,	7402,	5850,	0,	0,	0,	EXTLVR	120
0,	0,	0,	0,	0,	0,	EXTEXR	121
0,	0,	0,	0,	385,	3506,	EXTEXR	122
11574,	10465,	7667,	9095,	10221,	9295,	EXTEXR	123
7636,	8246,	7203,	8269,	6680,	6850,	EXTEXR	124
7284,	7724,	8713,	2070,	142,	24,	EXTEXR	125
0,	0,	0,	0,	0,	0,	EXTEXR	126
0,	0,	0,	0,	0,	0,	EXTEXR	127
0,	0,	0,	0,	0,	0,	EXTEXR	128
0,	0,	0,	67,	7730,	16219,	EXTEXR	129
10788,	8525,	8293,	9960,	8614,	9277,	EXTEXR	130
8666,	10264,	12607,	16507,	17929,	18207,	EXTEXR	131
19931,	19615,	19610,	9934,	15977,	13433,	EXTEXR	132
15600,	15123,	14477,	14980,	13258,	13295,	EXTEXR	133
12054,	11753,	10049,	10545,	10377,	10333,	EXTEXR	134
10369,	11490,	12094,	13102,	11605,	10903,	EXTEXR	135
11038,	9239,	8106,	0,	0,	0,	EXTEXR	136
0,	0,	0,	0,	0,	0,	FSHLVR	137
0,	0,	0,	0,	0,	0,	FSHLVR	138
0,	0,	0,	0,	0,	0,	FSHLVR	139
0,	0,	0,	0,	0,	0,	FSBLVR	140
0,	0,	0,	0,	0,	0,	FSBLVR	141
0,	0,	0,		0,	0,	FSBLVR	142
0,	0,	0,	0,	0,	0,	FSBLVR	143
0,	0,	0,	0,	0,	0,	FSBLVR	144
0,	0,	0,	0,	0,	0,	FSHLVR	145
0,	0,	0,	0,	0,	0,	FSHLVR	146
0,	0,	0,	0,	0,	0,	FSBLVR	147
22796,	11955,	9577,	16832,	0,	15897,	FSBLVR	148
13477,	0,	19422,	6828,	7758,	5151,	FSBLVR	149
15234,	2175,	8766,	5031,	6452,	9532,	FSHLVR	150
0,	0,	12802,	0,	15107,	13553,	FSBLVR	151
5090,	6305,	4743,	0,	0,	0,	FSBLVR	152
0,	0,	0,	0,	0,	0,	FSBEXR	153
0,	0,	0,	0,	0,	0,	FSBEXR	154
0,	0,	0,	0,	0,	0,	FSHEXR	155
0,	0,	0,	0,	0,	0,	FSBEXR	156
0,	0,	0,	0,	0,	0,	FSBEXR	157
0,	0,	0,	0,	0,	0,	FSHEXR	158
0,	0,	0,	0,	0,	0,	FSBEXR	159
0,	0,	0,	0,	0,	0,	FSBEXR	160
0,	0,	0,	0,	0,	0,	FSBEXR	161
0,	0,	0,	0,	0,	0,	FSHEXR	162
0,	0,	0,		0,	0,	FSBEXR	163
18497,	15934,	12032,	10683,	9933,	8933,	FSBEXR	164
10354,	10880,	11902,	12409,	10845,	10796,	FSHEXR	165
9734,	9406,	8653,	8292,	8670,	8744,	FSBEXR	166
8712,	8455,	7766,	7267,	20029,	7799,	FSHEXR	167
7970,	6955,	6493,	0,	0,	0,	FSHEXR	168
86273,	160781,	118877,	125238,	112268,	99039,	R=G	169
101845,	169223,	107547,	100955,	154846,	127620,	R=G	170
194296,	215583,	139137,	140081,	135408,	109225,	R=G	171
95163,	156813,	107972,	88026,	95348,	104244,	R=G	172
142102,	146754,	128875,	133771,	96241,	87995,	R=G	173
138468,	113358,	78243,	71697,	75228,	88032,	R=G	174
104977,	108339,	104276,	96980,	69274,	68101,	R=G	175
71474,	83171,	68360,	60480,	64199,	85953,	R=G	176
160473,	233648,	224013,	209445,	153397,	155317,	R=G	177
129788,	115295,	127208,	106465,	137862,	240537,	R=G	178

308913,	416328,	407127,	331420,	259848,	247126,	REG	179
204792,	231455,	171700,	166424,	188092,	193711,	REG	180
211571,	239250,	200321,	174918,	158021,	154109,	REG	181
155672,	167323,	137770,	147035,	153607,	166630,	REG	182
206025,	231338,	188815,	170411,	136311,	122149,	REG	183
132999,	149245,	113877,	[illegible]	0,	0,	REG	184
0,	0,	0,	0,	0,	0,	EXT	185
0,	0,	0,	1828,	20227,	23312,	EXT	186
31174,	35523,	23532,	20794,	33111,	28243,	EXT	187
22236,	24064,	26103,	20651,	20823,	20276,	EXT	188
23908,	24657,	24123,	10683,	522,	54,	EXT	189
28,	11,	9,	4,	0,	0,	EXT	190
0,	0,	0,	0,	0,	0,	EXT	191
0,	0,	0,	0,	0,	0,	EXT	192
0,	0,	0,	26307,	36195,	44700,	EXT	193
31222,	32511,	33831,	27726,	28380,	34470,	EXT	194
36975,	42250,	47450,	55275,	63200,	79908,	EXT	195
78627,	81528,	73719,	62280,	67019,	60713,	EXT	196
51970,	57542,	50349,	50760,	48629,	48257,	EXT	197
40384,	41574,	38070,	38003,	36734,	35491,	EXT	198
37929,	45162,	41673,	46179,	41442,	37189,	EXT	199
33281,	30440,	28991,	0,	0,	0,	EXT	200
0,	0,	0,	0,	0,	0,	FSB	201
0,	0,	0,	0,	0,	0,	FSB	202
0,	0,	0,	0,	0,	0,	FSB	203
0,	0,	0,	0,	0,	0,	FSB	204
0,	0,	0,	0,	0,	0,	FSB	205
0,	0,	0,	0,	0,	0,	FSB	206
0,	0,	0,	0,	0,	0,	FSB	207
0,	0,	0,	0,	0,	0,	FSB	208
0,	0,	0,	0,	0,	0,	FSB	209
0,	0,	0,	0,	0,	0,	FSB	210
0,	0,	0,	0,	0,	0,	FSB	211
82958,	79535,	80702,	76213,	91712,	88471,	FSB	212
82890,	92416,	78016,	75711,	72589,	72540,	FSB	213
62316,	64338,	60819,	60281,	58772,	53324,	FSB	214
54237,	61340,	53244,	61357,	38981,	29070,	FSB	215
27846,	24495,	22320,	[illegible]	0,	0,	FSB	216
3614,	5140,	5295,	7215,	7350,	7020,	LIEXR	217
6174,	6495,	6167,	5877,	385,	3536,	LIEXR	218
11574,	10565,	7657,	9895,	10221,	9255,	LIEXR	219
7635,	8246,	7203,	8268,	6680,	6839,	LIEXR	220
17284,	7924,	8713,	16979,	11744,	9792,	LIEXR	221
10203,	8505,	6996,	6890,	7156,	7346,	LIEXR	222
7975,	8386,	10171,	10644,	7642,	6546,	LIEXR	223
6177,	6179,	5590,	5399,	5607,	6039,	LIEXR	224
7972,	8695,	10615,	67,	7730,	16219,	LIEXR	225
10788,	8525,	8293,	9566,	8614,	9277,	LIEXR	226
31,	3758,	10035,	31,	5921,	9457,	LIEXR	227
18497,	15934,	12032,	10683,	10562,	10836,	LIEXR	228
10354,	10980,	11902,	12409,	10845,	10776,	LIEXR	229
9734,	9406,	8653,	8292,	8670,	8744,	LIEXR	230
8712,	8455,	7766,	7267,	20029,	0,	LIEXR	231
0,	0,	0,	0,	0,	0,	LIEXR	232
33494,	32436,	104060,	54341,	53801,	56603,	UILVR	233
95736,	29647,	107308,	51202,	10775,	96318,	UILVR	234
24321,	35644,	137954,	40603,	43695,	69073,	UILVR	235
78215,	39385,	89159,	61444,	39200,	49670,	UILVR	236
21768,	42113,	46424,	35178,	70163,	49407,	LILVR	237
55738,	79972,	57287,	29553,	27514,	29349,	UILVR	238
26555,	22791,	30781,	28440,	46886,	21758,	UILVR	239

25133,	35595,	34823,	32207,	24866,	43991,	UI.VH	240
111664,	102992,	71440,	80510,	66471,	62141,	UI.VH	241
154929,	69447,	142063,	156424,	126403,	52629,	UI.VH	242
175416,	17437,	132237,	96240,	44062,	107399,	UI.VH	243
84544,	31227,	117702,	72764,	63834,	50221,	UI.VH	244
94440,	69948,	88206,	49808,	69121,	98657,	UI.VH	245
53351,	27602,	110090,	[illegible]	15125,	0,	UILVH	246
0,	0,	0,	0,	0,	0,	UILVR	247
0,	0,	0,	0,	0,	0,	UILVR	248
25996,	27576,	29156,	30482,	31041,	31942,	P\	249
33421,	34399,	36337,	44102,	51531,	59558,	P\	250
56695,	53130,	49768,	50135,	50292,	50558,	P\	251
51319,	52169,	52892,	54309,	55960,	57839,	P\	252
58750,	59970,	59055,	60132,	60074,	59516,	P\	253
60855,	62194,	63534,	63609,	63686,	63751,	P\	254
63978,	64321,	65620,	66188,	66477,	66773,	P\	255
66623,	66592,	66502,	67785,	68873,	70059,	P\	256
62775,	64321,	65720,	66188,	66477,	66773,	P\	257
66623,	66592,	66502,	67785,	68873,	70059,	P\	258
71628,	73199,	74768,	73791,	72813,	71856,	P\	259
73214,	74640,	75969,	77960,	79486,	81600,	P\	260
82635,	83968,	85136,	84131,	83125,	81125,	P\	261
81125,	85126,	79132,	78470,	77607,	76843,	P\	262
77799,	78755,	79711,	0,	0,	0,	P\	263
0,	0,	0,	0,	0,	0,	P\	264
13485,	13911,	14388,	14807,	15276,	15745,	AJCH	265
16240,	16734,	17228,	17967,	18705,	19443,	AJCH	266
20450,	20656,	21264,	21719,	22165,	22615,	AJCH	267
23317,	24118,	24720,	25639,	26559,	27248,	AJCH	268
28215,	28951,	27552,	30234,	30779,	31326,	AJCH	269
31890,	32455,	33020,	33204,	33389,	33573,	AJCH	270
33631,	34087,	34193,	34433,	34518,	34177,	AJCH	271
34846,	35188,	35330,	35557,	35785,	36012,	AJCH	272
36113,	36214,	36148,	36479,	36631,	36759,	AJCH	273
37003,	37217,	37431,	37754,	38081,	38406,	AJCH	274
38705,	39104,	39302,	39120,	38938,	38755,	AJCH	275
38847,	38988,	39031,	39368,	39730,	40079,	AJCH	276
40109,	40139,	40168,	40050,	39932,	39814,	AJCH	277
39768,	39723,	39677,	39227,	39376,	39225,	AJCH	278
39229,	39223,	39237,	0,	0,	0,	AJCH	279
0,	0,	0,	0,	0,	0,	AJCH	280
1942,	2229,	2616,	2863,	3110,	3357,	AJCU	281
3684,	3911,	4188,	1016,	16134,	22107,	AJCU	282
17753,	13399,	9045,	9133,	9211,	9309,	AJCU	283
9711,	10513,	11115,	11332,	11549,	11756,	AJCU	284
12307,	12348,	13390,	12556,	11923,	11178,	AJCU	285
11727,	12265,	12803,	12521,	12240,	11958,	AJCU	286
12183,	12407,	12632,	12085,	11539,	10992,	AJCU	287
10508,	10024,	9540,	9512,	9485,	9457,	AJCU	288
10206,	10955,	11704,	11724,	11743,	11753,	AJCU	289
11284,	10804,	10325,	10570,	10826,	11077,	AJCU	290
11398,	11720,	12041,	11250,	10458,	9657,	AJCU	291
10765,	11362,	12960,	14048,	15136,	16225,	AJCU	292
17219,	18213,	19207,	18059,	18511,	18154,	AJCU	293
17708,	17251,	16795,	16557,	16319,	16050,	AJCU	294
16789,	17498,	18207,	0,	0,	0,	AJCU	295
0,	0,	0,	0,	0,	0,	AJCU	296
10669,	11436,	12202,	12415,	12628,	12840,	GA	297
13547,	14254,	14961,	15977,	16692,	18008,	GA	298
18492,	18975,	19459,	19168,	18916,	18644,	GA	299
18091,	17538,	17057,	17418,	17852,	18285,	GA	300

18228,	18170,	18113,	17742,	17372,	17001,	GA	301
17238,	17174,	17711,	17864,	18057,	18230,	GA	302
18164,	18098,	18032,	17653,	16874,	16275,	GA	303
16040,	15784,	15529,	15594,	15656,	15720,	GA	304
16436,	17152,	17868,	17985,	18103,	18221,	GA	305
18394,	18571,	18746,	19550,	19966,	20576,	GA	306
21525,	22475,	23425,	[illegible]	23417,	[illegible]	GA	307
23602,	23790,	23978,	24238,	24620,	25276,	GA	308
25307,	25606,	25761,	25225,	24682,	24143,	GA	309
23649,	23154,	22660,	22280,	21912,	21538,	GA	310
21781,	22024,	22267,	0,	0,	0,	GA	311
0,	0,	0,	0,	0,	0,	GA	312
3518700,	3527300,	3530700,	3543800,	3571600,	3836600,	XLF	313
3611800,	3575600,	3594400,	3616000,	3615300,	3618300,	XLF	314
3591800,	3593100,	3611300,	3602700,	3658000,	3720100,	XLF	315
3668800,	3653700,	3616400,	3627700,	3617700,	3653700,	XLF	316
3606200,	3646300,	3637000,	3710200,	3731500,	3767300,	XLF	317
3707700,	3719200,	3712500,	3734200,	3738000,	3741900,	XLF	318
3712700,	3732300,	3762100,	3753500,	3781700,	3848400,	XLF	319
3812300,	3779000,	3827200,	3838100,	3868900,	3882800,	XLF	320
3650700,	3906600,	3910000,	3916200,	3932500,	4021200,	XLF	321
3954500,	3944300,	3937800,	3951500,	3947600,	3947200,	XLF	322
3926000,	3912600,	3918800,	3902700,	3897700,	3989100,	XLF	323
3933300,	3892400,	3896500,	3920100,	3931300,	3934500,	XLF	324
3358100,	3846700,	3849800,	3840000,	3866900,	3911400,	XLF	325
3861100,	3470400,	3886600,	3905700,	3917400,	3920800,	XLF	326
4014000,	3994900,	4016500,	4017200,	0,	0,	XLF	327
0,	0,	0,	0,	0,	0,	XLF	328
3320100,	3280700,	3305800,	3333500,	3377900,	3397100,	E	329
3312500,	3314400,	3376400,	3376500,	3340800,	3344300,	E	330
3283400,	3280400,	3298800,	3320900,	3403300,	3425300,	E	331
3342300,	3354600,	3357700,	3406600,	3385700,	3396700,	E	332
3332100,	3339000,	3362100,	3481300,	3418300,	3490000,	E	333
3403200,	3468200,	3511600,	3535200,	3531600,	3532400,	E	334
3473500,	3491800,	3513000,	3529500,	3574800,	3600500,	E	335
3573900,	3555200,	3635200,	3641800,	3670700,	3664900,	E	336
3552000,	3520400,	3533400,	3577400,	3623100,	3668800,	E	337
3633100,	3626900,	3659600,	3662800,	3614700,	3516500,	E	338
3408200,	3348900,	3361000,	3376800,	3435900,	3451000,	E	339
3427300,	3434900,	3471300,	3487400,	3495600,	3485800,	E	340
3387300,	3396600,	3411100,	3448100,	3492600,	3513900,	E	341
3458700,	3505400,	3540800,	3559200,	3573300,	3569700,	E	342
3650000,	3646500,	3691200,	3715900,	3811200,	3843900,	E	343
3793300,	3798300,	3855100,	0,	0,	0,	E	344
198600,	246400,	224900,	210500,	193700,	239500,	U	345
299300,	261200,	218000,	239500,	274500,	274000,	U	346
308400,	312400,	312500,	281800,	254700,	294800,	U	347
326500,	299100,	218700,	221000,	232000,	257000,	U	348
274100,	307300,	324900,	300900,	248500,	277300,	U	349
304500,	251700,	200900,	190600,	206400,	209500,	U	350
239200,	240500,	249100,	224600,	206900,	247900,	U	351
238400,	224600,	192000,	197100,	198200,	217900,	U	352
298700,	386600,	376600,	330100,	309400,	352400,	U	353
321400,	317400,	278200,	288700,	332900,	430700,	U	354
517800,	563700,	557900,	525900,	461800,	538100,	U	355
506000,	457500,	425200,	441700,	435700,	448700,	U	356
470800,	450100,	438700,	391900,	374200,	397500,	U	357
409400,	364600,	347800,	343500,	344100,	351100,	U	358
364000,	348400,	325300,	301600,	267400,	279500,	U	359
283600,	285200,	235500,	0,	0,	0,	U	360
86831,	58043,	76867,	55177,	50418,	108409,	WUB	361

164034,	57166,	74076,	92613,	47846,	63510,	WJB	362
157312,	66154,	31733,	58039,	59869,	75151,	WJB	363
49340,	75919,	112847,	95008,	91663,	130705,	WJB	364
105149,	75437,	59114,	63690,	67486,	57657,	WJB	365
70245,	67569,	79967,	63241,	74695,	118355,	WJB	366
105532,	80533,	63241,	75959,	73075,	70740,	WJB	367
108201,	78435,	71692,	76100,	76426,	77076,	WJB	368
76271,	118564,	105613,	45712,	52823,	113530,	WJB	369
93394,	70873,	62590,	82453,	102014,	74703,	WJB	370
100079,	31923,	28555,	65014,	65939,	139230,	WJB	371
66049,	0,	23110,	58917,	9391,	24135,	WJB	372
38971,	0,	24878,	7080,	11836,	40453,	WJB	373
69913,	10237,	32009,	19314,	17380,	16752,	WJB	374
8080,	0,	0,		0,	0,	WJB	375
0,	0,	0,	0,	0,	0,	WJB	376
86273,	160781,	118877,	125236,	112268,	99059,	UI	377
101845,	169733,	107547,	102005,	174446,	152300,	UI	378
215470,	251106,	162669,	170475,	168519,	137458,	UI	379
117369,	180877,	134075,	100077,	116171,	124530,	UI	380
166010,	171411,	152998,	144460,	96763,	88079,	UI	381
138496,	113369,	78252,	71701,	75228,	88092,	UI	382
124977,	102339,	104276,	96960,	69274,	68101,	UI	383
71474,	83171,	68360,	60480,	64199,	65953,	UI	384
160473,	233648,	224013,	23575	189592,	200107,	UI	385
161010,	187306,	161039,	133891,	166242,	275007,	UI	386
346093,	451578,	454577,	387095,	323048,	327034,	UI	387
376377,	392618,	326121,	304017,	346823,	342916,	UI	388
349174,	389208,	328686,	300089,	279239,	274916,	UI	389
253362,	274235,	236659,	245016,	249113,	257495,	UI	390
278121,	337440,	283497,	0,	0,	0,	UI	391
0,	0,	0,	0,	0,	0,	UI	392
15327000,	23841000,	22297000,	23971000,	18967000,	20527000,	R:GUOST	393
23100000,	34551000,	22926000,	19069000,	27541000,	27582000,	R:GUOST	394
33196000,	37867100,	32323000,	30323000,	24819009,	21273000,	R:GUOST	395
18061030,	30040000,	17720000,	16789000,	17692000,	22475000,	R:GUOST	396
26049001,	28111100,	29638000,	22241000,	19153000,	16529000,	R:GUOST	397
25572030,	26109000,	13598000,	12823000,	13809000,	16150000,	R:GUOST	398
22821030,	21098100,	22893000,	10166000,	14731000,	11696000,	R:GUOST	399
12408000,	15442000,	10094000,	11468000,	11792000,	14714000,	R:GUOST	400
34188000,	43912000,	52265000,	41585000,	38131000,	29356000,	R:GUOST	401
34054000,	40588100,	23749000,	25062000,	29571000,	64193000,	R:GUOST	402
98049161,	100002100,	105012000,	95135000,	73069000,	62567000,	R:GUOST	403
69292000,	64859100,	47765000,	40932000,	43050000,	60737000,	R:GUOST	404
64526000,	60401100,	63168000,	40362000,	34703000,	34565000,	R:GUOST	405
37590018,	40312805,	29093466,	28801968,	35000427,	48716493,	R:GUOST	406
55101106,	52757548,	55454628,	38806674,	29966791,	0,	R:GUOST	407
0,	0,	0,	0,	0,	0,	R:GUOST	408
0,	0,	0,	0,	0,	0,	EXTUOST	409
0,	0,	0,	0,	0,	0,	EXTUOST	410
7107000,	7212000,	6510000,	7164000,	7377000,	6901000,	EXTUOST	411
5400000,	5923000,	5358000,	5438000,	4781000,	5314000,	EXTUOST	412
5172000,	5310000,	6257000,	2078000,	0,	0,	EXTUOST	413
0,	0,	0,	0,	0,	0,	EXTUOST	414
0,	0,	0,	0,	0,	0,	EXTUOST	415
0,	0,	0,	0,	0,	0,	EXTUOST	416
0,	0,	0,	6318000,	9784000,	9012000,	EXTUOST	417
8372000,	8602000,	7588000,	7256000,	6852000,	9085000,	EXTUOST	418
10252000,	10380000,	12740000,	16347000,	19266000,	23459000,	EXTUOST	419
32278000,	27833000,	25257000,	24348000,	19713000,	23512000,	EXTUOST	420
20757000,	19455000,	17118000,	19324000,	18348000,	15791000,	EXTUOST	421
14291351,	14012519,	13195088,	12186734,	12454313,	13488545,	EXTUOST	422

```
13275899, 13416794, 16301767, 15135767, 14436498,        0,     EXTCOST 423
       0,        0,        0,        0,        0,        0,     EXTCOST 424
       0,        0,        0,        0,        0,        0,     FSRCOST 425
       0,        0,        0,        0,        0,        0,     FSRCOST 426
       0,        0,        0,        0,        0,        0,     FSRCOST 427
       0,        0,        0,        0,        0,        0,     FSRCOST 428
       0,        0,        0,        0,        0,        0,     FSRCOST 429
       0,        0,        0,        0,        0,        0,     FSRCOST 430
       0,        0,        0,        0,        0,        0,     FSRCOST 431
       0,        0,        0,        0,        0,        0,     FSRCOST 432
       0,        0,        0,        0,        0,        0,     FSRCOST 433
       0,        0,        0,        0,        0,        0,     FSRCOST 434
       0,        0,        0,        0,        0,        0,     FSRCOST 435
24361000, 22930000, 23150000, 25437000, 28400000, 30200000,     FSRCOST 436
27434000, 25540000, 28762000, 26264000, 22786000, 24746000,     FSRCOST 437
27191960, 21940525, 21132660, 19455405, 20382027, 20634797,     FSRCOST 438
19293173, 18100867, 20677863, 17764995, 13251030,        0,     FSRCOST 439
       0,        0,        0,        0,        0,        0,     FSRCOST 440
REG             1                                                       441
REGCOST         1                                                       442
EXTCOST         1                                                       443
FSRCOST         1                                                       444
UICOST          1                                                       445
REGLVR          1                                                       446
REGEXR          1                                                       447
EXT             1                                                       448
EXTLVR          1                                                       449
EXTEXR          1                                                       450
FSR             1                                                       451
FSRLVR          1                                                       452
FSREXR          1                                                       453
XLF             1                                                       454
E               1                                                       455
U               1                                                       456
PA              1                                                       457
UI              1                                                       458
NOR             1                                                       459
ADCR            1                                                       460
ADCU            1                                                       461
GA              1                                                       462
UIEXR           1                                                       463
UILVR           1                                                       464
$$END                                                                   465

14.28.45.,000010 PAGES PRINT, 000474 LINES PRINT, FOR $ 000.52 AT RG2.
```

APPENDIX F

BASIC SOURCES OF HISTORICAL DATA AND CONVERSION PROCEDURES

Table 1

Sources of Data Series

	Series	Sources
1.	Total Civilian Labor Force (Michigan)	MESC Civilian Labor Force Estimates Benchmark Series 3/74:1970-1974 Benchmark Series 3/75:1975-1977
2.	Total Employment (Michigan)	Same as Number 1
3.	Total Unemployment (Michigan)	Same as Number 1
4.	Unemployment Rate (Michigan)	Same as Number 1
5.	Unemployment Rate (United States)	Survey of Current Business, U. S. Dept. of Commerce/Bureau of Economic Analysis 1970-1976
6.	Number of Working Weeks Per Month	Bureau of Employment & Training/ Employment Planning Division - Policy Unit estimates.
7.	Michigan Liable Continued Weeks Claimed Compensable - Regular Benefits	MESC Program Statistics Series C 1970-1977
8.	Michigan Agent Continued Weeks Claimed - Regular Benefits	MESC Program Statistics Series C 1970-1977
9.	Michigan Liable Continued Weeks Claimed Compensable - Extended Benefits	MESC Program Statistics Series D, 1971-1972, 74-77
10.	Michigan Agent Continued Weeks Claimed - Extended Benefits	MESC Program Statistics Series D 1971-1972, 74-77
11.	Michigan Liable Continued Weeks Claimed Compensable - FSB	MESC Program Statistics, Series D 1975-1977
12.	Michigan Agent Continued Weeks Claimed - FSB	MESC Program Statistics, Series D 1975-1977
13.	Michigan Liable Initial Additional Claims - Regular Benefits	MESC Program Statistics Series C 1970-1977
14.	Michigan Agent Initial Additional Claims - Regular Benefits	MESC Program Statistics Series C 1970-1977
15.	First Payments - Regular Benefits	MESC Program Statistics Series C 1970-1977
16.	Michigan Liable Initial Additional Claims - Extended Benefits	MESC Program Statistics Series C 1971-72, 74-77

Series	Sources
17. Michigan Agent Initial Additional Claims - Extended Benefits	MESC Program Statistics Series C 1971-72, 74-77
18. First Payments - Extended Benefits	MESC Program Statistics Series D 1971-72, 74-77
19. Michigan Liable Initial Additional Claims - FSB	MESC Program Statistics Series C 1975-1977
20. Michigan Agent Initial Additional Claims - FSB	MESC Program Statistics Series C 1975-1977
21. First Payments - FSB	MESC Program Statistics Series D 1975-1977
22. Exhaustions - Regular Benefits	MESC Program Statistics Series D 1970-1977
23. Exhaustions - Extended Benefits	MESC Program Statistics Series D 1971-72, 74-77
24. Exhaustions - FSB	MESC Program Statistics Series D 1970-1977
25. ADC-R Caseload	Monthly figures derived through interpolation of Quarterly Caseload Data from Dept. of Social Services (Data Reporting Section).
26. ADC-U Caseload	Same as above
27. General Assistance Caseload	Same as above
28. ADC-R Case Openings (rate entering)	Same as above
29. ADC-U Case Openings (rate entering)	Same as above
30. General Assistance Case Openings rate entering)	Same as above
31. ADC-R Case Closings (rate leaving)	Same as above
32. ADC-U Case Closings (rate leaving)	Same as above
33. General Assistance Case Closings (rate leaving)	Same as above

Table 2

Regular Program

Year Month	A No. Working Weeks Per Mo.	B Mich. Liable Continued Weeks Claimed Compensable (Compensable + Waiting Week)	C Mich. Agent Continued Weeks Claimed	D Total (Person-Weeks) D=B+C	E Approx. Level of UI (Person-Months) $E = \frac{D}{A}$	F Standardized Level of Reg U.I. $F = \frac{E}{A}$ 4.345
1978		2,985,965	52,877	3,038,842	697,515	696,962
Jan	4.6	324,262	6,603	330,865	71,927	67,940
Feb.	4.2	331,798	5,961	337,759	80,419	83,195
March	4.2	300,505	5,560	306,065	72,873	75,388
April	4.4	273,392	4,743	278,135	63,213	62,422
May	4.6	191,751	3,307	195,058	42,404	40,053
June	4.0	310,000	3,641	213,641	53,410	58,017
July	4.6	240,163	4,165	244,328	53,115	50,170
Aug.	4.4	421,140	4,546	425,686	96,747	95,537
Sept.	4.2 .	221,658	3,913	225,571	53,707	55,562
Oct.	4.6	139,518	2,939	142,457	30,969	29,252
Nov.	4.2	146,715	3,227	149,942	35,700	36,933
Dec.	4.4	185,063	4,272	189,335	43,031	42,493
1969		2,821,932	50,973	2,872,905	663,802	668,123
Jan.	4.6	262,357	5,239	267,596	58,173	54,948
Feb.	4.0	297,420	5,560	302,980	65,745	82,278
March	4.2	259,321	5,522	264,843	63,058	65,235
April	4.4	272,655	5,451	278,106	63,206	62,416
May	4.4	185,500	3,153	188,653	42,876	42,340
June	4.2	188,215	3,364	191,559	45,609	47,184
July	4.6	254,532	3,901	258,433	56,181	53,067
Aug.	4.2	377,869	4,144	382,013	90,955	94,096
Sept.	4.4	173,592	3,313	176,905	40,206	39,703
Oct.	4.6	130,549	2,886	133,435	29,008	27,400
Nov.	4.0	169,912	3,625	173,537	43,384	47,126
Dec.	4.6	250,010	4,835	254,845	55,401	52,330
1970		6,216,621	107,018	6,323,639	1,458,775	1,464,562
Jan.	4.4	377,192	7,214	384,406	87,365	86,273
Feb.	4.0	582,008	10,051	592,059	148,015	160,781
March	4.4	520,509	9,171	529,680	120,382	118,877
April	4.4	549,620	8,403	558,023	126,823	125,238
May	4.2	448,503	7,285	455,788	108,521	112,268
June	4.4	433,788	7,721	441,509	100,343	99,089
July	4.6	488,236	7,744	495,980	107,822	101,845
Aug.	4.2	677,766	9,251	687,017	163,575	169,223
Sept.	4.4	470,411	8,787	479,198	108,909	107,547
Oct.	4.4	441,469	8,358	449,827	102,233	100,955
Nov.	4.2	617,391	11,258	628,649	149,678	154,846
Dec.	4.6	609,728	11,775	621,503	135,109	127,620
1971		6,623,545	153,054	6,776,599	1,564,382	1,571,896
Jan.	4.2	733,709	14,503	748,212	178,146	184,296
Feb.	4.0	777,081	16,779	793,860	198,465	215,583
March	4.6	663,006	14,584	677,590	147,302	139,137
April	4.4	613,578	13,256	626,834	142,462	140,681
May	4.2	537,989	11,744	549,733	130,889	135,408
June	4.4	475,535	11,137	486,672	110,607	109,225
July	4.4	413,955	10,064	424,019	96,368	95,163
Aug.	4.4	686,167	12,545	698,713	158,798	156,813
Sept.	4.4	467,902	13,190	481,092	109,330	107,972
Oct.	4.2	347,443	9,929	357,372	85,089	88,026
Nov.	4.4	413,197	11,643	424,840	96,555	95,348
Dec.	4.6	493,983	13,680	507,663	110,362	104,244

Table 2 (Continued)

	A	B	C	D	E	F
1972		5,459,800	138,030	5,507,825	1,293,223	1,300,820
Jan.	4.2	562,094	14,819	576,913	137,360	142,102
Feb.	4.2	580,259	15,544	595,798	141,857	146,754
March	4.6	611,053	16,566	627,619	136,439	128,875
April	4.0	479,811	12,808	402,619	123,155	133,777
May	4.6	456,657	12,034	468,691	101,889	96,241
June	4.4	381,668	10,409	392,077	89,108	87,995
July	4.2	550,924	11,233	562,157	133,847	138,468
Aug.	4.6	541,176	10.872	552,048	120,010	113,358
Sept.	4.2	309,444	8,208	317,652	75,631	78,243
Oct.	4.4	311,027	8,434	319,461	72,605	71,697
Nov.	4.4	326,570	8,622	335,192	76,180	75,228
Dec.	4.2	349,117	8,481	357,598	85,142	88,082
1973		3,876,526	98,903	4,328,107	989.876	985,602
Jan.	4.6	499,619	11,614	511,233	111,138	104,977
Feb.	4.2	429,780	10,059	439,839	104,724	108,339
March	4.4	454,247	10,376	464,623	105,596	104,276
April	4.2	386,056	7,701	393,757	93,752	96,988
May	4.6	330,158	7,203	337,361	73,339	69,274
June	4.2	270,112	6,367	276,479	65,828	68,101
July	4.4	310,828	7,639	318,467	72,379	71,474
Aug.	4.6	397,167	7,872	405,039	88,052	83,171
Sept.	4.0	245,279	6,449	251,728	62,932	68,360
Oct.	4.6	286,896	7,640	294,536	64,030	60,480
Nov.	4.4	278,517	7,534	286,051	65,012	64,199
Dec.	4.2	340,545	8,449	348,994	83,094	85,963
1974		8,635,092	158,837	8,793,929	2,026,188	2,033,448
Jan.	4.6	765,703	15,795	781.498	169,891	160,473
Feb.	4.0	845,267	15,117	860,384	215,096	233,648
March	4.2	894,624	14,831	909,455	216,537	224,013
April	4.4	920,288	12,936	933,224	212,096	209,445
May	4.6	735,869	11,168	747,037	162,399	153,397
June	4.0	562,104	9,836	571,940	142,985	155,317
July	4.6	620,333	11,732	632,065	137,405	129,788
Aug.	4.4	681,200	10,748	691,948	157,261	155,295
Sept.	4.2	505,725	10,718	516,443	122,963	127,208
Oct.	4.6	505,782	12,699	518,481	112,713	106,465
Nov.	4.2	546,405	13,291	559,696	113,261	137,862
Dec.	4.4	1,051,792	19,966	1,071,758	243,581	240,537
1975		13,156,451	321,516	12,677,967	3,110,628	3,127,236
Jan.	4.6	1,479,260	25,137	1,504,397	327,043	308,913
Feb.	4.0	1,506,558	26,524	1,533,082	383,271	416,328
March	4.2	1,623,927	28,942	1,652,869	393,540	407,127
April	4.4	1,451,044	27,445	1,478,489	336,020	331,820
May	4.4	1,132,872	24,934	1,157,806	263,138	259.848
June	4.2	978,083	25,209	1,003,292	238,879	247,126
July	4.6	968,874	28,458	997,332	216,811	204,792
Aug.	4.2	912,814	26,855	939,669	223,730	231,455
Sept.	4.4	737,680	27,363	765,043	173,873	171,700
Oct.	4.6	783,022	26,970	809,992	176,085	166,324
Nov.	4.0	669,359	23,271	692,630	173,158	188,092
Dec.	4.6	912,958	30,408	943,366	205,080	193,711
1976						
Jan.	4.4	914,484	40,522	955,006	217,046	214,334
Feb.	4.0	853,932	27,084	881,016	220,254	239,250
March	4.6	946,285	29,271	975,556	212,077	200,321
April	4.4	755,808	23,574	779,382	177,132	174,918
May	4.2	621,864	19,674	641,538	152,747	158,021
June	4.4	664,154	22,511	686,665	156,060	154,109
July	4.4	670,947	22,682	693,629	157,643	155,672
Aug.	4.4	724,016	23,751	747,767	169,947	167,823
Sept.	4.4	591,444	22,416	613,860	139,514	137,770
Oct.	4.2	577,671	21,297	598,968	142,611	147,535
Nov.	4.4	660,549	23,879	684,428	155,552	153,607
Dec.	4.6	796,172	25,296	821,468	178,580	168,680

Table 2 (Continued)

	A	B	C	D	E	F
1977						
Jan.	4.4	801,717	26,844	828,561	188,309	185,955
Feb.	4.0	825,845	26,033	851,878	212,970	231,338
March	4.6	891,737	26,642	918,379	199,648	188,580
April	4.2	670,723	34,737	705,460	167,967	173,766
May	4.4	587,546	25,666	613,212	139,366	137,624
June	4.4					
July	4.2					
Aug.	4.6					
Sept.	4.4					
Oct.	4.2					
Nov.	4.4					
Dec.	4.4					

Table 3

Extended Program

Year Month	A No. Working Weeks Per Mo.	B Mich. Liable Continued Weeks Claimed Compensable (Compensable + Waiting Week)	C Mich. Agent Continued Weeks Claimed	D Total (Person-Weeks) $D = B + C$	E Approx. Level of EB (Person-Months) $E = \frac{D}{A}$	F Standardized Level of EB . $F = \frac{E}{A}$ 4.345
1971						
Jan.	4.2	126,529	32	126,561	30,134	31,174
Feb.	4.0	130,661	146	130,807	32,702	35,523
March	4.6	114,403	195	114,598	24,913	23,532
April	4.4	128,063	233	128,296	29,158	38,794
May	4.2	134,174	252	134,426	32,006	33,111
June	4.4	125,558	284	125,842	28,600	28,243
July	4.4	98,679	264	98,943	22,487	22,206
Aug.	4.4	106,911	310	107,221	24,368	24,064
Sept.	4.4	115,888	418	116,306	26,433	26,103
Oct.	4.2	83,499	339	83,838	19,961	20,651
Nov.	4.4	92,416	363	92,779	21,086	20,823
Dec.	4.6	98,397	344	98,741	21,465	20,276
1972						
Jan.	4.2	96,510	551	97,061	23,110	23,908
Feb.	4.2	99,246	857	100,103	23,834	24,657
March	4.6	116,236	1,243	117,479	25,539	24,123
April	4.0	38,641	698	39,339	9,835	10,683
May	4.6	2,268	275	2,543	553	522
June	4.4	208	167	375	85	84
July	4.2	8	107	115	27	28
Aug.	4.6	6	47	53	12	11
Sept.	4.2	5	32	37	9	9
Oct.	4.4	5	13	18	4	4
Nov.	4.4	0	0	0	0	0
Dec.	4.2	0	0	0	0	0
1974						
Jan.	4.6	0	0	0	0	0
Feb.	4.0	0	0	0	0	0
March	4.2	0	0	0	0	0
April	4.4	117,104	114	117,218	26,640	26.307
May	4.6	176,019	248	176,267	38,319	36,195
June	4.0	164,662	271	164,933	41,233	44,790
July	4.6	151,812	236	152,048	33,054	31,222
Aug.	4.4	144,703	154	144,857	32,922	32,511
Sept.	4.2	137,214	134	137,348	32,702	33.831
Oct.	4.6	131,954	150	132,104	28,718	27,126
Nov.	4.2	115,093	124	115,217	27,433	28,380
Dec.	4.4	153,414	175	153,589	34,907	34,470
1974						
Jan.	4.6	–	–	180,065	39,362	37,180
Feb.	4.0	–	–	155,580	38,895	42,250
March	4.2	–	–	192,637	45,866	47,450
April	4.4	–	–	246,290	55,975	55,275
May	4.4	–	–	281,600	64,000	63,200
June	4.2	321,417	2,998	324,415	77,242	79,908
July	4.6	379,798	3,111	382,909	83,241	78,627
Aug.	4.2	328,321	3,077	331,398	78,904	81,628
Sept.	4.4	324,853	3,616	328,469	74,652	73,719
Oct.	4.6	299,620	3,682	303,302	65,935	62,280
Nov.	4.0	243,415	3,375	246,790	61,698	67,019
Dec.	4.6	291,690	3,982	295,672	64,277	60,713

Table 3 (Continued)

	A	B	C	D	E	F
1976						
Jan.	4.4	229,309	2,253	231,562	52,628	51,970
Feb.	4.0	209,178	2,716	211,894	52,974	57,542
March	4.6	242,187	3,011	245,198	53,304	50,349
April	4.4	220,395	2,656	223,051	50,693	50,060
May	4.2	195,219	2,207	197,426	47,006	48,629
June	4.4	212,674	2,388	215,062	48,876	48,267
July	4.4	177,859	2,080	179,939	40,895	40,384
Aug.	4.4	183,019	2,221	185,240	42,100	41,574
Sept.	4.4	167,616	2,014	169,630	38,552	38,070
Oct.	4.2	152,564	1,711	154,275	36,732	38,000
Nov.	4.4	161,847	1,830	163,677	37,199	36,734
Dec.	4.6	171,028	1,811	172,839	37,574	35,491
1977						
Jan.	4.4	167,271	1,731	169,002	38,409	37,929
Feb.	4.0	164,346	1,589	165,935	41,484	45,062
March	4.6	200,824	2,125	202,949	44,119	41,673
April	4.2	185,563	1,667	187,230	44,579	46,118
May	4.4	182,643	1,875	184,518	41,936	41,412
June	4.4					
July	4.2					
Aug.	4.6					
Sept.	4.4					
Oct.	4.2					
Nov.	4.4					
Dec.	4.4					

Table 4

Federal Supplemental Benefits

Year Month	A No. Working Weeks Per Mo.	B Mich. Liable Continued Weeks Claimed Compensable (Compensable + Waiting Week)	C Mich. Agent Continued Weeks Claimed	D Total (Person-Weeks) $D = B + C$	E Approx. Level of FSB (Person-Months) $E = \frac{D}{A}$	F Standardized Level of FSB $F = \frac{E}{A}$ 4.345
1975						
July	4.6	402,622	1,382	404,004	87,827	92,958
Aug.	4.2	321,445	1,457	322,902	76,881	79,535
Sept.	4.4	357,856	1,730	359,586	81,724	80,702
Oct.	4.6	369,145	2,009	371,154	80,686	76,213
Nov.	4.0	335,676	2,042	337,718	84,430	91,712
Dec.	4.6	428,485	2,465	430,950	93,685	88,492
1976						
Jan.	4.4	367 ,259	2,081	369,340	83,940	82,890
Feb.	4.0	338,247	2,064	340,311	85,078	92,416
March	4.6	377,737	2,197	370,934	82,504	78,016
April	4.4	335,290	2,056	337,346	76,670	75,711
May	4.2	293,329	1,370	294,699	70,166	72,589
June	4.4	321,665	1,551	323,216	73,458	72,540
July	4.4	276,304	1,311	277,615	63,094	62,306
Aug.	4.4	287,543	1,355	288,898	65,659	64,838
Sept.	4.4	269,825	1,167	270,992	61,589	60,819
Oct.	4.2	243,776	955	244,737	58,269	60,281
Nov.	4.4	260,854	1,015	261,869	59,516	58,772
Dec.	4.6	258,799	886	259,685	56,453	53,324
1977						
Jan.	4.4	240,927	735	241,662	54,923	54,237
Feb.	4.0	224,025	749	224,774	56,194	61,040
March	4.6	258,208	1,090	259,218	56,359	53,244
April	4.2	252,943	1,124	254,067	60,492	62,581
May	4.4	178,546	1,077	179,623	40,823	40,313
June	4.4					
July	4.2					
Aug.	4.6					
Sept.	4.4					
Oct.	4.2					
Nov.	4.4					
Dec.	4.4					

Table 5

Regular

Year Month	A No. Working Weeks Per Month	B Mich. Liable Per Month	C Mich. Agent Per Month	D Total (B + C)	E Weekly Average (D/A)	F Per Month	G Weekly Average (F/A)	H Initial Additional + First Payment = Weekly Average RUI (E + G)	I Standardized RUI H x 4.345
		Initial Additional Claims				First Payments			
1968									
Jan.	4.6	25,527	440	25,967	5,645	27,119	5,895	11,540	50,141
Feb.	4.2	30,257	454	30,711	7,312	19,729	4,697	12,009	52,179
March	4.2	14,416	243	14,659	3,490	15,988	3,807	7,297	31,705
April	4.4	11,842	264	12,106	2,751	13,513	3,071	5,822	25,285
May	4.6	11,953	214	12,167	2,645	9,430	2,050	7,340	20,390
June	4.0	13,968	238	14,206	3,552	11,355	2,839	6,391	27,756
July	4.6	23,234	328	23,562	5,122	19,198	4,173	9,295	40,368
Aug.	4.4	21,624	234	21,858	4,968	75,416	17,140	22,108	96,015
Sept.	4.2	8,820	226	9,046	2,154	16,982	4,043	6,197	26,914
Oct.	4.6	11,446	217	11,663	2,535	8,273	1,798	4,333	19,600
Nov.	4.4	15,065	294	16,911	3,491	8,823	2,101	5,593	24,216
Dec.	4.4	15,065	294	15,359	3,491	13,555	3,081	6,572	28,542
1969									
Jan.	4.6	15,316	299	15,615	3,395	23,226	5,049	8,444	36,672
Feb.	4.0	17,406	317	17,723	4,431	20,120	5,030	13,892	4,101
March	4.2	11,091	275	11,366	2,706	13,919	3,314	6,020	26,145
April	4.4	24,744	273	25,017	5,686	13,414	3,049	8,735	37,936
May	4.4	11,208	157	11,365	2,583	9,974	2,267	4,850	35,395
June	4.2	16,696	250	16,946	4,035	12,316	2,932	6,967	30,258
July	4.6	59,872	367	60,239	13,096	24,932	5,420	18,516	80,415
Aug.	4.2	13,969	213	14,182	3,377	59,079	14,066	17,442	75,755
Sept.	4.4	9,485	211	9,696	2,204	13,807	3,138	5,342	23,200
Oct.	4.6	9,429	195	11,384	2,092	8,066	1,753	3,845	16,699
Nov.	4.0	18,762	229	18,991	4,748	11,964	2,991	7,739	33,610
Dec.	4.6	23,568	341	23,909	5,197	19,882	4,322	9,519	41,341
1970									
Jan.	4.4	40,057	474	40,531	9,212	31,457	7,149	16,361	71,051
Feb.	4.0	59,975	517	60,492	15,123	42,738	10,685	25,808	4,208
March	4.4	35,433	420	35,853	8,148	32,487	7,383	10,531	67,451
April	4.4	37,811	430	38,241	8,691	30,559	6,945	15,636	67,907
May	4.2	24,262	365	24,627	5,864	21,968	5,230	11,094	48,181
June	4.4	30,483	392	30,875	7,017	20,231	4,598	11,615	50,444
July	4.6	29,316	542	69,858	15,187	41,001	8,913	24,100	104,666
Aug.	4.2	34,644	517	35,161	8,372	64,950	15,464	18,836	103,520
Sept.	4.4	32,627	502	33,129	7,529	19,351	4,398	11,927	51,799
Oct.	4.4	26,698	472	27,170	6,175	24,082	5,473	11,648	50,587
Nov.	4.2	41,405	606	42,011	10,002	28,565	6,801	16,803	72,975
Dec.	4.6	53,278	649	53,927	11,723	27,161	5,905	17,628	76,558
1971									
Jan.	4.2	43,969	632	44,601	10,618	43,390	10,331	20,949	90,981
Feb.	4.0	34,074	634	34,708	8,678	37,256	9,314	17,992	78,139
March	4.6	33,664	537	34,201	7,435	24,405	5,305	12,740	55,330
April	4.4	31,291	616	31,907	7,252	22,968	5,220	12,472	34,166
May	4.2	27,476	478	27,954	6,656	21,025	5,006	11,662	50,648
June	4.4	25,634	501	26,135	5,940	19,062	4,332	16,212	44,611
July	4.4	43,772	488	44,260	10,059	19,573	4,448	14,507	63,004
Aug.	4.4	29,739	699	30,438	6,918	79,695	18,113	25,031	108,710
Sept.	4.4	25,086	621	25,707	5,842	21,207	4,820	10,662	46,305
Oct.	4.2	18,615	462	19,077	4,542	21,865	5,206	9,748	42,336
Nov.	4.4	29,205	665	29,870	6,789	22,298	5,068	11,857	51,495
Dec.	4.6	33,042	792	33,834	7,355	33,251	7,228	14,583	63,334

Table 5 (Continued)

	A	B	C	D	E	F	G	H	I
1972									
Jan.	4.2	28,221	626	28,847	6,868	38,455	9,156	16,024	69,592
Feb.	4.2	22,880	477	23,357	5,562	29,453	7,013	12,575	54,613
March	4.6	23,607	493	24,100	3,065	26,504	5,762	8,827	38,336
April	4.0	16,344	374	16,718	4,180	18,209	4,552	8,732	37,923
May	4.6	17,612	405	18,017	3,917	17,823	3,875	7,792	33,841
June	4.4	30,764	481	31,245	7,101	19,681	4,473	11,574	50,266
July	4.2	54,929	469	55,398	13,190	57,376	13,661	26,851	11,661
Aug.	4.6	17,537	413	17,950	3,902	49,250	10,707	14,609	63,447
Sept.	4.2	12,095	420	12,515	2,980	15,690	3,736	6,716	29,168
Oct.	4.4	14,896	423	15,319	3,481	14,971	3,403	6,884	29,897
Nov.	4.4	19,880	433	20.313	4,616	18,393	4,180	8.796	38,201
Dec.	4.2	23,465	500	23,965	5,706	23,952	5,703	11,409	49,549
1973									
Jan.	4.6	20,303	554	20,857	4,535	33,606	7,306	11,841	51,425
Feb.	4.2	14,610	316	14,926	3,554	23,310	5,550	9,104	39.539
March	4.4	15,333	308	15,641	3,555	21,732	4,939	8,494	36,889
April	4.2	13,432	301	13,733	3,270	16,435	3,913	7,183	31,196
May	4.6	13,146	283	13,429	2,920	14,967	3,254	6,174	26,814
June	4.2	12,212	331	12,543	2,987	13,687	3,259	6,246	27,126
July	4.4	14,862	373	15,235	3,463	19,872	4,516	7,979	34,653
Aug.	4.6	12,136	351	12,487	2,714	44,044	9,575	12,289	53,371
Sept.	4.0	10,561	322	10,883	2,721	12,682	3,171	5,892	25,602
Oct.	4.6	16,571	433	17,004	3,696	14,797	3,217	6,913	30,023
Nov.	4.4	16,705	435	17,140	3,895	17,497	3,977	7,873	34,192
Dec.	4.2	39,172	519	39,691	9,451	29,735	7,080	16,531	71,794
1974									
Jan.	4.6	80,106	747	80,853	17,576	77,818	16,917	34,493	149,803
Feb.	4.0	88,047	425	88,472	22,118	76,021	19,005	41,123	178,597
March	4.2	108,510	425	108,935	25,937	54,124	12,887	38,824	168,613
April	4.4	57,764	390	58,154	13,217	39,018	8,868	22,085	95,915
May	4.6	44,401	388	44,789	9,736	28,593	6,216	15,952	69,279
June	4.0	23,205	347	23,552	5,888	21,084	5,271	11,159	48,464
July	4.6	54,743	506	55,249	12,011	34,681	7,539	19,550	84,906
Aug.	4.4	45,343	477	45,820	10,413	90,799	20,636	3,149	134,846
Sept.	4.2	21,900	499	22,399	5,333	26,261	6,253	11,586	50,318
Oct.	4.6	38,594	726	39.320	8,548	32,246	7,010	15,558	67,568
Nov.	4.2	61,113	829	61,942	14,748	37,861	9,015	23,763	103,203
Dec.	4.4	84,457	1,026	85,483	19,428	93,132	21,166	40,594	176,300
1975									
Jan.	4.6	106,584	841	107,425	23,353	139,322	30,287	53,640	232,959
Feb.	4.0	83,372	598	83,970	20,993	91,444	22,861	43,854	190,458
March	4.2	73,935	579	74,514	17,742	72,047	17,154	34,896	151,553
April	4.4	58,067	711	58,178	13,359	49,851	11,330	24,689	107,224
May	4.4	43,254	801	44,055	10,012	36,297	8,249	18,261	79,308
June	4.2	41,406	963	42,369	10,088	28,430	6,679	16,767	72,819
July	4.6	87,334	1,020	88,354	19,208	41,836	9,095	28,303	122,916
Aug.	4.2	51,357	938	52,295	12,451	78,442	18,677	31,128	135,189
Sept.	4.4	37,671	979	38,650	8,784	30,007	6,820	15,604	67,612
Oct.	4.6	38,748	942	39,690	8,628	33,598	7,304	15,932	69,193
Nov.	4.0	40,681	870	41,551	10,388	31,732	7,933	18,321	79,568
Dec.	4.6	50,739	1,148	51,887	11,280	48,724	10,592	21,872	94,990

Table 5 (Continued)

	A	B	C	D	E	F	G	H	I·
1976									
Jan.	4.4	28,213	963	29,176	6,635	66,903	15,205	21,840	94,851
Feb.	4.0	30.591	559	31,150	7,788	37,523	9,381	17,169	74,565
March	4.6	34,356	753	35,109	7,632	33,807	7,349	14,981	65,062
April	4.4	24,532	624	25,156	5,717	27,283	6,201	11,918	51,76C
May	4.2	24,436	789	25,225	6,006	21,684	5,163	11,169	48,507
June	4.4	25,400	770	26,170	5,948	24,417	5,549	11,497	49,931
July	4.4	41,016	819	41,835	9,508	41,632	9,462	18,970	82,387
Aug.	4.4	26,222	766	26,958	6,134	63,146	14,351	20,485	88,966
Sept.	4.4	26,634	812	27,446	6,238	25,308	5,752	11,990	52,073
Oct.	4.2	27,907	·728	28,635	6,818	28,596	6,809	13,627	59,182
Nov.	4.4	40,159	950	41,109	9,343	34,396	7,817	17,160	74,526
Dec.	4.6	43,009	1,027	44,036	9,573	55,345	12,032	21,605	93,830
1977									
Jan.	4.4	38,793	932	39,725	9,028	61,066	13,879	22,907	99,485
Feb.	4.0	40,102	672	40,774	10,193	42,623	10,656	20,849	90,547
March	4.6	27,801	718	28,519	6,200	37,571	8,168	14,368	62,427
April	4.2	21,119	616	21,735	5,175	22,545	5.368	10,543	45,809
May	4.4	19,816	642	20,458	4,650	22,138	5,031	9,681	42,065
June	4.4								
July	4.2								
Aug.	4.6								
Sept.	4.4								
Oct.	4.2								
Nov.	4.4								
Dec.	4.4								

Table 6

Extended Benefits

Year Month	A No. Working Weeks Per Month	Initial Additional Claims: B Mich. Agent Per Month	C Mich. Liable Per Month	D Total (B + C)	E Weekly Average $(\frac{D}{A})$	First Payments: F Per Month	G Weekly Average $(\frac{F}{A})$	H Initial Additional + First Payments = Weekly Average EB (E + G)	I Standardized REB H x 4.345
1971									
Jan.	4.2	4	814	818	195	10,837	2,580	2,757	12,057
Feb.	4.0	11	963	974	244	13,287	3,322	3,566	15,494
March	4.6	20	978	798	217	11,240	2,443	2,660	11,558
April	4.4	9	978	887	224	12,914	2,935	3,159	13,726
May	4.2	13	1,255	1,268	302	12,789	3,045	3,347	14,543
June	4.4	16	1,408	1,424	324	11,106	2,524	2,848	12,375
July	4.4	10	1,790	1,800	409	8,897	2,018	2,427	10,545
Aug.	4.4	7	1,808	1,815	413	10,016	2,276	2,689	11,684
Sept.	4.4	20	2,065	2,085	473	8,691	1,975	2,448	10,637
Oct.	4.2	11	1,828	1,839	438	8,658	2,061	2,499	10,858
Nov.	4.4	20	2,054	2,074	471	8,211	1,866	2,337	10,154
Dec.	4.6	19	1,682	1,701	369	9,882	2,148	2,517	10,936
1972									
Jan.	4.2	43	1,282	1,324	315	9,086	2,163	2,478	10,767
Feb.	4.2	45	1,158	1,203	287	9,979	2,376	2,663	11,571
March	4.6	36	1,108	1,144	249	12,198	2,652	2,901	12,605
April	4.0	13	119	132	33	4,836	1,209	1,242	5,396
May	4.6	1	123	124	27	267	58	15	369
June	4.4	7	1	8	2	232	53	55	239
July	4.2	7	1	8	2	33	8	10	43
Aug.	4.6	2	0	2	4	30	7	11	48
1974									
Feb.	4.0	0	0	0	0	0	–	–	–
March	4.2	0	0	0	0	0	–	–	–
April	4.4	7	249	256	59	31,200	7,091	7,150	31,067
May	4.6	7	869	876	191	15,493	3,368	3,559	15,464
June	4.0	10	1,092	1,102	275	11,995	2,999	3,274	14,226
July	4.6	12	1,669	1,681	366	16,161	3,513	3,879	16,854
Aug.	4.4	1	1,889	1,890	429	16,335	3,713	4,142	17,997
Sept.	4.2	13	1,741	1,754	417	10,491	2,498	2,915	12,666
Oct.	4.6	18	2,844	2,862	622	10,947	2,380	3,002	13,044
Nov.	4.2	32	4,289	4,321	1,029	10,149	2,416	3,445	14,969
Dec.	4.4	13	4,734	4,747	1,079	13,735	3,122	4,201	18,253
1975[5]									
Jan.	4.6	24	2,897	2,921	635	15,188	3,301	3,936	17,102
Feb.	4.0	45	1,682	1,727	732	17,345	4,336	5,068	22,020
March	4.2	56	1,633	1,689	402	20,932	4,983	5,385	23,398
April	4.4	85	2,160	2,245	510	27,901	6,341	6,851	29,768
May	4.4	75	1,916	1,991	453	32,493	7,384	7,837	34,052
June	4.2	100	2,400	2,500	595	31,820	7,576	8,171	35,503
July	4.6	90	3,754	3,844	836	34,911	7,589	8,425	36,607
Aug.	4.2	104	3,277	3,381	805	24,648	5,869	6,674	28,999
Sept.	4.4	125	4,940	5,665	1,151	21,871	4,971	6,122	26,600
Oct.	4.6	83	5,391	5,474	1,190	21,844	4,757	7,137	31,010
Nov.	4.0	65	5,274	5,339	1,335	17,786	4,447	5,782	25,123
Dec.	4.6	61	5,044	5,105	1,110	22,125	4,810	5,920	25,722
1976									
Jan.	4.4	54	2,695	2,749	625	19,502	4,432	5,057	21,973
Feb.	4.0	38	1,900	1,938	485	18,159	4,540	5,025	21,834
March	4.6	65	2,116	2,181	474	21,203	4,609	5,083	22,086
April	4.4	40	2,033	2,073	471	20,708	4,706	5,177	22,494
May	4.2	45	1,904	1,949	464	16,433	3,913	4,377	19,018
June	4.4	41	2,242	2,283	519	16,436	3,735	4,254	18,484
July	4.4	49	2,457	2,506	570	14,686	3,338	3,908	16,980
Aug.	4.4	62	2,546	2,608	593	14,112	3,207	3,800	16,511
Sept.	4.4	58	2,806	2,864	651	12,216	2,776	3,427	14,890
Oct.	4.2	41	2,984	3,025	720	11,422	2,720	3,440	14,947
Nov.	4.4	68	3,817	3,885	883	12,660	2,877	3,760	16,337
Dec.	4.6	51	2,976	3,027	673	15,125	3,361	4,080	17,510

Table 6 (Continued)

	A	B	C	D	E	F	G	H	I
1977									
Jan.	4.4	40	2,065	2,105	478	15,658	3,559	4,037	17,539
Feb.	4.0	47	1,541	1,588	397	15,578	3,895	4,292	18,647
March	4.6	72	1,545	1,617	352	18,547	4,032	4,384	19,048
April	4.2	44	1,915	1,959	466	17,860	4,252	4,718	20,501
May	4.4	37	2,011	2,048	465	14,795	3,363	3,828	16,630
June	4.4								
July	4.2								
Aug.	4.6								
Sept.	4.4								
Oct.	4.2								
Nov.	4.4								
Dec.	4.4								

Table 7

Federal Supplemental Benefits

Year Month	A No. Working Weeks per	Initial Additional Claims B Mich. Liable Per Month	C Mich. Agent Per Month	D Total (B + C)	E Weekly Average (D/A)	First Payments F Per Month	G Weekly Average (E/A)	H Initial Additional + First Payments = Weekly Average FSB (E + G)	I Standardized ΣFSB H x 4.345
1975									
Jan.	4.6	2,281	69	2,350	511	29,562	6,427	6,938	30,146
Aug.	4.2	1,999	75	2,074	494	20,705	4,930	5,424	23,567
Sept.	4.4	3,123	59	3,182	723	19,882	4,519	5,242	22,776
Oct.	4.6	3,389	34	3,423	744	20,743	4,509	5,253	22,824
Nov.	4.0	3,247	42	3,289	822	16,776	4,194	5,016	21,795
Dec.	4.6	3,529	46	3,575	777	19,260	4,187	4,964	21,569
1976									
Jan.	4.4	2,009	18	2,017	461	16,434	3,735	4,196	18,232
Feb.	4.0	1,694	26	1,720	430	14,176	3,544	3,974	17,267
March	4.6	1,987	47	2,034	442	15,885	3,453	3,895	16,924
April	4.4	1,820	26	1,846	420	15,300	3,477	3,897	16,932
May	4.2	1,596	19	1,625	387	13,161	3,134	3,521	15,299
June	4.4	[illegible]	36	1,948	442	14,156	3,217	3,659	15,898
July	4.4	2,050	23	2,073	471	12,848	2,920	3,391	14,734
August	4.4	1,969	39	2,008	456	12,287	2,792	3,248	14,113
Sept.	4.4	2,221	22	2,243	510	11,325	2,574	3,084	13,400
Oct.	4.4	2,304	31	2,335	556	10,612	2,527	3,083	13,396
Nov.	4.4	2,588	37	2,625	597	11,160	2,536	3,133	12,613
Dec.	4.6	2,206	19	2,225	484	11,356	2,569	3,053	13,265
1977									
Jan.	4.4	1,630	29	1,659	377	10,822	2,460	2,837	12,325
Feb.	4.0	1,249	34	1,283	321	10,218	2,555	2,876	12,494
March	4.6	1,140	54	1,194	260	12,326	2,680	2,940	12,772
April	4.2	1,022	39	1,061	253	11,729	2,793	3,046	13,233
May	4.4	1,124	30	1,154	262	11,878	2,700	2,962	12,868
June	4.4								
July	4.2								
Aug.	4.6								
Sept.	4.4								
Oct.	4.2								
Nov.	4.4								
Dec.	4.4								

Table 8

Regular

Year Month	A No. Working Weeks Per Month	B Standardized Rate Entering Reg. UI	C Rate Exhausting Per Month	D Standardized Rate Exhausting ($\frac{C}{A}$x4.345)	E Standardized Level of Regular UI	F Regular UI (E_t - E_t-1)	G Standardized Rate Leaving (B - D - F)	H ~~T~~22A ($\frac{G}{G+C}$)
1968								
Jan.	4.6	47,547	3,664	3,461	67,940	-	-	-
Feb.	4.2	50,246	3,843	3,976	83,195	15,255	31,015	.89
March	4.2	30,107	4,442	4,596	75,388	- 7,807	33,318	.88
April	4.4	25,285	5,344	5,277	62,422	- 12,966	32,974	.86
May	4.6	20,390	3,991	3,770	40,053	- 22,369	38,989	.91
June	4.0	27,756	3,604	3,915	58,017	17,964	5,877	.62
July	4.6	40,386	3,486	3,293	50,170	- 7,847	44,940	.93
Aug.	4.4	96,015	2,944	2,907	95,537	45,367	47,741	.94
Sept.	4.2	26,914	2,720	2,814	55,562	- 39,975	64,075	.96
Oct.	4.6	19,600	2,404	2,271	29,252	- 26,310	43,639	.95
Nov.	4.2	24,286	2,295	2,374	36,933	7,681	14,231	.86
Dec.	4.4	28,842	2,520	2,489	42,493	- 5,560	31,633	.93
1969								
Jan.	4.6	36,672	3,115	2,942	54,948	12,455	21,275	.87
Feb.	4.0	41,011	3,436	3,733	82,278	27,330	9,948	.74
March	4.2	26,145	3,919	4,055	65,235	17,043	5,047	.56
April	4.4	37,936	4,891	4,830	62,416	- 2,819	35,925	.88
May	4.4	35,395	3,917	3,868	42,340	- 20,076	51,603	.93
June	4.2	30,258	3,590	3,714	47,184	4,844	21,700	.86
July	4.6	80,415	2,925	2,763	53,067	5,883	71,769	.96
Aug.	4.2	75,755	2,900	3,000	94,096	41,029	31,726	.92
Sept.	4.4	23,200	2,994	2,957	39,703	- 54,393	74,636	.96
Oct.	4.6	16,699	2,321	2,192	27,400	- 12,303	26,810	.92
Nov.	4.0	38,610	2,820	3,063	47,126	19,726	10,821	.79
Dec.	4.6	41,341	3,111	2,939	52,330	5,204	33,198	.91
1970								
Jan.	4.4	71,051	3,660	3,614	86,273	33,943	33,494	.90
Feb.	4.0	112,084	4,732	5,140	160,781	74,508	32,436	.87
March	4.4	67,451	5,362	5,295	118,877	- 41,904	104,060	.95
April	4.4	67,907	7,306	7,315	125,238	6,361	54,341	.88
May	4.2	48,181	7,104	7,350	112,268	- 12,970	53,801	.88
June	4.4	50,444	7,108	7,020	99,089	- 13,179	56,603	.89
July	4.6	104,666	6,586	6,174	101,845	2,756	95,736	.94
Aug.	4.2	103,520	6,278	6,495	169,223	67,378	29,647	.83
Sept.	4.4	51,799	6,245	6,167	107,547	- 61,676	107,308	.95
Oct.	4.4	50,587	5,749	5,677	100,955	- 6,592	51,502	.90
Nov.	4.2	72,975	8,031	8,309	154,846	53,891	10,775	.57
Dec.	4.6	76,558	7,904	7,466	127,620	- 27,226	96,318	.92
1971								
Jan.	4.2	90,981	9,680	9,984	184,296	56,676	24,321	.72
Feb.	4.0	78,139	10,759	11,688	215,583	31,287	35,164	.77
March	4.6	55,330	10,273	9,704	139,137	- 76,446	122,072	.92
April	4.4	54,166	11,968	11,819	140,681	1,544	40,803	.77
May	4.2	50,648	11,822	12,231	135,408	- 5,273	43,690	.79
June	4.4	44,611	9,831	9,709	109,225	- 26,183	61,085	.86
July	4.4	65,004	7,895	7,797	95,163	- 14,062	69,269	.90
Aug.	4.4	108,710	8,896	8,785	156,813	61,650	38,275	.81
Sept.	4.4	56,305	7,475	7,382	107,972	- 48,841	87,764	.92
Oct.	4.2	42,336	8,873	9,180	88,026	- 19,946	53,102	.86
Nov.	4.6	51,495	8,379	8,275	95,348	7,322	35,898	.81
Dec.	4.6	63,334	9,964	9,412	104,244	8,896	45,026	.82

Table 8 (Continued)

	A	B	C	D	E	F	G	H
1972								
Jan.	4.2	69,592	9,633	9,966	142,102	37,858	21,768	.69
Feb.	4.2	54,613	10,677	11,046	146,754	4,652	38,915	.78
March	4.6	38,336	15,060	14,226	128,875	- 17,879	41,989	.74
April	4.0	37,923	12,890	14,003	133,777	4,902	19,018	.60
May	4.6	33,841	12,282	11,602	96,241	- 37,536	59,775	.83
June	4.4	50,266	9,881	9,758	87,995	- 8,246	48,754	.85
July	4.2	116,614	9,862	10,203	138,468	50,473	55,938	.85
Aug.	4.6	63,447	9,088	8,585	113,358	- 25,110	79,972	.90
Sept.	4.2	29,168	6,762	6,996	78,243	- 35,115	57,287	.89
Oct.	4.4	29,897	6,977	6,890	71,697	- 6,546	29,553	.81
Nov.	4.4	38,201	7,246	7,156	75,228	3,531	27,514	.79
Dec.	4.2	49,549	7,100	7,346	88,082	12,854	29,349	.81
1973								
Jan.	4.6	51,425	8,443	7,975	104,977	16,895	26,555	.76
Feb.	4.2	39,539	8,106	8,386	108,339	3,362	22,791	.74
March	4.4	36,889	10,299	10,171	104,276	- 4,063	30,781	.75
April	4.2	31,196	9,788	10,044	96,988	- 7,288	28,440	.75
May	4.6	26,814	8,090	7,642	69,988	- 27,714	46,886	.85
June	4.2	27,126	6,327	6,546	68,101	- 1,173	21,753	.77
July	4.4	34,653	6,255	6,177	71,474	3,373	25,103	.80
Aug.	4.6	53,371	6,435	6,079	83,171	11,697	35,595	.85
Sept.	4.0	25,602	5,146	5,590	68,360	- 14,811	34,823	.87
Oct.	4.6	30,026	5,716	5,399	60,480	- 7,880	32,507	.85
Nov.	4.4	34,192	5,678	5,607	64,199	3,719	24,866	.81
Dec.	4.2	71,794	5,837	6,039	85,963	21,764	43,991	.88
1974								
Jan.	4.6	149,803	8,439	7,972	160,473	74,510	67,324	.89
Feb.	4.0	178,597	8,004	8,695	233,648	73,175	96,727	.92
March	4.2	168,613	10,260	10,615	224,013	- 9,635	167,633	.94
April	4.4	95,915	12,917	12,756	209,445	- 14,568	97,727	.88
May	4.6	69,280	13,472	12,726	153,397	- 56,048	112,602	.89
June	4.0	48,464	11,671	12,678	155,317	1,920	33,866	.74
July	4.6	84,906	19,484	18,405	129,788	- 25,529	92,030	.83
Aug.	4.4	134,846	14,713	14,530	155,295	25,507	94,809	.87
Sept.	4.2	50,318	9,683	10,018	127,208	- 28,087	68,387	.88
Oct.	4.6	67,568	10,029	9,474	106,465	- 20,743	78,837	.89
Nov.	4.2	103,203	10,087	10,436	137,862	31,397	61,370	.86
Dec.	4.4	176,300	14,551	14,370	240,537	102,675	59,255	.80
1975								
Jan.	4.6	232,959	16,283	15,380	308,913	68,376	149,203	.90
Feb.	4.0	190,458	18,671	20,282	416,328	107,415	62,761	.77
March	4.2	151,553	24,010	24,282	407,127	- 9,201	136,472	.85
April	4.4	107,224	32,044	31,643	331,820	- 75,307	150,888	.82
May	4.4	79,308	33,494	33,075	259,848	- 71,972	118,205	.78
June	4.2	72,819	32,382	33,500	247,126	- 12,722	52,041	.62
July	4.6	122,916	32,383	30,588	204,792	- 42,334	134,662	.81
Aug.	4.2	135,189	23,181	23,981	231,455	126,663	0	.00
Sept.	4.4	67,612	19,846	19,598	171,700	- 59,755	107,769	.84
Oct.	4.6	69,193	19,084	18,016	166,324	- 5,376	56,543	.75
Nov.	4.0	79,568	16,704	18,145	188,092	+ 21,768	39,655	.70
Dec.	4.6	94,990	17,335	16,374	193,711	+ 5,619	72,997	.81
1976								
Jan.	4.4	94,851	18,498	18,267	214,334	+ 20,633	55,951	.75
Feb.	4.0	74,565	18,008	19,561	239,250	+ 24,916	30,088	.63
March	4.6	65,063	21,718	10,514	100,321	- 38,929	83,478	.79
April	4.4	51,760	19,980	19,730	174,918	- 25,403	57,433	.74
May	4.2	48,507	15,792	16,337	158,021	- 16,897	49,067	.76
June	4.4	49,931	14,536	14,354	154,109	- 3,912	39,489	.73
July	4.4	82,387	14,610	14,427	155,672	+ 1,563	66,397	.82
Aug.	4.4	88,966	12,770	12,610	167,823	+ 12,151	64,205	.83
Sept.	4.4	52,073	11,171	11,031	137,770	- 30,053	71,095	.86
Oct.	4.4	59,182	10,251	10,123	147,535	+ 9,765	39,294	.79
Nov.	4.4	74,526	12,616	13,051	153,607	+ 6,072	55,403	.88
Dec.	4.6	93,830	15,065	14,230	152,889	- 718	80,318	.84

Table 8 (Continued)

	A	B	C	D	E	F	G	H
1977								
Jan.	4.4	99,485	15,696	15,500	185,955	+ 33,066	50,919	.76
Feb.	4.0	90,547	16,190	17,586	231,338	+ 45,383	27,578	.63
March	4.6	62,427	19,310	18,240	188,580	- 42,758	86,945	.82
April	4.2	45,809	16,349	16,913	173,766	+ 14,814	18,082	.46
May	4.4	42,065	13,194	13,029	137,624	+ 36,142	(-) 0	0
June	4.4							
July	4.2							
Aug.	4.6							
Sept.	4.4							
Oct.	4.2							
Nov.	4.4							
Dec.	4.4							

Table 9

Extended Benefits

Year Month	A No. Working Weeks Per Month	B Rate Entering Standardized EB	C Rate Exhausting Per Month	D Standardized Rate Exhausting Per Month $(\frac{C}{A}x4.345)$	E Standardized Level of EB	F Regular EB (E_t-E_t-1)	G Standardized Rate Leaving (B-D-F)	H 23 $(\frac{G}{G+C})$
1971								
Jan.	4.2	12,057	11,188	11,574	31,174	–	–	–
Feb.	4.0	15,494	9,819	10,665	35,523	+ 4,349	480	.05
March	4.6	11,558	8,117	7,667	23,532	-11,991	15,882	.66
April	4.4	13,726	9,219	9,095	28,794	+ 5,262	(-) 0	0
May	4.2	14,543	9,880	10,221	33,111	+ 4,317	5	.0005
June	4.4	12,375	9,373	9,255	18,243	- 4,868	7,988	.46
July	4.4	10,545	7,733	7,636	22,206	- 6,037	8,946	.54
Aug.	4.4	11,684	8,350	8,246	24,064	+ 1,858	1,580	.16
Sept.	4.4	10,637	7,294	7,203	26,103	+ 2,039	1,395	.16
Oct.	4.2	10,858	7,992	8,268	10,651	- 5,452	8,042	.50
Nov.	4.4	10,154	6,765	6,680	10,823	+ 172	3,302	.33
Dec.	4.6	10,936	7,241	6,839	20,276	- 547	4,644	.39
1972								
Jan.	4.2	10,767	7,041	7,284	23,908	+ 3,632	(-) 0	0
Feb.	4.2	11,571	7,467	7,724	24,657	+ 749	3,098	.29
March	4.6	12,605	9,225	8,713	24,123	- 543	4,435	.32
April	4.0	5,396	2,464	2,676	10,683	-13,440	16,160	.87
May	4.6	369	1,510	142	522	-10,161	10,388	.87
June	4.4	239	25	24	84	- 438	653	.96
July	4.2	43	–	–	28	–	–	–
Aug.	4.6	48	–	–	11	–	–	–
Sept.	4.2	–	–	–	– 9	–	–	–
Oct.	4.4	–	–	–	4	–	–	–
1974								
April	4.4	31,067	68	67	26,307	–	–	–
May	4.6	15,464	8,184	7,730	36,195	+ 9,888	(-) 0	0
June	4.0	14,226	14,931	16,219	44,790	+ 8,595	(-) 0	0
July	4.6	16,834	11,421	10,788	31,222	-13,568	19,634	.63
Aug.	4.4	17,997	8,633	8,525	32,511	+ 1,289	8,183	.49
Sept.	4.2	12,666	8,016	8,293	33,831	+ 1,320	3,053	.28
Oct.	4.6	13,044	9,916	9,366	27,126	- 6,795	10,473	.51
Nov.	4.2	14,969	8,327	8,614	28,380	+ 1,254	5,101	.38
Dec.	4.4	18,253	9,394	9,277	34,470	+ 6,090	2,886	.24
1975								
Jan.	4.6	17,102	9,175	8,666	37,180	+ 2,710	5,726	.38
Feb.	4.0	22,020	9,449	10,264	42,250	+ 5,070	6,686	.41
March	4.2	23,398	12,186	12,607	47,450	+ 5,200	5,591	.31
April	4.4	29,768	16,615	16,407	55,275	+ 7,825	5,536	.25
May	4.4	34,052	18,156	17,929	63,200	+ 7,925	8,198	.31
June	4.2	35,503	17,600	18,207	79,908	+16,708	588	.03
July	4.6	36,607	21,101	19,931	78,627	- 1,282	17,958	.46
Aug.	4.2	28,999	18,960	19,615	81,628	+ 3,002	6,382	.25
Sept.	4.4	26,600	19,866	19,618	73,719	- 7,909	14,891	.43
Oct.	4.6	31,010	10,521	19,383	62,280	-11,439	23,066	.53
Nov.	4.0	25,123	14,708	15,977	67,019	+ 4,739	4,407	.23
Dec.	4.6	25,722	14,221	13,433	60,713	- 6,306	18,595	.57
1976								
Jan.	4.4	21,973	15,797	15,600	51,970	- 8,743	15,116	.49
Feb.	4.0	21,834	13,922	15,123	57,542	+ 5,572	1,139	.08
March	4.6	22,086	15,327	14,477	50,349	- 7,193	14,802	.49
April	4.4	22,494	14,663	14,480	50,060	- 289	8,303	.36
May	4.2	19,018	12,816	13,258	48,629	- 1,431	7,191	.36
June	4.4	18,484	13,433	13,265	48,267	- 362	5,581	.29
July	4.4	16,980	12,207	12,054	40,384	- 7,883	12,809	.51
Aug.	4.4	16,511	11,902	11,753	41,574	+ 1,190	3,568	.23
Sept.	4.4	14,890	10,176	10,049	38k070	- 3,504	8,345	.45
Oct.	4.2	14,947	10,193	10,545	38,000	- 70	4,472	.30
Nov.	4.4	16,337	10,468	10.337	36,734	- 1,266	7,266	.41
Dec.	4.6	17,510	10,992	10,383	35,491	- 1,243	8.370	.43

Table 9 (Continued)

	A	B	C	D	E	F	G	H
1977								
Jan.	4.4	17,539	10,500	10,369	37,929	+ 2,438	4,732	.31
Feb.	4.6	18,647	10,578	11,490	45,062	+ 7,133	24	.002
March	4.6	19,048	12,804	12,094	47,673	- 3,389	10,343	.45
April	4.2	20,501	12,665	13,102	46,118	+ 1,566	5,848	.32
May	4.4	16,630	11,752	11,605	41,412	+ 4,706	319	.026
June	4.4							
July	4.2							
Aug.	4.6							
Sept.	4.4							
Oct.	4.2							
Nov.	4.4							
Dec.	4.4							

Table 10

Federal Supplemental Benefits

Year Month	A No. Working Weeks Per Month	B Standardized Rate Entering FSB	C Rate Exhausting Per Month	D Standardized Rate Exhausting Per Month $(\frac{C}{A} \times 4.345)$	E Standardized Level of FSB	F FSB $(E_t - E_t - 1)$	G FSB Rate Leaving (B-D-F)	H ⸸24 $(\frac{G}{G+C})$
1975								
July	4.6	30,146	19,583	18,497	82,958	-11,147	22,796	.54
Aug.	4.2	23,567	15,402	15,934	79,536	- 3,422	11,055	.42
Sept.	4.4	22,776	12,184	12,032	80,703	+ 1,167	9,577	.44
Oct.	4.6	22,824	11,310	10,683	75,213	- 4,490	16,631	.60
Nov.	4.0	21,795	9,723	9,933	91,712	+15,499	(-) 0	0
Dec.	4.6	21,569	11,472	8,983	88,491	- 3,221	15,807	.58
1976								
Jan.	4.4	18,232	10,485	10,354	82,892	- 5,599	13,477	.56
Feb.	4.0	17,267	10,016	10,880	92,416	+ 9,526	(-) 0	0
March	4.6	16,924	12,600	11,902	78,016	-14,400	19,422	.61
April	4.4	16,932	12,566	12,409	75,711	- 2,305	6,828	.35
May	4.2	15,299	10,483	10,845	72,589	- 3,122	7,576	.42
June	4.4	15,898	10,933	10,796	72,540	- 49	5,151	.32
July	4.4	14,734	9,857	9,734	62,306	-10,234	15,234	.61
Aug.	4.4	14,113	9,525	9,406	64,838	+ 2,532	2,175	.19
Sept.	4.4	13,400	8,763	8,653	60,819	- 4,019	8,766	.50
Oct.	4.2	13,396	8,015	8,292	60,281	- 538	5,842	.41
Nov.	4.4	13,613	8,780	8,670	58,772	- 1,509	6,452	.42
Dec.	4.6	13,265	9,257	8,744	53,324	- 5,448	9,969	.52
1977								
Jan.	4.4	12,325	8,822	8,712	54,237	+ 913	-2,700	.23
Feb.	4.6	12,494	7,784	8,455	61,040	+ 6,803	(-) 0	0
March.	4.6	12,772	8,222	7,786	53,244	- 7,796	12,802	.60
April	4.2	13,833	7,314	7,567	62,581	+ 9,337	(-) 0	0
May	4.4	12,868	20,283	20,029	40,313	- 22,268	15,107	.42
June	4.4							
July	4.2							
Aug.	4.6							
Sept.	4.4							
Oct.	4.2							
Nov.	4.4							
Dec.	4.4							

Table 11

ADC-R

Year Month	A Monthly Caseload	B No. Employable	C Total Rate Leaving	D Employable Rate Leaving	E Total Rate Entering	F Employable Rate Entering
1969						
Jan.	48,981	10,462	1,288	275	-	-
Feb.	49,498	10,573	1,196	255	1,805	386
March	50,016	10,683	1,104	236	1,855	396
April	50,957	10,884	1,012	216	1,904	407
May	51,897	11,085	-	-	1,953	417
June	52,838	11,286	-	-	-	-
July	54,091	11,554	-	-	-	-
Aug.	55,345	11,822	-	-	-	-
Sept.	56,598	12,089	-	-	-	-
Oct.	58,110	12,412	1,043	223	2,555	546
Nov.	59,621	12,735	1,055	225	2,728	582
Dec.	61,133	13,058	1,066	228	2,901	620
1970						
Jan.	63,120	13,485	1,078	230	3,075	657
Feb.	65,127	13,911	1,070	229	3,133	669
March	67,124	14,338	1,062	227	3,192	682
April	69,320	14,807	1,054	225	3,250	694
May	71,516	15,276	1,154	246	3,390	724
June	73,712	15,745	1,255	268	3,530	754
July	76,028	16,240	1,355	289	3,671	784
Aug.	78,343	16,734	1,349	288	4,044	864
Sept.	80,659	17,228	1,342	286	4,417	943
Oct.	84,114	17,967	1,336	285	4,791	1,023
Nov.	87,568	18,705	1,476	315	4,727	1,010
Dec.	91,023	19,443	1,616	345	4,663	996
1971						
Jan.	93,866	20,450	1,757	375	4,600	982
Feb.	96,709	20,656	1,766	377	4,364	932
March	99,552	21,264	1,775	379	4,129	882
April	101,661	21,714	1,785	381	3,893	832
May	103,769	22,165	1,839	393	4,339	927
June	105,878	22,615	1,892	404	4,785	1,022
July	109,162	23,317	1,946	416	5,231	1,117
Aug.	112,447	24,018	2,005	428	5,630	1,202
Sept.	115,731	24,720	2,064	441	6,029	1,287
Oct.	120,035	25,639	2,123	453	6,428	1,373
Nov.	124,340	26,559	2,178	465	6,169	1,318
Dec.	128,644	27,248	2,232	477	5,965	1,274
1972						
Jan.	132,092	28,215	2,286	488	5,734	1,225
Feb.	135,539	28,951	2,478	529	5,629	1,202
March	128,987	27,552	2,670	570	5,523	1,179
April	141,543	30,234	2,862	611	5,418	1,157
May	144,099	30,779	2,883	616	5,471	1,168
June	146,655	31,326	2,905	621	5,524	1,180
July	149,300	31,890	2,926	625	5,578	1,191
Aug.	151,944	32,455	3,054	652	5,109	1,091
Sept.	154,589	33,020	3,181	679	4,640	991
Oct.	155,452	33,204	3,309	707	4,171	891
Nov.	156,314	33,389	3,197	683	4,174	892
Dec.	157,177	33,573	3,084	659	4,177	892

	A	B	C	D	E	F
1973						
Jan.	158,385	33,631	2,972	635	4,180	893
Feb.	159,592	34,087	3,395	725	4,334	926
March	160,800	34,193	3,818	816	4,488	959
April	161,202	34,433	4,241	906	4,642	992
May	161,603	34,518	4,262	910	4,907	1,048
June	162,005	34,177	4,284	905	5,172	1,105
July	163,137	34,846	4,305	916	5,437	1,161
Aug.	164,270	35,088	4,378	935	5,488	1,172
Sept.	165,402	35,330	4,450	951	5,538	1,183
Oct.	166,467	35,557	4,523	966	5,588	1,194
Nov.	167,533	35,785	4,431	946	5,298	1,131
Dec.	168,598	36,012	5,339	927	5,008	1,070
1974						
Jan.	169,070	36,113	4,246	907	4,718	1,008
Feb.	169,541	36,214	4,437	948	4,998	1,068
March	170,013	36,148	4,627	988	5,278	1,127
April	170,753	36,479	4,817	1,029	5,557	1,187
May	171,494	36,631	4,735	1,011	5,563	1,188
June	172,234	36,789	4,654	994	5,568	1,189
July	173,236	37,003	4,372	977	5,574	1,191
Aug.	174,238	37,217	4,514	964	5,689	1,215
Sept.	175,240	37,431	4,456	952	5,804	1,240
Oct.	176,761	37,754	4,399	939	5,919	1,264
Nov.	178,281	18,081	4,309	920	5,788	1,236
Dec.	179,802	38,406	4,214	901	5,657	1,208
1975						
Jan.	181,201	38,705	4,126	881	5,525	1,180
Feb.	182,601	39,004	4,601	983	5,249	1,121
March	184,000	39,302	5,076	1,084	4,974	1,062
April	183,146	39,120	5,551	1,186	4,698	1,003
May	182,293	38,938	5,542	1,184	5,116	1,093
June	181,439	38,755	5,533	1,182	5,535	1,182
July	181,869	38,847	5,523	1,180	5,953	1,272
Aug.	182,298	38,988	5,191	1,109	5,934	1,268
Sept.	182,728	39,031	4,859	1,038	5,915	1,263
Oct.	184,364	39,380	4,528	967	5,895	1,259
Nov.	186,000	39,730	4,409	942	5,367	1,146
Dec.	187,637	40,079	4,290	916	4,839	1,034
1976						
Jan.	187,776	40,109	4,171	891	4,310	921
Feb.	187,915	40,139	4,415	943	4,323	923
March	188,053	40,168	4,659	995	4,337	926
April	187,500	40,050	4,903	1,047	4,350	929
May	186,947	39,932	4,483	958	4,021	859
June	186,394	39,814	4,063	868	3,692	789
July	186,181	39,768	3,644	778	3,364	719
Aug.	185,968	39,723				
Sept.	185,756	39,677				
Oct.	185,050	39,527				
Nov.	184,344	39,376				
Dec.	183,637	39,225				

Table 11 (Continued)

	A	B	C	D	E	F
1977						
Jan.	183,656	39,229				
Feb.	183,675	39,233				
March	183,695	39,237				
April						
May						
June						
July						
Aug.						
Sept.						
Oct.						
Nov.						
Dec.						

Table 12

ADC-U Estimated Levels and Rates

Year Month	A Monthly Caseload	B Rate Leaving	C Rate Entering
1969			
Jan.	1,242	83	151
Feb.	1,310	86	122
March	1,378	88	92
April	1,350	91	63
May	1,323	-	-
June	1,295	-	-
July	1,179	-	-
August	1,062	-	-
Sept.	946	-	-
Oct.	1,116	47	217
Nov.	1,285	63	305
Dec.	1,455	78	393
1970			
Jan.	1,842	93	480
Feb.	2,229	172	512
March	2,616	250	544
April	2,863	328	575
May	3,110	320	577
June	3,357	311	578
July	3,634	302	579
Aug.	3,911	308	2,484
Sept.	4,188	314	4,389
Oct.	10,161	321	6,294
Nov.	16,134	2,106	4,637
Dec.	22,107	3,892	2,980
1971			
Jan.	17,753	5,677	1,323
Feb.	13,399	4,089	1,216
March	9,045	2,501	1,108
April	9,133	913	1,001
May	9,211	903	1,162
June	9,309	893	1,324
July	9,911	883	1,485
Aug.	10,513	975	1,449
Sept.	11,115	1,067	1,412
Oct.	11,332	1,159	1,376
Nov.	11,549	1,041	1,366
Dec.	11,766	923	1,357
1972			
Jan.	12,307	806	1,347
Feb.	12,849	977	1,094
March	13,390	1,149	840
April	12,656	1,320	587
May	11,923	1,125	815
June	11,189	930	1,044
July	11,727	735	1,273
Aug.	12,265	811	1,076
Sept.	12,803	887	878
Oct.	12,521	963	681
Nov.	12,240	868	755
Dec.	11,958	773	829
1973			
Jan.	12,183	679	903
Feb.	12,407	819	786
March	12,632	959	669
April	12,085	1,099	552
May	11,539	1,091	566
June	10,992	1,084	579
July	10,508	1,076	592
Aug.	10,024	973	642
Sept.	9,540	871	691
Oct.	9,512	768	741
Nov.	9,485	735	966
Dec.	9,457	702	1,192

Table 12 (Continued)

	A	B	C
1974			
Jan.	10,106	669	1,418
Feb.	10,955	862	1,368
March	11,704	1,055	1,318
April	11,724	1,248	1,268
May	11,743	1,171	1,024
June	11,763	1,093	780
July	11,284	1,016	537
Aug.	10,804	938	702
Sept.	10,325	861	868
Oct.	10,576	783	1,034
Nov.	10,826	722	996
Dec.	11,077	661	958
1975			
Jan.	11,398	599	921
Feb.	11,720	724	675
March	12,041	849	429
April	11,250	974	183
May	10,458	864	703
June	9,667	755	1,223
July	10,765	645	1,743
Aug.	11,862	657	1,752
Sept.	12,960	670	1,761
Oct.	14,048	682	1,770
Nov.	15,136	689	1,746
Dec.	16,225	697	1,722
1976			
Jan.	17,219	704	1,698
Feb.	18,213	937	1,484
March	19,207	1,170	1,270
April	18,859	1,403	1,056
May	18,511	1,470	1,063
June	18,164	1,538	1,070
July	17,708	1,605	1,077
Aug.	17,252		
Sept.	16,795		
Oct.	16,557		
Nov.	16,319		
Dec.	16,080		
1977			
Jan.	16,789		
Feb.	17,498		
March	18,207		

Table 13

General Assistance Estimated Levels and Rates

Year Month	A Monthly Caseload	B No. Employable	C Total Rate Leaving	D Employable Rate Leaving	E Total Rate Entering	F Employable Rate Entering
1969						
Jan.			3,425	1,298	3,720	1,488
Feb.			3,680	1,472	3,618	1,447
March	24,957	9,983	3,935	1,574	3,517	1,407
April	24,182	9,673	4,190	1,676	3,415	1,366
May	23,406	9,362	4,097	1,639	3,578	1,431
June	22,631	9,052	4,004	1,602	3,742	1,497
July	22,625	9,050	3,911	1,564	3,905	1,562
Aug.	22,618	9,047	3,665	1,466	3,849	1,540
Sept.	22,612	9,045	3,419	1,368	3,893	1,557
Oct.	23,326	9,330	3,173	1,269	3,887	1,555
Nov.	24,041	9,616	4,175	1,670	5,290	2,116
Dec.	24,755	9,902	5,176	2,070	6,693	2,677
1970						
Jan.	26,672	10,669	6,178	2,471	8,095	3,238
Feb.	28,589	11,436	6,472	2,589	7,927	3,171
March	30,506	12,202	6,766	2,706	7,760	3,104
April	31,038	12,415	7,060	2,824	7,592	3,037
May	31,569	12,628	7,144	2,858	8,087	3,235
June	32,101	12,840	7,227	2,891	8,583	3,433
July	33,868	13,547	7,311	2,924	9,078	3,631
Aug.	35,636	14,254	7,825	3,130	9,850	3,940
Sept.	37,903	14,961	8,339	3,336	10,621	4,248
Oct.	39,942	15,977	8,853	3,541	11,392	4,557
Nov.	42,480	16,692	8,832	3,533	10,928	4,371
Dec.	45,019	18,008	8,810	3,542	10,463	4,185
1971						
Jan.	46,229	18,492	8,789	3,516	9,999	4,000
Feb.	47,438	18,975	10,200	4,980	10,780	4,312
March	48,648	19,459	11,611	4,644	11,561	4,624
April	47,969	19,188	13,022	5,209	12,343	4,937
May	47,290	18,916	12,291	4,916	11,377	4,551
June	46,611	18,644	11,560	4,624	10,412	4,165
July	45,228	18,091	10,829	4,332	9,446	3,778
Aug.	43,845	17,538	9,950	3,980	4,389	3,756
Sept.	42,462	17,057	9,071	3,628	9,332	3,733
Oct.	43,545	17,418	8,192	3,277	9,275	3,710
Nov.	44,629	17,852	8,203	3,281	9,077	3,631
Dec.	45,712	18,285	8,214	3,286	8,879	3,552
1972						
Jan.	45,569	18,228	8,225	3,290	8,681	3,472
Feb.	45,425	18,170	8,222	3,289	8,218	3,287
March	45,282	18,113	8,219	3,288	7,754	3,102
April	44,356	17,742	8,217	3,287	7,290	2,916
May	43,429	17,372	7,878	3,151	7,458	2,983
June	43,503	17,001	7,540	3,016	7,625	3,050
July	43,095	17,238	7,201	2,880	1,792	3,117
Aug.	43,686	17,474	7,022	2,809	7,560	3,024
Sept.	44,278	17,711	6,842	2,737	7,328	2,931
Oct.	44,711	17,884	6,663	2,665	7,095	2,838
Nov.	45,143	18,057	6,827	2,731	7,060	2,824
Dec.	45,576	18,230	6,991	2,796	7,025	2,810

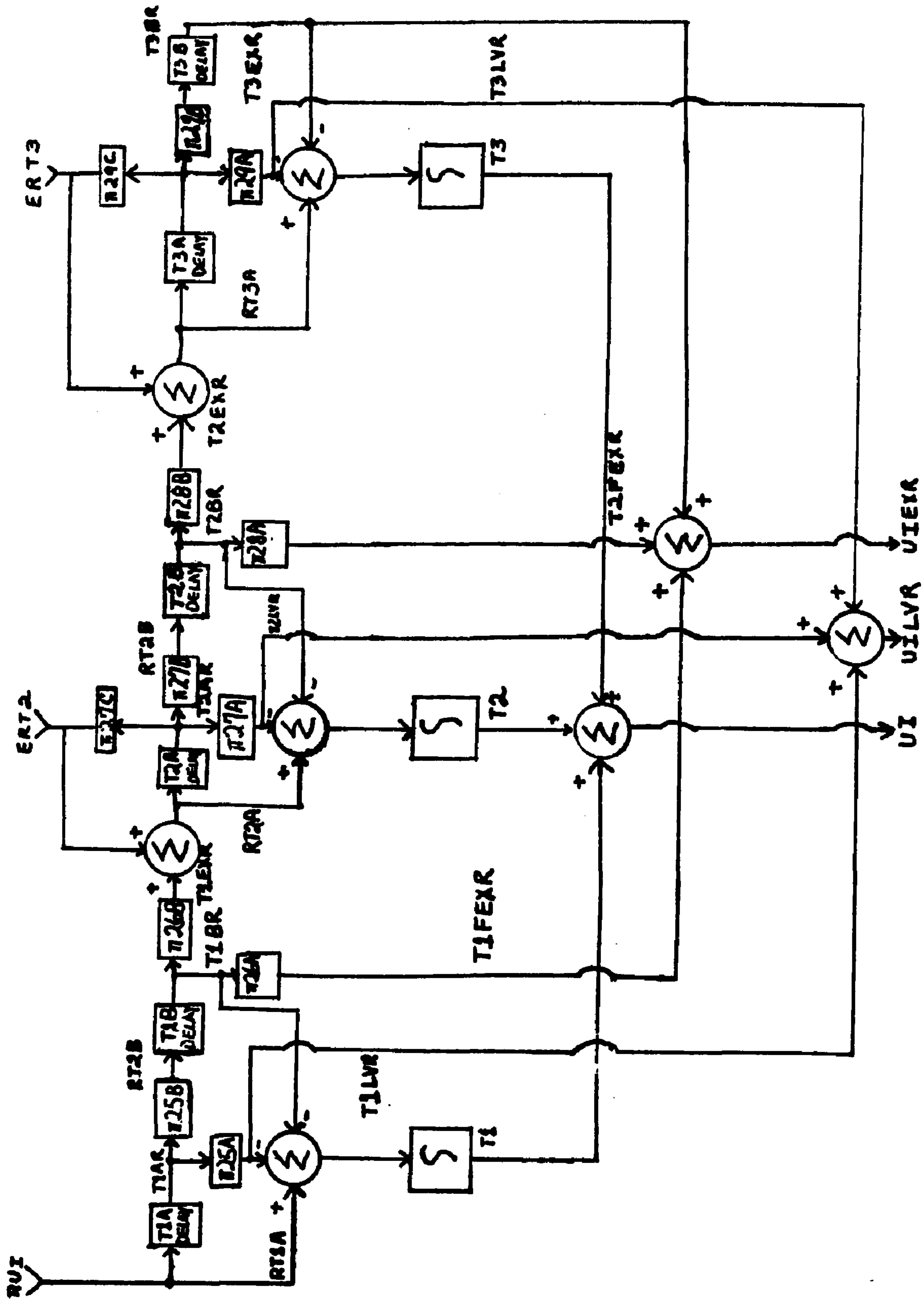
Table 13 (Continued)

	A	B	C	D	E	F
1973						
Jan.	45,410	18,164	7,155	3,862	6,989	2,796
Feb.	45,245	18,098	7,050	2,820	6,457	2,583
March	45,079	18,032	6,944	2,778	5,924	2,370
April	43,632	17,453	6,839	2,736	5,392	2,157
May	42,184	16,879	6,641	2,656	5,464	2,186
June	40,737	16,295	6,444	2,578	5,536	2,214
July	40,099	16,040	6,246	2,498	5,608	2,243
Aug.	39,460	15,784	6,229	2,492	5,856	2,342
Sept.	38,822	15,529	6,212	2,485	6,105	2,442
Oct.	38,981	15,592	6,194	2,478	6,353	2,541
Nov.	39,140	15,656	6,180	2,472	6,882	2,753
Dec.	39,299	15,720	6,165	2,466	7,412	2,965
1974						
Jan.	41,089	16,436	6,151	2,460	7,941	3,176
Feb.	42,879	17,152	5,954	2,382	7,245	2,898
March	44,669	17,868	5,756	2,302	6,549	2,620
April	44,963	17,985	5,559	2,224	5,854	2,342
May	45,258	18,103	5,802	2,321	6,144	2,458
June	45,552	18,221	6,045	2,418	6,435	2,574
July	45,990	18,396	6,287	2,515	6,725	2,690
Aug.	46,427	18,571	6,075	2,430	6,875	2,750
Sept.	46,865	18,746	5,863	2,345	7,025	2,810
Oct.	48,390	19,356	5,651	2,260	7,176	2,870
Nov.	49,914	19,966	6,562	2,625	8,380	3,352
Dec.	51,439	20,576	7,493	2,997	9,584	3,834
1975						
Jan.	53,813	21,525	8,414	3,366	10,788	4,315
Feb.	56,188	22,475	8,336	3,334	9,916	3,966
March	58,562	23,425	8,259	3,304	9,044	3,618
April	58,553	23,421	8,181	3,272	8,172	3,269
May	58,543	23,417	8,150	3,260	8,300	3,320
June	58,534	23,414	8,119	3,248	8,429	3,372
July	59,004	23,602	8,088	3,235	8,558	3,423
Aug.	59,475	23,790	7,654	3,062	8,824	3,530
Sept.	59,945	23,978	7,270	2,888	9,090	3,636
Oct.	61,345	24,538	6,786	2,714	9,355	3,742
Nov.	61,551	24,620	7,516	3,006	9,358	3,743
Dec.	63,241	25,296	8,246	3,298	9,361	3,744
1976						
Jan.	63,268	25,307	8,977	3,591	9,364	3,746
Feb.	64,015	25,606	8,942	3,577	8,751	3,500
March	64,402	25,761	8,907	3,563	8,138	3,255
April	63,054	25,222	8,872	3,549	7,524	3,010
May	61,706	24,682	8,559	3,424	7,280	2,912
June	60,357	24,143	8,246	3,298	7,036	2,814
July	59,122	23,649	7,933	3,173	6,792	2,717
Aug.	57,887	23,155				
Sept.	56,651	22,660				
Oct.	55,716	22,286				
Nov.	54,781	21,912				
Dec.	53,845	21,538				

APPENDIX G

MODEL DIAGRAM

THREE-TIER UI SYSTEM


RUI
ERT2
ERT3
T1A DELAY
T1B DELAY
T2A DELAY
T2B DELAY
T3A DELAY
T3B DELAY
T1AR
T1BR
T2BR
T3EXR
T2EXR
T1FEXR
T1LVR
T3LVR
RT1A
RT2A
RT3A
T1
T2
T3
UIEXR
UILVR
UI

APPENDIX H

THREE-TIER MODEL PARAMETERS

THREE-TIER MODEL PARAMETERS

$\pi 25B$ = .925 - SUR

$\pi 25B$ = 1.0 - $\pi 25A$

$\pi 26A$ = 1.55 - 11.11 x SUR

$\pi 26B$ = 1.0 = $\pi 26A$

$\pi 27A$ = 1.0 - $\pi 27B$

$\pi 27B$ = .268 + 2.8 x SUR

$\pi 27C$ = .08

$\pi 28A$ = 1.77 - 11.11 x SUR

$\pi 28B$ = 1.0 - $\pi 28A$

$\pi 29A$ = 1.0 - $\pi 29B$

$\pi 29B$ = .257 + 3.48 x SUR

$\pi 29C$ = .05

SUR = Michigan unemployment rate (five month smoothing)

DELAY PARAMETERS

TIER	MEAN TIME (MONTHS)	ORDER
TIER 1 (A)	1.3	3
TIER 1 (B)	1.3	3
TIER 2 (A)	1.1	3
TIER 2 (B)	1.6	3
TIER 3 (A)	1.3	3
TIER 3 (B)	1.3	3

APPENDIX I

THREE-TIER FORTRAN PROGRAM LISTING

```
      PROGRAM TMODEL (INPUT, OUTPUT, TAPE1, TAPE 2, TAPE 99,TAPE5,TAPE10
     +)
      COMMON KK,T,DT,PUI, PT1A, T1AR, PT1B, T1LVR, T1BR, T1EXR, T1FEXR,
     2T1NET, T1, PT2A, T2AR, PT2B, T2LVR, EPT2, T2BR, T2EXR, T2FEXR,
     3T2NET, T2, PT3A, T3AR, PT3B, T3LVR, EPT3, T3BR, T3EXR, T3NET, T3,
     4UI, UILVR, UIEXR, T1COST, T2COST, T3COST, UICOST,
     +PT1EXT,T1EXTP,T1EXT,PT2EXT,T2EXTP,T2EXT
      DIMENSION PUI1(156), SUP1(156),TIME1(156),T1EXT1(7),T2EXT1(15)
      DIMENSION T1A1(3), T1B1(3), T2A1(3), T2B1(3), T3A1(3), T3B1(3)
      INTEGER PROGRAM(156)
      REWIND 10
      DO 9 K=1,7
9     T1EXT1(K)=0.0
      DO 11 K=1,15
11    T2EXT1(K)=0.0
      REWIND 5
        REWIND 2
      REWIND 1
      DO 1 I=1,156
1     TIME1(I)=FLOAT(I)
C READ INPUT DATA
      DO 6 K=1,156
6     PROGRAM(K)=1
      READ(1,600)(PUI1(J),J=1,92)
600   FORMAT(6F10.0)
      READ(1,600)(PUI1(J),J=93,156)
        DO 8 K=1,156
8       PUI1(K)=50000.
      READ(1,600)(SUP1(J),J=1,92)
      READ(1,600)(SUP1(J),J=93,156)
        DO 919 JK=1,156
        PROGRAM(JK)=2
        READ(10,925)RVAL
919     SUP1(JK)=RVAL
925     FORMAT(F10.0)
C INITIALIZE TIME VARIABLES
      T=0.0
      DT=0.2
      IDT=1
      DELP=1.3
C SET MEAN DELAY TIMES
      DELT1A=1.3
      DELT1B=1.3
      DELT2A=1.1
      DELT2B=1.6
      DELT3A=1.3
      DELT3B=1.3
C SET ORDER OF DELAYS
      KT1A=3
      KT1B=3
      KT2A=3
      KT2B=3
      KT3A=3
      KT3B=3
C SET INITIAL PARAMETER VALUES
      P25A=.925-TABLI(SUP1,TIME1,T,156)
      P25B=1.0-P25A
      P26A=RANGE(1.555-TABLI(SUP1,TIME1,T,156)*11.11)
      P26B=1.0-P26A
      P27B=.268+TABLI(SUP1,TIME1,T,156)*2.8
      P27A=1.0-P27B
```

```
      P27C=.08
      P28A=RANGE(1,777-TABLI(SUR1,TIME1,T,156)*11,11)
      P28B=1.0-P28A
      P29B=.257+TABLI(SUR1,TIME1,T,156)*3.48
      P29A=1.0-P29B
      P29C=.05
C SET INITIAL VALUE OF RUI
      RUI=TABLI(RUI1,TIME1,T,156)
C INITIALIZE TIER 1 VARIABLES
      RT1A=RUI
      DO 10 IZ=1,KT1A
   10 T1A1(IZ)=RT1A
      T1AP=T1A1(KT1A)
      RT1B=P25B*T1AP
      T1LVP=P25A*T1AP
      DO 15 IZ=1,KT1B
   15 T1B1(IZ)=RT1B
      T1BP=T1B1(KT1B)
      T1EXP=P25B*T1BP
      RT1EXT=T1EXTP=T1EXT=0.0
      T1FEXP=P25A*T1BP+T1EXTP
      T1NET=RT1A-T1LVP-T1BP
      T1=T1A1(1)*DELT1A+T1B1(1)*DELT1B
C INITIALIZE TIER 2 VARIABLES
      RT2A=T1EXP/(1.0-P27C)
      DO 20 IZ=1,KT2A
   20 T2A1(IZ)=RT2A
      T2AP=T2A1(KT2A)
      RT2B=P27B*T2AP
      T2LVP=P27A*T2AP
      ERT2=P27C*T2AP
      DO 25 IZ=1,KT2B
   25 T2B1(IZ)=RT2B
      T2BP=T2B1(KT2B)
      T2EXP=P28B*T2BP
      RT2EXT=T2EXTP=T2EXT=0.0
      T2FEXP=P28A*T2BP+T2EXTP
      T2NET=RT2A-T2LVP-T2BP
      T2=T2A1(1)*DELT2A+T2B1(1)*DELT2B
C INITIALIZE TIER 3 VARIABLES
      RT3A=T2EXP/(1.0-P29C)
      DO 30 IZ=1,KT3A
   30 T3A1(IZ)=RT3A
      T3AP=T3A1(KT3A)
      RT3B=P29B*T3AP
      T3LVP=P29A*T3AP
      ERT3=P29C*T3AP
      DO 35 IZ=1,KT3B
   35 T3B1(IZ)=RT3B
      T3BP=T3B1(KT3B)
      T3EXP=T3BP
      T3NET=RT3A-T3LVP-T3BP
      T3=T3A1(1)*DELT3A+T3B1(1)*DELT3B
C CALCULATE INITIAL TOTAL UI VARIABLES
      UI=T1+T2+T3
      UILVP=T1LVP+T2LVP+T3LVP
      UIEXP=T1FEXP+T2FEXP+T3EXP
C PRINT INITIALIZED OUTPUT DATA
      K=0
      CALL ALFRED
C PRINT INITIALIZED COST DATA
```

```
      CALL COSTA(1,T1,T2,T3)
C INCREMENT TIME BY MONTH
      DO 200 K=1,156
      KK=K
      I=K
C INCREMENT TIME BY DT
      DO 100 J=1,5
C UPDATE TIME
      T=T+DT
C CALCULATE TIER 3 STATE VARIABLES
      T3=T3+DT*T3NET
      CALL DELDT(RT3A,T3AR,T3A1,DELT3A,IDT,DT,KT3A)
      CALL DELDT(RT3B,T3BR,T3B1,DELT3B,IDT,DT,KT3B)
C CALCULATE TIER 2 STATE VARIABLES
      T2=T2+DT*T2NET
      CALL DELDT(RT2B,T2BR,T2B1,DELT2B,IDT,DT,KT2B)
      CALL DELDT(RT2A,T2AR,T2A1,DELT2A,IDT,DT,KT2A)
      CALL OCTDEL(RT1EXT,T1EXTR,T1EXT1,7,T1EXT)
C CALCULATE TIER 1 STATE VARIABLES
      T1=T1+DT*T1NET
      CALL DELDT(RT1B,T1BR,T1B1,DELT1B,IDT,DT,KT1B)
      CALL VDEL(RT1A,T1AR,T1A1,DELT1A,DELP,DT,KT1A)
      CALL OCTDEL(RT2EXT,T2EXTR,T2EXT1,15,T2EXT)
C INTERPOLATE VALUE OF PUI
      PUI=TABLI(PUI1,TIME1,T,156)
      UR=TABLI(SUR1,TIME1,T,156)
C UPDATE PARAMETER VALUES
      DELT1A=(UR/ALOG(PUI))*100.0+.9
      P25A=.925-TABLI(SUR1,TIME1,T,156)
      P25B=1.0-P25A
      P26A=RANGE(1.555-TABLI(SUR1,TIME1,T,156)*11.11)
      P26B=1.0-P26A
      P27B=.263+TABLI(SUR1,TIME1,T,156)*2.9
      P27A=1.0-P27B
      P27C=.09
      P28A=RANGE(1.777-TABLI(SUR1,TIME1,T,156)*11.11)
      P28B=1.0-P28A
      P29B=.257+TABLI(SUR1,TIME1,T,156)*3.46
      P29A=1.0-P29B
      P29C=.05
C CALCULATE TIER 1 ALGEBRAIC VARIABLES
      RT1A=PUI
      RT1B=P25B*T1AR
      T1LVR=P25A*T1AR
      T1EXR=P26B*T1BR
      IF(PROGRAM(K).EQ.1)36,37
36    T1FEXR=P26A*T1BR+T1EXTR
      RT1EXT=0.0
      GO TO 38
37    T1FEXR=T1EXTR
      RT1EXT=P26A*T1BR
38    CONTINUE
      T1NET=RT1A-T1LVR-T1BR
C CALCULATE TIER 2 ALGEBRAIC VARIABLES
      ERT2=P27C*T2AR
      RT2A=ERT2+T1EXR
      RT2B=P27B*T2AR
      T2LVR=P27A*T2AR
      T2EXR=P28B*T2BR
      IF(PROGRAM(K).EQ.1)40,41
40    T2FEXR=P28A*T23R+T2EXTR
```

```
      RT2EXT=0.0
      GO TO 42
41    T2FEXR=T2EXTR
      RT2EXT=P28A*T2BR
42    CONTINUE
      T2NET=RT2A-T2LVR-T2BR
C CALCULATE TIER 3 ALGEBRAIC VARIABLES
      ERT3=P290*T3AR
      RT3A=ERT3+T2EXR
      RT3B=P293*T3AR
      T3LVR=P29A*T3AR
      T3EXR=T3BR
      T3NET=RT3A-T3LVR-T3BR
C CALCULATE TOTAL UI VARIABLES
      UI=T1+T2+T3
      UILVR=T1LVR+T2LVR+T3LVR
      UIEXR=T1FEXR+T2FEXR+T3EXR
  100 CONTINUE
C PRINT OUTPUT DATA BY MONTH
      CALL ALFRED
C PRINT COST DATA
      WRITE(5,997)T1,T2,T3
997   FORMAT(3F10.2)
      CALL COSTA(K,T1,T2,T3)
  200 CONTINUE
        REWIND 5
      CALL TTYPLT(3,5HLEVEL)
      END
      SUBROUTINE ALFRED
      COMMON KK,T,DT,RUI,RT1A,T1AR,RT1B,T1LVR,T1BR,T1EXR,T1FEXR,
     1T1NET,T1,RT2A,T2AR,RT2B,T2LVR,ERT2,T2BR,T2EXR,T2FEXR,
     2T2NET,T2,RT3A,T3AR,RT3B,T3LVR,ERT3,T3BR,T3EXR,T3NET,
     3T3,UI,UILVR,UIEXR,T1COST,T2COST,T3COST,UICOST,
     +RT1EXT,T1EXTR,T1EXT,RT2EXT,T2EXTR,T2EXT
C PRINT OUTPUT DATA
      RETURN
      PRINT 1000,K,RUI,RT1A,T1AR,RT1B,T1LVR
      PRINT 1001,T1BR,T1EXR,T1FEXR,T1NET,T1
      PRINT 1002,RT2A,T2AR,RT2B,T2LVR,ERT2
      PRINT 1003,T2BR,T2EXR,T2FEXR,T2NET,T2
      PRINT 1004,RT3A,T3AR,RT3B,T3LVR,ERT3
      PRINT 1005,T3BR,T3EXR,T3NET,T3
      PRINT 1006,UI,UILVR,UIEXR
      PRINT 1007,RT1EXT,T1EXTR,T1EXT
      PRINT 1009,RT2EXT,T2EXTR,T2EXT
C COMMENT CARD
 1000 FORMAT(1H0,5HTIME ,I3,2X,3HRUI,8X,F10.0,4X,4HRT1A,
     +7X,F10.0,4X,4HT1AR,7X,F10.0,4X,4HRT1B,7X,F10.0,4X,
     +5HT1LVR,6X,F10.0)
 1001 FORMAT(11X,4HT1BR,7X,F10.0,4X,5HT1EXR,6X,F10.0,4X,6HT1FEXR,
     +5X,F10.0,4X,5HT1NET,6X,F10.0,4X,2HT1,9X,F10.0)
 1002 FORMAT(11X,4HRT2A,7X,F10.0,4X,4HT2AR,7X,F10.0,4X,4HRT2B,
     +7X,F10.0,4X,5HT2LVR,6X,F10.0,4X,4HERT2,7X,F10.0)
 1003 FORMAT(11X,4HT2BR,7X,F10.0,4X,5HT2EXR,6X,F10.0,4X,6HT2FEXR,
     +5X,F10.0,4X,5HT2NET,6X,F10.0,4X,2HT2,9X,F10.0)
 1004 FORMAT(11X,4HRT3A,7X,F10.0,4X,4HT3AR,7X,F10.0,4X,4HRT3B,
     +7X,F10.0,4X,5HT3LVR,6X,F10.0,4X,4HERT3,7X,F10.0)
 1005 FORMAT(11X,4HT3BR,7X,F10.0,4X,5HT3EXR,6X,F10.0,4X,5HT3NET,
     +6X,F10.0,4X,2HT3,9X,F10.0)
 1006 FORMAT(11X,2HUI,9X,F10.0,4X,5HUILVR,6X,F10.0,4X,
     +5HUIEXR,6X,F10.0)
```

```
1007  FORMAT(11X,6HFT1EXT,5X,F10.0,4X,6HT1EXTP,
     +5X,F10.0,4X,5HT1EXT,6X,F10.0)
1008  FORMAT(11X,6HFT2EXT,5X,F10.0,4X,6HT2EXTP,
     +5X,F10.0,4X,5HT2EXT,6X,F10.0///)
      RETURN
      END
      SUBROUTINE COSTA(K,T1,T2,T3)
      DIMENSION REG(156),T2BENE(156),T3BENE(156),T1COST(156),
     +T2COST(156),T3COST(156)
C READ COST PROFILES
        RETURN
        I=K
      MONTH=K
10    IF(MONTH.GT.12)MONTH=MONTH-12
      IF(MONTH.GT.12) GO TO 10
      DUM1=DUM2=DUM3=DUM4=DUM5=DUM6=DUM7=DUM8=DUM9=DUM10=DUM11=DUM12=0.0
      LCDUM1=LCDUM2=LCDUM3=LCDUM4=0.0
C THE MONTHS ARE SET TO DUMMY VALUES.
      IF(MONTH.EQ.1)DUM1=1
      IF(MONTH.EQ.2)DUM2=1
      IF(MONTH.EQ.3)DUM3=1
      IF(MONTH.EQ.4)DUM4=1
      IF(MONTH.EQ.5)DUM5=1
      IF(MONTH.EQ.6)DUM6=1
      IF(MONTH.EQ.7)DUM7=1
      IF(MONTH.EQ.8)DUM8=1
      IF(MONTH.EQ.9)DUM9=1
      IF(MONTH.EQ.10)DUM10=1
      IF(MONTH.EQ.11)DUM11=1
      IF(MONTH.EQ.12)DUM12=1
      IF(I.GE.4.AND.I.LT.25)LCDUUM1=1
C THE LEGISLATIVE CHANGE DUMMIES ARE SET.
      IF(I.GE.25.AND.I.LT.54)LCDUM2=1
      IF(I.GE.54.AND.I.LT.66)LCDUM3=1
      IF(I.GE.66)LCDUM4=1
C THE AVERAGE WEEKLY BENEFITS ARE DETERMINED BY REGRESSION EQUATIONS.
      REGAWP=LCDUM4*37.4+LCDUM3*21.5+LCDUM2*9.9+LCDUM1*8.67
     +-DUM6*2.79+DUM8*3.49+DUM2*3.11+DUM1*2.17+48.62+CUM3*3.02
C CALCULATE MONTHLY COST
        IF(K.NE.1)GO TO 611
        READ(10,962)(REG(J),J=1,89)
962     FORMAT(8F10.0)
        REWIND 10
         DO 36 J=90,156
36       REG(J)=REG(89)
611      CONTINUE
        T1COST(K)=((3.61*REG(K)-11820)/REG(K))*T1*REGAWP
      T2COST(K)=(REGAWP*4.345)*T2
      T3COST(K)=(REGAWP*4.345)*T3
      IF (K.NE.156) RETURN
C PRINT MONTHLY COST
      PRINT 900
  900 FORMAT(5H1YEAR,4X,*MONTH*2X,6HT1COST,4X,6HT2COST,4X.6HT3COST)
      DO 100 IYR=1970,1982
      DO 100 MO=1,12
      K=((IYR-1970)*12)+MO
  100 CONTINUE
C CALCULATE YEARLY COST
      DO 200 I=12,156,12
      CUM1=CUM2=CUM3=0.0
      DO 150 J=1,12
```

```
      CUM1=CUM1+T1COST(I-J+1)
      CUM2=CUM2+T2COST(I-J+1)
      CUM3=CUM3+T3COST(I-J+1)
  150 CONTINUE
      IYR=((I+1)/12)+1969
C PRINT YEARLY COST
  200 CONTINUE
      DO 40 J=1,156
      WRITE(5,44)T1COST(J),T2COST(J),T3COST(J)
   40 CONTINUE
   44 FORMAT(3F10.0)
      RETURN
      END
      SUBROUTINE DELDT(RINR,ROUTR,CROUTR,DEL,IDT,DT,K)
C THIS IS A FORDYN SUBROUTINE FOR SIMULATING DISTRIBUTED TIME DELAYS.
C FOR A DESCRIPTION SEE FORDYN, AN INDUSTRIAL DYNAMICS SIMULATOR PAGE
C 6  TO 44 BY ROBERT W. LLEWELLYN, PROFESSOR OF INDUSTRIAL ENGINEERING,
C NORTH CAROLINA STATE UNIVERSITY.  PRIVATELY PRINTED BY TYPING SERVICE,
C RALEIGH, NORTH CAROLINA, 1965.
      DIMENSION CROUTR(3)
      DELI=(DEL*FLOAT(IDT))/(FLOAT(K)*DT)
      ROUTR=0.0
      DO 2  I=1,IDT
      RIN=RINR/FLOAT(IDT)
      DO 1 I=1,K
      ABC=CROUTR(I)
      CROUTR(I)=ABC+(RIN-ABC)/DELI
    1 RIN=ABC
    2 ROUTR=ROUTR+CROUTR(K)
      RETURN
      END
      FUNCTION TABLI(VAL,ARG,DUMMY,K)
C THIS IS A FORDYN TABLE LOOK-UP FUNCTION FOR INTERPOLATING VALUES IN A
C TABLED SERIES OF NUMBERS9  FOR A DESCRIPTION SEE FORDYN- AN INDUSTRIAL
C DYNAMICS SIMULATOR, PAGE 4 - 22 BY ROBERT W. LLEWELLYN, PROFESSOR OF
C INDUSTRIAL ENGINEERING, NORTH CAROLINA STATE UNIVERSITY,  PRIVATELY
C PRINTED BY TYPING SERVICE, RALEIGH, NORTH CAROLINA, 1965.
      DIMENSION VAL(K),ARG(K)
      DUM=AMAX1(AMIN1(DUMMY,ARG(K)),ARG(1))
      DO 1 I=2,K
      IF(DUM.GT.ARG(I)) GO TO 1
      TABLI=(DUM-ARG(I-1))*(VAL(I)-VAL(I-1))/(ARG(I)-ARG(I-1))
     +  +VAL(I-1)
      RETURN
    1 CONTINUE
      RETURN
      END
      SUBROUTINE TTYPLT(NX,NAME)
      DIMENSION IX(60),VAL1(156),VAL2(156),VAL3(156),T(156)
      BIG=0.0
      SMALL=99999999
      DO 100 K=1,156
      READ(5,900) VAL1(K),VAL2(K),VAL3(K)
  900 FORMAT(3F10.0)
  100 T(K)=VAL1(K)+VAL2(K)+VAL3(K)
        REWIND 2
      DO 101 J=1,156
      READ(2,900)VAL1(J),VAL2(J),VAL3(J)
  101 CONTINUE
      DO 50 K=1,156
        VAL3(K)=VAL2(K)+VAL1(K)
```

```
      BIG=AMAX1(BIG,VAL1(K),VAL2(K),VAL3(K),T(K))
      IF(VAL1(K).EQ.0.0.OR.VAL2(K).EQ.0)GO TO 50
      SMALL=AMIN1(SMALL,VAL1(K),VAL2(K),VAL3(K))
50    CONTINUE
        BIG=BIG+2000.
      DIV=(BIG-SMALL)/59.999
      DIV15=DIV*15+SMALL
      DIV30=DIV*30+SMALL
      DIV45=DIV*45+SMALL
      PRINT 910,SMALL,DIV15,DIV30,DIV45,BIG
910   FORMAT(1H1/,5(E8.2,7X)/4X,4(1H+,14(1H-))1H+)
      DO 110 K=1,156
      DO 120 J=1,60
      IPLT1=IPLT2=IPLT3=IPLT4=0
      TOT=T(K)
      IX(J)=1H
      JJ=J-1
      IF(VAL1(K).GE.(DIV*JJ)+SMALL.AND.VAL1(K).LT.DIV*(JJ+1)+SMALL)
     +IPLT1=1
      IF(VAL2(K).GE.(DIV*JJ)+SMALL.AND.VAL2(K).LT.DIV*(JJ+1)+SMALL)
     +IPLT2=1
      IF(VAL3(K).GE.(DIV*JJ)+SMALL.AND.VAL3(K).LT.DIV*(JJ+1)+SMALL)
     +IPLT3=1
      IF(TOT.GE.(DIV*JJ)+SMALL.AND.TOT.LT.DIV*(JJ+1)+SMALL)
     +IPLT4=1
      IF(J.EQ.15.OR.J.EQ.30.OR.J.EQ.45)IX(J)=1H.
      ISUM=IPLT1+IPLT2+IPLT3+IPLT4
      IF(IPLT1.EQ.1)IX(J)=1H1
      IF(IPLT2.EQ.1)IX(J)=1H2
      IF(IPLT3.EQ.1)IX(J)=1H3
      IF(IPLT4.EQ.1)IX(J)=1H4
      IF(ISUM.GT.1)IX(J)=1H*
120   CONTINUE
      PRINT920,K,IX
110   CONTINUE
920   FORMAT(I4,1H+,60A1,1H+)
      PRINT930,SMALL,DIV15,DIV30,DIV45,BIG
930   FORMAT(4X,4(1H+,14(1H-))1H+/5(E8.2,7X))
      PRINT 700,NAME
700   FORMAT(1H1,25X,A5,* OF UI,BY SYSTEM*
     +//1H ,65(1H-)//21X,*CURRENT     *
     +* THREE TIER*/*      QUARTER*,11X,*SYSTEM *
     +5X,*SYSTEM*,10X,*DIFFERENCE*//1H ,65(1H-))
      DO 640 M=1970,1977
      PRINT 720
720   FORMAT(/)
      DO 640 MM=1,4
      CUMD=CUMT=CUMC=0.
      DO 645 L=1,3
      N=((M-1970)*12)+(MM-1)*3+L
      CUMC=CUMC+(VAL1(N)+VAL2(N))/NX
      CUMT=CUMT+T(N)/NX
645   CUMD=CUMC-CUMT
      PRINT 710,M,MM,CUMC,CUMT,CUMD
710   FORMAT(I10,1H.,I1,5X,3(F12.0))
640   CONTINUE
      RETURN
      END
      SUBROUTINE OGTOIL(VIN,VOUT,VINT,N,STORE)
      DIMENSION VINT(1)
      VOUT=STORE=VINT(1)
```

```
      DO 1 I=2,N
      STORE=VINT(I)+STORE
      STORE=STORE*0.2
1     VINT(I-1)=VINT(I)
      VINT(N)=VIN
      RETURN
      END
      FUNCTION RANGE(VAL)
      IF(VAL.LT.0.0)VAL=0.0
      IF(VAL.GT.1.0)VAL=1.0
      RANGE=VAL
      RETURN
      END
      SUBROUTINE VDEL(VIN,VOUT,P,DEL,DELP,DT,K)
      DIMENSION P(1)
      FK=FLOAT(K)
      A=DT*FK/DEL
      DELD=(DELP-DEL)/(DT*FK)
      DELP=DEL
      DO 1 I=1,K
      DR=P(I)
      P(I)=DR+A*(VIN-DR*(1.-DELD))
      VIN=DR
1     VOUT=P(K)
      RETURN
      END
```

BIBLIOGRAPHY

BIBLIOGRAPHY

Alfeld, Louis Edward and Alan K. Graham. Introduction to Urban Dynamics. Cambridge, Massachusetts: Wright-Allen Press, Inc., 1976.

Blaustein, Saul J. "Making UI Better." Manpower VII (August 1975), 23-25.

_________. A New Job Security System for Michigan. Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, June 15, 1977 (draft copy).

_________. A New Job Security System for Michigan. Study of alternative strategies for the Michigan Unemployment Insurance Program, Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, November, 1977.

_________. Unemployment Insurance Objectives and Issues: An Agenda for Research and Evaluation. Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, November, 1968.

Burgess, Paul L. and Jerry L. Kinston. Unemployment Insurance, the Job Search Process and Reemployment Success. Working papers prepared under Contract UIS-72-10 for U.S. Department of Labor, Manpower Administration, Unemploymenr Insurance Service, June 1974.

Chambers, John C., Satinder K. Mullick, and Donald D. Smith. "How to choose the right forecasting technique." Harvard Business Review (July - August 1971): 45-74.

Cohen, Malcolm S. On the Feasibility of a Labor Market Information System. Vol. 2. A report prepared for U.S. Department of Labor, Manpower Administration. Ann Arbor, Michigan: Institute of Labor and Industrial Relations, University of Michigan-Wayne State University, 1974.

Collected Papers of Jay W. Forrester. Cambridge, Massachusetts: Wright-Allen Press, Inc., 1975.

Dahlhe, Sheryl and E. Lynn Savage. General Assistance in Michigan: A Profile of Program and Recipient Characteristics. Lansing: Michigan Department of Social Services, July, 1975.

"Developments in Simulation in Social and Administrative Science." Schultz and Sullivan in Geutzkow, Kotler and Schultz, Simulation in Social and Administrative Science. Englewood Cliffs, New Jersey: Prentice Hall, 1972.

Forrester, Jay W. Urban Dynamics. Cambridge, Massachusetts: MIT Press, 1969.

Garfinkle, Stuart H. "The Outcome of a Spell of Unemployment." Monthly Labor Review (January 1977): 54-57.

Guzzardi, Walter, Jr. "How to Deal with the 'New Unemployment." Fortune (October 1976): 132-216.

Haber, William, Dale Heien, Stephen T. Marston, and Arthur R. Schwartz. An Econometric Model to Estimate Benefit Outlays for Federal Unemployment Insurance Programs (UCFE & UCX). A report prepared for the Unemployment Insurance Service, Manpower Administration, U.S. Department of Labor. Ann Arbor: Institute of Labor and Industrial Relations, University of Michigan-Wayne State University, 1974.

Hilaski, Harvey J. The Status of Research on Gross Changes in the Labor Force. Washington, D.C.: Division of Employment and Unemployment Analysis, U.S. Bureau of Labor Statistics.

Jenicke, Lawrence and Mark Sisco. "Michigan Manpower Simulation Model." Status Report, October 20, 1976 (mimeographed).

Llewellyn, Robert W. Fordyn, an Industrial Dynamics Simulator. Privately published by Typing Service, Raleigh, North Carolina, 1965.

Manetsch, Thomas and Gerald Park. System Analysis and Simulation with Applications to Economic and Social Systems. East Lansing, Michigan: M.S.U. Department of Engineering Research, November, 1973.

Manpower Report of the President. A Report on Manpower Requirements, Resources, Utilization, and Training by the United States Department of Labor. Washington, D.C.: U.S. Government Printing Office, January, 1969.

Marston, Stephen T. "The Impact of Unemployment Insurance on Job Search," in Brookings Papers on Economic Activity, I, 1975. Edited by Arthur M. Okum and George L. Perry. Washington, D.C.: The Brookings Institution, 1975, 13-60.

Michigan. Bureau of Employment and Training. Michigan Manpower Simulation Model, Operators Guide (version 1.1). Lansing: Michigan Department of Labor, January, 1978.

Michigan Employment Security Commission. MESC'S Employers' Handbook. Detroit: Michigan Employment Security Commission, January, 1976.

Mueller, Eva and Jay Schmiedeskamp. Persistent Unemployment, 1957-1961. Kalamazoo: The W.E. Upjohn Institute for Employment Research, November, 1962.

National Commission for Manpower Policy. First Annual Report to the President and the Congress of the National Commission for Manpower Policy: Toward a National Manpower Policy. Washington, D.C.: National Commission for Manpower Policy, October, 1975.

Perry, George L. "Unemployment Flows in the U.S. Labor Market," in Brookings Papers on Economic Activity, II, 1972. Edited by Arthur M. Okum and George L. Perry. Washington, D.C.: The Brookings Institution, 1972, 245-292.

Smith, Ralph E. The Discouraged Worker in a Full Employment Economy. Washington, D.C.: The Urban Institute, January 28, 1974.

__________. Dynamic Determinants of Labor Force Participation: Some Evidence from Gross Change Data. Washington, D.C.: The Urban Institute, January, 1974.

__________. A Simulation Model of the Demographic Composition of Employment Composition of Employment, Unemployment, and Labor Force Participation: Status Report. Washington, D.C.: The Urban Institute, July, 1974.

Stevenson, Gloria. "Behind the Lines: Managing UI." Manpower VII (August 1975): 14-20.

Unemployment and Income Security: Goals for the 1970's. Kalamazoo, Michigan: The W.E. Upjohn Institute for Employment Research, July 1969.

U.S. Department of Health, Education and Welfare in cooperation with the Michigan Department of Social Services. Profile of the Michigan ADC Caseload. Washington, D.C.: U.S. Department of Health, Education and Welfare, 1971, 1973.

Weber, Arnold R., Paul J. Smith, Curtis P. Harding and William Haber. "UI Issues." Manpower VII (August 1975): 2-5.

White, J. Kenneth and Lawrence Jenicke. "Manpower Planning: A Macro Viewpoint." Paper prepared for presentation at Midwest Academy of Management, November, 1976.

Wolfbein, Seymour L. Employment, Unemployment and Public Policy. New York: Random House, 1967.