A MACROECONOMETRIC FORECASTING MODEL OF TAIWAN

By

PETER TSU-YUAN CHANG

Bachelor of Arts in Business Administration
National Taiwan University
Taipei, Taiwan
1961

Master of Arts
College of Chinese Culture
Huakang, Taiwan
1964

Master of Science
Brigham Young University
Provo, Utah
1969

Submitted to the Faculty of the Graduate College
of the Oklahoma State University
in partial fulfillment of the requirements
for the Degree of
DOCTOR OF PHILOSOPHY
December, 1977

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Thesis Approved:

Michael R. Edgmand
Thesis Adviser

John D. Rea

Robert D. Morrison

Michael J. Applegate

Norman N. Durham
Dean of the Graduate College

ACKNOWLEDGMENTS

This dissertation is dedicated to my parents, Ah-shi and Chiu-chiu Chang, whose love, faith and support of many kinds sustained me through my education.

I am deeply indebted to the members of my graduate committee, Dr. Michael J. Applegate, Dr. Michael R. Edgmand, Dr. Robert Morrison and Dr. John D. Rea, for their valuable assistance. Special gratitude goes to Dr. Michael R. Edgmand, Chairman of the committee, for his valuable suggestions and assistance throughout the research.

I would also like to express my appreciation to Dr. John D. Rea for providing the MACROSIM program and to Professor C. K. Liew at the University of Oklahoma for providing the DYMULT program.

A special debt of gratitude is owed to Mr. Stanley Rogers of the Agricultural Economics Department at Oklahoma State University. His assistance in the preparation of the computer programs used in this study is beyond appreciation.

I would like to express my sincere gratitude to my friends, particularly Dr. Hong-i Yang, Mrs. George Schwartz and the late Dr. George Schwartz, and Mr. George Chiang for their concern, inspiration and encouragement.

My appreciation to Linda Day and Charlene Fries for typing this dissertation and Mike Rollins for reducing the computer printouts.

Finally, gratitude is expressed to my wife, Rosanna. Her constant love, devotion and understanding are essential to any success I attained.

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CHAPTER I

INTRODUCTION

In the last two or three decades, great progress has been made in the use of macroeconometric models as a means for analyzing the behavior of aggregate economic variables. The use of econometric models by government economic planning agencies has also become prevalent. Following the models of Tinbergen (cf. 52, p. 69) and Klein and Goldberger (cf. 62, p. 701), models have been developed for the United States, the United Kingdom, Canada, Japan, the Netherlands, Sweden, and many other countries. Macroeconometric models have been constructed to estimate the quantitative impact of alternative government policies, investigate the nature of short-run macroeconomic fluctuations, and forecast such magnitudes as gross national product (GNP), national income, employment, and the price level. In the area of government policy making, however, more discussion has been focused on economic measures for accomplishing the goals and less on forecasting (52, p. 9).

This is particularly true in the case of Taiwan. Only a few models have been constructed for the Taiwan economy. Moreover, these models are incomplete and are based on very limited data. A more complete and up-to-date forecasting model of Taiwan is greatly needed.

Taiwan is a small island relatively poor in natural resources with a very dense population. For the past two decades, much effort has been devoted to economic development. However, economic development requires sound economic policy predicated on a good forecasting tool. Since a forecasting model can be used for policy simulation and forecasting, the present study might benefit policy makers in Taiwan.

Objectives

This study is an attempt to construct a macroeconometric model of Taiwan for forecasting purposes. Additional objectives include examination for structural changes, and--if structural changes have occurred--determination of their effects on forecasting accuracy and comparison of the relative performance between the model and earlier models on Taiwan.[1]

The Area of Study

The model is a non-linear block recursive system containing thirteen equations. Eight are behavioral equations and five are identities. The model is based on annual data on Taiwan covering the time period from 1952 to 1973. Major computer programs used in the study are the Econometric Analysis System (EAS) for estimation of the structural parameters and the Macroeconometric Simulation (MACROSIM) for simulation and forecasting.[2] The Dynamic Multipliers (DYMULT) is also adopted for analysis of stability and derivation of dynamic multipliers in Liu's model.[3]

This study differs from previous models of Taiwan in several ways. It is non-linear and employs the simulation approach to evaluate performance. Since it contains more equations, it describes the economy in greater detail. In particular, it includes equations for wage income, the price level, and the monetary sector. The model also covers a longer period of time--from 1952 to 1973. The estimation of the structural parameters is based on the time series data from 1952 to 1973 with the remaining three years of data (1974 to 1976) reserved for ex post forecasting. The initial year is 1952; it is the writer's belief that 1951 data may be unduly influenced by the Korean War and should be excluded. Since quarterly data is available only in recent years, the model is based on annual data.

Organization of the Study

Chapter II provides economic background information relevant to this study of Taiwan. A review of the literature pertaining to the model is given in Chapter III. The specification, identification and estimation of the model are discussed in Chapter IV. In Chapter V, simulation is used to examine the dynamic properties of the model. Some implications of the dynamic multipliers and policy simulations are also provided. Chapter VI contains an evaluation of the performance of the model based upon ex post simulation and ex post forecast. The tests for sensitivity and structural change are also included in this chapter. In addition, a comparison of this writer's model with the Taiwan naive model and Seaks' model is also made. The last chapter summarizes the study and also contains a discussion of the study's limitations and suggestions for further studies.

ENDNOTES

[1]The equations which represent the economy are based on data for the 1952-1973 period. If no structural change occurred during the period, the equations are the same for each subperiod. However, if structural change occurred, the equations will vary by subperiod and only the equations based on recent data will provide reliable forecasts.

[2]The EAS is a computer package developed and implemented by Richard E. Just and Stanley M. Fletcher, Department of Agricultural Economics, Oklahoma State University, in March, 1975. The program is designed to give the user a broad range of capabilities for econometric analysis and ease of data manipulation and transformation (51). The MACROSIM, designated to be a flexible tool for studying economic models, was developed by Hester and Taylor in 1970 in Fortran IV for Univac 1108. Further conversion to suit for IBM/360 was due to Sowey in 1971. This program performs linear system simulation experiments, forecasting, solution of non-linear equation systems and generates Monte Carlo samples (30). For the purpose of this study, the MACROSIM has been revised and is designated as the revised MACROSIM in this study.

[3]The DYMULT program, developed by C. K. Liew at the University of Oklahoma, is designed for dealing with a simple linear simultaneous equations model with lags. The DYMULT checks the stability conditions of the system of equations and calculates the impact, interim and total multipliers (44).

CHAPTER II

THE TAIWAN ECONOMY

Taiwan is an island roughly 250 miles long and 60 to 90 miles wide with an area of approximately 14,000 square miles (the equivalent of 36,000 square kilometers).[1] Located about 100 miles off the coast of Fukien and separated from the mainland China by the Taiwan Straits, Taiwan is slightly larger than Massachusetts and Connecticut combined and slightly smaller than the Netherlands.

Geologically, it is a part of the island chain found around the western rim of the Pacific Ocean. Located astride the Tropic of Cancer, Taiwan is shaped like a tobacco leaf. The island is dominated by the Central Mountain Range which runs from north to south and divides the island into the rocky, rugged regions of the east and the fertile plains of the west. About 57 percent of the mountains are forested. Rivers are short and swift, most of them descending from the Central Mountain Range and running west. None of the rivers are commercially navigable but the streams provide hydroelectric power.

The climate is subtropical in northern and central parts of Taiwan and tropical in the south. Summers are long and humid with an average temperature of about 80°F. Winter in the north is confined to January and February, the average temperature a mild 60°F. Rainfall is about 101 inches a year. This makes the island very well-suited to agriculture; however, only a quarter of the land is presently cultivated as a result of the mountainous land which makes up two-thirds of the island.

Also known as Formosa, Taiwan is believed to be originally populated by Polynesians. In the 12th century, many Chinese moved to Taiwan from the provinces of Fukien and Canton. Later, the island was occupied by the Dutch (1624 to 1662), the Spanish (1626 to 1641), and the Japanese (1895 to 1945). During the Japanese occupation, the island was built up as a base for Japan's invasion of Southeast Asia. In 1949, many Chinese relocated in Taiwan when the Chinese Communists took over the mainland.[2]

A Brief Historical Review of the Economy

From 1951 to 1975, the average annual increase in real Gross National Product (GNP) was 8.15 percent (16, p. 139). Gross National Product doubled from 1951 to 1961 (see Table I), then doubled once again by 1969. In the six years following, Gross National Product increased by 61 percent. Thus, for the past 25 years, GNP doubled approximately every decade.

Real GNP, without adjustment for gain or loss due to changes in the terms of trade, grew rapidly from 1951 to 1975. For the period, the average growth rate was 8.15. However, the average conceals a wide range of experience. In some years (1952, 1964-1965, 1967, 1970-1973), real GNP increased at a rate in excess of 10 percent. In 1974 and 1975, real GNP grew at less than three percent per year.

Because of population increases, real per capita income did not increase as rapidly as GNP during the period. The average annual increase in per capita income was 4.42 percent. During 1951 to 1961,

TABLE I

REAL GROSS NATIONAL PRODUCT, PER CAPITA INCOME, AND GENERAL PRICE LEVEL OF THE TAIWAN ECONOMY, 1951-1975

	GNP[a]		Per Capita Income[b]		General Price Level[c]	
Year	Amount (NT $ Million)[d]	Increase %	Amount (NT $)	Increase %	Price Level	Increase %
1951	52,121	---	5,515	---	23.63	---
1952	57,795	10.89	5,842	5.93	29.84	20.81
1953	62,582	8.28	6,078	4.04	36.73	18.76
1954	68,022	8.69	6,200	2.01	37.08	0.94
1955	73,270	7.72	6,450	4.03	41.06	9.69
1956	77,149	5.29	6,526	1.18	44.77	8.29
1957	82,461	6.89	6,766	3.68	48.86	8.37
1958	87,184	5.73	6,841	1.11	51.59	5.29
1959	93,278	6.99	7,080	3.49	55.69	7.36
1960	98,523	5.62	7,236	2.20	63.75	12.64
1961	104,973	6.55	7,508	3.76	66.96	4.79
1962	112,622	7.29	7,697	2.52	68.78	2.65
1963	122,241	8.54	8,335	8.29	71.75	4.14
1964	136,197	11.42	9,290	11.46	75.42	4.87
1965	150,367	10.40	9,495	2.21	75.42	0.00
1966	162,019	7.75	9,929	4.57	77.98	3.28
1967	178,790	10.35	10,692	7.68	81.59	4.42
1968	194,648	8.87	11,201	4.76	87.81	7.08
1969	211,341	8.58	11,697	4.43	92.54	5.11
1970	234,161	10.80	12,710	8.66	96.70	4.30
1971	261,436	11.65	13,863	9.07	100.00	3.30
1972	292,693	11.96	14,927	7.68	105.01	1.77
1973	327,588	11.92	16,088	7.78	118.62	11.47
1974	329,560	0.60	15,612	-2.96	159.14	25.46
1975	338,805	2.81	15,390	-1.42	164.92	4.50

Sources: Directorate-General of Budget, Accounting and Statistics, Republic of China, National Income of the Republic of China (1975), pp. 16, 25 and 130; and (1977), p. 123.

[a]At 1971 prices without adjustment for gain or loss due to changes in terms of trade.

[b]At 1971 prices with adjustment for gain or loss due to changes in terms of trade.

[c]Implicit price deflator for GNP.

[d]NT $ stands for New Taiwan Dollar. The (Old) Taiwan Dollar was the currency used during the period following the withdrawal of Japanese from Taiwan in 1945 and prior to the arrival of the Nationalist Chinese from mainland China in 1949. However, since the (Old) Taiwan Dollar suffered very badly from hyper-inflation in late 1948 and early 1949, the government in Taiwan reformed the currency in June, 1949 by converting the (Old) Taiwan Dollar into the New Taiwan Dollar (NT Dollar) at a rate of 40,000 to 1. The NT $ has been circulated since then. Multiple exchange rates prevailed in Taiwan prior to September, 1963. During the period between September, 1963 and February, 1973, the exchange rate of NT Dollar to U.S. Dollar was stabilized at 40 to 1. Since February, 1973 it has been at 38 to 1.

there was a 36 percent increase in per capita income. For the periods from 1961 to 1969 and from 1969 to 1975, the increases were 56 and 32 percent, respectively.

General price level (GNP deflator) had shown an upward trend during the past two and one half decades (Table I). For the period, the average increase was 7.60 percent. The rate of inflation, as measured by the percent change in the general price level, was less than 10 percent for most years during the same period except 1953 (23.09 percent), 1955 (10.73 percent), 1960 (14.47 percent), 1973 (12.96 percent), and 1974 (34.16 percent) (see Appendix A).

Since 1953, the government in Taiwan has carried out a series of four-year economic plans for economic development. The first and second four-year plans (1953-1960) aimed at establishing a number of import-substitution industries. During the third and fourth four-year plan periods (1961-1968), economic development accelerated. This was the result of a rapid expansion of exports. Agriculture, industry, transportation and communications showed progress; the international payments situation also showed tremendous improvement. During the fifth four-year plan period (1969-1972), industry continued to boom and export trade expanded vigorously. The average annual growth rate of the economy exceeded 10 percent. The sixth four-year plan (1973-1977) focused on continued economic growth as its goal.

Several factors contribute to this rapid economic growth. First, the political situation has been very stable during this period. This allowed much effort to be devoted to economic development and growth. Second, U.S. economic and military aid contributed greatly to the stabilization of the economy of Taiwan. These aids have been in the form of grants, credits, and other assistance. Even though U.S. military aid phased out in 1965, continued economic aid has helped to cover the deficits of the balance of payments. From 1953 to 1974, Taiwan received a total of $952.4 million in foreign aid from the U.S. (including $237 million in loans).[3] In addition, investment (I) has increased tremendously during this period of time. The percentage of investment (I) to Gross National Product (GNP) is 10.34 in 1952, 13.36 in 1961, 18.56 in 1969 and 28.28 in 1975. Third, the increase in both quantity and quality of labor supply has contributed to this rapid development. Although Taiwan has implemented a family planning project in recent years, the population growth rate is still as high as three percent. Consequently, the labor supply has increased rapidly. The quality of labor has also improved substantially, due to the extension of compulsory education from six years to nine years in the 1960's.

Recent Developments in the Economy

Beginning in 1973, import prices have risen rapidly as a result of world-wide inflation, poor harvests, and the energy crisis. Domestic prices have also shown a sharp increase. Like most economies in 1974, the Taiwan economy was seriously affected by both inflation and recession (8, p. 179). During this period the oil-importing countries took measures to discourage imports and encourage exports in order to overcome their unfavorable balance of payments. These measures led to sharper competition in the world market. Substantial increases in domestic prices and wages in early 1974 further compounded the problem in Taiwan. Hence, Taiwan's exports encountered more difficulty than ever before (8, p. 181).[4] As a result, the recession persisted into the later half of the year and worsened in 1975. Inflation and recession have continued to slow down the economic growth in recent years. This is evidenced by a 0.6 percent increase in real GNP in 1974. This increase is the smallest in the past two decades. Several measures have been taken to stimulate the economy, including lowering interest rates and reducing taxes. With these measures in effect, the growth rate of GNP increased to 2.8 percent in 1975. In 1974, Taiwan had a per capita income of $811 (in U.S. dollars) as compared to $3449 in Japan, $382 in Korea, $1511 in Portugal, $303 in Thailand, and $5951 in the United States (17, p. 217).

The Structure of the Taiwan Economy

Agriculture and Industry

In 1975, agricultural products constituted 15.87, mining and manufacturing 36.49, commercial 11.65, government service 13.10, transportation and communication 6.18 and others 16.71 percent of the GNP. Major agricultural products in Taiwan include farm crops (rice, sweet potatoes, peanuts, soybeans, corn, sugar, tea, tobacco, pineapples, bananas, citrus fruits, asparagus, mushrooms and onions), livestock (hogs, cattle, poultry and milk), fishery products (deep-sea, inshore and coastal fisheries and fish-culture), and forestry (timber, industrial raw material wood and fuel wood). The principal industrial products include mining (coal, crude oil, natural gas, electrolytic copper, sulphur, salt and gold), heavy and petrochemical products (paper and paper board, rubber tires, plastic shoes, caustic soda, PVC resin, bars and shapes, aluminum ingots, sewing machines, general machinery, textile machinery, agricultural machinery, electric fans, air conditioners, refrigerators, washing machines, transistor radios, TV sets, recording machines, electronic calculators, electronic components and parts, automobiles, motorcycles, bicycles, ships and vessels, fluorescent lamps), light industry products (canned pineapples, canned asparagus, canned mushrooms, wheat flour, monosodium glutamate, rayon staple, rayon filament, polyester staple, polyamicle filament, cotton yarn, cotton fabrics and garments, knitted garments, plate glass, cement and plywood) (8, p. 189 and pp. 195-196). Agriculture and industry accounted for 35.51 and 19.42 percent of gross national product, respectively, in 1951, 31.04 and 24.72 percent in 1961, 18.49 and 33.78 percent in 1969, and 16.26 and 36.32 percent in 1975, respectively (16, pp. 28-29).

This pattern indicates a gradual shift from agriculture to industry. Agriculture appears to be growing at a much slower rate than manufacturing. This can be seen in a 4.3 percent average annual real growth rate for agriculture as compared with a 16.0 percent for manufacturing (17, p. 27).

Consumption Patterns

Consumption constituted 54.87 percent of gross national product in 1975 (17, p. 81). There is a significant change in the composition of private consumption expenditure along with the change of income in Taiwan (Table II). Expenditures on food accounted for 55.77 percent of private consumption expenditure in 1951 and only 43.69 percent in 1975. While the percent of expenditure on food is declining, expenditures on beverage, health, household, and transport show rising trends with the exception of recreation.

TABLE II

THE COMPOSITION OF THE PRIVATE CONSUMPTION OF THE TAIWAN ECONOMY, SELECTED YEARS[a]

Year	Food	Beverage	Health[b]	Household[c]	Recreation	Transport[d]
1951	55.77	1.92	3.93	11.63	3.27	1.39
1961	50.60	2.99	6.11	12.96	2.11	1.31
1969	42.34	3.66	5.96	16.94	3.38	2.76
1975	43.69	3.44	5.25	15.87	3.88	4.05

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, pp. 44-45.

[a]At current prices: unit = %; total private consumption = 100.

[b]Health includes personal care and health expenses.

[c]Household includes rent and water, furniture, furnishings and household equipment, and household operation.

[d]Transport includes transport and communication.

Pattern of Gross Domestic Capital Formation

Investment constituted 28.28 percent of gross national product in 1975 (17, p. 81). The structure of Gross Domestic Capital Formation has also changed during the last two decades (Table III). While the proportion of investment in manufacturing, transport, storage, and communication has gradually increased, it decreased drastically in agriculture, hunting, animal husbandry, forestry, and fishing. The change in the proportion for housing and government services is insignificant. This demonstrates that a large amount of capital was invested in manufacturing, transport, storage, and communication, electricity, gas and water, while a smaller amount was invested in mining, finance, and insurance. By type of purchaser, both government enterprises and general government investment declined, while private enterprises rose substantially.

Apart from the above statistics, the government in Taiwan has improved the investment climate since the early 1950's by easing government controls; amending obsolete, obstructive legislation; simplifying administrative procedures; improving the credit system; improving labor management relations and providing tax incentives for investment. To specifically encourage investment, the government exempts qualified investors from business income tax for five years and also exempts from customs duty on imported machinery and equipment for basic industries. Capital intensive and technology-intensive industries are encouraged. Industrial districts with public utilities and services have been developed in various parts of the island for the convenience of new investors. "Export Processing Zones," similar to free trade zones, encourage the growth of export industries through the exemption of

TABLE III

A COMPARISON OF 1951 AND 1974 GROSS DOMESTIC CAPITAL FORMATION OF THE TAIWAN ECONOMY[a]

By Industry Use	1951	1974
Manufacturing	27.44	43.84
Electricity, gas and water	5.15	14.06
Transport, storage and communication	12.22	12.75
Housing except owner-occupied, commercial, and miscellaneous personal services	8.87	6.99
Agriculture, hunting, forestry, and fishing	32.63	6.02
Wholesale and retail trade	3.25	7.91
Government services	4.40	2.40
Mining, finance, insurance, construction, and other services	6.04	6.03
Total	100.00	100.00
By Type of Purchaser		
Private Enterprises	45.21	59.42
Public corporation and government enterprises	39.31	30.86
General government	15.48	9.72
Total	100.00	100.00

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, pp. 51-52.

[a]At 1971 constant prices: unit = %; gross domestic capital formation = 100.

import duty for machinery and equipment, raw materials, and semi-finished products in addition to the normal exemption of commodity, business, and other taxes provided to the export manufacturers. Land, public utilities and services, as well as standard factory buildings, are also made available to investors (7, p. 199).

The Structure of Governmental Revenues and Expenditures

For the past two decades, the composition of government current revenues has greatly changed (Table IV). Indirect taxes as a percentage of current revenue rose rapidly until 1969 and then declined substantially after 1969. Income tax revenue, however, shows a steady increase. The figures in Table IV reflect a rapid increase of income tax and profit tax and a substantial decrease in the indirect taxes since 1969. The decline in transfers from abroad, as given in Table IV, were due to the phaseout of U. S. military aid in 1965 (7, p. 105).

In recent years, the percentage of government consumption in terms of current expenditure and saving gradually decreased. Government saving increased slightly (Table V). General administration and defense gradually decreased as shown in Table VI. On the other hand, expenditures on education, health and welfare have drastically increased (Table VI).

The Structure of Imports and Exports

The exports and imports as a percentage of Gross National Product (GNP) from foreign trade are 35.77 and 31.96 percent, respectively, in 1975 (Table I and Table VII). These figures indicate that about

TABLE IV

THE COMPOSITION OF GOVERNMENT CURRENT REVENUES OF THE TAIWAN ECONOMY, SELECTED YEARS[a]

Year	Property and Enterprise	Indirect Taxes and Revenues from Monopolies	Business Profit Taxes	Income Tax from Private Institutions	Current Transfers from Private Institutions	Current Transfers from Abroad
1951	14.70	43.13	6.70	3.01	6.33	26.13
1961	13.42	51.92	4.70	4.71	4.52	20.73
1969	18.91	64.24	3.37	5.39	7.43	0.66
1975	13.93	60.93	8.05	8.72	8.25	0.12

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. _National Income of the Republic of China_. Taipei, Taiwan: Executive Yuan, 1975, pp. 32-33.

[a]At current prices: unit = %; total current revenue = 100.

TABLE V

THE COMPOSITION OF GOVERNMENT CURRENT EXPENDITURE AND SAVING OF THE TAIWAN ECONOMY, SELECTED YEARS[a]

Year	Current Expenditure		Saving
	Consumption	Other Current Expenditure[b]	
1951	81.46	1.49	17.05
1961	82.32	3.46	14.22
1969	77.50	3.83	18.67
1975	68.23	3.48	28.29

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, p. 33.

[a]At current prices: unit = %; total current expenditure and saving = 100.

[b]Other current expenditure includes current transfers to households and private non-profit institutions, interest on public debts, and current transfers to the rest of the world.

TABLE VI

THE COMPOSITION OF THE GOVERNMENT CONSUMPTION EXPENDITURE OF THE TAIWAN ECONOMY, SELECTED YEARS[a]

Year	General Administration and Defense	Justice and Police	HEW[b]	Economic Development	Transportation and Communication	Others
1951	69.03	4.57	8.08	1.96	2.15	14.21
1961	68.48	4.85	16.47	2.39	2.51	5.30
1969	55.12	4.40	19.00	4.40	1.99	15.09
1975	52.06	4.69	22.11	3.36	1.07	16.71

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, pp. 36-37.

[a]At current prices: unit = %; government consumption expenditure = 100.

[b]HEW includes education and research, public health, and social security benefits.

TABLE VII

GROWTH OF EXPORTS AND IMPORTS OF THE TAIWAN ECONOMY, 1951-1975[a]

Year	Exports		Imports	
	Amount (NT $ Million)	Increase (%)	Amount (NT $ Million)	Increase (%)
1951	45.18	---	69.47	---
1952	49.93	10.51	92.56	33.24
1953	60.05	20.27	98.51	6.43
1954	45.11	-24.88	102.81	4.37
1955	55.63	23.32	87.01	-15.37
1956	60.12	8.07	108.21	24.37
1957	68.09	13.26	113.14	4.56
1958	82.88	21.72	135.14	19.44
1959	86.80	4.73	138.49	2.48
1960	99.74	14.91	148.30	7.08
1961	113.95	14.25	164.57	10.97
1962	123.30	8.21	182.43	10.85
1963	163.79	32.84	187.97	3.04
1964	200.08	22.16	226.41	20.45
1965	250.16	25.03	286.80	26.67
1966	296.94	18.70	298.96	4.24
1967	246.50	-16.99	377.71	26.34
1968	436.21	76.96	493.05	30.54
1969	545.73	25.11	571.40	15.89
1970	687.15	25.91	697.85	22.13
1971	917.44	33.51	852.61	22.18
1972	1216.13	32.56	1009.14	18.36
1973	1505.78	23.82	1232.12	22.10
1974	1387.02	- 7.89	1458.36	18.36
1975	1212.06	-12.61	1082.73	-25.76

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, pp. 61 and 128.

[a]At 1971 prices.

one-third of GNP in Taiwan relies on foreign trade. Like other developing countries, foreign trade in Taiwan has been under strict government control.[5] During the past two decades, exports (except 1957, 1974, and 1975) and imports (except 1955 and 1975) have shown a rapid expansion (Table VII).

The composition of imports and exports, however, has drastically changed (Table VIII). The proportion of capital equipment imports has gradually increased while consumers goods has decreased relatively. The exports of processed products originally ranked first, agricultural products next and industrial products last. However, in 1974, industrial products accounted for 84 percent of total exports while processed agricultural products (11 percent) and agricultural products (5 percent) accounted for only 16 percent. Major export items in 1974 included textiles, electrical machinery and supplies, plywood, wood products and furniture, machinery and general metal products, basic metals, fishery products, sugar and sugar products, bananas, canned asparagus, petroleum products, canned pineapples, rubber products, cement and cement products, transportation equipment, paper and paper products, fruits, glass products, plastics and plastic products (8, p. 203). Major import items in 1974 included machinery tools, electrical products and equipment, basic metals, chemicals, transportation equipment, cotton and man-made fibers, soybeans, timber, wheat, crude oil, corn, food, beverage and tobacco, pulp, paper and paper products, raw materials for plastics, medical supplies, dyestuffs and pigments, and wool (8, p. 204).

Money and Banking

Banks in Taiwan can be classified as central government banks,

TABLE VIII

THE COMPOSITION OF IMPORTS AND EXPORTS OF THE TAIWAN ECONOMY, SELECTED YEARS[a]

Year	Imports			Exports		
	Capital Equipment	Agricultural and Industrial Raw Material	Consumer Product	Industrial Product	Processed Agricultural Product	Agricultural Product
1957	21	72	7	13	71	16
1961	26	64	10	41	44	15
1969	35	61	4	74	17	9
1974	32	62	6	84	11	5

Source: Directorate-General of Budget, Accounting and Statistics, Republic of China. National Income of the Republic of China. Taipei, Taiwan: Executive Yuan, 1975, p. 63.

[a]At current prices: unit = %; total imports = 100; total exports = 100.

local government banks, commercial banks, development banks, and foreign banks (8, pp. 212-220).

The central government banks include the Central Bank of China, Bank of Communication, Farmers' Bank of China, Central Trust of China, and Postal Remittances and Saving Bank. The Central Bank of China is the banks' bank. Its major functions include the regulation of money and credit, management of foreign exchange, issuance of currency, acting as fiscal agent for the central government, bank examinations and economic research. The Bank of Communication is an industrial bank and responsible for industrial development. The Farmers' Bank of China specializes in agricultural financing. The Central Trust of China acts as a purchasing and marketing agent for the government as well as for public and private enterprises.

Local government banks include the Bank of Taiwan, City Bank of Taipei, Land Bank of Taiwan and Cooperative Bank of Taiwan. Established in 1946, the Bank of Taiwan handled a number of central banking operations during the period from 1949 to June, 1961. It acts as the agent for the Central Bank of China in currency issuance and treasury; it also acts as the fiscal agent for the provincial government. It is a commercial bank with emphasis on financing industries and foreign trade and exchange transactions. The City Bank of Taipei, owned by the Taipei Municipal Government, acts as the fiscal agent of the Taipei Municipal Government and handles the flotation of city bonds. The Land Bank of Taiwan specializes in land and agricultural financing. The Cooperative Bank of Taiwan functions mainly as a central banking institution for cooperatives.

There are also six commercial banks, two development banks, and twelve foreign banks in operation in Taiwan. All the banks (except foreign banks) in Taiwan are operated under the branch banking system. They all engage in multiple banking operations, including regular commercial banking. Most of them have foreign exchange departments as well as savings departments.

Money supply was controlled by the Bank of Taiwan before June, 1961, and more recently by the Central Bank of China.

Transportation and Communication

Transportation and communications include railroad, highway, telecommunications, postal service, waterway transportation, harbors, air transportation, meteorology and tourism. In response to the increasing demands on transportation and communications resulting from fast-growing economy and population in Taiwan, in 1974 the government undertook ten major construction projects. Six projects are related to transportation--The Taiwan Area North-South Freeway, West Trunk Line Electrification Project and North Link Railway Construction, Taichung Harbor Construction, Suao Harbor Construction and Tao-yuan International Airport Construction. These projects are expected to be completed by 1978.

Summary

Taiwan is not endowed with rich natural resources; however, the government in Taiwan has carried out a series of four-year economic plans for economic development. During the past two and one-half decades, there has been a rapid growth in the economy. This is evidenced by an 8.15 percent of annual increase in real Gross National Product. Per capita income also grew substantially with an average annual increase of 4.42 percent. Several factors contributed to this rapid economic growth including a stable political situation, U. S. aid, a substantial increase in investment and a significant increase in the quantity and quality of labor.

With regard to the price level, it has shown an upward trend for the past two and one-half decades. In 1974, the economy experienced both inflation and recession which worsened in 1975. As a result, the economic growth has slowed in recent years.

There was a gradual shift from agriculture to industry; a decline in the percent of expenditure on food with a rise of expenditures on beverage, health care, household and transport; a change of capital formation toward manufacturing and away from agriculture; a rapid increase in revenue from the income and profit taxes and a substantial decrease in the indirect taxes. Governmental current revenue still relies heavily on indirect taxes. In addition, while government expenditures on general administration and defense have gradually decreased, expenditures for education, health and welfare have increased.

ENDNOTES

[1]Strictly speaking, Taiwan province is comprised of 78 islands. There are 14 in the Taiwan group and 64 in the Penghu group, also known as Pescadores.

[2]The total population, tabulated at the end of the third quarter of 1975, was 16.03 million. Its growth rate was estimated at roughly three percent. The density was about 440 persons per square kilometer. Two million were from the mainland and fourteen million were native-born. By age groups, 37 percent were under age 15, 51 percent were between 15 and 59, and 12 percent over 60. By occupation, 37 percent were in agriculture, 22 percent in industry, and 41 percent in commerce, service, and other areas.

[3]The figures are calculated from those on page 808 in Statistical Abstract of the United States, 1975.

[4]Exports of goods and services increased 24.8 percent in 1974 and decreased 6.4 percent in 1975; at the same time, imports of goods and services increased 66.1 percent and decreased 14.0 percent in 1975 (16, p. 9).

[5]The international trade in Taiwan is not free. Besides tariffs, exchange controls exist. During the period 1953 to 1964, Taiwan suffered balance of payments deficits and foreign exchange shortages. As a consequence, the government imposed imports control. Exporters were licensed and asked to surrender their foreign exchange to the control authority. The importers' foreign exchange were rationed in accordance of trade merits and/or quotas. After 1964, there were trade surpluses, hence the government decided to ease the import controls step by step. Since then, the policy has shifted from import controls to export promotion.

CHAPTER III

A REVIEW OF EARLIER ECONOMETRIC MODELS OF THE TAIWAN ECONOMY

In this chapter, three earlier macroeconometric models of Taiwan are discussed. The models are: (1) a small scale macroeconometric model of Taiwan constructed by T. C. Liu in 1965 (6, pp. 770-776); (2) the macroeconometric model constructed by the United Nations Economic Commission for Asia and the Far East in 1967 (65, pp. 164-232); and (3) a macroeconometric study of Taiwan by Seaks in 1972 (57). Summaries of these models are given in Tables IX, X and XI, respectively.

Liu's model was originally constructed in regard to the fourth four-year economic plan. The model consists of nine equations. Seven are behavioral equations--the consumption (C), private investment (Ip), government investment (Ig), imports (M), inventory (V), government current revenues (T), and depreciation and business saving functions (Sb). Two are definitions, namely, the disposable income (Yd) and the income identities (Y) (Table IX). The ordinary least squares (OLS) method was used for the estimation of the behavioral equations. From these nine structural equations, it is possible to derive the reduced form equations that express the endogenous variables for income, consumption, private investment, government investment, imports, and government current revenues, etc., in terms of the predetermined variables (including exogenous and lagged endogenous variables). Given the

1956-1964

TABLE IX

THE LIU MODEL

Behavioral Equations

(1)	$C = 0.610Yd + 0.170C_{-1} + 9.151$ $\quad(.217)^a \quad (.317)$	$R^2 = 0.9888$
(2)	$Ip = 0.132Y - 0.125\bar{R} + 0.320Ip_{-1} - 4.010$ $\quad(.054)^a \quad (.079) \quad (.262)$	$R^2 = 0.9526$
(3)	$Ig = 0.018Y + 1.051Ag + 0.667Ig_{-1} - 1.605$ $\quad(.018) \quad (.184)^a \quad (.167)^a$	$R^2 = 0.9816$
(4)	$M = 0.115Y + 0.519M_{-1} - 3.106$ $\quad(.046)^a \quad (.227)$	$R^2 = 0.9886$
(5)	$V = 0.020Y$	
(6)	$T = 0.144Y$	
(7)	$Sb = 0.070Y$	

Identities

(8) $Yd = Y - Sb - T + Tr$

(9) $Y = C + (Ip + Ig + V) + G + (X - M)$

Endogenous Variables

Y = GNP

C = consumption

Yd = disposable income

Ip = private investment

Ig = government fixed Investment

M = imports

V = inventory

T = government current revenues

Sb = depreciation and business saving

TABLE IX (Continued)

Predetermined Variables
Exogenous Variables
$\bar{R}$ = real interest rate (T)
Ag = U.S. aid for government fixed investment
G = government consumption
X = exports
Tr = transfer payments
Lagged Endogenous Variables
C_{-1} = C lagged one period
Ip_{-1} = Ip lagged one period
Ig_{-1} = Ig lagged one period
M_{-1} = M lagged one period

Source: Ko-Wie Chang, Economic Development in Taiwan (Chinese ed). Taipei, Taiwan: Chun-Chung Book Company, 1970, pp. 770-776.

[a]Indicates that the t ratio of the parameter estimate is significant at the 5% level of significance. The numbers in parentheses beneath the parameter estimates are the corresponding standard errors. R^2 is the coefficient of multiple determination.

TABLE X

THE U.N. COMMISSION MODEL

Behavioral Equations

(1)	$YD = 39{,}677.00 + \underset{(0.0045)^a}{0.4978} \sum_{i=0}^{t-1} I_i + u_1$	$\bar{R}^2 = 0.9900$ $d = 0.8700$ $s = 1122.5000$
(2)	$Cp = 4{,}158.73 + \underset{(0.0088)^a}{0.6}\ YD + u_2$	$\bar{R}^2 = 0.9769$ $d = 1.0100$ $s = 1126.9400$
(3)	$Cg = 891.44 + \underset{(0.0608)^a}{0.1970}\ YD + u_3$	$\bar{R}^2 = 0.9042$ $d = 0.5200$ $s = 775.9000$
(4)	$\sum_{i=0}^{t} Ji = 18{,}375.27 + \underset{(0.0033)^a}{0.5310}\ YD + u_4$	$\bar{R}^2 = 0.8100$ $d = 1.3700$ $s = 420.6800$
(5)	$\log Et = 3.5526 + \underset{(0.00255)^a}{0.04593}\ t + u_5$	$\bar{R}^2 = 0.7430$ $d = 1.0900$ $s = 0.0889$
(6)	$M = 5{,}930.28 + \underset{(0.0137)^a}{0.2798}\ YD + u_6$	$\bar{R}^2 = 0.7869$ $d = 0.7600$ $s = 1749.2900$
(7)	$F = 45.81 + \underset{(1.166)}{1.063}\ (t - 1952) + u_7$	$\bar{R}^2 = 0.3950$ $d = 1.2400$ $s = 40.6200$

Identities

(8) $Y = YD + F$

(9) $Jt = \sum_{i=1}^{t} Jt - \sum_{i=1}^{t-1} Jt$

(10) $YD = Cp + Cg + I + J + E - M$

Endogenous Variables

YD = gross domestic product (GDP)

Cp = private consumption expenditure

Cg = general government expenditure

TABLE X (Continued)

Endogenous Variables (Continued)

J = increase in stocks

E = exports of goods and services

M = imports of goods and services

F = net factor income from abroad

Y = gross national product (GNP)

Predetermined Variables

Exogenous variables:

I = gross fixed domestic capital formation

t = time

1 = constant term

Source: U.N. Economic Commission for Asia and the Far East. Sectoral Aspects of Long-Term Economic Projections With Special Reference to Asia and the Far East. Bangkok: U.N. Economic Commission for Asia and the Far East, 1967, pp. 167-170.

[a]Indicates that the t ratio of the parameter estimate is significant at 5% level of significance. The numbers in the parentheses beneath the parameter estimates are the corresponding standard errors. $\bar{R}^2$ is the coefficient of multiple determination corrected for the degree of freedom. d is the Durbin-Watson statistic for the test of first-order auto-correlation in the disturbance terms. s is the standard deviation of the estimated regression equation.

TABLE XI

THE SEAKS MODEL

Summary of the Econometric Model
(As Estimated by 2SLS)

Behavioral Equations

(1) $C = .4101C_{-1} + .4916(P + W) + 2761$

$\quad\;\; (.0938)^a \quad (.0692)^a$

$R^2 = .999$, $d = 2.013$, $s = 708.900$

(2) $IP = .2333GDP - .0982K_{-1} + .6509IP_{-1} - 8955$

$\quad\;\; (.0563)^a \quad (.0394)^a \quad (.1729)^a$

$R^2 = .986$, $d = 2.095$, $s = 1078.400$

(3) $W = .2766NI + .2817NI_{-1} - 4248$

$\quad\;\; (.1027)^a \quad (.1131)^a$

$R^2 = .998$, $d = .831$, $s = 784.300$

(4) $M = .9251M_{-1} + .2957I - 1459$

$\quad\;\; (.1542)^a \quad (1295)^a$

$R^2 = .988$, $d = 2.142$, $s = 1670.600$

(5) $X = .3582IWT + .5888WPI - .1485PTE + 1.702IG_{-1} - 71050$

$\quad\;\; (.0615)^a \quad (.1916)^a \quad (.0399)^a \quad (.391)^a$

$R^2 = .994$, $d = 2.517$, $s = 1396.100$

(6) $D = .0112GDP + .9472D_{-1} - 225.9$

$\quad\;\; (.0123) \quad (.1917)^a$

$R^2 = .998$, $d = 1.582$, $s = 144.700$

Identities

(7) $I = IP + IG$

(8) $NI = GDP - D - T$

(9) $P = NI - W - Z$

(10) $GDP = C + I + G + X - M$

(11) $K = K_{-1} + I - D$

Endogenous Variables

C = consumption

IP = gross private investment

W = private wage bill

TABLE XI (Continued)

Endogenous Variables (Continued)

M = imports

X = exports

D = depreciation

I = total gross investment

NI = national income

P = profits

GDP = gross domestic product

K = capital stock

Predetermined Variables

Exogenous Variables:

IWT = index of world trade (1964 = 100%)

WPI = world price index (1964 = 100%)

PTE = price index of Taiwan exports (1964 = 100%)

1 = constant term

Policy Variables:

IG = government investment

G = government spending (exclusive of investment)

T = indirect taxes

Z = government income from property and entrepreneurship

Lagged Endogenous Variables:

C_{-1}, K_{-1}, IP_{-1}, NI_{-1}, IG_{-1}, and D_{-1}

TABLE XI (Continued)

The Birth Rate Model

(12) $BR = -4.225FP + 2.314CMR_{-1} + 1.265DR_{-2} + 11.46$ $\quad R^2 = .960$

$\quad\quad (.669)^a \quad (1.268) \quad (.443)^a$ $\quad d = 1.611$

BR = birth rate per one thousand population

FP = government real per capita expenditure on family planning in constant 1964 new Taiwan dollars

CMR_{-1} = crude marriage rate per thousand population lagged one period

DR_{-2} = crude death rate per thousand lagged two years

(13) $BR = -1.471TIME + .0936CMR_{-1} - 1.023DR_{-2} + 44.64$ $\quad R^2 = .980$

$\quad\quad (-10.51) \quad (.11) \quad (-2.39)$

Source: Terry Gilpin Seaks, "An Econometric Model of Taiwan, 1952-1972" (Unpub. Ph.D. dissertation, Duke University, 1972.)

[a]Indicates that the t ratio of the parameter estimate is significant at the 5% level of significance. The numbers in the parentheses beneath the parameter estimates are the corresponding standard errors. R^2 is the coefficient of determination. d is the Durbin-Watson statistic. s is the satndard error of the regression equation.

values of the exogenous variables, it is then possible to calculate the values of endogenous variables. To formulate the optimum policy measure for achieving the predetermined growth rate with Liu's model, policy makers must consider: (1) the potential for domestic economic development; (2) the possibility of foreign aid; and (3) the potential effects of various economic growth rates on domestic income, employment, and balance of payment, etc.

Liu's model is unsatisfactory in several respects. For one thing, it is based on data for the 1956-1964 period. This means that the sample size is relatively small. The model is based on unpublished data gathered by the Council of International Economic Cooperation and Development which do not always correspond to those published by the Directorate-General of Budget, Accounting and Statistics, Republic of China (ROC) an official--and possibly more reliable--agency in Taiwan (57, p. 9). Although no money sector is included, the interest rate is included in the private investment equation (Ip). His model is stable (see Appendix B for a more detailed analysis on Liu's model).

The U. N. Commission's model was constructed to estimate the final demand for goods and services. These estimates were then used in the construction of an input-output table for long-term sectoral projections. The model consists of seven behavioral equations--the gross domestic product (YD), private consumption (Cp), government consumption (Cg), inventory stock (J), export (E), import (M), and net income from abroad (F) functions and three definitions or identities--the GNP (Y), GDP (YD), and inventory investment (J) identities (see Table X for the variables and equation forms). The structure of the model was estimated by the iterative least squares method (65, p. 171). Unfortunately, the model is poorly specified. Seven equations are estimated over eleven years (1953 to 1963) with merely one independent variable in each equation. In addition, GDP is used in four of the seven stochastic equations (private consumption (Cp), government consumption (Cg), inventory stock (J) and import functions (M)) with two equations (export (E) and net income from abroad (T) functions) involving a time trend (t) and one (GDP) using the lagged capital stock. The model is unsatisfactory for two reasons. First, nearly every variable estimated is highly correlated with GDP (57, p. 7), making this set of equations of little explanatory value. Second, the Durbin-Watson statistics given are all very low, possibly as a result of serial correlation in the errors and the effects of some explanatory variables being ignored (57, p. 8 and 9, p. 108).

Seaks' model, based on data for the 1952-1970 period, is the most recent macroeconometric study of Taiwan. It contains eleven simultaneous linear difference equations of which six are behavioral equations (consumption (C), private investment (IP), wage income (W), imports (M), exports (X) and depreciation (D)). Five are identities (total gross investment (I), national income (NI), profits (P), gross domestic product (GDP) and capital stock (K)). Two separate equations are given to describe the birth rate and population (Table XI). The model was estimated by two-stage least squares (2SLS) and a variant of three-stage least squares (57, p. 127). Although Seaks' model is more complete than the other models, it has some shortcomings. First, the consumption function is regressed on profits and private wage bill (P+W) and consumption lagged one period (C_{-1}) instead of disposable income (Yd) and consumption lagged one period (C_{-1}). The adoption of (P+W) as a proxy to replace Yd is theoretically unjustifiable since data for Yd are available in the national income statistics of the Republic of China (see 15, p. 71 and pp. 122-125; and 16, pp. 114-115). Second, as in the previous models, Seaks made no attempt to incorporate the price level and money market into his model. Seaks claimed that any attempt to estimate conventional equations for the monetary sector proved rather unsuccessful (57, p. 31). To support his argument, he further cited Chu's et al. study in which the equations estimated suffered severe auto-correlation by including both price and monetary variable.[1] Although several other empirical studies with a focus on the demand or expenditure side of the economy for shortrun forecasting purposes also exclude the money market, it is the writer's belief that monetary equations are essential in order to capture the repercussions of the money market on the real sector. Third, Seaks' model is found to be unstable (see Appendix C for the results of the DYMULT analysis on his model). This indicates a serious error in his model specification which subsequently leads to poor model performance (54, p. 311). The predictive ability of Seaks' model is compared with the writer's model in Chapter VI.

The earlier models implicitly assume no structural change in the Taiwan economy. Since the writer suspects that the rapid transition from an agriculture-oriented to industrialized economy may result in structural change, it is necessary to examine this possibility. If structural change has occurred, a forecasting model based on the entire period is likely to yield inaccurate forecasts.

CHAPTER IV

THE STRUCTURE OF THE MODEL

In specifying a macroeconometric model, we must take assumptions about the operation of the economy. Economic theory often indicates which relationships make up the model, which variables should be included in each of the relationships and the signs of many of the partial derivatives. However, economic theory falls short in specifying the functional form of the relations, the time lags, and the values of the parameters. It does not allow for the presence of stochastic disturbances since all relations are given in deterministic form (40, p. 532). Nor does economic theory take a specific economy into consideration. Thus, economic theory is of assistance in model construction; however, empirical results must be considered and discretion must be used in constructing a model.

The size of a model depends on its purpose. For short-term forecasting, a model might contain only four equations (26, p. 230). According to Kogiku (41, pp. 186-197), Kuh (42, p. 5) and Muench (48, pp. 127-175), more than two-hundred equations may be necessary to describe the economy of a well-developed country in detail.

In a developing economy such as Taiwan, data are often limited. Because of data limitations and limited resources available to the author, a system of 13 equations is specified in this study. There are 13 endogenous variables in the system. The eight behavioral equations are those for consumption, private investment, taxes, depreciation, imports, wage income, the price level and the interest rate. The other five are identities which close the system; these are for gross investment, the inflation rate, the capital stock, disposable income and gross domestic product (Table XII).

Specification

Behavioral Equations

Consumption (C). Friedman's permanent income hypothesis purports to explain consumption behavior as a function of permanent income (24). During any particular time period, the observed consumption expenditure of a spending unit is assumed to differ randomly from its true permanent consumption due to such transitory factors as the timing of outlays for durables, vacations, emergencies, and similar causes. The observed level of income will also differ from its permanent level due to such factors as the timing of receipts and fluctuations in economic conditions. Over longer periods of time, these short-run factors smooth out and reveal underlying relationships of a more permanent nature (53, p. 66). Specifically, the hypothesis states that permanent expenditures of a spending unit equals the product of permanent income (y_p) multiplied by the fraction of y_p consumed (k), where k is a function of the interest rate the spending unit would earn or pay when it lends or borrows (i), the ratio of non-human wealth to permanent income (w), and a number of factors such as spending unit's tastes, age, family composition, etc. (U). The hypothesis can be written as:

$$c_p = k(i, w, U)y_p$$

TABLE XII

SUMMARY OF THE SPECIFICATION OF THE MODEL

$$C = b_{10} + b_{11}Yd + b_{12}C_{-1} + u_1 \qquad (1)$$

$$Ip = b_{20} + b_{21}Y + b_{22}RR + b_{23}Ip_{-1} + u_2 \qquad (2)$$

$$T = b_{30} + b_{31}Y + u_3 \qquad (3)$$

$$D = b_{40} + b_{41}K_{-1} + u_4 \qquad (4)$$

$$M = b_{50} + b_{51}Y + b_{52}RMP + u_5 \qquad (5)$$

$$W = b_{60} + b_{61}Y + u_6 \qquad (6)$$

$$Py = b_{70} + b_{71}Ms + b_{72}Pm + u_7 \qquad (7)$$

$$R = b_{80} + b_{81}Y + b_{82}(Ms/Py) + u_8 \qquad (8)$$

$$I = Ip + Ig \qquad (9)$$

$$INFL = 100(Py - Py_{-1})/Py_{-1} \qquad (10)$$

$$= 100Z_2 - 100, \quad \text{where } Z_2 = Py/Py_{-1} \qquad (10.1)$$

$$K = K_{-1} + I - D \qquad (11)$$

$$Yd = Y - D - T + Tr \qquad (12)$$

$$Y = C + I + G + X - M \qquad (13)$$

Endogenous Variables[a]

C = real private consumption

Ip = real gross private investment

T = real direct and indirect taxes

D = real depreciation

M = real imports

W = real wage income

TABLE XII (Continued)

Py = price level (implicit price deflator for Taiwan's GNP, 1971 = 100)

R = nominal rate of interest (in terms of percent)

I = real gross investment

$INFL$ = actual rate of inflation (in terms of percent)

K = real capital stock

Yd = real disposable income

Y = real gross domestic product (GDP)

$RR = R - INFL$

$RMP = 100\ (Py/Pm)$

Predetermined Variables[a]

Exogenous Variables

Ms = nominal money supply (in N.T. millions dollars)

Pm = implicit price deflator for Taiwan's imports, 1971 = 100

Ig = real governmental investment in capital goods

Tr = real transfer payments to households and private institutions

G = real government expenditure excluding governmental capital investment

X = real exports

Lagged Endogenous and Exogenous Variables

C_{-1} = real consumption lagged one period

Ip_{-1} = real private investment lagged one period

K_{-1} = real capital stock lagged one period

Py_{-1} = price deflator for GNP lagged one period

[a] All real variables are in real terms in millions of N.T. dollars at 1971 prices unless otherwise stated.

Assuming this relation can be applied to every common unit in an economy, the aggregate consumption function can be given as:

$$C_p = K(i, w, U)Y_p$$

where K may be interpreted as a function of the mean values of i, w, and U (53, pp. 66-69).

In his empirical study with time series data, Friedman approximates C_p by real consumption (C) and Y_p by the weighted average of past and present income with exponentially declining weights. Thus, the aggregate consumption takes the form:

$$C_t = r + K(Y_{pt})$$

where r = 0, and K = 0.88. This K value corresponds closely with the value of the observed average propensity to consume (APC = 0.877) over the sample period (53, pp. 74-75).

In contrast to Friedman's hypothesis, most Keynesian formulations assert that real consumption is a function of real disposable income with an unvanishing constant term. For example, Christ specifies real consumption as a linear function of disposable income and real consumption lagged one period (12, p. 582). This formulation is a compromise between the absolute and permanent income concepts. The consumption lagged one period in Christ's formulation is equivalent to Friedman's formulation by making consumption dependent on a set of all past values of disposable income with geometrically declining weights. This is analogous to Friedman's original scheme in which consumption depends on present and past income with a seventeen-year scheme to capture the effects of past income. The inclusion of consumption lagged one period implies a type of Koyck transformation of a distributed lag model; it assumes that recent values of disposable income are weighted more heavily than those of the remote past with effects of past values of disposable income diminished through time at constant geometric rates.[1]

Liu and Seaks also contend that the real consumption function is a linear function of real disposable income and real consumption lagged one period.[2] Their formulations have a very good explanatory power as indicated by the very high coefficients of determination (R^2) in their studies. Thus, this writer specifies the consumption function as follows:

$$C = b_{10} + b_{11}Yd + b_{12}C_{-1} + u_1 \qquad (1)$$

where C, Yd and C_{-1} denote real consumption, real disposable income and real consumption lagged one period, respectively. The b_{10} is a constant term. The b_{11} is the marginal propensity to consume (MPC) out of the disposable income and u_1 is the disturbance term. The signs and magnitudes of b_{10} and b_{12} are expected to be positive and $0 < b_{11} < 1$.

The data for C and Yd are, respectively, consumption expenditures and disposable income in real terms (1971 prices). Since the original data for Yd are not consistent with other data, Yd is derived from the following identity:

$$Yd = Y - D - T + Tr$$

where Yd, Y, D, T and Tr are, respectively, disposable income, gross domestic product, depreciation, taxes, and transfer payments in real terms (1971 prices) (see detailed discussion on data in Appendix A).

Investment (I). In Taiwan, both private and government investment are important. For this reason, investment is divided into two components: private investment (Ip) and government investment (Ig).

According to the neoclassical theory of investment as expounded by Jorgenson, the desired capital stocks, hence, investment, are functions of output and user cost of capital (36, p. 174; 53, p. 104). Following Jorgenson, output is assumed to be a determinant of the private investment. Expectation of the desired stock will not be a function of current GNP alone (57, p. 23). Past values of GNP also enter into the consideration as entrepreneurs plan their capital spending, particularly where the gap between the desired and actual capital stock lagged one period is not entirely closed in any one year (12, p. 583-584). Following this reasoning, it seems necessary to introduce a lagged value of Ip on the right-hand side of the equation.

Regarding the user cost of capital, the real interest rate should be included in investment function. According to Friedman, when there is a general expectation of price changes, the real rate of interest is more relevant to investment; hence, the real interest rate should be used (25, p. 39).

Theoretically, the real interest rate equals the nominal interest rate minus the expected rate of inflation (25, p. 36). Since the data on the expected rate of inflation is unavailable, the actual rate of inflation is used as a proxy in the present study. Hence, real interest rate (RR) is defined as:

$$RR = R - INFL$$

where R is the nominal rate of interest and INFL is the actual rate of inflation. The actual rate of inflation (INFL) is defined as:

$$INFL = 100\ (P_y - P_{y-1})/P_{y-1}$$

where P_y is the implicit price deflator for Taiwan's GNP (1971 = 100).

Thus, the private investment is specified as:

$$Ip = b_{20} + b_{21}Y + b_{22}RR + b_{23}Ip_{-1} + u_2 \qquad (2)$$

where Ip, Y, RR and u_2 are designated for real private investment, real GDP, real interest rate, and the disturbance term, respectively. The signs of b_{21} and b_{23} are expected to be positive and b_{22} to be negative.

Regarding the data for this equation, real GDP is used instead of real GNP since it is desirable to work with the total product of Taiwan exclusive of net factor income from the rest of the world. In the case of Taiwan, the real GDP differs only slightly from the real GNP. The Ip data consist of fixed capital formation for private enterprises and for households and private non-profit institutions. These data are deflated by the implicit deflator for fixed capital formation. The Ip data also contain the increase in stocks for the private enterprises: the data are deflated by the implicit deflator for increase in stocks.

In Liu's model, government investment is an endogenous variables. In contrast, Seaks assumed government investment to be exogenous. Because of the difficulties in specifying the appropriate government investment function, government investment is assumed to be exogenous in this study. The Ig data consist of the fixed capital formation for public corporations (including government enterprises) and for general government; both are deflated by the implicit deflator for the fixed capital formation. In addition, Ig data contain the increase in stocks for public corporations (including government enterprises); these data are deflated by the implicit deflator for increase in stocks.

Tax Equation (T). Theoretically, the aggregate tax function is of the form $T = f(Y)$. This can be approximated by a linear function of either $T = t_0 + t_1Y$ or $T = t_1Y$. In Liu's model, taxes are assumed proportional to income. In Seaks' model, taxes are assumed exogenous. Neither formulation is convincing. It appears that both the income tax (a direct tax) and the sales and excise taxes (indirect taxes) are related to the level of income; thus, income should be included as an explanatory variable in the tax equation. However, since tax receipts may not be proportional to income, the more general form $T = t_0 + t_1Y$ is postulated. Thus, the tax equation is specified as:

$$T = b_{30} + b_{31}Y + u_3 \qquad (3)$$

where T and Y are real taxes and real GDP, respectively. The terms b_{30}, b_{31}, and u_3 represent a constant term, the marginal rate of taxation and the disturbance term, respectively. The sign of b_{31} is expected to be positive.

Regarding the data for the equation, T contains indirect taxes, business profit tax, and direct taxes. These data are deflated by the implicit deflator for the gross national product since the deflator for taxes is not available. Y is real gross domestic product (1971 prices).

Depreciation (D). In his survey, study of investment behavior, Jorgenson contends that capital replacement is proportional to actual capital stock (37, p. 1112). Similarly, Christ argues that depreciation is a linear function of the existing capital stock (12, p. 583). Thus, it is assumed that the current year's depreciation depends upon previous end-of-year capital stock. In a particular linear functional form, a constant term can be added. The equation for depreciation can be expressed as follows:

$$D = b_{40} + b_{41}K_{-1} + u_4 \quad (4)$$

where D is the real depreciation and K_{-1} is the previous end-of-year real capital stock. The terms b_{40}, b_{41}, and u_4 denote a constant, the marginal rate of depreciation, and the disturbance term, respectively. The sign of b_{41} is expected to be positive.

Concerning the data for the depreciation, D is the real depreciation, defined as provision for fixed capital consumption in real terms. Assuming that K_{-1} is the real net private domestic capital stock on December 31 of the preceding year (defined as cumulated net investment beginning with 1951, i.e., $K_{1950} = 0$), the data for K (capital stock) is derived from the following identity (12, p. 581):

$$K = K_{-1} + I - D$$

Imports (M). Assuming that consumers allocate their income among consumable commodities in order to achieve maximum satisfaction, the theory of demand suggests that the quantity of imports purchased by any consumer depends on his income, the price of imports, and the price of other consumable commodities (43, pp. 9-10). This demand relations for individual consumers can be aggregated over individuals and over commodities by theorems on aggregated (43, pp. 42-48). This theory further suggests that this demand relationship can be expressed as a function of real income and relative prices of domestic consumable commodities to imports (43, p. 10). In addition to the consumer goods, imports also include raw materials and capital goods. The demand for these inputs also depend upon real income and relative prices of domestic commodities to imports. As to the functional form for the import-demand function, both linear and log-linear are widely used (43, p. 17).

Empirically, the imports equation in Liu's model is a linear function of GNP and imports lagged one period. In Seaks' model, the import equation is a linear function of gross investment and imports lagged one period. The inclusion of imports lagged one period, a Koyck-type transformation of distributed lags, presumably captures the past influences of income and investment in Liu's and Seaks' formulations, respectively. While Liu's formulation is traditional, Seaks' represents a departure from conventional economic theory in order to encompass a particular aspect of the Taiwan economy--the government's determination to promote economic growth through the acquisition of capital goods. To achieve this, the government has imposed strong import controls by selling foreign exchange only to those who import primarily capital goods (57, pp. 26-27). Although Liu's and Seaks' formulations of the imports equation differ, the explanatory power as measured by the coefficient of determination (R^2) is very high in both models.

The inclusion of M_{-1} in the formulation yielded very poor results in the present study.[3] Hence, this writer has included relative prices of domestic consumable goods to imports, RMP (= 100 Py/Pm), rather than M-1. Thus, a linear import equation is specified as follows:

$$M = b_{50} + b_{51}Y + b_{52}RMP + u_5 \qquad (5)$$

where M is real imports, b_{50} the constant term, b_{51} the marginal propensity to import and b_{52} the coefficient of RMP. The term Y is real GDP, RMP is the relative price of Py to Pm in terms of percent, and u_5 is the disturbance term. The signs of b_{51} and b_{52} are expected to be positive. The data for M and Y are real imports and real GDP, respectively. The data for RMP is the relative price in terms of percent.

Seaks defines export as an endogenous variable; however, the explanatory variables in his model (index of world trade (IWT), world price index (WPI), price of Taiwan exports (PTE) and governmental investment lagged one period (IG_{-1})) are exogenous. In contrast, Liu considers exports to be exogenous. Exports are determined primarily by other countries; hence, it is assumed to be exogenous in the present study. The data of exports are measured in real terms (1971 prices).

Wage Income (W). Many econometric models assume that the wage income in real terms is a function of current and lagged output (57, p. 24). In describing the U. S. economy, Klein has shown that profit maximization subjected to a log-linear production function can lead to an equation in the following form:

$$W = W\ (Y,\ Y_{-1})$$

where W is the wage income in real terms and Y is some measure of output (38, pp. 14-21).

According to Seaks (57, p. 24), there is evidence to support such a formulation. To support his argument, he cites the study of Chu, et al., which demonstrates that a Cobb-Douglas function fits the data for Taiwan well up to 1968. Although Seaks formulates this equation in a linear form, he replaces Y with NI to solve the problem of multicollinearity between GDP and GDP lagged one period.

In the present study, a very high correlation is found not only between Y and Y_{-1} but also between NI and NI_{-1}. Furthermore, the coefficients estimated for Y_{-1} and NI_{-1} are both negative. This contradicts the theoretical expectation. The inclusion of Y_{-1} in the present study fails to improve the explanatory power. This lack of improvement is indicated by a negligible increase of coefficient of determination (R^2). Thus, the writer regresses wage income (W) in real terms on real GDP (Y) in the formulation of wage income equation. This appears logical since wage income theoretically is part of national income which is in turn a part of gross domestic product. Thus, the writer specifies the real wage income equation as follows:

$$W = b_{60} + b_{61}Y + u_6 \qquad (6)$$

where W is defined as the real wage income, Y is the real GDP and b_{60} is the constant term. The sign of b_{61} is expected to be positive. With regard to data for the equation of wage income, W contains wages and salaries, pay and allowance of members of the armed forces, and employer's contribution to social security. The data are deflated by the implicit deflator for national income. No separate deflator for wage income is available.

Price Formation Equation (Py). In simple versions of the Keynesian model, the price level is determined by the level of money wages which is treated as exogenous. This is a major weakness of traditional Keynesian theory. A review of the models discussed earlier reveals that none deal with the price level. According to Yu, the causes of price changes in Taiwan can be formulated as follows (70, pp. 8-11):

$$\Delta P = f\ (\Delta Ms,\ \Delta w_{-1},\ \Delta Pm)$$

where ΔP is the change in price, ΔMs is the change in money supply, ΔPm is the change in import price, and Δw_{-1} is the change in money wage rate lagged one period.

Although Yu's formulation is in first difference form, the relationship between these variables are obvious. Since consistent data on money wage are not available, the price formation equation is specified as follows:

$$Py = b_{70} + b_{71}Ms + b_{72}Pm + u_7 \quad (7)$$

where Py is the price level, Ms is the nominal money supply and Pm is the import price, u_7 is the disturbance term, and the signs of b_{71} and b_{72} are expected to be positive. This formulation gives the linkage between the money market and the real sector via money supply and the price of imports.

Several alternative formulations, such as including the lagged variables of Ms, Py or Pm, were tried. These alternatives are discussed in the section on estimation.

Interest Rate Equation (R). In post-Keynesian formulation, the demand for money in aggregate form is a function of income and the rate of interest (42, p. 9). Friedman contends that the demand for money can be treated as a special topic in capital or wealth theory since money is only one of many assets (25, p. 11). Thus, Friedman formulates the demand function for the real money for an individual wealth holder as (25, pp. 11-14):

$$\frac{Md}{P} = f(y,\ w;\ r_m,\ r_b,\ r_e,\ \frac{1}{P}\frac{dP}{dt};\ U)$$

where $\frac{Md}{P}$ denotes the demand for real money, y denotes real income, w denotes the fraction of wealth in nonhuman form (the fraction of income derived from property), r_m denotes the expected nominal rate of return on money, r_b denotes the expected nominal rate of return on fixed-value securities (including the expected changes in their prices),

r_e denotes the expected nominal rate of return on equities (including the expected changes in their prices), $\frac{1}{P}\frac{dP}{dt}$ is the expected rate of change of prices of goods, and hence, the expected nominal rate of return on real assets, and U denotes any variables other than income that may affect the utility attached to the services of money.

The aggregation problems arise if the equation is applied to the economy as a whole. The amount of money demanded depends on the distribution of such variables as y and w among individuals. If there are no distribution effects, the equation can be applied to the economy as a whole. The total wealth of a society (V) may be written as:

$$V = \frac{Yp}{r}$$

This expresses the relation between the stock (wealth, V) and the flow (permanent income, Yp) via the rate of interest r. This wealth can further be classified as human (Vh) and nonhuman (Vn). To simplify, the variables of y and w can be represented by the variable of total wealth in the demand function for money. The demand for real money can be written as (53, pp. 176-178):

$$\frac{Md}{P} = f^* \left(\frac{Yp}{rP}; r_m, r_b, r_e, \frac{1}{P}\frac{dP}{dt}\right)$$

Since the nominal rates of return r_m, r_b, r_e and $\frac{1}{P}\left(\frac{dP}{dt}\right)$ move together, they can be represented by a single nominal rate R. Further assume that r also moves with the other nominal rates of return (R) and can also be represented by R. Then the demand function for real money can be further simplified as (53, p. 178):

$$\frac{Md}{P} = h \left(\frac{Yp}{P}, R\right)$$

where $\frac{Md}{P}$ denotes the demand for real money, R denotes the nominal rate of interest and $\frac{Yp}{P}$ denotes real (permanent) income.[4]

Since the money supply is determined by the Central Bank of China, it is assumed in the present study to be exogenous. Given the demand and supply functions for money and in the money market, equilibrium occurs when:[5]

$$\frac{Md}{Py}(Y, R) = \frac{Ms}{Py}$$

In this equation, the real money supply $(\frac{Ms}{Py})$ can be considered as exogenous since Py is determined from the earlier price formation equation (7). Assuming that the demand for real money equation takes a linear functional form, the above equation can then be written as:

$$aY + bR + c = \frac{Ms}{Py} + u^*$$

where a, b, and c are constants, and u* is the disturbance term. Solving for R, the equation becomes:

$$R = -(\frac{c}{b}) - (\frac{a}{b}) Y + (\frac{1}{b}) \frac{Ms}{Py} + \frac{1}{b} u^* \qquad (8)$$

or

$$R = b_{80} + b_{81}Y + b_{82} \frac{Ms}{Py} + u_8$$

where

$$b_{80} = -\frac{c}{b},\ b_{81} = -\frac{a}{b},\ b_{82} = \frac{1}{b},\ \text{and } u_8 = \frac{1}{b} u^*$$

where R is the nominal rate of interest, Y is the real GDP and $\frac{Ms}{Py}$ is the real money supply. The b_{80} is a constant term and u_8 is the disturbance term. The sign of b_{81} is expected to be positive and b_{82} negative.

With regard to the data for the interest rate (R), the end-of-period call loan rate is used except for 1952. The discount rate is used in that year. These data were used since no other data are available. The money supply consists of currency and demand deposits. In the case of Taiwan, it is the sum of currency and deposits money. Currency is defined as the currency issued (notes and coins) minus vault cash. Deposits money includes checking accounts and demand deposits (passbook deposits).

Definitions and Identities

Several identities are needed to close the system. They are: real gross investment (I), the rate of inflation (INFL), the real capital stock (K), real disposable income (Yd) and real income identity (Y). Real gross investment is the sum of the real private and government investment:

$$I = Ip + Ig \tag{9}$$

Real government investment is confined to governmental capital expenditures only.

Theoretically, the general level of prices is best measured by the GNP deflator. If Py is the price level at time t, and Py_{-1} denotes the price level at time t_{-1}, the rate of inflation is defined as the percentage change in the price level:

$$INFL = 100\ (Py - Py_{-1})/Py_{-1} = 100\ \frac{Py}{Py_{-1}} - 100$$

$$= 100Z_2 - 100 \tag{10}$$

where

$$Z_2 = \frac{Py}{Py_{-1}}$$

Since Py and Py_{-1} are index numbers to express the result in percentage terms, the expression is multiplied by 100.

The real capital stock (K) is the sum of previous end-of-period real capital stock (K_{-1}) and the real net investment (I-D) during this current period. Hence,

$$K = K_{-1} + I - D \tag{11}$$

where I and D denote real gross investment and real depreciation, respectively.

Real disposable income (Yd) is defined as:

$$Yd = Y - D - T + Tr \tag{12}$$

where Y, D, T, and Tr denote real GDP, real depreciation, real taxes, and real transfer payments, respectively.

Real income identity (Y) is defined as the sum of real consumption (C), real domestic gross investment (I), real government expenditures (G), and real trade balance (X-M). This can be written as:

$$Y = C + I + G + (X - M) \tag{13}$$

where X and M denote the real exports and real imports, respectively.

With regard to the data for these identities, Tr contains current transfers from the government and from the rest of the world. Since the deflator for Tr is not available, both are deflated by the implicit deflator for national income.

Identification

There may be a problem in untangling the simultaneous relationships if there are no restrictions on the model to prevent determinants of one variable from becoming confused with others (57, p. 33). The identification problem occurs in all simultaneous equation models.

The necessary, or order, condition for the structural equation of a linear system to be identified requires that:

$$K^{**} \geq G^{\Delta} - 1$$

where K^{**} is the number of predetermined variables excluded from the equation and G^{Δ} is the number of endogenous variables included in the equation (34, p. 250). This condition is not applicable to a non-linear system. It may be applicable to its subsystem, provided the subsystem is a linear one. An examination of the system in the present study indicates that once Py is estimated from Equation (7), the remaining subsystem becomes linear. Hence, a check of the identification of the subsystem is in order. For simplification, Table XIII summarizes the identification of the equations in the model's subsystem. The general conclusion from examining the table is that six out of seven behavioral equations in the subsystem are over-identified. The depreciation equation and the remaining five identities are identified.

Estimation

There are 13 endogenous variables and 13 equations making the system complete. The model as a whole implies a non-linear system of a recursive block nature. By a block recursive system, it means a group of equations which can be broken up into blocks of equations in such a way that equations within each block are simultaneous, but groups of equations across blocks are recursive. Thus, the knowledge of the endogenous variables in the first block permits the determination of the endogenous variables in the second block (54, p. 270).

Equation (7) forms a single block with only one equation in the block. Since the disturbance term of this equation is assumed to be

TABLE XIII

IDENTIFICATION OF THE EQUATIONS IN THE SUBSYSTEM OF THE MODEL

Endogenous Variable	C	Ip	T	D	M	W	R	I	INFL	K	Yd	Y	K**	$G^{\Delta}-1$	Identifiability[d]
C	1[a]	0	0	0	0	0	0	0	0	0	1	0	9	1	Over-identified
Ip	0	1	0	0	0	0	1	0	1	0	0	1	9	3	Over-identified
T	0	0	1	0	0	0	0	0	0	0	0	1	10	1	Over-identified
D	0	0	0	1	0	0	0	0	0	0	0	0	-	-	Identified[b]
M	0	0	0	0	1	0	0	0	0	0	0	1	8	1	Over-identified
W	0	0	0	0	0	1	0	0	0	0	0	1	10	1	Over-identified
R	0	0	0	0	0	0	1	0	0	0	0	1	8	1	Over-identified
I	0	1	0	0	0	0	0	1	0	0	0	0	-	-	Identified[c]
INFL	0	0	0	0	0	0	0	0	1	0	0	0	-	-	Identified[c]
K	0	0	0	1	0	0	0	1	0	1	0	0	-	-	Identified[c]
Yd	0	0	1	1	0	0	0	0	0	0	1	1	-	-	Identified[c]
Y	1	0	0	0	1	0	0	1	0	0	0	1	-	-	Identified[c]

[a]The figures 1 and 0 in the square matrix of endogenous variables indicate the presence or absence, respectively, of the particular variable in the equation (41, pp. 18-25 and 58).

[b]Since this equation is a minimal self-contained subsystem, no examination of identifiability is necessary.

[c]Since these equations are identities, no examination of identifiability is necessary.

[d]The order condition of identification for the remaining equations is as follows:

$$K^{**} \geqq G^{\Delta}-1,$$

where K** is the number of predetermined variables excluded, and G^{Δ} is the number of endogenous variables included.

independent of the system and the assumptions for least squares method are fulfilled, the OLS (ordinary least squares) method is used to estimate this single equation. The result of the estimation by using the EAS (econometric analysis system) program is given in Table XIV.

Estimation of Equation (7)

Since consistent data on money wage rates are not available for the time period covered in this study, several alternative versions of equation (7) were tried. The best equation was then selected. The criteria used in the selection were: (1) the coefficient of multiple determination corrected for the degree of freedom ($\bar{R}^2$); (2) a priori sign of coefficient; (3) the Durbin-Watson statistic; and (4) the standard errors of the parameter estimates ($s_{\hat{b}i}$).

The coefficient of multiple determination corrected for the degree of freedom ($\bar{R}^2$) is used to measure the explanatory power of the regression equation. The correction of the degree of freedom is necessary because there are only 22 observations--a very small sample--in this study. The value of $\bar{R}^2$ ranges from 0 to 1 with higher value indicating a greater explanatory power. A priori sign of coefficient is used to check any sign contradictory to that expected from theory. The Durbin-Watson statistic (d) is used to detect the first order auto-correlation in the disturbance term. The value of d ranges roughly from 0 to 4. When d value is very small (but larger than 0), a positive auto-correlation is indicated. Otherwise, a very large d value (but smaller than 4) indicates a negative auto-correlation. A midrange value of 2 shows no first-order auto-correlation in the disturbance term. The test was designed for a small sample under the assumption of a single equation

TABLE XIV

ALTERNATIVE ESTIMATES OF THE EQUATION (7) AS ESTIMATED BY THE ORDINARY LEAST SQUARES FOR THE PERIOD 1952 TO 1973

Equation Number	Dependent Variables	Coefficient (and Standard Error) of Explanatory Variables[a] Constant	Ms	Pm	Py_{-1}	Pm_{-1}	Ms_{-1}	$\bar{R}^2$ [a]	d[a]	Number of Wrong Signs
(7.1)	Py	13.42288	0.00035 (0.00010)*	0.64734 (0.07375)*				0.9482	0.7079	0
(7.2)	Py	6.80179	0.00017 (0.00004)*	0.12092 (0.04491)*	0.77137 (0.05432)*			0.9940	2.0827	0
(7.3)	Py	17.13769	-0.00141 (0.00025)*	0.52698 (0.04850)*			0.00262 (0.00036)*	0.9818	1.5455	1
(7.4)	Py	22.91761	0.00064 (0.00006)*	-0.39548 (0.11986)*		0.91982 (0.10107)*		0.9872	1.6652	1
(7.5)	Py	8.30853	-0.00012 (0.00023)	0.16978 (0.05820)*	0.66909 (0.09677)*		0.00047 (0.00037)	0.9941	2.1667	1
(7.6)	Py	21.62970	-0.00041 (0.00019)*	-0.11229 (0.09138)		0.61443 (0.08430)*	0.00142 (0.00030)*	0.9945	2.2130	2

[a]The * indicates the t ratio is significant at the 5 percent level of significance; $\bar{R}^2$ is the coefficient of Multiple Determination corrected for the degree of freedom; and the symbol d is the Durbin-Watson statistic for testing first order auto-correlation in the disturbance terms.

model with exogenous independent variables. Thus, the test is not strictly valid when an equation contains a lagged value in the dependent variable or when an equation is part of the simultaneous system (35, p. 249). For a large sample with lagged dependent variable in a single equation, the Durbin test (h) should be used instead (35, pp. 312-313). The h statistic can be derived from the d statistic as follows:

$$h = r\sqrt{\frac{n}{1 - n\ v(\hat{b}_1)}}$$

where r is the estimated first-order auto-correlation of the residuals, $v(\hat{b}_1)$ is the estimate of sampling variance of b_1 (the coefficient of Py_{-1}) in the simple least-square regression. The value of r can be approximated by:

$$r \approx 1 - \frac{1}{2} d$$

The standard errors of the parameter estimates ($s_{\hat{b}i}$) are the numbers given in the parentheses beneath the parameter estimate. If the value of the parameter estimate is more than twice (2.101 to be exact) the size of the corresponding estimated standard error, we can infer that under a two-tailed test the parameter estimate is significantly different from 0 at the five percent level of significance. Equivalently, this can be converted into the t ratio. If the t ratio exceeds 2.101 in an absolute value for two-tailed test, the null hypothesis that the true parameter is 0 will be rejected at the five percent level of significance. In Table XIV, the symbol * indicates a significant t ratio of parameter estimated at the five percent level for the two-tailed test.

By the criterion of $\bar{R}^2$ alone, Equations (7.2), (7.5), and (7.6) have relatively high explanatory power in the present study (Table XIV). Of these three equations, Equation (7.2) is the only one with the correct sign. Hence, Equations (7.5) and (7.6) are excluded from further consideration. Since Equation (7.2) contains a lagged dependent variable, Durbin test (h) should be used instead of the Durbin-Watson test. However, since the Durbin test is designed for large samples, this test can be used only as a rough guide. With an r value of -.04 and a $v(\hat{b}_1)$ value of .0029511, the calculated h value for equation (7.2) is -.19. Since this calculated value of h is smaller than 1.645 for the one-tailed test at the .05 level, the hypothesis of no positive auto-correlation is not rejected.

Summarizing the above, Equation (7.2) is the best since it gives a very high value of $\bar{R}^2$ (0.994) with all signs of the parameter estimated in the expected direction, and with an h value of -.19 indicating no first-order auto-correlation in the disturbance term. The t ratios of the parameter estimated are all significant at the five percent level of significance. Hence, Equation (7.2) is selected for use--along with the remaining simultaneous system in later chapters for simulation and forecasting. Equation (7.2) implies that other things being equal, the price level (Py) will increase by .00017 (as measured by the index number) with an increase of one million N.T. dollars inthe nominal money supply, i.e., the nominal money supply has very little effect on the price level. The price level will increase by .12092 with an increase of one unit of the index number in import price (Pm). The price level will increase by .77137 with an increase of one unit of the index number in the previous year's price level (Py_{-1}).

The remaining seven behavioral equations (Equations (1) to (6) and (8)) and identities form another block. Once Py is estimated from the first block, its value can be considered as exogenous, and predetermined to this second block. This second block of a non-linear system becomes a linear simultaneous system. As shown in Table XIII, most of the behavioral equations in this system are overidentified. To avoid the inconsistency caused by direct application of the OLS, 2 SLS (two-stage least squares) is applied to this linear simultaneous system. The result of estimation using the EAS program is given in Table XV. The data used for estimation is given in Appendix C. Note that only the time series data from 1952 to 1973 is used for estimation, while the data of 1974, 1975, and the preliminary data of 1976 are reserved for the test of ex post forecast.

Estimation of the Second Block Equations

The equations estimated are those equations from (1) to (6) and (8). The results of estimation by 2SLS is given in Table XV.

Although the Durbin-Watson test statistic (d) is provided in the table, it is not valid for testing first-order auto-correlation (or serial correlation) of the error terms in the present study. The Durbin-Watson test is originally designed for small samples with a single equation where all explanatory variables are strictly exogenous. However, since this study involves simultaneous equations with lagged dependent variables, the Durbin-Watson test is not applicable. Neither is the Durbin test (h)--designed for large samples with lagged dependent variable--since this study involves a relatively small sample. At this stage, it appears that no test is available to handle a system with a

TABLE XV

ESTIMATE OF THE SECOND BLOCK EQUATIONS AS ESTIMATED BY TWO STAGE LEAST SQUARES FOR THE PERIOD 1952 TO 1973

---

(1) $C = 2554.185 + 0.395026Yd + 0.460133C_{-1}$ $\bar{R}^2 = 0.9989$
(0.0815)[a] (0.1333)[a] $d = 1.6236$

(2) $Ip = -6128.921 + 0.123866Y - 18.23567RR + 0.370361Ip_{-1}$ $\bar{R}^2 = 0.9757$
(0.0331)[a] (109.8802) (0.1978)[a] $d = 2.0603$

(3) $T = -3152.600 + 0.179732Y$ $\bar{R}^2 = 0.9834$
(832.1396)[a] (0.0050)[a] $d = 0.6151$

(4) $D = 1894.030 + 0.0537986K_{-1}$ $\bar{R}^2 = 0.9975$
(0.0006)[a] $d = 1.0052$

(5) $M = -42441.43 + 0.413878Y + 181.7376RMP$ $\bar{R}^2 = 0.9563$
(0.0187)[a] (150.4654) $d = 0.2718$

(6) $W = -5657.661 + 0.440653Y$ $\bar{R}^2 = 0.9989$
(0.0030)[a] $d = 0.8997$

(7) $R = 24.53202 - 0.00011Y + 0.03679\ (Ms/Py)$ $\bar{R}^2 = 0.7050$
(0.0003)[a] (0.0125)[a] $d = 1.1090$

The seven alternatives are:[b]

(8.1) $R = 11.90991 - 0.00006574Y + 0.0244132Z + 0.530312R_{-1}$ $\bar{R}^2 = 0.7734$
(0.00003)[a] (0.0116)[a] (0.1911) $d = 2.1463$

(8.2) $R = 27.40220 - 0.000185987Y + 0.00539389Z + 0.0835433Z_{-1}$ $\bar{R}^2 = 0.7507$
$d = 0.9319$

(8.3) $R = 24.74099 - 0.000008293Y + 0.0341019Z - 0.000109656Y_{-1}$ $\bar{R}^2 = 0.6963$
(0.0002) (0.0139)[a] (0.0003) $d = 1.1244$

(8.4) $R = 29.43320 + 0.000223786Y - 0.0192675Z + 0.117670Z_{-1}$
(0.002) (0.0190) (0.0344)[a]

$- 0.000470145Y_{-1}$ $\bar{R}^2 = 0.7998$
(0.0002)[a] $d = 1.1464$

(8.5) $R = 14.50521 - 0.000142048Y - 0.00852384Z + 0.545766R_{-1}$
(0.00003)[a] (0.0144) (0.1599)[a]

$+ 0.0864962Z_{-1}$ $\bar{R}^2 = 0.8317$
(0.0278)[a] $d = 2.0224$

TABLE XV (Continued)

(8.6) $R = 12.13418 + \underset{(0.0002)}{0.0000220864Y} + \underset{(0.0125)}{0.0221044Z} + \underset{(0.1883)^a}{0.528127R_{-1}}$

$- \underset{(0.0002)}{0.0000939588Y_{-1}}$ $\bar{R}^2 = 0.7665$, $d = 2.1440$

(8.7) $R = 16.60888 + \underset{(0.0001)}{0.000259370Y} - \underset{(0.0143)}{0.0325844Z} + \underset{(0.127557)}{0.541020R_{-1}}$

$+ \underset{(0.0252)^a}{0.119933Z_{-1}} - \underset{(0.0002)^a}{0.000460998Y_{-1}}$ $\bar{R}^2 = 0.8857$, $d = 2.3218$

where Z = Ms/Py (real money supply).

[a]Indicates that the t ratio of the parameter estimate is significant at the 5% level of significance. The numbers in the parentheses beneath the parameter estimates are the corresponding standard errors. $\bar{R}^2$ is the Coefficient of Multiple Determination corrected for the degree of freedom. The symbol d denotes the Durbin-Watson statistic for the test of first-order auto-correlation in the disturbance terms.

[b]By the criteria $\bar{R}^2$, the Equations (8.4), (8.5), and (8.7) appear to be better. However, by the criteria of the signs of current variables, only Equations (8.4) and (8.7) yield correct signs. The result of ex post simulation reveals that Equation (8.4) is the best in the sense that the simulation error is the smallest. Considering all these criteria simultaneously, Equation (8.4) is the best among these seven alternatives.

small sample and lagged dependent variable simultaneously. Therefore, serial correlation in the equations is not examined and no correction for serial correlation is made here.

Equations (1) to (6) are from previous specifications. The estimation results indicate that $\bar{R}^2$, ranged from .9563 to .9989, are very high in these six equations. All the explanatory variables except for RR, I_{p-1}, and RMP are all significant at the five percent level of significance. All signs for these six equations are as expected.

Although Equation (8) in the original specification produces two significant coefficient estimates, it yields relatively low $\bar{R}^2$ of .7050 and signs contradictory to the theoretical expectation. In addition, large simulation error produced by equation (8) suggests that this equation is unstable. The problem is the demand for money function. To derive the function, data for the call, a loan interest rate was used (except for 1952). This rate is not determined by the supply of and demand for money; it is determined by government action. As a consequence, the rate is constant for long periods of time and may produce misleading results in regard to the demand for the money function. The data for the interest rate are presented in Appendix A. To obtain an alternative version of Equation (8), seven alternatives ((8.1)-(8.7)), including dependent and explanatory lagged variables, are considered (Table XV). The results indicate that Equation (8.4) is the best one and is, therefore, included in the system.[6]

First, let us discuss Equation (1). Both Yd and C_{-1} are significant at the five percent level of significance. The $\bar{R}^2$ of 0.999, the highest along with the $\bar{R}^2$ of wage income (0.999), indicates that the estimated relationship explains 99.9 percent of the variation in consumption.[7] The short-run MPC (Marginal Propensity to Consume) out of disposable income is 0.395. The long-run MPC can be derived by assuming that C grows at a certain percentage, say r percent a year, and employ $C = C_{-1}$ (1 + r) in the calculation. Based on the data reported in Appendix A, real consumption (C) has grown at an annual average rate of 8.07 percent from 1952 to 1973. Calculation of the long-run MPC in this fashion gives an estimate of the long run MPC of .688. In Seaks' study the short run MPC (out of the sum of profit and wage income) is .4916 and long-run MPC is .794, based on a growth rate of 7.74 percent (57, p. 20). Liu found that the short-run MPC (out of disposable income) is .610 (6, p. 770) and a long-run MPC is .724, assuming that C grows at an eight percent average annual rate.[8] The short-run and long-run MPCs in the present model are smaller than those associated with the Liu and Seaks models. This finding contradicts the theoretical expectation. This may be due to different data sources (e.g., Liu and the author) or different definitions of the explanatory variables (e.g., Seaks uses P + W while the author uses Yd as one of the explanatory variables in the consumption equation).

In Equation (2), Ip is linearly related to Y, RR, and Ip_{-1}. Although only Y explanatory variable is significant at the five percent level, the writer believes that real rate of interest, RR, should be included as a determinant of private investment. Although RR is not even significant at the 50 percent level, it does not necessarily indicate a lack of real relationship between RR and Ip. There are theoretical grounds for believing that Ip is negatively related to RR. This argument is substantiated by the negative coefficient between Ip and RR as shown in Table XV. So long as the t ration remains negative, it does not contradict our belief. In addition, RR provides a link with the money market. The estimated equation has a very high $\bar{R}^2$ of .976. Ip_{-1} is significant at the 10 percent level. Equation (2) implies that, other things equal, Ip increases by .123866 million N.T. dollars in real terms (1971 prices) as Y(GDP) increases by one million N.T. dollars in real terms. The equation also indicates that an increase of one percent in RR will cause a decrease of 18.23567 million N.T. dollars in Ip, and an increase of one million N.T. dollars in Ip_{-1} will cause an increase of Ip by .37036 million N.T. dollars.

The tax Equation (3) yields a very high $\bar{R}^2$ of .983. The explanatory variable, Y, is significant at the five percent level. The marginal rate of taxation, as given, is about .18 which implies that taxes increase by 0.18 million N.T. dollars in real terms (1971 prices) when Y(GDP) increases by one million N.T. dollars. The constant term in the tax equation is significant at the five percent level. This finding is different from Liu's study in which the constant term was assumed to be zero.

The depreciation Equation (4) gives a marginal rate of depreciation roughly at 5.4 percent which seems fairly reasonable. The explanatory variable, K_{-1}, in the equation is significant at the five percent level. The equation also gives a very high $\bar{R}^2$ of .998.

The imports equation (5) is a linear function of Y and RMP, where Y is significant at the five percent level. Although RMP is significant only at the 25 percent level, it is included on theoretical grounds. The $\bar{R}^2$ of the equation is .956 which is very high. The Equation (5) implies that imports will increase by .413878 million N.T. dollars with an increase of one million N.T. dollars in real GDP. Similarly, imports will increase by 181.736 million N.T. dollars with an increase of one point in RMP index.

In wage income Equation (6), the explanatory variable of Y is significant at the five percent level. The $\bar{R}^2$ of .999 is the highest one along with that of consumption.[9] The equation indicates that the wage income will increase by .440653 million N.T. dollars in real terms with an increase of one million N.T. dollars in real Y.

The last equation estimated is the interest rate Equation (8.4). This equation is non-linear since a non-linear variable, Py^{-1}, is involved in the equation. Since Py is only part of variable (i.e., $Z = \frac{Ms}{Py}$) estimated from Equation (7.2) in the first block, Py in this remaining block is considered as exogenous, and hence, predetermined. The equation subsequently becomes a linear one. As shown on Table XV, both Y and $\frac{Ms}{Py}$ in this equation are not significant at the five percent level, but their lagged variables are significant. The $\bar{R}^2$ of .7998, the lowest one among all equations, is still fairly high. Although the coefficients of Y and Z $(= \frac{Ms}{Py})$ are not significant in Equation (8.4), they are retained. In the equation, other things being equal, R increases by .000223786 percent with an increase of one million N.T. dollars in Y; R decreases by .0192675 percent and increases by .11767 percent with an increase of one million N.T. dollars in Z and Z_{-1}, respectively. (Lagged Z has a larger positive effects on R.) As Y_{-1} increases by one million N.T. dollars in real terms, R will decrease by .000470145 percent (almost trivial). (Lagged variable of Y again has a larger negative effect on R.)

In summary, the given $\bar{R}^2$ for all equations in the system except the Equation (8.4) are very high. This may be caused by the upward trend found in almost every variable of time series data or by the incorporation of the lagged variable in the right-hand side of the equation.

ENDNOTES

[1]While the original work of Koyck was done in the context of investment demand analysis in 1954, Milton Friedman used a similar lag structure for his study of consumer behavior in 1957. The basic idea of this lag structure is that one variable reacts to another not instantaneously, but rather distributed over a period of time in the past. In case of consumption function, consumption in the current period (C_t) depends not only on income of the current time period (Y_t), but also on the series of past incomes: Y_{t-1}, Y_{t-2}, . . . Consider the consumption function:

$$C_t = a + \sum_{i=0}^{\infty} b_i Y_{t-1} + u_t \qquad (1)$$

Suppose that the impact on current consumption of a previous income declines exponentially, i.e., the consumer presumably adjusts his expenditure on consumption according to a weighted sum of his past levels of income, the weights declining over time. In functional form, the following equation results:

$$C_t = a + b \sum_{i=0}^{\infty} \lambda^i Y_{t-1} + u_t \qquad 0 \leq \lambda < 1 \qquad (2)$$

where $b_i = b\,\lambda^i$, b is some constant.

If $0<\lambda<1$, the weights given to the incomes of previous period decline in proportion to λ^i. If λ is 0, the lag scheme collapses immediately. The restriction that λ is between 0 and 1 ensures the convergence of the b_i's to 0. By expanding (2), for the time period t,

$$C_t = a + bY_t + \lambda\, bY_{t-1} + \lambda^2\, bY_{t-2} + \lambda^3\, bY_{t-3} + \ldots + u_t \qquad (2)'$$

For the time period t-1,

$$C_{t-1} = a + bY_{t-1} + \lambda\, bY_{t-2} + \lambda^2\, bY_{t-3} + \ldots + u_{t-1} \qquad (3)$$

Multiplying (3) by λ, and subtracting it from (2)', we have

$$C_t - C_{t-1} = a(1-\lambda) + bY_t + (u_t - \lambda\, u_{t-1})$$

or

$$C_t = a(1-\lambda) + bY_t + \lambda C_{t-1} + v_t \quad (4)$$

where

$$v_t = u_t - \lambda u_{t-1}$$

Note that in Equation (4), the transformed model involves the estimation of only two parameters b and λ, instead of infinite sequence of parameters b_i of the Equation (1). By this Koyck transformation, it reduces the number of parameters to be estimated from infinite to two which is a manageable term and thus aids in reducing the multicollinearity problem (see 19, pp. 187-189).

[2]In Seaks' model the sum of wages and profits is used as a proxy of disposable income.

[3]While both Liu and Seaks obtained a coefficient estimate for M smaller than 1, the present study yields a value larger than 1 and a^{-1} poor simulation result.

[4]Tsour, in his study of the demand for money function, has demonstrated that per capita demand for real money is a function of per capita real income and the interest rate for both the U.S. and Taiwan economies (64). The significance of the estimated coefficients and the direction of the signs for U.S. and Taiwan were found to be quite similar. Therefore, the theoretical relationship which has been developed to explain the monetary behavior in the U.S. is also applicable to the economy of Taiwan (64, pp. 83-85).

[5]Since the period covered in this study is too short to get Yp, Y(=GDP) is used as a proxy for Yp in the money demand function.

[6]Besides these alternatives, the writer also tried several others including the treatment of RR (Real Interest Rate) and Z (Real Money Supply) as dependent variables along with either R or RR as one of the explanatory variables in the regression equation. These experiments are summarized in the Appendix D.

[7]Since Yd includes C, the high R^2 may be spurious.

[8]The long-run MPC is calculated by the writer. Since the data Liu used for estimation are not available, the writer assumed that C grows at an eight percent average annual rate which falls between that of Seaks (7.74) and that of the present study (8.07).

[9]As with consumption, this high $\bar{R}^2$ may be spurious since wage income (W) is a part of national income and hence, a part of gross domestic product (Y).

CHAPTER V

DYNAMIC SIMULATION, DYNAMIC MULTIPLIERS AND POLICY SIMULATION

As specified in the previous chapter, the model contains lagged endogenous variables as predetermined variables. Since time lags are explicitly included, the model is dynamic. The predetermined variables and the disturbances generate the current values of the endogenous variables. The time paths of the exogenous variables and the disturbances determine the time paths of endogenous variables.

In this chapter, the dynamic properties of the model are analyzed. Two aspects are involved: (1) the stability of the system (i.e., dynamic stability); and (2) the effects on the values of the endogenous variables of a unit change in the values of the exogenous variables (i.e., dynamic multipliers).

Dynamic Simulation

The analytical approach may be used to examine the stability of a linear system (see 54, pp. 344-345; and 56). But no simple analytical method appears available for a non-linear system. We must resort to the simulation approach, which can solve a simultaneous set of difference equations mathematically (54, p. 310). Given the parameter estimates and identities in the system, the initial values are specified for exogenous and predetermined variables. If a dynamic system runs unconstrained simulation for some time periods (e.g., 50 time periods for MACROSIM) with all lagged endogenous variables being appropriately updated, the simultaneous solution of the system provides the time paths for each of the endogenous variables. The model is considered stable where the continuously updated values for endogenous variables are approaching equilibrium values over time, regardless of being damped or oscillated. Divergence of these values over time indicates that the model is unstable.

In this study, the MACROSIM program is used for the dynamic simulation (see Appendix E for a detailed discussion). The results of the simulation runs are summarized in Table XVI. Since the simulation values of the endogenous variables approach equilibrium values over time, the model is stable.

Dynamic Multipliers

A common practice in calculating the dynamic multipliers is to first run a bench mark simulation. A bench mark simulation is a simulation without any constraint, which can be used as a base for comparison. After the bench mark simulation values are obtained, one unit change in one of the exogenous variables (such as G, Ms, and Ig, etc.) or parameter estimates (such as t_0 or t_1, etc.) is assumed to determine the impact on the endogenous variables. There are three kinds of multipliers in terms of time dimension--impact multipliers, interim multipliers and long run (or total) multipliers. The impact multipliers indicate the immediate effect of each exogenous variable on each endogenous variable. The interim multipliers show the effects on each endogenous variable in a given time period. The long run multipliers indicate the total effect

TABLE XVI

SUMMARY OF DYNAMIC SIMULATIONS,[a] TAIWAN FORECASTING MODEL

Vari-able	Exogenous: Initial Values: First Run	Second Run	Third Run	Fourth Run	Fifth Run	Equilibrium Value	Endogenous: Vari-able	Equilibrium Value
CNST	1.000	---	---	---	---	1.000	C	39849.914
MS	1654.000	---	---	---	---	1654.000	Ip	1647.501
PM	32.110	---	---	---	---	32.110	T	7720.207
MS/P	45.031	---	---	---	---	45.031	D	5080.707
RMP	114.390	---	---	---	---	114.390	M	9753.984
IG	3433.200	---	---	---	---	3433.200	W	20999.469
TR	301.870	---	---	---	---	301.870	Py	47.984
G	19312.000	---	---	---	---	19312.000	R	17.931
X	6006.000	---	---	---	---	6006.000	I	5080.691
CL1	36276.000	39931.078	39852.070	39849.969	39849.914	39849.914	INFL	0.000
IPL1	3120.300	1662.021	1647.885	1647.511	1647.501	1647.501	K	59233.477
KL1	8002.000	58398.934	59211.199	59232.848	59233.461	59233.477	Yd	47995.562
PYL1	29.840	47.984	---	---	---	47.984	Y	60494.629
ZL1	43.934	34.470	---	---	---	34.470		
YL1	57809.000	60509.000	60496.430	60494.676	60494.629	60494.629		
Z2	1.231	1.231	---	---	---	149.436		

[a]For details of dynamic simulation runs see Appendix D. Notice that: (a) the title "TAIWAN FORECASTING MODEL" is used hereafter for simplification; (b) the original printouts give prints of each endogenous variable in one page and are followed by a plot in the next page. Only prints that are grouped in four are given in the appendix. Every five pages represents a simulation run. The notation --- denotes that the figure has been carried to the next run, i.e., the figure is the same as the previous run.

on each endogenous variable. These dynamic multipliers provide information concerning the pattern of variable interaction over time, thereby offering a valuable guide to policy formation and execution. Alternative policy simulations can be conducted to assess the combined effects on endogenous variables when a certain policy mix is chosen. The precise pattern and size of these dynamic multipliers also provide an additional check on the stability of the system. The system is considered stable if the total multipliers are finite or, equivalently, the interim multipliers grow smaller and smaller in absolute value and converge to zero over time (i.e., the effects from exogenous shock fade away).

In the present study, the revised MACROSIM program is employed to calculate the dynamic multipliers. A summary of these dynamic multipliers is presented in Table XVII. As shown in the table, a one million N.T. dollar increase in government expenditure in a given year brings an increase of 1.031 and 1.328 million N.T. dollars in gross domestic product in the same year and in the long run, respectively. Similarly, an increase of 0.336, 0.125 and 0.187 million N.T. dollars in the same year and an increase of 0.598, 0.272 and 0.234 million N.T. dollars in the long run are observed on consumption, private investment, and taxes, respectively. This increase in government expenditure also leads to 0.429 and 0.551 million N.T. dollars on imports in the same year and in the long run, respectively; 0.453 and 0.586 million N.T. dollars increase in wage income; 0.121 and 0.273 increase in gross investment; 0.133 and 4.813 increase in capital stock; 0.840 and 0.828 increase in disposable income. In the same year the impact on depreciation, price level, interest rate, and rate of inflation are all trivial (0.000).

TABLE XVII

SUMMARY OF DYNAMIC MULTIPLIERS,[a] TAIWAN FORECASTING MODEL

Multiplier for	$\Delta G = 1.0$		$\Delta IG = 1.0$		$\Delta TR = 1.0$		$\Delta t_1 = 0.1$		$\Delta t_0 = 1.0$		$\Delta MS = 1.0$	
	Impact	Total	Impact	Total	Impact	Total	Impact	Total	Impact	Total	Impact	Total
Y	1.031	1.328	1.031	0.391	0.406	0.973	-2,367.015	-5,370.371	-0.405	-0.973	-0.078	-0.582
C	0.336	0.598	0.332	-0.535	0.527	1.172	-3,063.180	-6,497.781	-0.529	-1.182	-0.027	-0.238
Ip	0.125	0.272	0.125	0.083	0.047	0.195	- 283.537	-1,095.307	-0.048	-0.197	0.003	-0.177
T	0.187	0.234	0.187	0.070	0.074	0.172	5,387.308	4,547.191	0.927	0.825	-0.008	-0.105
D	0.000	0.258	0.000	1.035	0.000	0.184	0.000	-1,042.532	0.000	-0.190	0.000	-0.172
M	0.429	0.551	0.425	0.160	0.168	0.393	- 979.660	-2,222.687	-0.168	-0.404	0.058	0.172
W	0.453	0.586	0.453	0.172	0.180	0.422	-1,043.031	-2,366.477	-0.179	-0.429	-0.035	-0.262
Py	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R	0.000	0.000	0.000	0.000	0.000	0.000	- 0.529	1.324	0.000	0.000	0.000	0.002
I	0.121	0.273	1.121	1.082	0.047	0.199	- 283.535	-1,095.302	-0.048	-0.197	0.000	-0.176
INFL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.133	4.813	1.133	19.305	0.059	3.430	- 283.535	-1,943.122	-0.047	-3.532	0.020	-3.195
Yd	0.840	0.828	0.840	-0.715	1.332	1.617	-7,754.348	-8,875.043	1.332	-1.608	-0.066	-0.305

[a]Dynamic multipliers include impact, interim, and long-run (total) multipliers. Only the impact and total multipliers are summarized here. The unit for G, IG, TR, and t_0 are in millions of N.T. Dollars in real terms at 1971 prices. The change in t_1 is from 0.18 to 0.28. The unit of MS is in millions of N.T. Dollars.

The long-run effects on these endogenous variables are also trivial (0.000), except for depreciation which has an increase of 0.258 million N. T. dollars. Since the total multiplier contains both the interim and the impact multipliers, and since all total multipliers for the government expenditure except for Yd are larger than the corresponding impact multipliers, we see that the increase in government expenditure has positive net interim effects. Thus, the table indicates no sign differences between the impact and the total multipliers for the government expenditure. In general, since all the government expenditure multipliers are positive, it is concluded that the increase in government expenditure has a stimulating or expansionary effect on the Taiwan economy. The magnitude of all multipliers of government expenditure ranges from 0.000 to 4.813.

With regard to transfer payments, both impact and total multipliers for Y (= GDP) are less than 1. However, the impact and total multipliers for Yd are 1.332 and 1.617, respectively. These last multipliers are larger than 1. Other multipliers are similar to the government expenditure multipliers in the sense that they also have a positive or stimulating effect on the economy. The magnitude of these transfer payment multipliers range from 0.000 to 3.430.

A one million N. T. dollar increase in governmental investment produces both impact and total multipliers similar to the government expenditure multipliers. The impact and total multipliers for Y (= GDP) are 1.031 and 0.391, respectively. These multipliers are relatively small. The governmental investment multipliers have different signs for consumption and disposable income. Presumably, governmental investment confines to capital investment; it does not contribute to the increase in disposable income, and hence, consumption. Given a fixed amount of resources, consumption and disposable income are reduced at the expense of the increase in governmental investment. There are some negative net interim multipliers. The magnitude of these multipliers ranges from 0.000 to 19.305.

With regard to money supply, a one million N.T. dollar increase brings 0.078 and 0.262 decrease in gross domestic product in the same year and in the long run, respectively. It also brings 0.027 and 0.238 million N.T. dollar decrease in consumption, 0.003 increase and 0.177 decrease in private investment, 0.008 and 0.105 decrease in taxes, 0.035 and 0.262 decrease in wage income, 0.000 and 0.176 decrease in gross investment, and 0.066 and 0.305 decrease in disposable income in the same year and in the long run, respectively. On the contrary, a one million N.T. dollar increase of money supply in a given year brings an increase of 0.058 and 0.172 million N.T. dollars in imports in the same year and in the long run, respectively. On depreciation and on capital stock, a one million N.T. dollar increase of money supply produces an increase of 0.000 and 0.020 million N. T. dollars in the same year, respectively, but a decrease of 0.172 and 3.195 million N.T. dollars in the long run. The impacts and the long-run effects on price level 0.000 and 0.000), interest rate (0.000 and 0.002), and inflation (0.000 and 0.000) are all trivial. A one million N.T. dollar increase of money supply leads to some positive and some negative net interim effects. The signs of these net interim effects are consistent with the corresponding impact and total multipliers except for the interim effect on capital stock and private investment. Thus, the table indicates sign differences between the impact and the total multipliers of money supply on capital stock and private investment. Other things being equal, an increase in nominal money supply (Ms) in this model will raise the interest rate (R), which will subsequently depress investment, and hence, gross domestic product (Y). Therefore, the money supply multipliers are, in general, negative. Since most money supply multipliers are negative, it is concluded that increase in money supply has a contractive effect on the Taiwan economy. The magnitude of these multipliers range from 0.000 to 3.195.

Regarding the marginal rate of taxation, the multipliers follow a pattern similar to that of money supply with some exceptions. Unlike money supply multipliers, both the impact and total multipliers are positive on taxes and negative on imports and capital stock. The magnitude of tax rate multipliers range from 0.000 to 8875.0. Notice that the size of the tax multipliers becomes very large since the exogenous change in the marginal rate of taxation is 0.1 rather than one million N. T. dollars.[1] However, the increase in tax rate has a contractive effect on the economy in general. The tax multipliers, due to the constant term in the tax equation, follow the same pattern as that of tax rate multipliers except for their magnitude. This magnitude of tax multipliers, due to the constant term, ranges from 0.000 to 3.532. Notice that the exogenous change is one million N.T. dollars. In general, these tax increases have a contractive effect on the economy.

Consistent with the writer's earlier finding, the model is stable since all total multipliers in the Table XVII are finite. Increase in government expenditures, government investment, and transfer payments stimulate the Taiwan economy. In contrast, increase in money supply, the marginal rate of taxation and the constant term in the taxes equation produce a contractive effect. It appears that the exogenous increase in any of the policy instruments in Table XVII produces no immediate impact on depreciation since depreciation is defined as a function of capital stock lagged one period. The price level and rate of inflation are found quite insensitive to these exogenous changes. The interest rate is also insensitive to these exogenous changes except for the tax rate increase.

Policy Simulation

In this study, twelve policy simulation runs are also conducted for evaluation of the impact and total effects on the economy resulting from the exogenous changes in the selected policy mix. These results are summarized in Table XVIII. In this study, only the combination of two instruments are arbitrarily selected as examples of policy simulation. In fact, the revised MACROSIM can deal with a maximum of five or six exogenous changes (including changes of structural parameter estimates) simultaneously. In Table XVIII, the impact and total effects on each endogenous variable, due to exogenous change in the policy mix, are interpreted as the immediate effect in the same year and the total effect in the long run, respectively. As shown in the table, among these, policy mix (6) (an increase in government expenditure by one million N. T. dollars accompanied by a simultaneous decrease in the marginal rate of taxation by 0.1) is the most effective measure in stimulating the Taiwan economy. This policy mix produces a stimulating impact of 2569.055 million N.T. dollars and a stimulating total effect of 6524.684 million N.T. dollars on the Taiwan economy. Nevertheless, this policy mix will also bring a decrease of tax revenues by 5844.597

TABLE XVIII

SUMMARY OF THE POLICY SIMULATIONS,[a] TAIWAN FORECASTING MODEL

Effects on	(1) $\Delta G=1$, $\Delta Ms=1$ Impact	(1) Total	(2) $\Delta G=1$, $\Delta Ms=-1$ Impact	(2) Total	(3) $\Delta Ig=1$, $\Delta Ms=1$ Impact	(3) Total	(4) $\Delta Ig=1$, $\Delta Ms=-1$ Impact	(4) Total	(5) $\Delta G=1$, $\Delta t_1=.1$ Impact	(5) Total	(6) $\Delta G=1$, $\Delta t_1=-.1$ Impact	(6) Total
C	0.297	0.352	0.356	0.797	0.293	-0.785	0.352	-0.336	-3,062.898	-6497.312	3,323.621	7,893.391
Ip	0.138	0.112	0.132	0.462	0.134	-0.084	0.128	0.265	- 283.420	-1095.062	307.746	1,330.891
T	0.171	0.137	0.203	0.344	0.171	-0.035	0.203	0.172	5,387.586	4547.531	-5,844.597	-5,529.121
D	0.000	0.098	0.000	0.430	0.000	0.871	0.000	1.203	0.000	-1042.297	0.000	1,273.973
M	0.492	0.723	0.367	0.363	0.492	0.336	0.367	-0.020	- 979.250	-2222.187	1,063.293	2,700.480
W	0.430	0.332	0.504	0.844	0.430	-0.082	0.504	0.434	-1,042.594	-2365.937	1,132.082	2,875.184
Py	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	0.000
R	0.000	0.002	0.001	-0.002	0.000	0.002	0.001	-0.002	- 0.529	1.324	0.575	- 1.609
I	0.136	0.113	0.129	0.465	1.136	0.922	1.129	1.270	- 283.418	-1095.055	307.746	1,330.895
INFL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	0.141	1.840	0.133	8.004	1.141	16.254	1.133	22.441	- 283.414	-19426.840	307.743	23,737.211
Yd	0.805	0.539	0.949	1.164	0.801	-1.012	0.945	-0.387	-7,753.633	-8874.402	8,413.723	10,780.211
Y	0.981	0.773	1.153	1.934	0.981	-0.164	1.153	0.996	-2,366.023	-5369.160	2,569.055	6,524.684

TABLE XVIII (Continued)

Effects on	(7) $\Delta G=1$, $\Delta t_0=10$ Impact	Total	(8) $\Delta G=1$, $\Delta t_0=-10$ Impact	Total	(9) $\Delta Ig=1$, $\Delta t_1=.1$ Impact	Total	(10) $\Delta Ig=1$, $\Delta t_1=-.1$ Impact	Total	(11) $\Delta Ig=1$, $\Delta t_0=10$ Impact	Total	(12) $\Delta Ig=1$, $\Delta t_0=-10$ Impact	Total
C	- 4.949	-11.211	5.590	12.359	-3,062.898	-6,498.340	3,323.621	7,892.141	-4.953	-12.340	5.586	11.219
Ip	- 0.353	-1.700	0.623	2.275	- 283.416	-1,095.228	307.746	1,330.680	-0.357	-1.896	0.619	2.078
T	9.453	8.488	-9.082	-8.008	5,387.586	4,547.293	-5,844.596	-5,529.199	9.453	8.316	-9.082	-8.180
D	0.000	-1.633	0.000	2.156	0.000	-1,041.501	0.000	1,274.738	0.000	-0.859	0.000	2.934
M	- 1.254	-3.484	2.117	4.582	- 979.250	-2,222.539	1,063.293	2,700.055	-1.254	-3.867	2.117	4.191
W	- 1.332	-3.703	2.254	4.879	-1,042.597	-2,366.312	1,132.078	2,874.727	-1.332	-4.117	2.254	4.465
Py	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
R	0.000	0.002	0.001	-0.002	- 0.529	1.324	0.575	- 1.608	0.000	0.003	0.001	-0.002
I	- 0.356	-1.699	0.621	2.277	- 282.418	-1,094.225	308.746	1,331.684	0.644	-0.891	1.621	3.082
INFL	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
K	- 0.351	-30.441	0.625	40.219	- 282.418	-19,412.016	308.743	23,751.523	0.649	-16.004	1.625	54.664
Yd	-12.476	-15.246	14.203	16.941	-7,753.637	-8,875.812	8,413.723	10,778.375	-12.480	-16.789	14.199	15.395
Y	- 3.015	-8.395	5.129	11.094	-2,366.027	-5,370.008	2,569.055	6,523.684	-3.015	-9.328	5.129	10.145

[a]Only the impact and total multipliers are summarized. The units for G, Ig and t_0 are in millions of N.T. Dollars in in real terms at 1971 prices. When t_1 is positive, the magnitude of change in t is from 0.18 to 0.28. When t_1 is negative, the magnitude of change in t_1 is from 0.18 to 0.08. The unit of Ms is in millions of N.T. Dollars.

million N.T. dollars in the same year and by a total effect of 5529.121 million N.T. dollars in the long run. On the other hand, policy mix (9) (a combination of an increase in governmental investment of one million N.T. dollars and an increase in the tax rate of 0.1) is most effective in contracting the Taiwan economy. Policy mix (9) produces a dampening impact of 2366.027 million N.T. dollars and a dampening total effect of 5370.008 million N.T. dollars in the long run. But this policy mix also brings an increase of 5387.586 million N.T. dollars impact in tax revenues and a total effect increase by 4547.293 million N. T. dollars in the long run. These findings seem to suggest that policy makers face a trade-off problem in an attempt to stimulate or contract the economy: stimulate the economy at the expense of reducing tax revenues; increase tax revenues at the expense of dampening the economy; or compromise at some degree.

But real experiment with the economy may not be feasible or desirable and may be very expensive, if not impossible. For this reason, this kind of policy simulation is an extremely useful tool for assessing the consequences of a certain policy mix. Policy makers may formulate more appropriate future policy and plan the course of action in accordance with the results on policy simulation.

ENDNOTES

[1] Because a change in the marginal tax rate of .1 implies a large change in tax revenue, the marginal tax rate multiplier is much larger in absolute terms than the other multipliers. Therefore, the multiplier for the marginal tax rate should not be compared to the other multipliers.

CHAPTER VI

THE EVALUATION OF THE PERFORMANCE OF THE MODEL

In the previous chapter, the dynamic properties of the model were examined. In this chapter, the performance of the model is evaluated, the relative performance of the model is assessed, and the model is examined for structural change.

General Criteria for Model Evaluation

Several criteria are available for the evaluation of the model performance (54, pp. 314-320; 57, pp. 84-90; and 68, pp. 179-180). These include simulation fit, turning points forecasted (or simulated), and sensitivity.

The Simulation Fit

The simulation fit refers to the "fit" of the variables in a simulation context. Some quantitative measures are desirable to examine how closely each endogenous variable tracks its corresponding historical data series (54, p. 316). Deviation in actual or observed value is usually designated by the difference between the forecasted (or simulated) value and the corresponding actual value. The differences for all variables are then summed up to obtain the total deviation. These differences are positive and negative; hence, they sum to zero. To avoid the cancelling effect, the sum of absolute deviations or the square root of the sum of squared deviations is used to measure the total deviation. The total deviation is divided by the number of observations to yield an average deviation. The mean absolute error (MAE) is a measure of the absolute deviations. If these absolute deviations are expressed in terms of percent, the measure becomes mean absolute percent error (MAPE). In terms of square root of the sum of squared deviations, this gives the root-mean square error (RMSE). If these squared deviations are expressed in terms of percent, the measure becomes the root-mean square percent error (RMSPE). Deviation can also be measured in terms of change, such as the Theil's Inequality Coefficient (TIC). These measures are discussed below.

The Root-Mean Square Simulation Error (RMSE). The RMSE is a measure of the deviation of the simulated value from the actual (historical) value, with a larger value indicating greater deviation and poorer simulation fit of the model. To make a meaningful comparison, the size of the error must be compared with the average size (i.e., mean) of the variable in question. Otherwise, comparison should be made with the same measure for the same variable of comparable models. The RMSE can be expressed as:

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

where Y_t^s represents the simulated value of Y_t, Y_t^a the actual value, and T the number of periods in the simulation.

The Root-Mean Square Percent Error (RMSPE). The RMSPE is a measure of percent deviation of simulated value from actual value. It can be expressed as:

$$RMSPE = \frac{1}{T}\sqrt{\sum_{t=1}^{T}\left[\left(\frac{Y_t^s - Y_t^a}{Y_t^a} \times 100\right)\right]^2} \tag{2}$$

The Mean Absolute Error (MAE). The MAE measures the absolute value of deviation of the simulated value from actual value. The absolute value is used to avoid the cancellation effect of an error with both positive and negative numbers. The MAE can be written as:

$$MAE = \frac{1}{T}\sum_{t=1}^{T}\left|Y_t^s - Y_t^a\right| \tag{3}$$

The Mean Absolute Percent Error (MAPE). The MAPE is a measure of the absolute value of percent deviation of the simulated value from actual value. The MAPE can be expressed as:

$$MAPE = \frac{1}{T}\sum_{t=1}^{T}\left|\frac{Y_t^s - Y_t^a}{Y_t^a} \times 100\right| \tag{4}$$

Theil's Inequality Coefficient (TIC). The TIC measures forecast change compared to actual change. It can be written as:

$$TIC = \frac{\sqrt{\frac{1}{n}\sum (P_i - A_i)^2}}{\sqrt{\frac{1}{n}\sum P_i^2} + \sqrt{\frac{1}{n}\sum A_i^2}} \tag{5}$$

where P_i represents the predicted change ($= Y_t^s - Y_{t-1}^s$), A_i the actual change ($= Y_t^a - Y_{t-1}^a$), and n = T - 1 the number the change observed (= sample size - 1). TIC ranges from 0 to 1 with a value of 0 indicating a perfect forecast and a value of 1 indicating the poorest forecast.

In summary, while the RMSE and the RMSPE measure errors in terms of level, the MAE and the MAPE measure errors in terms of absolute level. In regard to the TIC, errors are measured in terms of change. The MAE and the MAPE are easy to calculate; however, the information about the direction of deviation is lost by using absolute values. The RMSE and the RMSPE have an advantage--since they may be decomposed into standard deviation and bias for further analysis of the bias direction (54, p. 22 and p. 290). Hence, these two measures are most widely used.

The Turning Points

A turning point indicates a sudden change of direction in actual or simulated data. The ability to predict the correct turning points from a model is an important criterion in model evaluation. Typically, one examines how well the turning points in the simulated or forecasted series correspond with the turning points in the actual data. A close correspondence indicates a better model performance.

The Overall Sensitivity of the Model

We can examine how the model reacts to such factors as change of initial period of simulation, parameter estimates, and time paths of exogenous variables. Presumably, the model should not be sensitive to any change of the initial period used for simulation if it approximates reality. Neither the simulation nor the forecasting performance should be affected drastically in the case of a minor change in one of the model's coefficients or the time path of one of the exogenous variables.

Evaluation of Model Performance

In an attempt to evaluate the performance of the model, the ex post simulation and the ex post forecasting are conducted. The ex post simulation refers to the simulation within the sample estimation period. By simulating the model over the period for which the actual series is available, a comparison can be made for each endogenous variable between the simulated series and the actual series. Thus, the ex post simulation provides a useful test of the validity of the model. In addition, the ex post simulation can also be employed in policy simulations. We can compare its effects by changing the parameter values or the time paths for exogenous variables as a result of alternative policies. The ex post forecasting refers to forecasting beyond the sample estimation period up to the present time. The revised MACROSIM is used in the ex post simulation as well as in the ex post forecasting in this chapter.

Model Performance in Terms of the Simulation Fit

The detailed results of simulation fit of the model within the sample estimation period are given in Appendix F. From this appendix, the Mean Absolute Percent Errors for these 13 endogenous variables are summarized in Table XIX. The simulated value of gross domestic product is off 8.09 percent from the actual (or historical) value. The value of the price level deviates from actual series by 2.05 percent. The private investment, interest rate, and rate of inflation, however, are

TABLE XIX

THE ACCURACY OF EX POST SIMULATION,
TAIWAN FORECASTING MODEL

Endogenous Variable	Mean Absolute Percent Error (MAPE)
C	8.90
Ip	31.25
T	5.53
D	8.15
M	10.39
W	8.22
Py	2.05
R	19.86
I	16.53
INFL	27.68
K	10.31
Yd	9.29
Y	8.09

off 31.25 percent, 19.86 percent, and 27.68 percent, respectively. The large deviations produced by private investment and interest rate are primarily due to the greater difficulty involved in these specifications. Since gross investment contains both private and governmental investment, large deviations produced by private investment is also reflected in gross investment. When the price changes, the rate of inflation fluctuates accordingly. In general, within the sample period, the model performs fairly well.

The writer also uses the revised MACROSIM to perform a three-period ex post forecast for the model with 1974 as the initial year (Appendix G). This result is compared with the ex post simulation for 1953-1973. Comparison results are shown in Table XX. Since the forecast is done beyond the estimation period, a considerable increase is expected in some error measures, such as the MAPE associated with depreciation, interest rate, and rate of inflation; the RMSPE associated with depreciation, interest rate, and rate of inflation; and the TIC associated with taxes, interest rate, and gross investment. However, the error of the overall forecast for the gross domestic product (the most important variable) increases slightly less than six percent in terms of MAPE and increases 0.02 in terms of TIC. Since the rate of inflation is very sensitive to the change in price level, the big difference between the measures in the sample and beyond the sample period as measured by the MAPE is not surprising. A few equations (such as private investment, interest rate, rate of inflation, and gross investment) do not perform as well as expected. On the whole, the model performs fairly well beyond the estimation period; hence, the model can be used for ex ante forecasting.

TABLE XX

COMPARISON OF THE ACCURACY OF EX POST SIMULATION AND FORECASTING, TAIWAN FORECASTING MODEL

Simulation Type	Ex Post Simulation					Ex Post Forecasting					Difference				
Period	1953-1973					1974-1976									
Criteria	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC
C	7048.43	8.90	1744.44	2.15	0.25	22697.31	12.04	13983.01	7.31	0.29	15648.88	3.14	12238.57	5.16	0.04
Ip	2452.22	31.25	867.45	9.00	0.53	17628.23	38.00	10842.06	25.32	0.76	15176.01	6.75	9974.61	16.32	0.23
T	1182.59	5.53	356.42	1.56	0.33	6092.04	9.88	5433.21	8.84	0.79	4909.45	4.35	5076.79	7.28	0.46
D	529.70	8.15	137.34	2.09	0.19	6744.13	27.82	3961.61	16.13	0.10	6214.43	19.67	3824.27	14.04	0.09
M	2214.58	10.39	607.43	3.32	0.33	15887.19	10.22	10621.25	6.92	0.38	13672.61	-0.17	10013.82	3.60	0.05
W	4415.35	8.22	1098.02	2.03	0.24	20485.02	13.42	12525.78	8.07	0.22	16069.67	5.20	11427.76	6.04	0.02
Py	1.34	2.05	0.36	0.58	0.23	12.76	7.87	8.64	5.38	0.47	11.42	5.82	8.28	4.80	0.24
R	2.89	19.86	0.74	5.32	0.66	6.26	45.91	3.82	27.38	0.92	3.37	26.05	3.08	22.06	0.26
I	3452.34	16.53	867.48	4.36	0.38	17628.29	17.54	10841.82	10.99	0.98	14175.95	1.01	9974.34	6.63	0.60
INFL	2.55	27.68	0.83	7.79	0.63	11.13	137.07	7.21	88.62	0.66	8.58	109.39	6.38	80.83	0.03
K	9868.73	10.31	2554.80	2.84	0.13	10748.56	1.76	6806.20	1.13	0.10	879.83	-8.55	4251.40	-1.71	-0.03
Yd	9961.05	9.29	2493.10	2.24	0.23	36984.96	13.89	21977.06	8.20	0.19	27023.91	4.60	19483.96	5.96	-0.04
Y	10856.51	8.09	2673.26	1.93	0.19	49821.16	14.03	30194.88	8.38	0.21	38964.65	5.94	27521.62	6.45	0.02

Model Performance in Terms of Turning Points

The prints and plots of the results of ex post simulation are given in Appendix F. Both the observed and the forecasted series for 1953-1973 (i.e., "1" is 1953) are included. To see how well turning points in the forecasted series correspond with turning points in the actual data for a given endogenous variable, we need to compare two consecutive observed values (i.e., observed change) in the observed series first. Then, denote the change by a "+" for an increase, a "-" for a decrease, and no change by "0" for all 20 observed changes. Repeat the same process for all 20 forecasted changes. Next, the sign of the forecasted change is compared to that of the observed change in the same year. A sign opposite from that of the observed change indicates a "missed turning point." The total number of turning points missed can then be calculated for a given endogenous variable with a smaller number indicating a better performance of a model. The results of the performance of the model in terms of turning points missed are discussed below.

No turning points are missed for consumption, depreciation, wage income, price level, capital stock, disposable income, or gross domestic product.[1] This general pattern is in agreement with the general upward trend as shown in the plots. For each of these variables, the forecasted series track the observed series very closely. One turning point is missed for each of the following variables: taxes, imports, and gross investment. For taxes, the observed change between 1963 and 1964 was decreasing (-) while the forecasted change was increasing (+). For imports, the observed change between 1954 and 1955 was decreasing while the forecasted change was increasing. For gross investment, the observed change between 1954 and 1955 was decreasing while the forecasted change was increasing. The plots of these three variables indicate a general upward trend for both series. Thus, for taxes, imports, and gross investment, the forecasted series track very closely with the actual series. Four turning points (one-fifth of the total turning points) are missed regarding private investment and interest rate. For private investment, the observed changes between 1954 and 1955, between 1956 and 1957, between 1968 and 1969, and between 1971 and 1972 all decreased while all corresponding forecasted changes increased. For interest rates, the observed changes between 1961 and 1962, between 1966 and 1967, and between 1970 and 1971 all decreased with corresponding forecasted changes in the opposite direction. The observed change between 1972 and 1973 increased while the forecasted change decreased. Although the private investment misses four turning points, the plots indicate a general upward trend for both series. Hence, the forecasted series track quite closely with the actual series for private investment. This is not the case with the interest rate which fluctuates in varying degree and direction between the observed series and the forecasted series. Hence, the forecasted series do not track the observed series very closely for the interest rate. Finally, eight turning points (two-fifths of all turning points) are missed regarding rate of inflation. The observed changes between 1954 and 1955, between 1959 and 1960, between 1962 and 1963, between 1963 and 1964, and between 1967 and 1968 all increased while all the corresponding forecasted changes decreased. In contrast, the observed changes between 1957 and 1958, between 1969 and 1970, and between 1970 and 1971 all decreased while all the corresponding forecasted changes increased. Although eight turning points are missed for the rate of inflation, the plots indicate a fairly close track between the fluctuation trend of the forecasted series and the fluctuation trend of the observed series.

In summary, of the 13 endogenous variables, seven have no turning point missed, three miss one turning point, two miss four turning points, and only one endogenous variable misses eight turning points in the model. The plots indicate that the forecasted series track very closely with the observed series in all 13 endogenous variables except for interest rate. In general, the performance of the model can be considered good in terms of turning point criteria.

Model Performance in Terms of Sensitivity

In order to see whether the writer's model is sensitive to any change in the initial period used in simulation, the writer uses the revised MACROSIM to conduct several ex post simulations. The alternative initial periods chosen are 21, 14, 7, and 24 periods. The results of these simulations are given in Table XXI. These results are further summarized in Table XXII. Note that only three measures (the MAPE, RMSPE and TIC) are selected for comparison since these relative measures are more relevant. It appears that the model, as measured by several simulation error measures, is rather sensitive to change in the initial simulation period; particularly the measures of MAPE, RMSPE for private investment, interest rate, gross investment, and rate of inflation. This finding seems to further substantiate a priori notion that private investment, gross investment and interest rate equations are more difficult to specify. As to the rate of inflation, the sensitivity may be due to the way it is defined in terms of price level. Furthermore, the

TABLE XXI

SIMULATION RUNS FOR SENSITIVITY STUDY, TAIWAN FORECASTING MODEL

Program	PCSNSTV1 (= PCFOR7)					PCSNSTV2				
Period	1953-1973 (21-Period)					1960-1973 (14-Period)				
Criteria	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC
C	7048.43	8.90	1744.44	2.15	0.25	7049.27	6.72	2205.47	2.10	0.23
Ip	2452.22	31.25	867.45	9.00	0.53	3551.66	14.45	1133.56	4.29	0.38
T	1182.59	5.53	356.42	1.56	0.33	1362.41	4.88	488.20	1.64	0.27
D	529.70	8.15	137.34	2.09	0.19	540.05	3.75	212.61	1.24	0.13
M	2214.58	10.39	607.43	3.32	0.33	2161.55	5.77	747.62	2.01	0.20
W	4415.35	8.22	1098.02	2.03	0.24	2768.92	6.54	1439.44	1.94	0.18
Py	1.34	2.05	0.36	0.58	0.23	1.64	2.05	0.51	0.66	0.17
R	2.89	19.86	0.74	5.32	0.66	2.81	21.38	0.94	7.23	0.64
I	3452.34	16.53	867.48	4.36	0.38	3551.86	9.03	1133.63	2.73	0.27
INFL	2.55	27.68	0.83	7.79	0.63	1.93	31.85	0.68	10.91	0.56
K	9868.73	10.31	2554.80	2.84	0.13	11497.37	4.92	3964.51	1.49	0.08
Yd	9961.05	9.29	2493.10	2.24	0.23	10143.43	6.96	3243.25	2.21	0.22
Y	10856.51	8.09	2673.26	1.93	0.19	11291.58	6.14	3521.21	1.90	0.17

TABLE XXI (Continued)

Program	PCSNSTV3					PCSNSTV4				
Period	1967-1973 (7-Period)					1953-1976 (24-Period)				
Criteria	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC
C	6650.91	5.15	2677.96	2.08	0.17	9572.77	9.60	2541.65	2.16	0.26
Ip	4135.67	11.98	1699.05	5.00	0.43	5228.81	32.17	1587.03	8.54	0.57
T	1788.64	4.76	808.30	2.18	0.22	1889.61	6.22	771.14	1.78	0.38
D	505.10	2.71	276.41	1.45	0.12	1263.20	10.42	486.97	2.65	0.26
M	2633.02	3.83	1335.09	2.06	0.17	3708.02	10.23	1323.19	3.01	0.34
W	5060.52	5.16	2030.71	2.06	0.14	6652.89	9.02	1934.47	2.09	0.24
Py	1.90	2.02	0.93	0.99	0.14	2.76	2.77	1.12	0.84	0.31
R	3.38	26.81	1.41	11.29	0.76	3.01	21.03	0.73	5.27	0.81
I	4136.15	7.37	1699.21	3.11	0.30	5228.94	16.67	1587.01	4.07	0.41
INFL	1.37	25.71	0.68	12.56	0.48	3.63	42.57	1.16	13.81	0.65
K	11076.00	3.72	4549.88	1.53	0.06	9950.82	9.24	2436.04	2.49	0.12
Yd	10428.22	5.72	4403.84	2.41	0.17	13808.31	10.04	3704.95	2.26	0.23
Y	11941.92	5.11	4870.59	2.09	0.13	16248.14	8.98	4664.30	2.03	0.19

TABLE XXII

SENSITIVITY TO THE INITIAL SIMULATION PERIOD,
TAIWAN FORECASTING MODEL

Programs	PCSNSTV2 - PCSNSTV1			PCSNSTV3 - PCSNSTV2			PCSNSTV3 - PCSNSTV1			PCSNSTV4 - PCSNSTV1		
Criteria[a]	MAPE	RMSPE	TIC	MAPE	RMSPE	TIC	MAPE	RMSPE	TIC	MAPE	RMSPE	TIC
C	- 2.18	-0.05	-0.02	-1.57	-0.02	-0.06	- 3.75	-0.07	-0.08	0.70	0.01	0.01
Ip	-16.80	-4.71	-0.15	-2.47	0.71	0.05	-19.27	-4.00	-0.10	0.92	-0.46	0.04
T	- 0.65	0.08	-0.06	-0.12	0.54	-0.05	- 0.77	0.62	-0.11	0.69	0.22	0.05
D	- 4.40	-0.85	-0.06	-1.04	0.21	-0.01	- 5.44	-0.64	-0.07	2.27	0.56	0.07
M	4.62	-1.31	-0.13	-1.94	0.05	-0.03	- 6.56	-1.26	-0.16	-0.16	-0.31	0.01
W	- 1.68	-0.09	-0.06	-1.38	0.12	-0.04	- 3.06	0.03	-0.10	0.80	0.06	0.00
Py	0.00	0.08	-0.06	-0.03	0.33	-0.03	- 0.03	0.41	-0.09	0.72	0.26	0.08
R	1.52	1.91	-0.02	5.43	4.06	0.12	6.95	5.97	0.10	1.17	-0.05	0.15
I	- 7.50	-1.63	-0.11	-1.66	0.38	0.03	- 9.16	-1.25	-0.08	0.14	-0.29	0.03
INFL	4.17	3.12	-0.07	-6.14	1.65	-0.08	- 1.97	4.77	-0.15	14.89	6.02	0.02
K	- 5.39	-1.35	-0.05	-1.20	0.04	-0.02	- 6.59	-1.31	-0.07	-1.07	-0.35	-0.01
Yd	- 2.33	-0.03	-0.01	-1.24	0.20	-0.05	- 3.57	0.17	-0.06	0.75	0.02	0.00
Y	- 1.95	-0.03	-0.02	-1.03	0.19	-0.04	- 2.98	0.16	-0.06	0.89	0.10	0.00

[a]MAPE: Mean-Absolute-Percent-Error; RMSPE: Root-Mean-Square-Percent Error; TIC: Theil's Inequality Coefficient.

model as evaluated by the simulation measure TIC seems to be rather insensitive to changes in the initial period.

So far the performance of the model has been evaluated within the sample period and beyond the sample period up to the present. Actually, the model should also be evaluated in terms of its accuracy in future prediction (i.e., ex ante forecast). Since the actual values of the exogenous variables are not known at the time the forecast is made, these values must be projected. For ex ante forecasts beyond one period must be provided. Frequently, a forecaster generates a set of alternative forecasts with each conditional on a particular set of assumptions about the future course of the exogenous variables. Since the information necessary for this project is not available to the writer, no attempt on ex ante forecast is made in this study.

The Relative Performance of the Model

In order to evaluate the performance of this model relative to other models, the writer conducted an ex post simulation for the Taiwan naive model and an ex post simulation for Seaks' model via the revised MACROSIM program. The Taiwan naive model assumes the functional form of $Y = f(Y_{-1})$ in the construction of the behavioral equations. The endogenous and exogenous variables in the naive model are defined similarly to the Taiwan forecasting model. Estimated equations by ordinary least squares (OLS) and the identities are presented in Table XXIII. The comparison between the writer's model and the Taiwan naive model is given in Table XXIV. Two points are arbitrarily assigned to the one with a smaller error indicating a better performance. Otherwise, one point is assigned. Then the average points are obtained for each

TABLE XXIII

SUMMARY OF TAIWAN NAIVE MODEL

Behavioral Equations

(1)	$C = -1935.735 + 1.105317\ C_{-1}$ $(0.0107)*$	$\bar{R}^2 = 0.9979 \quad d = 2.01$
(2)	$Ip = 486.4411 + 1.112293\ Ip_{-1}$ $(0.0472)*$	$\bar{R}^2 = 0.9617 \quad d = 2.47$
(3)	$T = -892.935 + 1.153155\ T_{-1}$ $(0.0252)*$	$\bar{R}^2 = 0.9896 \quad d = 2.10$
(4)	$D = -80.8184 + 1.139877\ D_{-1}$ $(0.0156)*$	$\bar{R}^2 = 0.9959 \quad d = 1.39$
(5)	$M = -1718.498 + 1.237353\ M_{-1}$ $(0.0160)*$	$\bar{R}^2 = 0.9963 \quad d = 2.70$
(6)	$W = -1700.263 + 1.133818\ W_{-1}$ $(0.0100)*$	$\bar{R}^2 = 0.9983 \quad d = 2.07$
(7)	$Py = 1.808126 + 1.036052\ Py_{-1}$ $(0.0266)*$	$\bar{R}^2 = 0.9856 \quad d = 1.43$
(8)	$R = 2.067835 + 0.851149\ R_{-1}$ $(0.1048)*$	$\bar{R}^2 = 0.7458 \quad d = 2.27$

Identities

(9) $I = Ip + Ig$

(10) $INFL = 100.(Py - Py_{-1})/Py_{-1} = 100.Z_2 - 100$

(10.1) where $Z_2 = Py/Py_{-1}$

(11) $K = K_{-1} + I - D$

(12) $Yd = Y - D - T - Tr$

(13) $Y = C + I + G + X - M$

TABLE XXIV

COMPARISON OF THE SIMULATION ACCURACY OF THE TAIWAN NAIVE AND FORECASTING MODELS

Model Period Criteria	Taiwan Naive Model 1953-1973					Taiwan Forecasting Model 1953-1973					Taiwan Naive Model	Taiwan Forecasting Model
	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC	Average	Average
C	2984.52	3.74	738.14	0.92	0.16	7048.43	8.90	1744.44	2.15	0.25	2.0	1.0
Points	2	2	2	2	2	2	2	2	2	2		
Ip	7055.48	52.11	1822.41	13.42	0.48	3452.22	31.25	867.45	9.00	0.53	1.2	1.8
Points	1	1	1	1	2	2	2	2	2	1		
T	3643.90	15.18	978.29	3.59	0.38	1182.59	5.53	356.42	1.56	0.33	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
D	1486.27	17.10	395.23	4.00	0.20	529.70	8.15	137.54	2.09	0.19	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
M	14739.16	31.88	4829.32	7.89	0.26	2214.58	10.39	607.43	3.32	0.33	1.2	1.8
Points	1	1	1	1	2	2	2	2	2	1		
W	2905.43	5.20	751.18	1.27	0.19	4415.35	8.22	1098.02	2.03	0.24	2.0	1.0
Points	2	2	2	2	2	1	1	1	1	1		
Py	3.85	5.76	0.94	1.40	0.27	1.34	2.05	0.36	0.58	0.23	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
R	1.59	10.00	0.41	2.52	0.82	2.89	19.86	0.74	5.32	0.66	1.8	1.2
Points	2	2	2	2	1	1	1	1	1	2		
I	7139.57	29.24	1825.58	7.00	0.52	3452.34	16.53	867.48	4.36	0.38	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
INFL	3.22	38.00	1.01	11.45	0.95	2.55	27.68	0.83	7.79	0.63	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
K	40627.55	25.45	11517.71	6.08	0.16	9868.73	10.31	2554.80	2.84	0.13	1.0	2.0
Points	1	1	1	1	1	2	2	2	2	2		
Yd	10421.05	7.00	3288.72	1.80	0.22	9961.05	9.29	2493.10	2.24	0.23	1.6	1.4
Points	1	2	1	2	2	2	1	2	1	1		
Y	11297.35	5.64	3778.17	1.56	0.16	10856.51	8.09	2673.26	1.93	0.19	1.6	1.4
Points	1	2	1	2	2	2	1	2	1	1		
Grand Average											1.338	1.662

variable in each model. To compare the overall relative performance of models, the grand average of all variables is calculated for each model. The result shows that the writer's Taiwan forecasting model has a grand average point of 1.662 compared with 1.338 for the Taiwan naive model (Table XXIV). Thus, the basic model is relatively superior in overall performance. Nevertheless, the naive model is superior to the basic model in predicting consumption and wage income.

A comparison of relative performance between the writer's model and Seaks' model is also made. Earlier the DYMULT program was used to examine Seaks' model; based on those results, the model appears to be unstable. Thus, his model may be misspecified. We now compare the performance of the writer's model relative to Seaks' model. The results of ex post simulation on one version of Seaks' model (two-stage least squares) are given in Appendix H. Since only eight variables are comparable (see Table XXV), the comparisons are made in terms of these variables only. In calculating relative performance, three points are assigned to the one with the smallest error, two points to the one with the next smallest error and one point to the one with the largest error. The grand average for the writer's model is 3.00 compared with 1.875 for Seaks' Efficient Estimates version and 1.125 for his two-stage least square version. This comparison indicates that the writer's Taiwan forecasting model is considerably better than both versions of Seaks' model in terms of overall performance.

Test for Structural Change

The assumption of no structural change is implied in the model specification. This section examines the possibility of structural

TABLE XXV

COMPARISON OF THE SIMULATION ACCURACY OF THE SEAKS AND TAIWAN FORECASTING MODELS

Model Period Criteria	The Seaks Model (2SLS) 1953-1970					The Seaks Model (Efficient Estimates) 1953-1970				
	MAE	MAPE	RMSE	RMSPE	TIC	MAE	MAPE	RMSE	RMSPE	TIC
C	26528.25	38.42	9570.75	11.74	0.74	17224.38	24.93	5563.35	7.25	0.64
Points	1	1	1	1	1	2	2	2	2	2
Ip	16736.93	130.17	5528.74	37.18	0.96	15326.95	114.11	5055.80	32.03	0.92
Points	1	1	1	1	1	2	2	2	2	2
D	5290.67	86.49	1514.14	21.19	0.96	757.66	14.90	217.56	4.21	0.37
Points	1	1	1	1	1	2	2	2	2	2
M	8813.89	42.20	2763.76	11.90	0.67	9413.84	40.14	3218.79	11.24	0.81
Points	2	1	2	1	2	1	2	1	2	1
W	19050.30	45.99	6810.70	13.55	0.72	12339.79	29.77	4019.04	8.51	0.63
Points	1	1	1	1	1	2	2	2	2	2
I	16792.48	81.06	5529.12	22.53	0.77	15382.50	70.89	5056.30	19.36	0.83
Points	1	1	1	1	1	2	2	2	2	1
K	32330.43	45.47	9743.15	14.24	0.40	25859.24	28.52	8271.49	7.98	0.43
Points	1	1	1	1	2	2	2	2	2	1
Y (= GDP)	39619.30	35.12	14263.10	10.41	0.67	25221.80	23.17	8040.22	6.58	0.58
Points	1	1	1	1	1	2	2	2	2	2

TABLE XXV (Continued)

The Taiwan Forecasting Model 1953–1973					The Seaks Model (2SLS)	The Seaks Model (Efficient Est.)	The Taiwan Forecasting Model
MAE	MAPE	RMSE	RMSPE	TIC	Average Points	Average Points	Average Points
7048.43 3	8.90 3	1744.44 3	2.15 3	0.25 3	1.0	2.0	3.0
3452.22 3	31.25 3	867.45 3	9.00 3	0.53 3	1.0	2.0	3.0
529.70 3	8.15 3	137.34 3	2.09 3	0.19 3	1.0	2.0	3.0
2214.58 3	10.39 3	607.43 3	3.32 3	0.33 3	1.6	1.4	3.0
4415.35 3	8.22 3	1098.02 3	2.03 3	0.24 3	1.0	2.0	3.0
3452.34 3	16.53 3	867.48 3	4.36 3	0.38 3	1.2	1.8	3.0
9868.73 3	10.31 3	2554.80 3	2.84 3	0.13 3	1.2	1.8	3.0
10856.51 3	8.09 3	2673.26 3	1.93 3	0.19 3	1.0	2.0	3.0
Grand Average					1.125	1.875	3.000

change. In the case of a large sample, Chow's test, the dummy variables technique can be used (10; 19, pp. 172-178). Since the sample size of 22 (1952-1973) in this study is relatively small, this writer proposes a Chi-square test of the discrepancy for structural change.[2] Since the model involves a simple one period lag structure, the EAS program produces only 21 periods of actual series and predicted series. The actual series are the original observed data while the predicted series are series of predicted values based on the regression equation fitted. The actual and the predicted series are compared to see whether there is any discrepancy. Consider that there is an observed value associated with each time period. Hence, 21 time periods yield 21 observed randomly distributed values. For convenience, however, the time series may be rearranged in an ascending (or descending) order of time. Similarly, the predicted series can also conceivably be obtained in a similar fashion.

The procedure involved in calculating the Chi-square value is:

(a) Choose one maximum and one minimum value from the A_i (actual) and the P_i (predicted) series so that the range is large enough to cover the differences of maximum and minimum values from both series.

(b) The range of the difference is divided by 3 (assume that three classes of intervals are involved--large, medium and small).

(c) Based on these intervals, count the frequencies of A_i falling in O_i and frequencies of P_i falling in E_i (where O_i is the observed frequency and E_i is the expected frequency.

(d) Based on these O_i and E_i distributions, calculate the Chi-square according to the following formula:

$$\chi^2 = \sum_{i=1}^{3} \frac{(O_i - E_i)^2}{E_i}$$

(e) Compare this Chi-square value calculated with the expected Chi-square value of 5.99. Reject the null hypothesis of no structural change at the five percent level of significance if the Chi-square calculated is larger.

Since all the Chi-square values calculated are smaller than the Chi-square value, the null hypothesis of no structural change is not rejected. Hence, the model specification seems to be reasonable (for details of the Chi-square test, see Table XXVI).

TABLE XXVI

A CHI-SQUARE TEST FOR THE STRUCTURAL CHANGE, TAIWAN FORECASTING MODEL

Equation	Class Interval	O_i	E_i	Computed χ^2	χ^2, .95	Decision
Consumption (C)	39,311.00- 83,496.00	11	12			No
	83,497.00-127,681.00	6	5	0.028	5.99	structural
	127,682.00-171,866.00	4	4			change
Private Investment (Ip)	2,807.00- 18,726.00	12	13			No
	18,727.00- 34,645.00	5	5	0.410	5.99	structural
	34,646.00- 50,564.00	4	3			change
Taxes (T)	7,968.00- 24,543.00	14	13			No
	24,544.00- 41,118.00	4	5	0.280	5.99	structural
	41,119.00- 57,693.00	3	3			change
Depreciation (D)	2,324.00- 9,307.00	14	14			No
	9,308.00- 16,290.00	4	4	---	5.99	structural
	16,291.00- 23,273.00	3	3			change
Imports (M)	4,253.00- 44,313.00	15	14			No
	44,314.00- 84,373.00	3	5	1.370	5.99	structural
	84,374.00-124,433.00	3	2			change
Wage Income (W)	21,619.00- 60,660.67	13	12			No
	60,660.68- 99,702.34	5	6	0.250	5.99	structural
	99,702.35-138,744.00	3	3			change
Price Level (Py)	33.00- 61.67	7	8			No
	61.68- 90.34	9	8	0.250	5.99	structural
	90.35-119.00	5	5			change
Interest Rate (R)	9.90- 13.80	6	7			No
	13.81- 17.70	8	8	0.310	5.99	structural
	17.71- 21.60	7	6			change

ENDNOTES

[1]Actually, there are no turning points for these variables.

[2]This test was adopted from Cooper (11, p. 116) with some modifications. The Chi-square in the present study was calculated from the observed and expected frequencies rather than directly from observed and predicted values.

CHAPTER VII

SUMMARY AND CONCLUSION

Summary of the Study

In the preceding chapters, a macroeconometric forecasting model was constructed for the Taiwan economy. This model is based on annual data covering the time period 1952-1973. Following the specification and estimation of the model, the dynamic properties and the overall performance of the model within and beyond the estimation periods were examined. In addition, its performance relative to other models was also assessed. Finally, the test of structural change was conducted.

The model is a non-linear block recursive system containing 13 equations. The equations for consumption, private investment, tax, depreciation, imports, wage income, price formation, and interest rate are behavioral equations; the equations for gross investment, inflation, capital stock, disposable income, and gross domestic product are identities. The price formation equation forms the first block, the remaining equations constitute the second block. Since wage rate data are not available, alternative versions of the price equation were tried. Based on these trials, the equation with money supply, price of imports, and lagged price as independent variables was chosen. The original specification for the interest rate (R) yielded two wrong signs and poor simulation results in the estimation of the second block equations. Several alternatives including the lagged variables of interest rate, gross domestic product, and real money supply were tried. The one with lagged real money supply and lagged gross domestic product was then selected to replace the original specification of the interest rate.

This model is examined with regard to its dynamic properties, namely, dynamic stability and dynamic multipliers. The results of dynamic simulation indicate that, once given a departure of endogenous variables from corresponding equilibrium values, simulated values approached equilibrium values over time. Furthermore, all the total multipliers are finite. Hence, the model is stable. All the dynamic multipliers, except that of money supply, show the signs and magnitudes as expected from a priori. Exogenous increases in government expenditure, governmental investment, and transfer payments stimulate the Taiwan economy. However, exogenous increases in the money supply, the marginal rate of taxation, and the constant term in the tax equation have the opposite effect. It appears that changes in government expenditures, the money supply, governmental investment, transfer payments, and constant term of the tax equation have little or no immediate impact on the price level, the rate of inflation, and the interest rate.

Furthermore, the impacts and total effects on the economy resulting from the exogenous change of twelve selected policy mixes were also assessed. The results indicated that an increase in government expenditure by one million N. T. dollars accompanied by a simultaneous decrease in the marginal rate of taxation by 0.1 was the most effective measure in stimulating the Taiwan economy. However, this policy mix also resulted in a decrease of tax revenues. Of 12 selected policy mixes, a combination of an increase in governmental investment of one million N. T. dollars and an increase in the tax rate of 0.1 was the most effective measure in contracting the economy. However, this policy mix also brought an increase in tax revenues.

The overall performance of the model was evaluated in terms of its simulation fit within and beyond the estimation periods, turning points, and sensitivity. With regard to the simulation fit within the sample estimation period, the simulated values of most endogenous variables (consumption, taxes, depreciation, imports, wage income, price level, capital stock, disposable income, and gross domestic product) were off less than 10 percent from their actual or observed values. Large deviations were produced by gross investment (off 16.53 percent), interest rate (off 19.86 percent), rate of inflation (off 27.68 percent), and private investment (31.25 percent). With regard to the simulation fit beyond the estimation period up to present, the model performed fairly well, even if a few equations (such as private investment, interest rate, rate of inflation, and gross investment) did not perform as well as expected. In terms of the criteria of turning points, seven of the thirteen endogenous variables have no turning points missed, three missed one turning point, two missed four turning points, and only one endogenous variable missed eight turning points. However, the plots indicated that the forecasted series track very closely with the observed series in all thirteen endogenous variables except for the interest rate. In general, the performance of the model can be considered quite good in terms of turning points. In terms of model sensitivity, the overall performance within the estimation period appears to be rather stable, although some variables associated with certain error measures are sensitive to the initial period used for simulation.

Compared with the Taiwan naive model, the writer's model is found superior to overall performance of ex post simulation. The writer's Taiwan forecasting model is also found superior to both versions of Seaks' model based on overall performance of eight comparable variables. In addition, Seaks' model is unstable. This may indicate that Seaks' model is misspecified.

A test of the assumption of no structural change is made. The result indicates no structural shift. Hence, the model specification seems to be rather reasonable. Therefore, the model is justified for further use in ex ante forecasting.

Limitations and Suggestions for Further Studies

A major limitation of this study is that the model is unable to predict unemployment. This limitation results from a lack of data on employment. In addition, a compromise has to be made on the specification of the price equation because of the lack of data on wage rate. The problem is further compounded by inconsistencies in the data. Finally, the model is a small scale model because of budget limitations. It appears that no test of serial correlation is available involving a small sample with lagged endogenous variable and a simultaneous system at the same time.

Construction of a quarterly model is recommended to increase the sample size. Since the present study also substantiates a relatively poor performance of monetary sector along with earlier studies, further study in the area of monetary sector for the Taiwan economy is strongly needed.

Conclusions

The macroeconometric forecasting model of Taiwan constructed in this study is considered to be superior to both the Taiwan naive model and Seaks' model. Moreover, the model differs from all previous ones on the Taiwan economy in that it includes price variable and monetary sector, the simulation technique is used, and the system is of a non-linear recursive nature. The model constructed is also based on a longer time period. Nevertheless, since no model is perfect, adjustments may be necessary in the practical application for forecasting. In other words, minor adjustments such as making small changes in some of the model's coefficients, as well as introducing adjustable parameters at key points in the model, are often needed so as to improve the ability of the model to forecast (54, p. 358). Additional information, such as governmental policy change, exogenous major events and new data, etc., if any, must be incorporated into the model.

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APPENDIXES A

This appendix contains a detailed account of the data sources and methods used in deriving the time series for this study.

Data Sources

(A) Directorate-General of the Budget, Accounting and Statistics, Executive Yuan, Republic of China: National Income of the Republic of China, 1976.

(B) Directorate-General of the Budget, Accounting and Statistics, Executive Yuan, Republic of China: National Income of the Republic of China, 1973.

(C) Economic Research Department of the Central Bank of China, Republic of China: Taiwan Financial Statistics Monthly, February, 1976.

(D) International Monetary Fund: International Financial Statistics.

Units Used

All variables except Py, Pm, RMP, INFL, R, RR, and Ms are in millions of N.T. dollars in real terms (1971 prices). For the variables Py, Pm, and RMP, the year 1971 is used as a base. The unit for R, INFL, and RR is in percent, and that of Ms is in millions of N.T. dollars.

Methods Used in Deriving the Time Series

Since the national income statistics in Taiwan is compiled in accordance with the provision of the National Accounts System of the United Nations, the data in sources (A) and (B) are said to be in standard form ((17), p. 293). Hence, the National Accounts System will not be elaborated here. The national income statistics of Taiwan is compiled annually. Although quarterly data are available for the most recent periods, they are inadequate for the purpose of this study. Hence, the annual data are used in this study.

The data for C, I, G, X, M, and Y (= GDP) for the period 1952-1976 are taken from (A), pages 116-119. Since it is desirable to work with the total product of Taiwan exclusive of net factor income from the rest of the world, GDP--instead of GNP--is used. In fact, the real GDP differs only slightly from real GNP in the case of Taiwan. The data for Yd is derived from the identity Yd = Y - D - T + Tr.

The data for Ip and Ig (gross private and government investment, respectively) for the period 1958-1975 are taken from (A), pages 104-105, and the data for the period 1952-1957 are taken from (B), pages 118-119. The Ip data consist of fixed capital formation for private enterprises and for households and private nonprofit institutions. These data are deflated by the implicit deflator for fixed capital formation. The Ip data also contain the increase in stocks for the private enterprises; the data are deflated by the implicit deflator for increase in stocks. The Ig data consist of the fixed capital formation for public corporations (including government enterprises) and for general government; both are delfated by the implicit deflator for the fixed capital formation. In addition, Ig data also contain the increase in stocks for public corporations (including government enterprises); these data are deflated by the implicit deflator for increase in stocks. The deflators for fixed capital formation and increase in stocks are given in (A), pages 120-123. The data for 1976 are derived from (A), page 119. The total gross domestic investment of 1976 is appropriated by the ratio of the last three-year average of Ip to Ig. The data for T (taxes) for the period 1958-1975 are from (A), pages 110-111; and those for the period 1952-1957 are from (B), pages 130-131. T contains indirect taxes, business profit taxes and direct taxes. These data are deflated by the implicit deflator for gross national product as given in (A), pages 120-123, since the deflator for taxes is not available. The data for 1976 are derived from (A), pages 31 and 111. The data for D (provision for fixed capital consumption) for the period 1952-1976 are taken from (A), pages 124-127. The data for Tr (transfer payments) for the period 1958-1975 are from (A), pages 106-107, and for the period 1952-1957 are from (B), pages 122-123. Tr contains current transfers from the government and from the rest of the world. This total series is then deflated by the implicit deflator for national income as given in (A), pages 120-123, since the deflator for Tr is not available. The figure for 1976 is derived from 1975's figure by multiplying a three-year (1972, 1973, and 1974) average growth rate of 0.813. The data for W (wage income) for the period 1958-1975 are from (A), pages 98-99, and for the period 1952-1957 are from (B), pages 106-107. (Note that there is a slight inconsistency of data due to the recent revision.) The series is then deflated by the deflator for national income, since wage income is merely a component of national income and the deflator for wage income is not available. The data for 1976 are derived from (A), pages 22 and 123, assuming that wage income increases proportionally to that of real national income. The data for K (capital stock) are derived from the identity: $K = K_{-1} + I - D$, assuming that K_{-1} = real net private domestic capital stock on December 31 of the preceding year (defined as cumulated net investment beginning with 1951, i.e., $K_{1950} = 0$) (see Reference (12), p. 581).

The data for Py, Pm, and RMP (the price indexes for GNP, imports, and 100 times the relative price of Py/Pm, respectively) are either taken or derived from (A), pages 120-123. The data for Ms (nominal money supply) for the period 1952-1974 are from (C), page 28. For the period 1975-1976, data are from (D), Vol. 30(3), March, 1977, page 100. The data for R (the interest rate) are taken from (D):

for 1952, Vol. 13(3), December, 1960, p. 86;

for 1953-1957, Vol. 15(3), December, 1962, p. 82;

for 1958-1962, Vol. 18(3), December, 1965, p. 80;

for 1963-1967, Vol. 23(3), December, 1970, p. 82;

for 1968-1974, Vol. 28(4), December, 1975, p. 100; and

for 1975-1976, Vol. 30(3), March, 1977, p. 100.

Except the discount rate is used for 1952, the end-of-period call loan rate is used for the interest rate. The data for INFL (rate of inflation) are derived by the definition: $100(Py - Py_{-1})/Py_{-1}$. Note that this is an actual rate. Theoretically, an anticipated rate should be used; however, such a rate is not available for this study. The data for RR (real interest rate) are derived from the definition: RR = R - INFL.

Finally, for a glance of the trend and shape of data, (a) C, I, G, TB (trade balance, defined as X - M), and Y are plotted against Time; (b) Ip, Ig, and I are plotted against Time; (c) Y, D, T, Tr, and Yd are plotted against Time, and (d) INFL is plotted against Time.

The following Data File and plots are taken from the writer's EAS (Econometric Analysis System) program printouts from an IBM 370/158 computer at the University Computer Center, Oklahoma State University, Stillwater, Oklahoma.

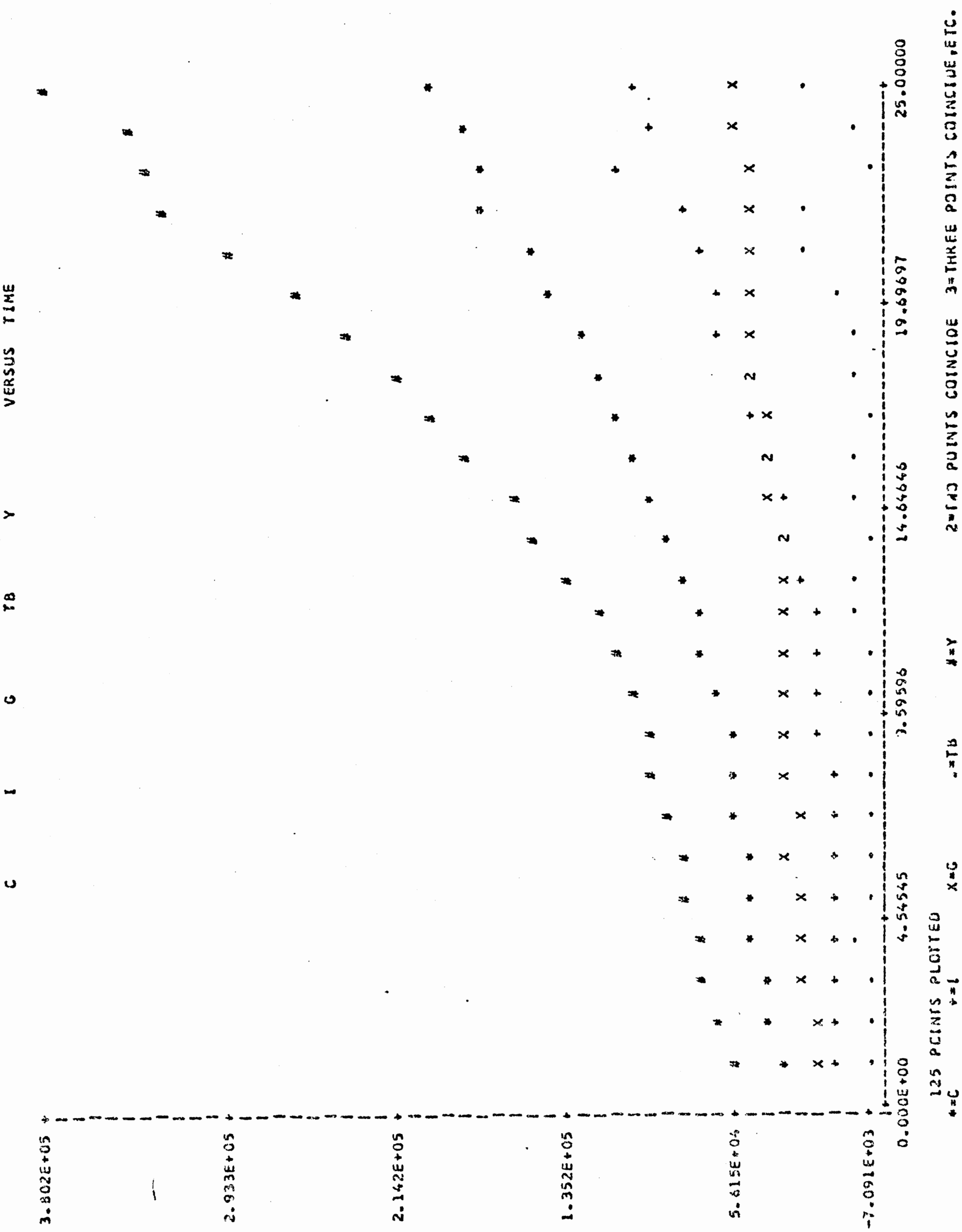
VARIABLES ON EAS DATA FILE 'DATA'

OBS.NO.	YEAR	C	I	G	X	M	Y	YD
1	1952.0000000	36276.0000000	6938.0000000	18858.0000000	4993.0000000	9255.0000000	57809.0000000	47979.6900000
2	1953.0000000	39311.0000000	7813.0000000	19312.0000000	6006.0000000	9849.0000000	62593.0000000	52243.9100000
3	1954.0000000	43337.0000000	8644.0000000	21622.0000000	4510.0000000	10281.0000000	68032.0000000	55135.0300000
4	1955.0000000	46043.0000000	7242.0000000	23130.0000000	5563.0000000	8791.0000000	73277.0000000	59365.5700000
5	1956.0000000	46952.0000000	8442.0000000	26577.0000000	6012.0000000	10621.0000000	77162.0000000	62338.2400000
6	1957.0000000	50006.0000000	8527.0000000	28533.0000000	6509.0000000	11314.0000000	82561.0000000	66645.0600000
7	1958.0000000	54110.0000000	10208.0000000	28129.0000000	8288.0000000	13514.0000000	87221.0000000	71123.4100000
8	1959.0000000	56534.0000000	11954.0000000	29933.0000000	8680.0000000	13649.0000000	93302.0000000	75674.5500000
9	1960.0000000	58910.0000000	14459.0000000	30014.0000000	9975.0000000	14830.0000000	98528.0000000	80105.9100000
10	1961.0000000	63378.0000000	16229.0000000	30502.0000000	11395.0000000	16456.0000000	105048.0000000	86161.2600000
11	1962.0000000	68572.0000000	17525.0000000	32556.0000000	12331.0000000	18242.0000000	112744.0000000	90802.9700000
12	1963.0000000	73132.0000000	18788.0000000	32833.0000000	16380.0000000	18795.0000000	122387.0000000	99111.5300000
13	1964.0000000	83676.0000000	22420.0000000	32890.0000000	20009.0000000	22641.0000000	136354.0000000	112523.3100000
14	1965.0000000	90460.0000000	28796.0000000	35104.0000000	25016.0000000	28680.0000000	150696.0000000	122474.2000000
15	1966.0000000	93842.0000000	32221.0000000	36487.0000000	29693.0000000	29895.0000000	162348.0000000	131856.5300000
16	1967.0000000	102671.0000000	40032.0000000	39370.0000000	34652.0000000	37772.0000000	179003.0000000	145232.2900000
17	1968.0000000	111157.0000000	47626.0000000	42008.0000000	43619.0000000	49304.0000000	195106.0000000	153597.0800000
18	1969.0000000	119953.0000000	49879.0000000	44321.0000000	54575.0000000	57140.0000000	211588.0000000	162623.0000000
19	1970.0000000	129964.0000000	60186.0000000	45492.0000000	58713.0000000	69782.0000000	234573.0000000	180418.4000000
20	1971.0000000	141096.0000000	67565.0000000	46411.0000000	91747.0000000	85261.0000000	261558.0000000	201187.0000000
21	1972.0000000	154814.0000000	68650.0000000	48468.0000000	121611.0000000	100918.0000000	292625.0000000	222570.5400000
22	1973.0000000	170898.0000000	81581.0000000	49070.0000000	150582.0000000	124433.0000000	327698.0000000	248273.8400000
23	1974.0000000	175520.0000000	112030.0000000	49238.0000000	138744.0000000	145835.0000000	329697.0000000	249052.7300000
24	1975.0000000	185218.0000000	95454.0000000	55215.0000000	142047.0000000	138071.0000000	339863.0000000	251935.2400000
25	1976.0000000	196606.0000000	102493.0000000	56842.0000000	202274.0000000	177980.0000000	380235.0000000	292959.8500000

OBS.NO.	YEAR	IP	IG	T	D	TR	W	K
1	1952.0000000	3120.3300000	3818.4300000	7925.6000000	2251.0000000	347.2900000	21218.9300000	8002.0000000
2	1953.0000000	4379.7900000	3433.2000000	7968.9600000	2682.0000000	301.8700000	21619.1000000	13133.0000000
3	1954.0000000	5503.2200000	3141.3000000	10552.8600000	2756.0000000	411.8000000	26082.9200000	19021.0000000
4	1955.0000000	3736.5200000	3505.2500000	11517.2900000	2788.0000000	393.8600000	27889.5200000	23475.0000000
5	1956.0000000	4332.7200000	4109.7400000	12282.7800000	2858.0000000	317.0200000	30165.4000000	29059.0000000
6	1957.0000000	3919.3400000	4607.8200000	13196.8900000	3121.0000000	401.9500000	31392.0000000	34465.0000000
7	1958.0000000	4178.1400000	6029.5900000	14151.9700000	3351.0000000	1405.3800000	33210.6100000	41322.0000000
8	1959.0000000	5643.1000000	6310.9300000	14785.4200000	3896.0000000	1053.9800000	34682.5300000	49380.0000000
9	1960.0000000	7906.6500000	6551.9700000	14519.2200000	4613.0000000	711.1300000	36833.1200000	59226.0000000
10	1961.0000000	9365.2400000	6864.4000000	14925.3300000	5153.0000000	1191.5900000	39846.7300000	70302.0000000
11	1962.0000000	9769.6700000	7755.2300000	17474.5600000	5873.0000000	1406.5300000	43603.7600000	81954.0000000
12	1963.0000000	11636.9000000	7150.0100000	17871.7800000	6715.0000000	1311.3100000	47739.1700000	94027.0000000
13	1964.0000000	14816.2800000	7603.2000000	17483.4300000	7536.0000000	1188.7400000	54212.7700000	108911.0000000
14	1965.0000000	19913.9400000	8882.1000000	21646.7800000	7908.0000000	1332.9800000	59225.5400000	129799.0000000
15	1966.0000000	21909.1700000	10311.7500000	23444.4700000	8685.0000000	1638.0000000	64537.8700000	153335.0000000
16	1967.0000000	25807.9900000	14274.2700000	25597.5000000	10133.0000000	1959.7900000	72453.1300000	183264.0000000
17	1968.0000000	31095.3200000	16530.7900000	31249.2900000	11533.0000000	1273.3700000	79963.2900000	219377.0000000
18	1969.0000000	29453.0300000	20425.9600000	36838.1200000	13114.0000000	987.1200000	86685.9600000	256142.0000000
19	1970.0000000	36500.6100000	23634.2400000	39788.0000000	15750.0000000	1383.4000000	97149.9900000	300581.0000000
20	1971.0000000	39710.0000000	27855.0000000	43647.0000000	18273.0000000	1549.0000000	111903.0000000	349873.0000000
21	1972.0000000	38830.7900000	29820.2800000	50513.2800000	21146.0000000	1604.8200000	124458.4600000	397377.0000000
22	1973.0000000	50563.9700000	31017.6200000	57692.6300000	22953.0000000	1226.4700000	138718.4500000	456005.0000000
23	1974.0000000	66628.0500000	45400.4200000	60753.4200000	21191.0000000	1310.1500000	140762.2900000	546844.0000000
24	1975.0000000	37872.6400000	57579.6300000	65630.0000000	23850.0000000	1552.2400000	146481.5000000	618448.0000000
25	1976.0000000	55048.9900000	47444.0100000	61427.5600000	27047.0000000	1199.4100000	162784.8900000	693894.0000000

VARIABLES ON EAS DATA FILE 'DATA'

OBS.NO.	YEAR	MS	R	PY	PM	RMP	INFL	RR
1	1952.0000000	1311.0000000	19.8000000	29.8400000	26.3400000	113.2877752	UNDEFINED	UNDEFINED
2	1953.0000000	1654.0000000	21.6000000	36.7300000	32.1100000	114.3880411	23.0898123	-1.4898123
3	1954.0000000	2096.0000000	21.6000000	37.0800000	36.3600000	101.9801980	0.9528995	20.6471005
4	1955.0000000	2523.0000000	21.6000000	41.0600000	43.2600000	94.9144706	10.7335491	10.8664509
5	1956.0000000	3161.0000000	18.0000000	44.7700000	50.4200000	88.7941293	9.0355577	8.9644423
6	1957.0000000	3740.0000000	18.0000000	48.8600000	51.9600000	94.0338722	9.1355819	8.8644181
7	1958.0000000	5041.0000000	14.4000000	51.5900000	63.9800000	80.6345733	5.5873926	8.8126074
8	1959.0000000	5486.0000000	18.0000000	55.6900000	78.5600000	70.8884929	7.9472766	10.0527234
9	1960.0000000	6037.0000000	18.0000000	63.7500000	79.0700000	80.6247629	14.4729754	3.5270246
10	1961.0000000	7231.0000000	16.2000000	66.9600000	84.2700000	79.4588822	5.0352941	11.1647059
11	1962.0000000	7832.0000000	15.8000000	68.7200000	82.1700000	83.7045150	2.7180406	13.0819594
12	1963.0000000	10060.0000000	14.0000000	71.7500000	84.6900000	84.7207453	4.3181157	9.6818843
13	1964.0000000	13259.0000000	14.0000000	75.4200000	83.0900000	90.7690456	5.1149826	8.8850174
14	1965.0000000	14695.0000000	14.0000000	75.4200000	85.4000000	88.3138173	0.000000E+00	14.0000000
15	1966.0000000	17004.0000000	14.0000000	77.9800000	90.4300000	85.2324450	3.3943251	10.6056749
16	1967.0000000	21875.0000000	13.3000000	81.5900000	91.3100000	89.3549447	4.6293922	8.6706078
17	1968.0000000	24649.0000000	14.0000000	87.8100000	91.6800000	95.7737958	7.6234833	6.3765167
18	1969.0000000	28584.0000000	13.3000000	92.5400000	92.6900000	99.8381732	5.3866302	7.9133698
19	1970.0000000	34508.0000000	12.5000000	96.7000000	96.1100000	100.6138799	4.4953534	8.0046466
20	1971.0000000	40914.0000000	12.0000000	100.0000000	100.0000000	100.0000000	3.4126163	8.5873837
21	1972.0000000	55066.0000000	11.3000000	105.0100000	110.5400000	94.9972861	5.0100000	6.2900000
22	1973.0000000	80938.0000000	13.3000000	118.6200000	137.1400000	86.4955520	12.9606704	0.3393296
23	1974.0000000	86617.0000000	14.8000000	159.1400000	192.4700000	82.6830155	34.1595009	-19.3595009
24	1975.0000000	109303.0000000	13.3000000	164.9200000	178.8200000	92.2268203	3.6320221	9.6679779
25	1976.0000000	130560.0000000	12.0000000	172.7000000	183.1800000	94.2788514	4.7174388	7.2825612


C I G TB Y VERSUS TIME
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2.142E+05
1.352E+05
5.615E+04
-7.091E+03
0.000E+00
4.54545
9.59596
14.64646
19.69697
25.00000
125 POINTS PLOTTED
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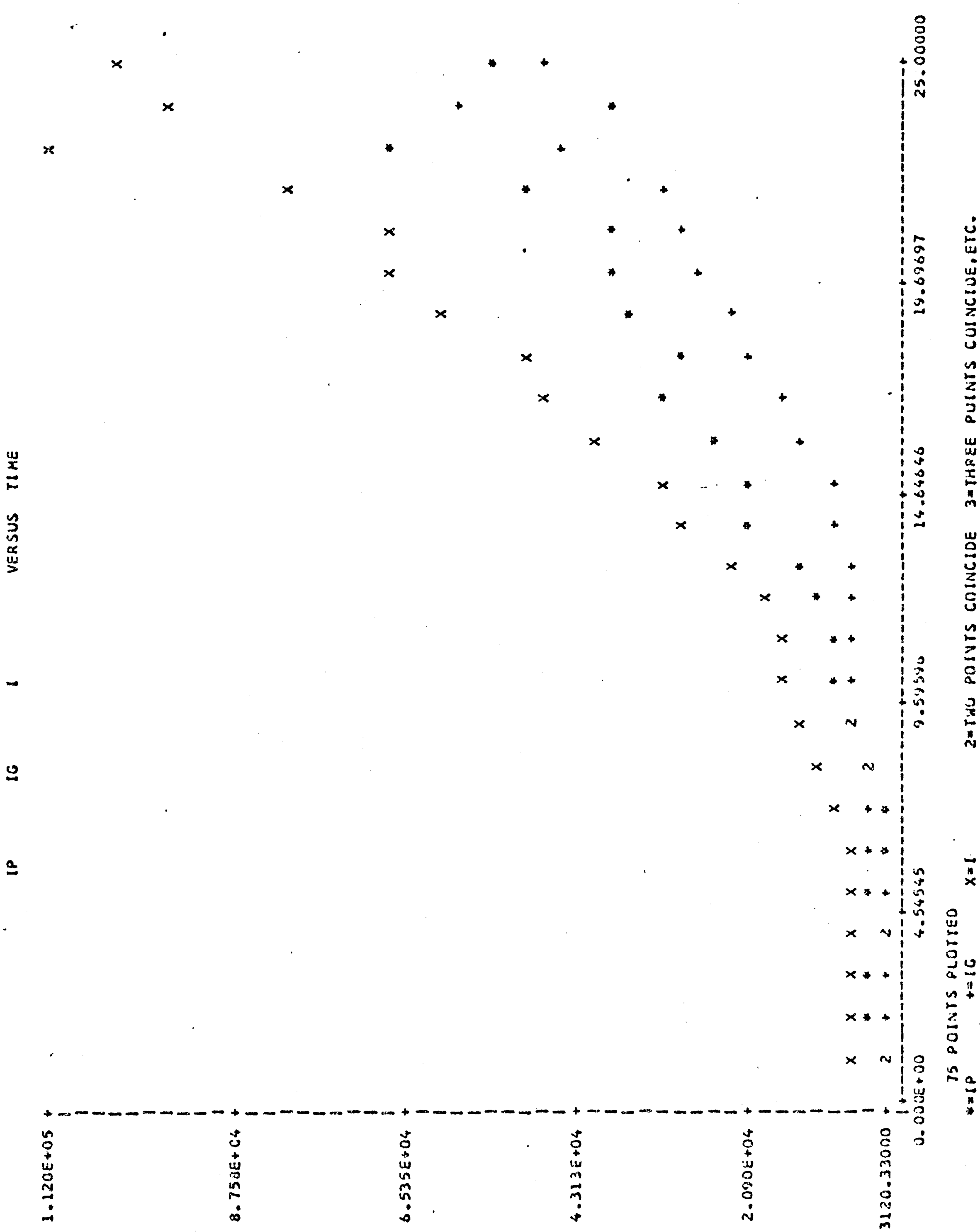
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2.090E+04
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0.000E+00
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9.59596
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25.00000
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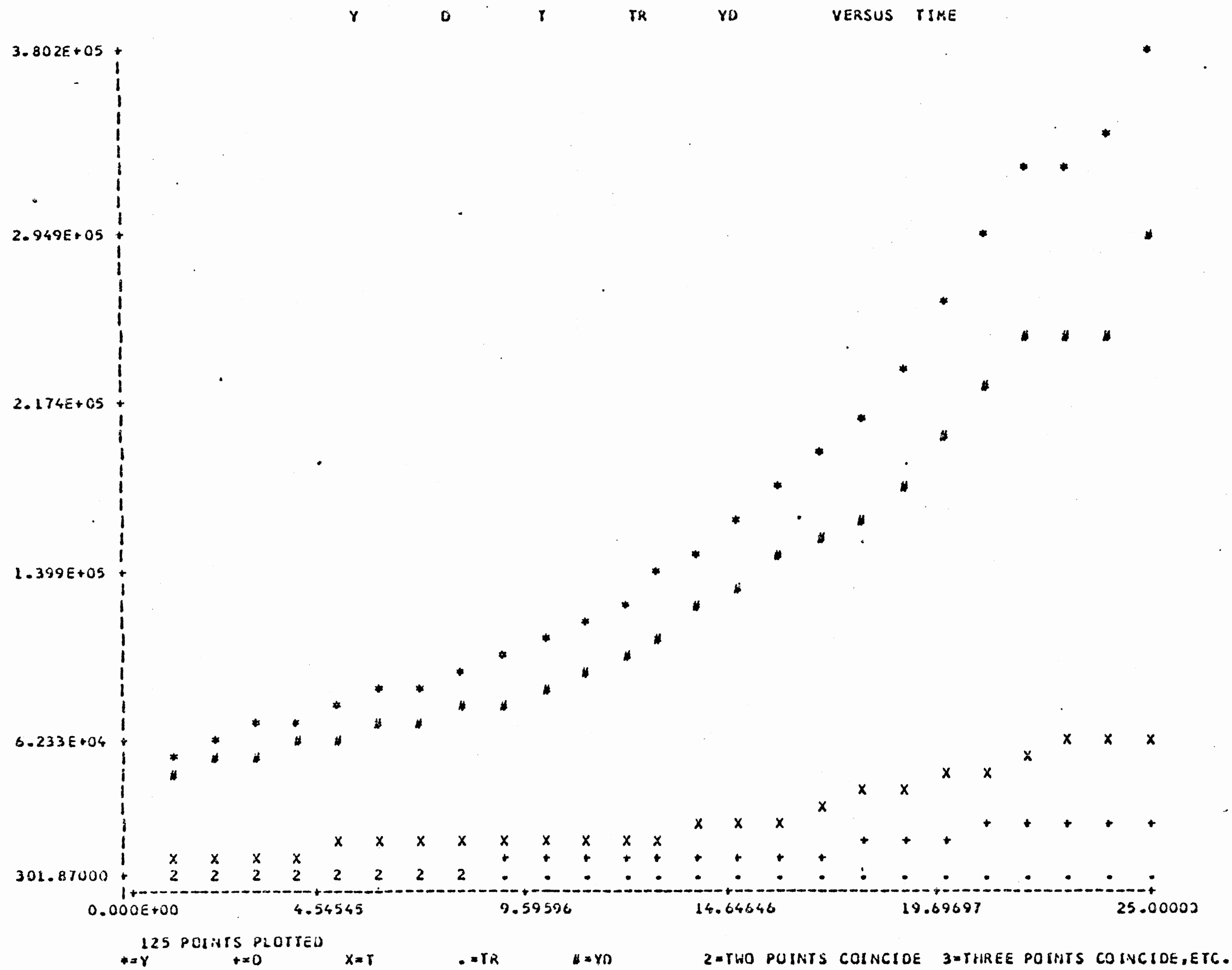
Y D T TR YD VERSUS TIME
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9.59596
14.64646
19.69697
25.00000
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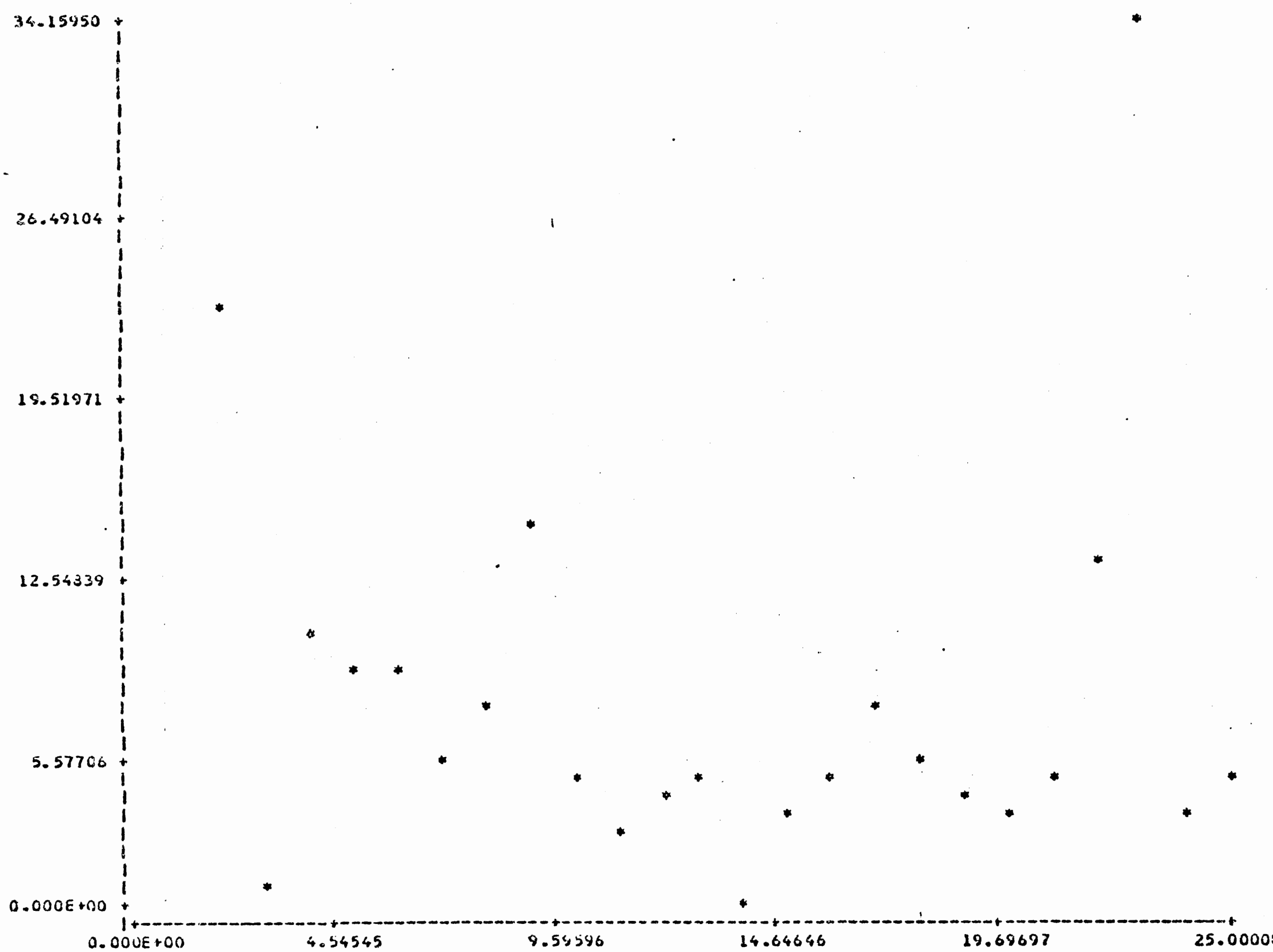
INFL VERSUS TIME



24 POINTS PLOTTED
*=INFL 2=TWO POINTS COINCIDE 3=THREE POINTS COINCIDE,ETC.

APPENDIX B

DYMULT PRINTOUTS--THE LIU MODEL

THIS IS THE- W -MATRIX--ENDOGENOUS COEFFICIENTS

1.00000	-.610000	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1.00000	0.0	-1.00000	0.0	0.0	0.0	1.00000	1.00000
0.0	0.0	1.00000	-.132000	0.0	0.0	0.0	0.0	0.0
-1.00000	0.0	-1.00000	1.00000	-1.00000	1.00000	-1.00000	0.0	0.0
0.0	0.0	0.0	-.180000E-01	1.00000	0.0	0.0	0.0	0.0
0.0	0.0	0.0	-.115000	0.0	1.00000	0.0	0.0	0.0
0.0	0.0	0.0	-.200000E-01	0.0	0.0	1.00000	0.0	0.0
0.0	0.0	0.0	-.144000	0.0	0.0	0.0	1.00000	0.0
0.0	0.0	0.0	-.700000E-01	0.0	0.0	0.0	0.0	1.00000

THIS IS THE W-INVERSE MATRIX

2.02990	1.23824	1.02990	1.02990	1.02990	-1.02990	1.02990	-1.23824	-1.23824
1.68836	2.02990	1.68836	1.68836	1.68836	-1.68836	1.68836	-2.02990	-2.02990
0.283542	0.172960	1.28354	0.283542	0.283542	-.283542	0.283542	-.172960	-.172960
2.14804	1.31031	2.14804	2.14804	2.14804	-2.14804	2.14804	-1.31031	-1.31031
0.386648E-01	0.235855E-01	0.386648E-01	0.386648E-01	1.03866	-.386648E-01	0.386648E-01	-.235855E-01	-.235855E-01
0.247025	0.150685	0.247025	0.247025	0.247025	0.752975	0.247025	-.150685	-.150685
0.429602E-01	0.262057E-01	0.429602E-01	0.429602E-01	0.429602E-01	-.429602E-01	1.04296	-.262057E-01	-.262057E-01
0.309318	0.188684	0.309318	0.309318	0.309318	-.309318	0.309318	0.811316	-.188684
0.150363	0.917214E-01	0.150363	0.150363	0.150363	-.150363	0.150363	-.917214E-01	0.908279

THIS IS THE- A -MATRIX--COEFFICIENTS OF ENDOGENOUS VARIABLES LAGGED ONE-PERIOD

0.170000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.320000	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.667000	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.519000	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS IS THE A* MATRIX -- G-MATRIX + (W-MATRIX * WI-MATRIX)

0.345083	0.0	0.329568	0.0	0.686944	-.534518	0.0	0.0	0.0
0.287021	0.0	0.540276	0.0	1.12614	-.876260	0.0	0.0	0.0
0.482021E-01	0.0	0.410733	0.0	0.189122	-.147158	0.0	0.0	0.0
0.365167	0.0	0.637374	0.0	1.43274	-1.11483	0.0	0.0	0.0
0.657301E-02	0.0	0.123727E-01	0.0	0.692789	-.200670E-01	0.0	0.0	0.0
0.419942E-01	0.0	0.790479E-01	0.0	0.164766	0.390794	0.0	0.0	0.0
0.730322E-02	0.0	0.137473E-01	0.0	0.286544E-01	-.222963E-01	0.0	0.0	0.0
0.525841E-01	0.0	0.989818E-01	0.0	0.206315	-.160536	0.0	0.0	0.0
0.255617E-01	0.0	0.481162E-01	0.0	0.100292	-.780384E-01	0.0	0.0	0.0

THIS IS THE- B -MATRIX--EXOGENOUS VARIABLES

0.0	0.0	0.0	0.0	0.0
0.0	0.0	1.00000	0.0	0.0
-.125000	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.00000	1.00000
0.0	1.05100	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0

THIS IS THE B* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

-.128738	1.08242	1.23824	1.02990	1.02990
-.211045	1.77447	2.02990	1.68836	1.68836
-.160443	0.298002	0.172960	0.283542	0.283542
-.268505	2.25759	1.31031	2.14804	2.14804
-.483310E-02	1.09163	0.235855E-01	0.386648E-01	0.386648E-01
-.308781E-01	0.259623	0.150685	0.247025	0.247025
-.537002E-02	0.451511E-01	0.262057E-01	0.429602E-01	0.429602E-01
-.386648E-01	0.325093	0.188684	0.309318	0.309318
-.187954E-01	0.158031	0.917214E-01	0.150363	0.150363

THIS IS THE- C -MATRIX--COEFFICIENTS OF EXOGENOUS VARIABLES LAGGED ONE-PERIOD

0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0

THIS IS THE C* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0

XXX DYNAMIC TOTAL MULTIPLIER XXX

	R	AG	TR	G	X
C	-0.27003	4.63619	1.81452	1.46894	1.46894
YD	-0.36741	6.30826	2.46894	1.99872	1.99872
IP	-0.27456	1.55794	0.36278	0.49362	0.49362
Y	-0.46745	8.02578	1.86888	2.54291	2.54291
IG	-0.02527	3.58997	0.10102	0.13745	0.13745
M	-0.11176	1.91884	0.44682	0.60797	0.60797
V	-0.00935	0.16051	0.03738	0.05086	0.05086
T	-0.06731	1.15571	0.26912	0.36618	0.36618
SB	-0.03272	0.56180	0.13082	0.17800	0.17800

INTERIM MULTIPLIERS FOR THE EFFECTS OF THE EXOGENOUS VARIABLE R

	C	YD	IP	Y	IG	M	V	T	SB
TOTAL	-.2700	-.3674	-.2746	-.4674	-.2527E-01	-.1118	-.9349E-02	-.6731E-01	-.3272E-01
LAG									
0	-.1287	-.2110	-.1604	-.2685	-.4833E-02	-.3088E-01	-.5370E-02	-.3866E-01	-.1880E-01
1	-.8412E-01	-.1020	-.6847E-01	-.1298	-.5560E-02	-.3095E-01	-.2596E-02	-.1869E-01	-.9086E-02
2	-.3887E-01	-.4028E-01	-.2868E-01	-.5124E-01	-.4631E-02	-.2196E-01	-.1025E-02	-.7379E-02	-.3587E-02
3	-.1431E-01	-.1262E-01	-.1130E-01	-.1606E-01	-.3378E-02	-.1324E-01	-.3212E-03	-.2313E-02	-.1124E-02
4	-.3902E-02	-.2410E-02	-.4020E-02	-.3066E-02	-.2308E-02	-.7226E-02	-.6132E-04	-.4415E-03	-.2146E-03
5	-.3948E-03	0.4404E-03	-.1212E-02	0.5603E-03	-.1530E-02	-.3686E-02	0.1121E-04	0.8068E-04	0.3922E-04
6	0.3836E-03	0.7389E-03	-.2639E-03	0.9400E-03	-.1003E-02	-.1805E-02	0.1880E-04	0.1354E-03	0.6580E-04
7	0.3209E-03	0.4192E-03	-.1404E-04	0.5333E-03	-.6596E-03	-.8753E-03	0.1067E-04	0.7679E-04	0.3733E-04
8	0.1209E-03	0.1088E-03	0.1377E-04	0.1384E-03	-.4374E-03	-.4384E-03	0.2768E-05	0.1993E-04	0.9687E-05
9	-.1991E-04	-.6634E-04	-.6733E-05	-.8440E-04	-.2933E-03	-.2372E-03	-.1688E-05	-.1215E-04	-.5908E-05
10	-.8377E-04	-.1318E-03	-.2428E-04	-.1676E-03	-.1986E-03	-.1424E-03	-.3353E-05	-.2414E-04	-.1174E-04
11	-.9725E-04	-.1361E-03	-.3062E-04	-.1731E-03	-.1356E-03	-.9382E-04	-.3463E-05	-.2493E-04	-.1212E-04
12	-.8666E-04	-.1150E-03	-.2911E-04	-.1463E-03	-.9309E-04	-.6551E-04	-.2925E-05	-.2106E-04	-.1024E-04
13	-.6843E-04	-.8302E-04	-.2410E-04	-.1120E-03	-.6410E-04	-.4688E-04	-.2240E-05	-.1613E-04	-.7839E-05
14	-.5053E-04	-.6377E-04	-.1842E-04	-.8113E-04	-.4422E-04	-.3366E-04	-.1623E-05	-.1168E-04	-.5679E-05
15	-.3589E-04	-.4476E-04	-.1341E-04	-.5694E-04	-.3052E-04	-.2402E-04	-.1139E-05	-.8200E-05	-.3986E-05
16	-.2493E-04	-.3087E-04	-.9476E-05	-.3927E-04	-.2106E-04	-.1698E-04	-.7855E-06	-.5655E-05	-.2749E-05
17	-.1712E-04	-.2111E-04	-.6578E-05	-.2686E-04	-.1453E-04	-.1190E-04	-.5372E-06	-.3868E-05	-.1880E-05
18	-.1170E-04	-.1440E-04	-.4524E-05	-.1832E-04	-.1002E-04	-.8285E-05	-.3665E-06	-.2639E-05	-.1283E-05
19	-.7984E-05	-.9828E-05	-.3098E-05	-.1250E-04	-.6910E-05	-.5738E-05	-.2501E-06	-.1801E-05	-.8753E-06
20	-.5456E-05	-.6719E-05	-.2120E-05	-.8549E-05	-.4763E-05	-.3961E-05	-.1710E-06	-.1231E-05	-.5984E-06
21	-.3736E-05	-.4604E-05	-.1452E-05	-.5858E-05	-.3282E-05	-.2729E-05	-.1172E-06	-.8435E-06	-.4100E-06
22	-.2564E-05	-.3161E-05	-.9954E-06	-.4022E-05	-.2262E-05	-.1879E-05	-.8044E-07	-.5792E-06	-.2815E-06
23	-.1762E-05	-.2174E-05	-.6836E-06	-.2766E-05	-.1558E-05	-.1293E-05	-.5532E-07	-.3983E-06	-.1936E-06
24	-.1213E-05	-.1497E-05	-.4701E-06	-.1904E-05	-.1074E-05	-.8902E-06	-.3808E-07	-.2742E-06	-.1333E-06
25	-.8351E-06	-.1031E-05	-.3236E-06	-.1312E-05	-.7398E-06	-.6129E-06	-.2624E-07	-.1889E-06	-.9183E-07
26	-.5754E-06	-.7106E-06	-.2229E-06	-.9040E-06	-.5097E-06	-.4221E-06	-.1808E-07	-.1302E-06	-.6328E-07
27	-.3966E-06	-.4897E-06	-.1536E-06	-.6231E-06	-.3512E-06	-.2907E-06	-.1246E-07	-.8972E-07	-.4362E-07
28	-.2733E-06	-.3375E-06	-.1058E-06	-.4294E-06	-.2420E-06	-.2003E-06	-.8589E-08	-.6184E-07	-.3006E-07
29	-.1884E-06	-.2326E-06	-.7293E-07	-.2960E-06	-.1667E-06	-.1380E-06	-.5919E-08	-.4262E-07	-.2072E-07
30	-.1298E-06	-.1603E-06	-.5026E-07	-.2040E-06	-.1149E-06	-.9506E-07	-.4079E-08	-.2937E-07	-.1428E-07
31	-.8946E-07	-.1105E-06	-.3464E-07	-.1406E-06	-.7915E-07	-.6550E-07	-.2811E-08	-.2024E-07	-.9839E-08
32	-.6165E-07	-.7613E-07	-.2387E-07	-.9686E-07	-.5454E-07	-.4513E-07	-.1937E-08	-.1395E-07	-.6780E-08
33	-.4248E-07	-.5246E-07	-.1645E-07	-.6674E-07	-.3758E-07	-.3110E-07	-.1335E-08	-.9611E-08	-.4672E-08
34	-.2927E-07	-.3614E-07	-.1133E-07	-.4599E-07	-.2589E-07	-.2143E-07	-.9197E-09	-.6622E-08	-.3219E-08
35	-.2017E-07	-.2490E-07	-.7809E-08	-.3169E-07	-.1784E-07	-.1477E-07	-.6337E-09	-.4563E-08	-.2218E-08
36	-.1390E-07	-.1716E-07	-.5381E-08	-.2183E-07	-.1229E-07	-.1017E-07	-.4366E-09	-.3144E-08	-.1528E-08
37	-.9575E-08	-.1182E-07	-.3707E-08	-.1504E-07	-.8470E-08	-.7010E-08	-.3008E-09	-.2166E-08	-.1053E-08
38	-.6597E-08	-.8147E-08	-.2555E-08	-.1036E-07	-.5836E-08	-.4830E-08	-.2073E-09	-.1493E-08	-.7255E-09
39	-.4546E-08	-.5613E-08	-.1760E-08	-.7141E-08	-.4021E-08	-.3328E-08	-.1428E-09	-.1028E-08	-.4999E-09
40	-.3132E-08	-.3868E-08	-.1213E-08	-.4921E-08	-.2771E-08	-.2293E-08	-.9841E-10	-.7086E-09	-.3444E-09

INTERIM MULTIPLIERS FOR THE EFFECTS OF THE EXOGENOUS VARIABLE AG

	C	YD	IP	Y	IG	M	V	T	SB
TOTAL	4.636	6.308	1.558	8.026	3.590	1.919	0.1605	1.156	0.5618
LAG									
0	1.082	1.774	0.2980	2.258	1.092	0.2596	0.4515E-01	0.3251	0.1580
1	1.083	1.474	0.3428	1.875	0.7619	0.3503	0.3749E-01	0.2700	0.1312
2	0.8228	1.047	0.2855	1.332	0.5321	0.3350	0.2664E-01	0.1918	0.9324E-01
3	0.5645	0.6961	0.2083	0.8857	0.3709	0.2757	0.1771E-01	0.1275	0.6200E-01
4	0.3708	0.4506	0.1423	0.5733	0.2577	0.2090	0.1147E-01	0.8255E-01	0.4013E-01
5	0.2402	0.2904	0.9431E-01	0.3694	0.1785	0.1510	0.7388E-02	0.5320E-01	0.2586E-01
6	0.1559	0.1886	0.6186E-01	0.2400	0.1234	0.1060	0.4800E-02	0.3456E-01	0.1680E-01
7	0.1023	0.1243	0.4067E-01	0.1561	0.8515E-01	0.7318E-01	0.3163E-02	0.2277E-01	0.1107E-01
8	0.6810E-01	0.8312E-01	0.2697E-01	0.1057	0.5870E-01	0.5014E-01	0.2115E-02	0.1523E-01	0.7402E-02
9	0.4591E-01	0.5629E-01	0.1808E-01	0.7161E-01	0.4044E-01	0.3426E-01	0.1432E-02	0.1031E-01	0.5013E-02
10	0.3127E-01	0.3847E-01	0.1225E-01	0.4895E-01	0.2786E-01	0.2341E-01	0.9790E-03	0.7049E-02	0.3426E-02
11	0.2145E-01	0.2645E-01	0.8362E-02	0.3365E-01	0.1919E-01	0.1602E-01	0.6731E-03	0.4846E-02	0.2356E-02
12	0.1476E-01	0.1824E-01	0.5740E-02	0.2321E-01	0.1321E-01	0.1098E-01	0.4642E-03	0.3342E-02	0.1625E-02
13	0.1020E-01	0.1260E-01	0.3953E-02	0.1603E-01	0.9103E-02	0.7544E-02	0.3206E-03	0.2308E-02	0.1122E-02
14	0.7042E-02	0.8703E-02	0.2726E-02	0.1107E-01	0.6271E-02	0.5189E-02	0.2214E-03	0.1594E-02	0.7751E-03
15	0.4863E-02	0.6010E-02	0.1882E-02	0.7646E-02	0.4320E-02	0.3572E-02	0.1529E-03	0.1101E-02	0.5352E-03
16	0.3357E-02	0.4148E-02	0.1299E-02	0.5277E-02	0.2977E-02	0.2461E-02	0.1055E-03	0.7599E-03	0.3694E-03
17	0.2316E-02	0.2861E-02	0.8960E-03	0.3640E-02	0.2051E-02	0.1696E-02	0.7280E-04	0.5241E-03	0.2548E-03
18	0.1597E-02	0.1973E-02	0.6180E-03	0.2510E-02	0.1413E-02	0.1169E-02	0.5019E-04	0.3614E-03	0.1757E-03
19	0.1101E-02	0.1360E-02	0.4261E-03	0.1730E-02	0.9737E-03	0.8055E-03	0.3459E-04	0.2491E-03	0.1211E-03
20	0.7586E-03	0.9369E-03	0.2937E-03	0.1192E-02	0.6709E-03	0.5551E-03	0.2384E-04	0.1716E-03	0.8344E-04
21	0.5227E-03	0.6455E-03	0.2024E-03	0.8213E-03	0.4623E-03	0.3825E-03	0.1643E-04	0.1183E-03	0.5749E-04
22	0.3602E-03	0.4448E-03	0.1395E-03	0.5659E-03	0.3185E-03	0.2636E-03	0.1132E-04	0.8148E-04	0.3961E-04
23	0.2481E-03	0.3064E-03	0.9609E-04	0.3399E-03	0.2195E-03	0.1816E-03	0.7797E-05	0.5614E-04	0.2729E-04
24	0.1710E-03	0.2111E-03	0.6620E-04	0.2686E-03	0.1512E-03	0.1252E-03	0.5372E-05	0.3868E-04	0.1880E-04
25	0.1178E-03	0.1455E-03	0.4561E-04	0.1851E-03	0.1042E-03	0.8624E-04	0.3701E-05	0.2665E-04	0.1295E-04
26	0.8116E-04	0.1002E-03	0.3143E-04	0.1275E-03	0.7179E-04	0.5942E-04	0.2550E-05	0.1836E-04	0.8926E-05
27	0.5592E-04	0.6905E-04	0.2165E-04	0.8786E-04	0.4947E-04	0.4094E-04	0.1757E-05	0.1265E-04	0.6150E-05
28	0.3853E-04	0.4758E-04	0.1492E-04	0.6053E-04	0.3408E-04	0.2821E-04	0.1211E-05	0.8717E-05	0.4237E-05
29	0.2655E-04	0.3278E-04	0.1028E-04	0.4171E-04	0.2349E-04	0.1944E-04	0.8342E-06	0.6006E-05	0.2920E-05
30	0.1829E-04	0.2259E-04	0.7083E-05	0.2874E-04	0.1618E-04	0.1339E-04	0.5748E-06	0.4138E-05	0.2012E-05
31	0.1260E-04	0.1556E-04	0.4880E-05	0.1980E-04	0.1115E-04	0.9228E-05	0.3960E-06	0.2851E-05	0.1386E-05
32	0.8684E-05	0.1072E-04	0.3363E-05	0.1364E-04	0.7682E-05	0.6359E-05	0.2729E-06	0.1965E-05	0.9551E-06
33	0.5984E-05	0.7389E-05	0.2317E-05	0.9401E-05	0.5293E-05	0.4381E-05	0.1880E-06	0.1354E-05	0.6581E-06
34	0.4123E-05	0.5091E-05	0.1596E-05	0.6478E-05	0.3647E-05	0.3019E-05	0.1295E-06	0.9328E-06	0.4534E-06
35	0.2841E-05	0.3508E-05	0.1100E-05	0.4463E-05	0.2513E-05	0.2080E-05	0.8926E-07	0.6427E-06	0.3124E-06
36	0.1957E-05	0.2417E-05	0.7579E-06	0.3075E-05	0.1732E-05	0.1433E-05	0.6150E-07	0.4428E-06	0.2153E-06
37	0.1349E-05	0.1665E-05	0.5222E-06	0.2119E-05	0.1193E-05	0.9875E-06	0.4238E-07	0.3051E-06	0.1483E-06
38	0.9293E-06	0.1148E-05	0.3598E-06	0.1460E-05	0.8221E-06	0.6804E-06	0.2920E-07	0.2102E-06	0.1022E-06
39	0.6403E-06	0.7907E-06	0.2479E-06	0.1006E-05	0.5664E-06	0.4688E-06	0.2012E-07	0.1449E-06	0.7042E-07
40	0.4412E-06	0.5448E-06	0.1708E-06	0.6931E-06	0.3903E-06	0.3230E-06	0.1386E-07	0.9981E-07	0.4852E-07

INTERIM MULTIPLIERS FOR THE EFFECTS OF THE EXOGENOUS VARIABLE TR

	C	YD	IP	Y	IG	M	V	T	SB
TOTAL	1.815	2.469	0.3628	1.869	0.1010	0.4468	0.3738E-01	0.2691	0.1308
LAG									
0	1.238	2.030	0.1730	1.310	0.2359E-01	0.1507	0.2621E-01	0.1887	0.9172E-01
1	0.4200	0.3434	0.1130	0.4369	0.2359E-01	0.1284	0.8737E-02	0.6291E-01	0.3058E-01
2	0.1297	0.9561E-01	0.5222E-01	0.1216	0.1793E-01	0.8065E-01	0.2433E-02	0.1752E-01	0.8515E-02
3	0.3118E-01	0.1496E-01	0.1922E-01	0.1904E-01	0.1230E-01	0.4405E-01	0.3307E-03	0.2741E-02	0.1333E-02
4	0.2000E-02	-.5410E-02	0.5243E-02	-.6883E-02	0.8080E-02	0.2207E-01	-.1377E-03	-.9912E-03	-.4818E-03
5	-.3827E-02	-.6332E-02	0.5304E-03	-.8692E-02	0.5233E-02	0.1045E-01	-.1738E-03	-.1252E-02	-.6084E-03
6	-.3139E-02	-.4079E-02	-.5154E-03	-.5190E-02	0.3397E-02	0.4829E-02	-.1038E-03	-.7474E-03	-.3633E-03
7	-.1501E-02	-.1585E-02	-.4311E-03	-.2017E-02	0.2230E-02	0.2274E-02	-.4034E-04	-.2904E-03	-.1412E-03
8	-.3440E-03	-.1457E-03	-.1624E-03	-.1854E-03	0.1484E-02	0.1159E-02	-.3708E-05	-.2670E-04	-.1298E-04
9	0.2275E-03	0.4688E-03	0.2676E-04	0.5965E-03	0.1000E-02	0.6701E-03	0.1193E-04	0.8589E-04	0.4175E-04
10	0.4164E-03	0.6191E-03	0.1125E-03	0.7877E-03	0.6814E-03	0.4384E-03	0.1575E-04	0.1134E-03	0.5514E-04
11	0.4146E-03	0.5536E-03	0.1307E-03	0.7170E-03	0.4674E-03	0.3100E-03	0.1434E-04	0.1033E-03	0.5019E-04
12	0.3415E-03	0.4444E-03	0.1164E-03	0.5653E-03	0.3220E-03	0.2259E-03	0.1131E-04	0.8141E-04	0.3957E-04
13	0.2566E-03	0.3256E-03	0.9193E-04	0.4142E-03	0.2222E-03	0.1649E-03	0.8284E-05	0.5964E-04	0.2899E-04
14	0.1834E-03	0.2291E-03	0.6789E-04	0.2915E-03	0.1535E-03	0.1191E-03	0.5829E-05	0.4197E-04	0.2040E-04
15	0.1274E-03	0.1578E-03	0.4822E-04	0.2007E-03	0.1060E-03	0.8489E-04	0.4014E-05	0.2890E-04	0.1405E-04
16	0.8728E-04	0.1076E-03	0.3350E-04	0.1369E-03	0.7314E-04	0.5980E-04	0.2737E-05	0.1971E-04	0.9580E-05
17	0.5944E-04	0.7312E-04	0.2300E-04	0.9303E-04	0.5046E-04	0.4173E-04	0.1861E-05	0.1340E-04	0.6512E-05
18	0.4045E-04	0.4974E-04	0.1571E-04	0.6329E-04	0.3480E-04	0.2894E-04	0.1266E-05	0.9113E-05	0.4430E-05
19	0.2757E-04	0.3393E-04	0.1073E-04	0.4317E-04	0.2399E-04	0.1998E-04	0.8633E-06	0.6216E-05	0.3022E-05
20	0.1885E-04	0.2321E-04	0.7330E-05	0.2953E-04	0.1653E-04	0.1377E-04	0.5906E-06	0.4252E-05	0.2067E-05
21	0.1292E-04	0.1592E-04	0.5020E-05	0.2026E-04	0.1139E-04	0.9474E-05	0.4051E-06	0.2917E-05	0.1418E-05
22	0.8872E-05	0.1094E-04	0.3444E-05	0.1392E-04	0.7848E-05	0.6518E-05	0.2785E-06	0.2005E-05	0.9747E-06
23	0.6103E-05	0.7533E-05	0.2367E-05	0.9584E-05	0.5407E-05	0.4485E-05	0.1917E-06	0.1380E-05	0.6709E-06
24	0.4203E-05	0.5190E-05	0.1629E-05	0.6603E-05	0.3725E-05	0.3087E-05	0.1320E-06	0.9508E-06	0.4622E-06
25	0.2896E-05	0.3577E-05	0.1122E-05	0.4550E-05	0.2567E-05	0.2126E-05	0.9101E-07	0.6553E-06	0.3185E-06
26	0.1996E-05	0.2465E-05	0.7731E-06	0.3137E-05	0.1768E-05	0.1464E-05	0.6273E-07	0.4517E-06	0.2196E-06
27	0.1376E-05	0.1699E-05	0.5328E-06	0.2162E-05	0.1218E-05	0.1008E-05	0.4324E-07	0.3113E-06	0.1514E-06
28	0.9485E-06	0.1171E-05	0.3672E-06	0.1490E-05	0.8395E-06	0.6947E-06	0.2981E-07	0.2146E-06	0.1043E-06
29	0.6537E-06	0.8073E-06	0.2531E-06	0.1027E-05	0.5785E-06	0.4787E-06	0.2054E-07	0.1479E-06	0.7190E-07
30	0.4505E-06	0.5563E-06	0.1744E-06	0.7078E-06	0.3986E-06	0.3298E-06	0.1416E-07	0.1019E-06	0.4955E-07
31	0.3104E-06	0.3834E-06	0.1202E-06	0.4877E-06	0.2746E-06	0.2273E-06	0.9755E-08	0.7023E-07	0.3414E-07
32	0.2139E-06	0.2642E-06	0.8282E-07	0.3361E-06	0.1892E-06	0.1566E-06	0.6722E-08	0.4840E-07	0.2353E-07
33	0.1474E-06	0.1820E-06	0.5707E-07	0.2316E-06	0.1304E-06	0.1079E-06	0.4631E-08	0.3335E-07	0.1621E-07
34	0.1016E-06	0.1254E-06	0.3932E-07	0.1596E-06	0.8984E-07	0.7435E-07	0.3191E-08	0.2298E-07	0.1117E-07
35	0.6998E-07	0.8641E-07	0.2710E-07	0.1099E-06	0.6190E-07	0.5123E-07	0.2199E-08	0.1583E-07	0.7696E-08
36	0.4821E-07	0.5954E-07	0.1867E-07	0.7575E-07	0.4265E-07	0.3530E-07	0.1515E-08	0.1091E-07	0.5302E-08
37	0.3322E-07	0.4102E-07	0.1286E-07	0.5219E-07	0.2939E-07	0.2432E-07	0.1044E-08	0.7516E-08	0.3653E-08
38	0.2289E-07	0.2827E-07	0.8863E-08	0.3596E-07	0.2025E-07	0.1676E-07	0.7192E-09	0.5178E-08	0.2517E-08
39	0.1577E-07	0.1948E-07	0.6107E-08	0.2478E-07	0.1395E-07	0.1155E-07	0.4956E-09	0.3568E-08	0.1734E-08
40	0.1087E-07	0.1342E-07	0.4208E-08	0.1707E-07	0.9613E-08	0.7957E-08	0.3415E-09	0.2458E-08	0.1195E-08

INTERIM MULTIPLIERS FOR THE EFFECTS OF THE EXOGENOUS VARIABLE G

	C	YD	IP	Y	IG	M	V	T	SB
TOTAL	1.469	1.999	0.4936	2.543	0.1375	0.6080	0.5086E-01	0.3662	0.1780
LAG									
0	1.030	1.688	0.2835	2.148	0.3866E-01	0.2470	0.4296E-01	0.3093	0.1504
1	0.3434	0.2759	0.1371	0.3510	0.3211E-01	0.1686	0.7020E-02	0.5054E-01	0.2457E-01
2	0.9561E-01	0.6105E-01	0.5411E-01	0.7768E-01	0.2281E-01	0.9642E-01	0.1553E-02	0.1119E-01	0.5437E-02
3	0.1496E-01	-.2118E-02	0.1696E-01	-.2695E-02	0.1517E-01	0.4973E-01	-.5390E-04	-.3881E-03	-.1886E-03
4	-.5410E-02	-.1304E-01	0.3238E-02	-.1659E-01	0.9819E-02	0.2390E-01	-.3318E-03	-.2389E-02	-.1161E-02
5	-.6832E-02	-.9692E-02	-.5916E-03	-.1233E-01	0.6327E-02	0.1099E-01	-.2466E-03	-.1776E-02	-.8632E-03
6	-.4079E-02	-.4784E-02	-.9927E-03	-.6086E-02	0.4111E-02	0.5003E-02	-.1217E-03	-.8764E-03	-.4260E-03
7	-.1585E-02	-.1462E-02	-.5632E-03	-.1860E-02	0.2708E-02	0.2383E-02	-.3720E-04	-.2678E-03	-.1302E-03
8	-.1457E-03	0.2029E-03	-.1461E-03	0.2581E-03	0.1811E-02	0.1266E-02	0.5163E-05	0.3717E-04	0.1807E-04
9	0.4688E-03	0.8092E-03	0.8913E-04	0.1029E-02	0.1227E-02	0.7756E-03	0.2059E-04	0.1482E-03	0.7206E-04
10	0.6191E-03	0.8843E-03	0.1770E-03	0.1125E-02	0.8383E-03	0.5319E-03	0.2250E-04	0.1620E-03	0.7876E-04
11	0.5636E-03	0.7513E-03	0.1828E-03	0.9559E-03	0.5764E-03	0.3860E-03	0.1912E-04	0.1377E-03	0.6691E-04
12	0.4444E-03	0.5714E-03	0.1545E-03	0.7270E-03	0.3975E-03	0.2839E-03	0.1454E-04	0.1047E-03	0.5089E-04
13	0.3256E-03	0.4099E-03	0.1183E-03	0.5215E-03	0.2745E-03	0.2073E-03	0.1043E-04	0.7509E-04	0.3650E-04
14	0.2291E-03	0.2348E-03	0.8568E-04	0.3624E-03	0.1896E-03	0.1493E-03	0.7247E-05	0.5218E-04	0.2537E-04
15	0.1578E-03	0.1948E-03	0.6013E-04	0.2478E-03	0.1309E-03	0.1060E-03	0.4957E-05	0.3569E-04	0.1735E-04
16	0.1076E-03	0.1324E-03	0.4147E-04	0.1684E-03	0.9037E-04	0.7437E-04	0.3368E-05	0.2425E-04	0.1179E-04
17	0.7312E-04	0.8989E-04	0.2837E-04	0.1144E-03	0.6234E-04	0.5175E-04	0.2287E-05	0.1647E-04	0.8005E-05
18	0.4974E-04	0.6117E-04	0.1935E-04	0.7782E-04	0.4298E-04	0.3581E-04	0.1556E-05	0.1121E-04	0.5448E-05
19	0.3393E-04	0.4176E-04	0.1320E-04	0.5313E-04	0.2962E-04	0.2469E-04	0.1062E-05	0.7650E-05	0.3719E-05
20	0.2321E-04	0.2860E-04	0.9028E-05	0.3638E-04	0.2041E-04	0.1700E-04	0.7276E-06	0.5239E-05	0.2547E-05
21	0.1592E-04	0.1963E-04	0.6186E-05	0.2493E-04	0.1407E-04	0.1170E-04	0.4995E-06	0.3597E-05	0.1748E-05
22	0.1094E-04	0.1350E-04	0.4247E-05	0.1718E-04	0.9691E-05	0.8046E-05	0.3436E-06	0.2474E-05	0.1203E-05
23	0.7533E-05	0.9299E-05	0.2921E-05	0.1183E-04	0.6677E-05	0.5536E-05	0.2366E-06	0.1704E-05	0.8282E-06
24	0.5190E-05	0.6408E-05	0.2011E-05	0.8153E-05	0.4600E-05	0.3811E-05	0.1631E-06	0.1174E-05	0.5707E-06
25	0.3577E-05	0.4417E-05	0.1385E-05	0.5620E-05	0.3170E-05	0.2624E-05	0.1124E-06	0.8092E-06	0.3934E-06
26	0.2465E-05	0.3045E-05	0.9546E-06	0.3874E-05	0.2184E-05	0.1807E-05	0.7748E-07	0.5578E-06	0.2712E-06
27	0.1699E-05	0.2099E-05	0.6560E-06	0.2670E-05	0.1505E-05	0.1245E-05	0.5341E-07	0.3845E-06	0.1869E-06
28	0.1171E-05	0.1447E-05	0.4535E-06	0.1841E-05	0.1037E-05	0.8579E-06	0.3681E-07	0.2650E-06	0.1288E-06
29	0.8073E-06	0.9970E-06	0.3126E-06	0.1268E-05	0.7143E-06	0.5911E-06	0.2537E-07	0.1827E-06	0.8879E-07
30	0.5563E-06	0.6870E-06	0.2154E-06	0.8741E-06	0.4922E-06	0.4073E-06	0.1748E-07	0.1259E-06	0.6119E-07
31	0.3834E-06	0.4734E-06	0.1484E-06	0.6023E-06	0.3391E-06	0.2807E-06	0.1205E-07	0.8673E-07	0.4216E-07
32	0.2642E-06	0.3262E-06	0.1023E-06	0.4150E-06	0.2337E-06	0.1934E-06	0.8300E-08	0.5976E-07	0.2905E-07
33	0.1820E-06	0.2248E-06	0.7048E-07	0.2860E-06	0.1610E-06	0.1333E-06	0.5719E-08	0.4118E-07	0.2002E-07
34	0.1254E-06	0.1549E-06	0.4856E-07	0.1970E-06	0.1109E-06	0.9182E-07	0.3941E-08	0.2837E-07	0.1379E-07
35	0.8641E-07	0.1067E-06	0.3346E-07	0.1358E-06	0.7644E-07	0.6327E-07	0.2715E-08	0.1955E-07	0.9503E-08
36	0.5954E-07	0.7352E-07	0.2305E-07	0.9354E-07	0.5267E-07	0.4359E-07	0.1871E-08	0.1347E-07	0.6548E-08
37	0.4102E-07	0.5066E-07	0.1589E-07	0.6445E-07	0.3629E-07	0.3004E-07	0.1289E-08	0.9281E-08	0.4512E-08
38	0.2827E-07	0.3490E-07	0.1095E-07	0.4441E-07	0.2500E-07	0.2070E-07	0.8881E-09	0.6395E-08	0.3109E-08
39	0.1948E-07	0.2405E-07	0.7541E-08	0.3060E-07	0.1723E-07	0.1426E-07	0.6120E-09	0.4406E-08	0.2142E-08
40	0.1342E-07	0.1657E-07	0.5196E-08	0.2108E-07	0.1187E-07	0.9825E-08	0.4217E-09	0.3036E-08	0.1476E-08

INTERIM MULTIPLIERS FOR THE EFFECTS OF THE EXOGENOUS VARIABLE X

	C	YD	IP	Y	IG	M	V	T	SB
TOTAL	1.469	1.999	0.4936	2.543	0.1375	0.6080	0.5086E-01	0.3662	0.1780
LAG									
0	1.030	1.688	0.2835	2.142	0.3866E-01	0.2470	0.4296E-01	0.3093	0.1504
1	0.3434	0.2759	0.1371	0.3510	0.3211E-01	0.1686	0.7020E-02	0.5054E-01	0.2457E-01
2	0.9561E-01	0.6105E-01	0.5411E-01	0.7768E-01	0.2281E-01	0.9642E-01	0.1553E-02	0.1119E-01	0.5437E-02
3	0.1496E-01	-.2118E-02	0.1696E-01	-.2695E-02	0.1517E-01	0.4973E-01	-.5390E-04	-.3881E-03	-.1686E-03
4	-.5410E-02	-.1304E-01	0.3238E-02	-.1659E-01	0.9819E-02	0.2390E-01	-.3318E-03	-.2389E-02	-.1161E-02
5	-.6832E-02	-.9692E-02	-.5916E-03	-.1233E-01	0.6327E-02	0.1099E-01	-.2466E-03	-.1776E-02	-.8632E-03
6	-.4079E-02	-.4784E-02	-.9927E-03	-.6086E-02	0.4111E-02	0.5003E-02	-.1217E-03	-.8764E-03	-.4260E-03
7	-.1585E-02	-.1462E-02	-.5632E-03	-.1860E-02	0.2708E-02	0.2383E-02	-.3720E-04	-.2678E-03	-.1302E-03
8	-.1457E-03	0.2029E-03	-.1461E-03	0.2581E-03	0.1811E-02	0.1266E-02	0.5163E-05	0.3717E-04	0.1807E-04
9	0.4688E-03	0.3092E-03	0.8913E-04	0.1029E-02	0.1227E-02	0.7756E-03	0.2059E-04	0.1482E-03	0.7206E-04
10	0.6191E-03	0.8343E-03	0.1770E-03	0.1125E-02	0.8383E-03	0.5319E-03	0.2250E-04	0.1620E-03	0.7876E-04
11	0.5636E-03	0.7513E-03	0.1328E-03	0.9559E-03	0.5764E-03	0.3860E-03	0.1912E-04	0.1377E-03	0.6691E-04
12	0.4444E-03	0.5714E-03	0.1545E-03	0.7270E-03	0.3975E-03	0.2839E-03	0.1454E-04	0.1047E-03	0.5089E-04
13	0.3256E-03	0.4099E-03	0.1183E-03	0.5215E-03	0.2745E-03	0.2073E-03	0.1043E-04	0.7509E-04	0.3650E-04
14	0.2291E-03	0.2848E-03	0.8568E-04	0.3624E-03	0.1896E-03	0.1493E-03	0.7247E-05	0.5218E-04	0.2537E-04
15	0.1578E-03	0.1946E-03	0.6013E-04	0.2478E-03	0.1309E-03	0.1060E-03	0.4957E-05	0.3569E-04	0.1735E-04
16	0.1076E-03	0.1324E-03	0.4147E-04	0.1684E-03	0.9037E-04	0.7437E-04	0.3368E-05	0.2425E-04	0.1179E-04
17	0.7312E-04	0.8989E-04	0.2837E-04	0.1144E-03	0.6234E-04	0.5175E-04	0.2287E-05	0.1647E-04	0.8005E-05
18	0.4974E-04	0.6117E-04	0.1935E-04	0.7782E-04	0.4298E-04	0.3581E-04	0.1556E-05	0.1121E-04	0.5448E-05
19	0.3393E-04	0.4176E-04	0.1320E-04	0.5313E-04	0.2962E-04	0.2469E-04	0.1062E-05	0.7650E-05	0.3719E-05
20	0.2321E-04	0.2860E-04	0.9028E-05	0.3638E-04	0.2041E-04	0.1700E-04	0.7276E-06	0.5239E-05	0.2547E-05
21	0.1592E-04	0.1963E-04	0.6186E-05	0.2498E-04	0.1407E-04	0.1170E-04	0.4995E-06	0.3597E-05	0.1748E-05
22	0.1094E-04	0.1350E-04	0.4247E-05	0.1718E-04	0.9691E-05	0.8046E-05	0.3436E-06	0.2474E-05	0.1203E-05
23	0.7533E-05	0.9299E-05	0.2921E-05	0.1183E-04	0.6677E-05	0.5536E-05	0.2366E-06	0.1704E-05	0.8282E-06
24	0.5190E-05	0.6408E-05	0.2011E-05	0.8153E-05	0.4600E-05	0.3811E-05	0.1631E-06	0.1174E-05	0.5707E-06
25	0.3577E-05	0.4417E-05	0.1385E-05	0.5620E-05	0.3170E-05	0.2624E-05	0.1124E-06	0.8092E-06	0.3934E-06
26	0.2465E-05	0.3045E-05	0.9546E-06	0.3874E-05	0.2184E-05	0.1807E-05	0.7748E-07	0.5576E-06	0.2712E-06
27	0.1699E-05	0.2099E-05	0.6580E-06	0.2670E-05	0.1505E-05	0.1245E-05	0.5341E-07	0.3845E-06	0.1869E-06
28	0.1171E-05	0.1447E-05	0.4535E-06	0.1841E-05	0.1037E-05	0.8579E-06	0.3681E-07	0.2650E-06	0.1288E-06
29	0.8073E-06	0.9970E-06	0.3126E-06	0.1268E-05	0.7143E-06	0.5911E-06	0.2537E-07	0.1827E-06	0.8879E-07
30	0.5563E-06	0.6870E-06	0.2154E-06	0.8741E-06	0.4922E-06	0.4073E-06	0.1748E-07	0.1259E-06	0.6119E-07
31	0.3834E-06	0.4734E-06	0.1484E-06	0.6023E-06	0.3391E-06	0.2807E-06	0.1205E-07	0.8673E-07	0.4216E-07
32	0.2642E-06	0.3262E-06	0.1023E-06	0.4150E-06	0.2337E-06	0.1934E-06	0.8300E-08	0.5976E-07	0.2905E-07
33	0.1820E-06	0.2248E-06	0.7048E-07	0.2860E-06	0.1610E-06	0.1333E-06	0.5719E-08	0.4118E-07	0.2002E-07
34	0.1254E-06	0.1549E-06	0.4856E-07	0.1970E-06	0.1109E-06	0.9182E-07	0.3941E-08	0.2837E-07	0.1379E-07
35	0.8641E-07	0.1067E-06	0.3346E-07	0.1358E-06	0.7644E-07	0.6327E-07	0.2715E-08	0.1955E-07	0.9503E-08
36	0.5954E-07	0.7352E-07	0.2305E-07	0.9354E-07	0.5267E-07	0.4359E-07	0.1871E-08	0.1347E-07	0.6548E-08
37	0.4102E-07	0.5066E-07	0.1589E-07	0.6445E-07	0.3629E-07	0.3004E-07	0.1289E-08	0.9281E-08	0.4512E-08
38	0.2827E-07	0.3490E-07	0.1095E-07	0.4441E-07	0.2500E-07	0.2070E-07	0.8881E-09	0.6395E-08	0.3109E-08
39	0.1948E-07	0.2405E-07	0.7541E-08	0.3060E-07	0.1723E-07	0.1426E-07	0.6120E-09	0.4406E-08	0.2142E-08
40	0.1342E-07	0.1657E-07	0.5196E-08	0.2108E-07	0.1187E-07	0.9825E-08	0.4217E-09	0.3036E-08	0.1476E-08

APPENDIX C

DYMULT PRINTOUTS--THE SEAKS MODEL

THIS IS THE- W -MATRIX--ENDOGENOUS COEFFICIENTS

1.00000	0.0	-.491600	0.0	0.0	0.0	0.0	0.0	-.491600	0.0	0.0
0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-.233300	0.0
0.0	0.0	1.00000	0.0	0.0	0.0	0.0	-.276600	0.0	0.0	0.0
0.0	0.0	0.0	1.00000	0.0	0.0	-.295700	0.0	0.0	0.0	0.0
0.0	0.C	0.0	0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	-.112000E-01	0.0
0.0	-1.00000	0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	0.0	1.00000	0.0	-1.00000	0.0
0.0	0.0	1.00000	0.0	0.0	0.0	0.0	-1.00000	1.00000	0.0	0.0
-1.00000	0.0	0.0	1.00000	-1.00000	0.0	-1.00000	0.0	0.0	1.00000	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	-1.00000	0.0	0.0	0.0	1.00000

THIS IS THE W-INVERSE MATRIX

2.39046	0.979299	0.0	-1.39046	1.39046	-1.17515	0.979299	1.17515	1.17515	1.39046	0.0
0.667348	1.47001	0.0	-.667348	0.667348	-.328068	0.470013	0.328068	0.328068	0.667348	0.0
0.782344	0.551005	1.00000	-.782344	0.782344	-.661200	0.551005	0.661200	0.384600	0.782344	0.0
0.197335	0.434683	0.0	0.802665	0.197335	-.970097E-01	0.434683	0.970097E-01	0.970097E-01	0.197335	0.0
0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0
0.320373E-01	0.225638E-01	0.0	-.320373E-01	0.320373E-01	0.984250	0.225638E-01	0.157495E-01	0.157495E-01	0.320373E-01	0.0
0.667348	1.47001	0.0	-.667348	0.667348	-.328068	1.47001	0.328068	0.328068	0.667348	0.0
2.82843	1.99207	0.0	-2.82843	2.82843	-2.39046	1.99207	2.39046	1.39046	2.82843	0.0
2.04609	1.44106	-1.00000	-2.04609	2.04609	-1.72926	1.44106	1.72926	2.00586	2.04609	0.0
2.86047	2.01463	0.0	-2.86047	2.86047	-1.40621	2.01463	1.40621	1.40621	2.86047	0.0
0.635310	1.44745	0.0	-.635310	0.635310	-1.31232	1.44745	0.312318	0.312319	0.635310	1.00000

THIS IS THE- A -MATRIX--COEFFICIENTS OF ENDOGENOUS VARIABLES LAGGED ONE-PERIOD

0.410100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.650900	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-.982000E-01
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.281700	0.0	0.0	0.0
0.0	0.0	0.0	0.925100	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.947200	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.00000

THIS IS THE A* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.980326	0.637426	0.0	-1.28631	0.0	-1.11310	0.0	0.0	0.0	0.0	-.961671E-01
0.273679	0.956831	0.0	-.617363	0.0	-.310746	0.0	0.0	0.0	0.0	-.144355
0.320839	0.358649	0.0	-.723747	0.0	-.626289	0.0	0.281700	0.0	0.0	-.541087E-01
0.809269E-01	0.282935	0.0	0.742546	0.0	-.918875E-01	0.0	0.0	0.0	0.0	-.426858E-01
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.131385E-01	0.146868E-01	0.0	-.296377E-01	0.0	0.932282	0.0	0.0	0.0	0.0	-.221577E-02
0.273679	0.956831	0.0	-.617363	0.0	-.310746	0.0	0.0	0.0	0.0	-.144355
1.15994	1.29663	0.0	-2.61658	0.0	-2.26424	0.0	0.0	0.0	0.0	-.195621
0.839101	0.937985	0.0	-1.89284	0.0	-1.63795	0.0	-.281700	0.0	0.0	-.141512
1.17308	1.31132	0.0	-2.64622	0.0	-1.33196	0.0	0.0	0.0	0.0	-.197836
0.260541	0.942144	0.0	-.587726	0.0	-1.24303	0.0	0.0	0.0	0.0	0.857861

THIS IS THE- B -MATRIX--EXOGENOUS VARIABLES

0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.358200	0.588800	-.148500	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.00000	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-1.00000	0.0	0.0
0.0	0.0	0.0	0.0	0.0	-1.00000	0.0
0.0	0.0	0.0	0.0	0.0	0.0	1.00000
0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS IS THE B* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.498062	0.818701	-.206483	0.979299	-1.17515	-1.17515	1.39046
0.239044	0.392934	-.991011E-01	0.470013	-.328068	-.328068	0.667348
0.280236	0.460644	-.116178	0.551005	-.661200	-.384600	0.782344
0.706852E-01	0.116191	-.293042E-01	0.434683	-.970097E-01	-.970097E-01	0.197335
0.358200	0.588800	-.148500	0.0	0.0	0.0	0.0
0.114757E-01	0.188635E-01	-.475753E-02	0.225638E-01	-.157495E-01	-.157495E-01	0.320373E-01
0.239044	0.392934	-.991011E-01	1.47001	-.328068	-.328068	0.667348
1.01314	1.66538	-.420022	1.99207	-2.39046	-1.39046	2.82843
0.732909	1.20474	-.303844	1.44106	-1.72926	-2.00586	2.04609
1.02462	1.68424	-.424780	2.01463	-1.40621	-1.40621	2.86047
0.227568	0.374071	-.943435E-01	1.44745	-.312318	-.312319	0.635310

THIS IS THE- C -MATRIX--COEFFICIENTS OF EXOGENOUS VARIABLES LAGGED ONE-PERIOD

0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.70200	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS IS THE C* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.0	0.0	0.0	2.36656	0.0	0.0	0.0
0.0	0.0	0.0	1.13583	0.0	0.0	0.0
0.0	0.0	0.0	1.33155	0.0	0.0	0.0
0.0	0.0	0.0	0.335863	0.0	0.0	0.0
0.0	0.0	0.0	1.70200	0.0	0.0	0.0
0.0	0.0	0.0	0.545274E-01	0.0	0.0	0.0
0.0	0.0	0.0	1.13583	0.0	0.0	0.0
0.0	0.0	0.0	4.81399	0.0	0.0	0.0
0.0	0.0	0.0	3.48244	0.0	0.0	0.0
0.0	0.0	0.0	4.86852	0.0	0.0	0.0
0.0	0.0	0.0	1.08130	0.0	0.0	0.0

STABILITY CONDITION WAS NOT MET. DYMULT. IS NOT CALCULATED.

THIS IS THE- W -MATRIX--ENDOGENOUS COEFFICIENTS

1.00000	0.0	-.487500	0.0	0.0	0.0	0.0	0.0	-.487500	0.0	0.0
0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-.263300	0.0
0.0	0.0	1.00000	0.0	0.0	0.0	0.0	-.368100	0.0	0.0	0.0
0.0	0.0	0.0	1.00000	0.0	0.0	-.391200	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	-.128000E-01	0.0
0.0	-1.00000	0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	0.0	1.00000	0.0	-1.00000	0.0
0.0	0.0	1.00000	0.0	0.0	0.0	0.0	-1.00000	1.00000	0.0	0.0
-1.00000	0.0	0.0	1.00000	-1.00000	0.0	-1.00000	0.0	0.0	1.00000	0.0
0.0	0.0	0.0	0.0	0.0	1.00000	-1.00000	0.0	0.0	0.0	1.00000

THIS IS THE W-INVERSE MATRIX

2.34264	0.817399	0.0	-1.34264	1.34264	-1.14204	0.817399	1.14204	1.14204	1.34264	0.0
0.734565	1.44720	0.0	-.734565	0.734565	-.358101	0.447203	0.358101	0.358101	0.734565	0.0
1.01380	0.617199	1.00000	-1.01380	1.01380	-.862325	0.617199	0.862325	0.494225	1.01380	0.0
0.287362	0.566146	0.0	0.712638	0.287362	-.140089	0.566146	0.140089	0.140089	0.287362	0.0
0.0	0.0	0.0	0.0	1.00000	0.0	0.0	0.0	0.0	0.0	0.0
0.357100E-01	0.217402E-01	0.0	-.357100E-01	0.357100E-01	0.982591	0.217402E-01	0.174086E-01	0.174086E-01	0.357100E-01	0.0
0.734565	1.44720	0.0	-.734565	0.734565	-.358101	1.44720	0.358101	0.358101	0.734565	0.0
2.75413	1.67672	0.0	-2.75413	2.75413	-2.34264	1.67672	2.34264	1.34264	2.75413	0.0
1.74034	1.05952	-1.00000	-1.74034	1.74034	-1.48031	1.05952	1.48031	1.84841	1.74034	0.0
2.78984	1.69846	0.0	-2.78984	2.78984	-1.36005	1.69846	1.36005	1.36005	2.78984	0.0
0.698855	1.42546	0.0	-.698855	0.698855	-1.34069	1.42546	0.340692	0.340692	0.698855	1.00000

THIS IS THE- A -MATRIX--COEFFICIENTS OF ENDOGENOUS VARIABLES LAGGED ONE-PERIOD

0.416000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.771700	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-.134200
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.181700	0.0	0.0	0.0
0.0	0.0	0.0	0.801900	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.919300	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.00000

THIS IS THE A* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.974538	0.630786	0.0	-1.07666	0.0	-1.04987	0.0	0.0	0.0	0.0	-.109695
0.305579	1.11681	0.0	-.589048	0.0	-.329202	0.0	0.0	0.0	0.0	-.194215
0.421739	0.476292	0.0	-.812963	0.0	-.792736	0.0	0.181700	0.0	0.0	-.828280E-01
0.119542	0.436695	0.0	0.571464	0.0	-.128784	0.0	0.0	0.0	0.0	-.759767E-01
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.148553E-01	0.167769E-01	0.0	-.286358E-01	0.0	0.903296	0.0	0.0	0.0	0.0	-.291754E-02
0.305579	1.11681	0.0	-.589048	0.0	-.329202	0.0	0.0	0.0	0.0	-.194215
1.14572	1.29392	0.0	-2.20854	0.0	-2.15359	0.0	0.0	0.0	0.0	-.225015
0.723980	0.817628	0.0	-1.39558	0.0	-1.36085	0.0	-.181700	0.0	0.0	-.142187
1.16057	1.31070	0.0	-2.23717	0.0	-1.25029	0.0	0.0	0.0	0.0	-.227933
0.290724	1.10003	0.0	-.560412	0.0	-1.23250	0.0	0.0	0.0	0.0	0.808703

THIS IS THE- B -MATRIX--EXOGENOUS VARIABLES

0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.383600	0.469000	-.175700	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	1.00000	0.0	0.0	0.0
0.0	0.0	0.0	0.0	-1.00000	0.0	0.0
0.0	0.0	0.0	0.0	0.0	-1.00000	0.0
0.0	0.0	0.0	0.0	0.0	0.0	1.00000
0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS IS THE B* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.515036	0.629698	-.235902	0.817399	-1.14204	-1.14204	1.34264
0.281779	0.344511	-.129063	0.447203	-.358101	-.358101	0.734565
0.388892	0.475470	-.178124	0.617199	-.862325	-.494225	1.01380
0.110232	0.134773	-.504895E-01	0.566146	-.140089	-.140089	0.287362
0.383600	0.469000	-.175700	0.0	0.0	0.0	0.0
0.136983E-01	0.167480E-01	-.627424E-02	0.217402E-01	-.174086E-01	-.174086E-01	0.357100E-01
0.281779	0.344511	-.129063	1.44720	-.358101	-.358101	0.734565
1.05648	1.29169	-.483901	1.67672	-2.34264	-1.34264	2.75413
0.667593	0.816218	-.305777	1.05952	-1.48031	-1.84841	1.74034
1.07018	1.30844	-.490175	1.69846	-1.36005	-1.36005	2.78984
0.268081	0.327763	-.122789	1.42546	-.340692	-.340692	0.698855

THIS IS THE- C -MATRIX--COEFFICIENTS OF EXOGENOUS VARIABLES LAGGED ONE-PERIOD

0.0	0.C	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.C	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.C	0.0	1.69300	0.0	0.0	0.0
0.0	0.C	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.C	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0	0.0

THIS IS THE C* MATRIX -- O-MATRIX + (W-MATRIX * WI-MATRIX)

0.0	0.C	0.0	2.27309	0.0	0.0	0.0
0.0	0.C	0.0	1.24362	0.0	0.0	0.0
0.0	0.C	0.0	1.71636	0.0	0.0	0.0
0.0	0.C	0.0	0.486504	0.0	0.0	0.0
0.0	0.0	0.0	1.69300	0.0	0.0	0.0
0.0	0.0	0.0	0.604570E-01	0.0	0.0	0.0
0.0	0.0	0.0	1.24362	0.0	0.0	0.0
0.0	0.0	0.0	4.66275	0.0	0.0	0.0
0.0	0.C	0.0	2.94639	0.0	0.0	0.0
0.0	0.0	0.0	4.72320	0.0	0.0	0.0
0.0	0.0	0.0	1.18316	0.0	0.0	0.0

STABILITY CONDITION WAS NOT MET. DYMULT. IS NOT CALCULATED.

APPENDIX D

ADDITIONAL EXPERIMENTS WITH REAL MONEY SUPPLY EQUATION

Additional experiments with Equation (8) were conducted in this study. The results are summarized here.

First Experiment: Regress RR as a Dependent Variable

Equation Z was obtained by the OSL method as follows:

$$Z = 13.8334 + \underset{(0.003)}{0.0101524Y} - \underset{(1.725)}{4.572759RR} - \underset{(0.003)}{0.00924552Y_{-1}} - \underset{(1.306)}{1.791671RR_{-1}}$$

$\bar{R}^2 = 0.9771$
$s = 22.2339$
$d = 1.1700$

Solve for RR:

$$RR = 3.025176 + 0.0022201Y - 0.2186863Z - 0.0020218Y_{-1} - 0.391814RR_{-1}$$

This RR equation then joined the remaining equations in the system for simulation. The results indicated that RR took on negative ever-increasing absolute values after the first period of simulation. By regressing RR as a dependent variable, the system was not stable. Hence, the experiment was not satisfactory.

Second Experiment: Regress Z as a Dependent Variable Along With R as One of the Independent Variables

Equation Z was obtained:

$$Z = 100.9989 + \underset{(0.001)}{0.0060933Y} - \underset{(2.604)}{6.754465R} + \underset{(2.095)}{5.205114R_{-1}} - \underset{(0.002)}{0.0082225Y_{-1}} + \underset{(0.277)}{1.920915Z_{-1}}$$

$\bar{R}^2 = 0.9925$
$s = 12.4083$
$d = 2.0800$

This Z equation along with the remaining equations in the system was simulated. With this Z equation included, the system was not stable. Furthermore, the ex post simulation error for Z was tremendously large (e.g., the absolute percentage error was 59.76% at the first period and was 62041.33% at the fifteenth period. Again, this alternative was not satisfactory.

Third Experiment: Drop R_{-1}, Y_{-1}, Z_{-1}, Y_{-1}, and R_{-1}, Z_{-1} and R_{-1}, Z_{-1} and Y_{-1}, and All Lagged Variables One Term at a Time From the Complete Formulation in the Second Experiment Above

The following were estimated equations designated as (A1), (A2), (A3), (A4), (A5), (A6), and (A7) for dropping R_{-1}, Y_{-1}, Z_{01}, Y_{-1} and R_{-1}, Z_{-1} and R_{-1}, Z_{-1} and Y_{-1}, and dropping all lagged variables, respectively.

(A1) $$Z = \underset{}{119.2633} + \underset{(0.0018)*}{0.005845414Y} - \underset{(2.4004)}{2.963355R} - \underset{(0.0021)}{0.0077001Y_{-1}} + \underset{(0.3060)}{1.759556Z_{-1}}$$

$\bar{R}^2 = 0.9909$, s = 14.1146, d = 2.1400

(A2) $$Z = -41.11124 - \underset{(0.007)}{0.000444063Y} - \underset{(3.2667)}{1.903473R} + \underset{(2.8837)}{4.171499R_{-1}} + \underset{(0.3666)}{1.566403Z_{-1}}$$

$\bar{R}^2 = 0.9865$, s = 17.1877, d = 1.3700

(A3) $$Z = -239.8716 + \underset{(0.0028)*}{0.00628916Y} - \underset{(3.4809)}{5.475944R} + \underset{(3.6967)}{1.791365R_{-1}} - \underset{(0.0033)}{0.00443184Y_{-1}}$$

$\bar{R}^2 = 0.9769$, s = 22.5235, d = 1.0080

(A4) $$Z = -18.95841 - \underset{(0.0007)}{0.000308148Y} + \underset{(2.4750)}{0.923478R} + \underset{(0.3757)}{1.453716Z_{-1}}$$

$\bar{R}^2 = 0.9861$, s = 18.0237, d = 1.4800

$$(A5)\quad Z = -222.7905 + \underset{(0.0029)^*}{0.00619288Y} + \underset{(2.8088)^*}{6.482556R} - \underset{(0.0033)}{0.00435754}$$

$\bar{R}^2 = 0.9780$
$s = 22.6490$
$d = 1.0900$

$$(A6)\quad Z = -286.530 + \underset{(0.0001)^*}{0.00241663Y} + \underset{(3.4384)^*}{7.003996R} + \underset{(3.8526)}{1.553603R_{-1}}$$

$\bar{R}^2 = 0.9763$
$s = 23.4994$
$d = 0.9696$

$$(A7)\quad Z = -274.0994 + \underset{(0.0001)^*}{0.00238497Y} + \underset{(2.6816)^*}{8.153309R}$$

$\bar{R}^2 = 0.9778$
$s = 23.4369$
$d = 1.0700$

The above seven equations were then added to the system one at a time for ex post simulation runs. The system produced very large mean-absolute-percent errors by including options (A1), (A2) or (A4). It was 924.4485, 1211.3027, and 1333.4473 for the system with options (A1), (A2), and (A4), respectively. Although the system yielded relatively small mean-absolute-percent errors by including options (A3), (A6), and (A7) (16.2169, 16.9012, 15.0863, and 16.5323, respectively), it had incorrect signs. It produced two wrong signs by including options (A3) or (A6) in the system, and one wrong sign by including options (A5) or (A7). Since the results on all seven alternatives were not satisfactory, they were eliminated for further consideration.

APPENDIX E

DYNAMIC SIMULATION--TAIWAN FORECASTING MODEL

The MACROSIM program is used for the dynamic simulation. Five types of cards are required for these simulation experiments: the program control card, the dynamic cards, the endogenous name cards,the structure cards, and the initial value cards. On the program control card, a 05 type (pure dynamic) simulation is specified to allow a dynamic system to run unconstrained simulation for 50 time periods with all lagged endogenous variables being appropriately updated. In addition, the control parameter 5 is specified as 99 for a nonlinear model. Next, on the dynamic card six lagged endogenous variables are specified. They are set to be equal to endogenous variables determined simultaneously from an immediately preceding time period. These variables are updated in the same sequence as they appear on the dynamic cards. The third type of cards, the endogenous name cards, provides names for endogenous variables. The fourth type of cards, the structure cards, specifies the structure of the model and gives the value of the parameters in each equation. For convenience of preparation, a structure matrix is set up as shown in Table XXVII. The left-hand side includes 15 endogenous variables. Two of these (Z and Z_3) are dummy relations which are necessary in these simulations. The right-hand side are 16 exogenous variables including a constant, 6 lagged endogenous variables, and a dummy relation (Z_2) which defines the variable in INFL definition. Besides, in the USER subroutine, three FORTRAN statements are added to specify the nonlinear or linear transformation relationships. These are:

TABLE XXVII

THE STRUCTURE MATRIX FOR SIMULATION, TAIWAN FORECASTING MODEL

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
		C	IP	T	D	M	W	PY	R	I	INFL	I	YD	Y	Z	Z3
(1)	C	1.0											-.395026			
(2)	IP		1.0						18.23567		-18.23567			-.123866		
(3)	T			1.0										-.179732		
(4)	D				1.0											
(5)	M					1.0								-.413878		
(6)	W						1.0							-.440653		
(7)	PY							1.0								
(8)	R								1.0					-.0002238		
(9)	I		-1.0							1.0						
(10)	INFL										1.0					
(11)	K				1.0					-1.0		1.0				
(12)	YD			1.0	1.0								1.0	-1.0		
(13)	Y	-1.0				1.0				-1.0				1.0		
(14)	Z														1.0	
(15)	Z3															1.0

TABLE XXVII (Continued)

(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	
CNST	MS	PM	MS/P	RMP	IG	TR	G	X	CL1	IPL1	XL1	PYL1	ZL1	YL1	Z2	
2554.185									.460133							(1)
-6128.921										.370361						(2)
-3152.600																(3)
1894.030											.0537986					(4)
-42441.43				181.7376												(5)
-5657.66																(6)
6.801787	.00017289	.120918										.771372				(7)
29.43320			-.0192675										.117670	-.000470		(8)
					1.0											(9)
-100.0															100.0	(10)
											1.0					(11)
						1.0										(12)
							1.0	1.0								(13)
			1.0													(14)
				1.0												(15)
RHS (01)	(02)	(03)	(04)	(05)	(06)	(07)	(08)	(09)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	

RHS(4) = RHS(2)/PRINT(II,7) (1)

RHS(16) = PRINT(II,7)/RHS(13) (2)

RHS(5) = 100.*PRINT(II,7)/RHS(3) (3)

where

Relation (1) defines $Z = Ms/Py = Ms/P$ (1)'

Relation (2) defines $Z_2 = Py/P_{y-1}$ (2)'

Relation (3) defines $Z_3 = RMP = 100.*Py/Pm$ (3)'

The fifth type of cards, the initial value cards, specify the initial values of the exogenous variables. In this study the 1953's actual (historical) values are used for the initial values for the exogenous variables and the 1952's actual values are used for the lagged endogenous variables. The results of the simulation runs are given in this appendix.

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```
      SUBROUTINE USER (PRINT,RHS,II,M)
      DIMENSION PRINT (50,50), RHS (50)
      COMMON IN,IC,IP
      RHS(4)=RHS(2)/PRINT(II,7)
      RHS(16)=PRINT(II,7)/RHS(13)
      RHS(5)=100.*PRINT(II,7)/RHS(3)
      RETURN
      END
```

SIMULATION TAIWAN FORECASTING MODEL

SIMULATION TYPE IS 5.

THERE ARE 15. ENDOGENOUS VARIABLES AND 16. EXOGENOUS VARIABLES IN THE SYSTEM

THE SIMULATION PARAMETERS ARE 0.0 0.0 0.0 50.000 99.000

THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

MODEL STRUCTURE

C	=	0.395 YD	2554.185 CNST	0.460 CL1		
IP	=	-18.236 R	18.236 INFL	0.124 Y	-6128.922 CNST	0.370 IPL1
T	=	0.180 Y	-3152.600 CNST			
D	=	1894.030 CNST	0.054 KL1			
M	=	0.414 Y	-42441.430 CNST	181.738 RMP		
W	=	0.441 Y	-5657.660 CNST			
PY	=	6.802 CNST	0.000 MS	0.121 PM	0.771 PYL1	
R	=	0.300 Y	29.433 CNST	-0.019 MS/P	0.118 ZL1	-0.000 YL1
I	=	1.000 IP	1.000 IG			
INFL	=	-100.000 CNST	100.000 Z2			
K	=	-1.000 D	1.000 I	1.000 KL1		
YD	=	-1.000 T	-1.000 D	1.000 Y	1.000 TR	
Y	=	1.000 C	-1.000 M	1.000 I	1.000 G	1.000 X
Z	=	1.000 MS/P				
Z3	=	1.000 RMP				

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	MS	1654.0000	PM	32.1100	MS/P	45.0310	RMP	114.3900		
IG	3433.2000	TR	301.8701	G	19312.0000	X	6006.0000	CL1	36276.0000		
IPL1	3120.3000	KL1	8002.0000	PYL1	29.8400	ZL1	43.9340	YL1	57809.0000		
Z2	1.2309										

LAGGED ENDOGENOUS VARIABLES

PRIOR LOCATION	POSTERIOR LOCATION
1	25
2	26
11	27
7	28
14	29
13	30
0	0
0	0

DETERMINANT = 0.10000000E+01*10** 0

X VARIABLE	C
1.000	42008.539
2.000	44330.746
3.000	45933.758
4.000	46203.664
5.000	45928.227
6.000	45415.695
7.000	44315.270
8.000	44209.937
9.000	43642.746
10.000	43133.130
11.000	42687.152
12.000	42303.180
13.000	41976.094
14.000	41699.176
15.000	41465.430
16.000	41268.227
17.000	41101.629
18.000	40960.453
19.000	40840.320
20.000	40737.570
21.000	40649.172
22.000	40572.645
23.000	40505.973
24.000	40447.512
25.000	40395.914
26.000	40350.008
27.000	40309.187
28.000	40272.469
29.000	40239.344
30.000	40209.336
31.000	40182.055
32.000	40157.168
33.000	40134.391
34.000	40113.496
35.000	40094.297
36.000	40076.602
37.000	40060.285
38.000	40045.219
39.000	40031.281
40.000	40018.333
41.000	40006.434
42.000	39995.352
43.000	39985.082
44.000	39975.551
45.000	39966.703
46.000	39958.488
47.000	39950.855
48.000	39943.766
49.000	39937.176
50.000	39931.055

X VARIABLE	IP
1.000	3411.562
2.000	3624.518
3.000	3649.634
4.000	3548.136
5.000	3376.990
6.000	3177.339
7.000	2975.230
8.000	2785.410
9.000	2615.023
10.000	2465.520
11.000	2339.639
12.000	2232.639
13.000	2143.356
14.000	2069.168
15.000	2007.754
16.000	1956.963
17.000	1914.928
18.000	1880.951
19.000	1851.042
20.000	1826.777
21.000	1806.372
22.000	1789.105
23.000	1774.398
24.000	1751.777
25.000	1750.874
26.000	1741.377
27.000	1733.055
28.000	1725.710
29.000	1719.184
30.000	1713.332
31.000	1708.113
32.000	1703.384
33.000	1699.008
34.000	1695.195
35.000	1691.635
36.000	1688.374
37.000	1685.378
38.000	1682.624
39.000	1680.090
40.000	1677.746
41.000	1675.533
42.000	1673.582
43.000	1671.730
44.000	1670.016
45.000	1668.426
46.000	1666.951
47.000	1665.580
48.000	1664.310
49.000	1663.127
50.000	1662.031

X VARIABLE	T
1.000	9225.831
2.000	9331.414
3.000	9353.598
4.000	9231.676
5.000	9069.234
6.000	8897.203
7.000	8732.309
8.000	8582.734
9.000	8451.366
10.000	8339.051
11.000	8243.969
12.000	8164.387
13.000	8098.207
14.000	8043.359
15.000	7997.965
16.000	7960.359
17.000	7929.152
18.000	7903.141
19.000	7881.406
20.000	7863.105
21.000	7847.613
22.000	7834.406
23.000	7823.070
24.000	7813.277
25.000	7804.746
26.000	7797.258
27.000	7790.652
28.000	7734.777
29.000	7779.527
30.000	7774.316
31.000	7770.551
32.000	7766.595
33.000	7763.184
34.000	7759.973
35.000	7757.039
36.000	7754.316
37.000	7751.855
38.000	7749.566
39.000	7747.469
40.000	7745.512
41.000	7743.711
42.000	7742.039
43.000	7740.492
44.000	7739.059
45.000	7737.730
46.000	7736.492
47.000	7735.348
48.000	7734.281
49.000	7733.293
50.000	7732.375

X VARIABLE	D
1.000	2324.526
2.000	2567.708
3.000	2809.254
4.000	3039.176
5.000	3251.259
6.000	3442.724
7.000	3613.146
8.000	3763.530
9.000	3895.609
10.000	4011.417
11.000	4113.004
12.000	4202.301
13.000	4281.039
14.000	4350.734
15.000	4412.591
16.000	4468.008
17.000	4517.621
18.000	4562.301
19.000	4602.699
20.000	4639.367
21.000	4672.754
22.000	4703.246
23.000	4731.172
24.000	4756.801
25.000	4780.375
26.000	4802.094
27.000	4822.133
28.000	4840.645
29.000	4857.756
30.000	4873.617
31.000	4888.301
32.000	4901.910
33.000	4914.535
34.000	4926.250
35.000	4937.125
36.000	4947.223
37.000	4956.602
38.000	4965.316
39.000	4973.414
40.000	4980.941
41.000	4987.934
42.000	4994.434
43.000	5000.480
44.000	5006.098
45.000	5011.320
46.000	5016.180
47.000	5020.699
48.000	5024.898
49.000	5028.805
50.000	5032.437

X VARIABLE	M
1.000	5299.766
2.000	7469.113
3.000	8832.031
4.000	9598.820
5.000	10055.996
6.000	10301.012
7.000	10415.906
8.000	10452.957
9.000	10445.191
10.000	10413.125
11.000	10369.252
12.000	10321.093
13.000	10272.883
14.000	10226.949
15.000	10184.395
16.000	10145.617
17.000	10110.623
18.000	10079.238
19.000	10051.098
20.000	10025.887
21.000	10003.277
22.000	9982.949
23.000	9964.625
24.000	9948.043
25.000	9933.016
26.000	9919.363
27.000	9906.391
28.000	9895.492
29.000	9885.047
30.000	9875.445
31.000	9866.609
32.000	9858.459
33.000	9850.761
34.000	9844.031
35.000	9837.598
36.000	9831.658
37.000	9826.156
38.000	9821.047
39.000	9816.305
40.000	9811.922
41.000	9807.836
42.000	9804.059
43.000	9800.535
44.000	9797.262
45.000	9794.223
46.000	9791.402
47.000	9788.781
48.000	9786.340
49.000	9784.078
50.000	9781.965

X VARIABLE	PY
1.000	33.938
2.000	37.188
3.000	39.656
4.000	41.560
5.000	43.027
6.000	44.162
7.000	45.035
8.000	45.709
9.000	46.229
10.000	46.630
11.000	46.940
12.000	47.178
13.000	47.363
14.000	47.505
15.000	47.614
16.000	47.699
17.000	47.764
18.000	47.814
19.000	47.853
20.000	47.883
21.000	47.906
22.000	47.924
23.000	47.937
24.000	47.948
25.000	47.956
26.000	47.962
27.000	47.967
28.000	47.971
29.000	47.974
30.000	47.976
31.000	47.978
32.000	47.979
33.000	47.980
34.000	47.981
35.000	47.982
36.000	47.982
37.000	47.982
38.000	47.983
39.000	47.983
40.000	47.983
41.000	47.983
42.000	47.983
43.000	47.983
44.000	47.983
45.000	47.984
46.000	47.984
47.000	47.984
48.000	47.984
49.000	47.984
50.000	47.984

X VARIABLE	W
1.000	24690.793
2.000	25372.316
3.000	25004.109
4.000	24705.180
5.000	24306.030
6.000	23835.145
7.000	23480.379
8.000	23114.156
9.000	22792.562
10.000	22516.719
11.000	22283.594
12.000	22088.488
13.000	21926.230
14.000	21791.754
15.000	21680.445
16.000	21588.254
17.000	21511.734
18.000	21448.004
19.000	21394.672
20.000	21349.812
21.000	21311.832
22.000	21279.453
23.000	21251.672
24.000	21227.652
25.000	21206.738
26.000	21188.383
27.000	21172.180
28.000	21157.789
29.000	21144.918
30.000	21133.352
31.000	21122.918
32.000	21113.449
33.000	21104.840
34.000	21096.973
35.000	21089.770
36.000	21083.152
37.000	21077.066
38.000	21071.469
39.000	21066.301
40.000	21061.512
41.000	21057.098
42.000	21052.996
43.000	21049.199
44.000	21045.695
45.000	21042.434
46.000	21039.402
47.000	21036.598
48.000	21033.992
49.000	21031.559
50.000	21029.309

X VARIABLE	R
1.000	21.908
2.000	17.540
3.000	16.659
4.000	16.291
5.000	16.209
6.000	16.279
7.000	16.421
8.000	16.591
9.000	16.763
10.000	16.924
11.000	17.068
12.000	17.194
13.000	17.301
14.000	17.392
15.000	17.468
16.000	17.532
17.000	17.585
18.000	17.629
19.000	17.666
20.000	17.697
21.000	17.724
22.000	17.746
23.000	17.765
24.000	17.782
25.000	17.796
26.000	17.808
27.000	17.819
28.000	17.829
29.000	17.837
30.000	17.845
31.000	17.852
32.000	17.858
33.000	17.864
34.000	17.869
35.000	17.873
36.000	17.878
37.000	17.882
38.000	17.885
39.000	17.889
40.000	17.892
41.000	17.894
42.000	17.897
43.000	17.899
44.000	17.902
45.000	17.904
46.000	17.906
47.000	17.908
48.000	17.909
49.000	17.911
50.000	17.912

X VARIABLE	I	X VARIABLE	INFL	X VARIABLE.	K	X VARIABLE	YD
1.000	6844.754	1.000	13.931	1.000	12522.230	1.000	57623.086
2.000	7057.703	2.000	9.414	2.000	17012.234	2.000	58090.090
3.000	7082.324	3.000	6.637	3.000	21285.801	3.000	57721.586
4.000	6981.320	4.000	4.801	4.000	25227.957	4.000	56935.211
5.000	6810.176	5.000	3.534	5.000	28786.879	5.000	55961.301
6.000	6610.531	6.000	2.633	6.000	31954.091	6.000	55005.191
7.000	6403.418	7.000	1.979	7.000	34749.969	7.000	54082.223
8.000	6218.593	8.000	1.497	8.000	37205.047	8.000	53249.203
9.000	6048.215	9.000	1.137	9.000	39357.656	9.000	52519.463
10.000	5899.711	10.000	0.868	10.000	41245.937	10.000	51889.191
11.000	5772.332	11.000	0.654	11.000	42905.735	11.000	51353.645
12.000	5605.883	12.000	0.508	12.000	44369.367	12.000	50901.108
13.000	5576.547	13.000	0.390	13.000	45664.379	13.000	50520.398
14.000	5502.309	14.000	0.300	14.000	46816.508	14.000	50202.375
15.000	5440.945	15.000	0.231	15.000	47844.770	15.000	49931.223
16.000	5390.156	16.000	0.177	16.000	48766.914	16.000	49704.235
17.000	5348.121	17.000	0.137	17.000	49597.418	17.000	49512.238
18.000	5313.254	18.000	0.105	18.000	50348.371	18.000	49348.906
19.000	5284.234	19.000	0.081	19.000	51029.906	19.000	49209.238
20.000	5259.969	20.000	0.063	20.000	51650.512	20.000	49089.092
21.000	5239.565	21.000	0.048	21.000	52217.316	21.000	48984.980
22.000	5222.297	22.000	0.037	22.000	52736.367	22.000	48894.223
23.000	5207.590	23.000	0.029	23.000	53212.793	23.000	48814.590
24.000	5194.069	24.000	0.022	24.000	53650.965	24.000	48744.238
25.000	5184.066	25.000	0.017	25.000	54054.656	25.000	48681.727
26.000	5174.370	26.000	0.013	26.000	54427.133	26.000	48625.844
27.000	5166.246	27.000	0.010	27.000	54771.250	27.000	48575.548
28.000	5153.902	28.000	0.008	28.000	55089.512	28.000	48530.340
29.000	5152.375	29.000	0.006	29.000	55384.125	29.000	48489.270
30.000	5146.543	30.000	0.005	30.000	55657.053	30.000	48451.398
31.000	5141.305	31.000	0.004	31.000	55910.062	31.000	48417.781
32.000	5136.578	32.000	0.003	32.000	56144.730	32.000	48385.543
33.000	5132.289	33.000	0.002	33.000	56362.484	33.000	48357.391
34.000	5128.337	34.000	0.002	34.000	56564.625	34.000	48331.516
35.000	5124.328	35.000	0.001	35.000	56752.328	35.000	48307.246
36.000	5121.566	36.000	0.001	36.000	56926.672	36.000	48284.820
37.000	5118.570	37.000	0.001	37.000	57088.648	37.000	48264.129
38.000	5115.816	38.000	0.001	38.000	57239.156	38.000	48244.938
39.000	5113.281	39.000	0.000	39.000	57379.027	39.000	48227.273
40.000	5110.937	40.000	0.000	40.000	57509.031	40.000	48210.340
41.000	5108.773	41.000	0.000	41.000	57629.833	41.000	48195.513
42.000	5106.773	42.000	0.000	42.000	57742.223	42.000	48181.488
43.000	5104.922	43.000	0.000	43.000	57846.664	43.000	48168.379
44.000	5103.207	44.000	0.000	44.000	57943.777	44.000	48156.227
45.000	5101.617	45.000	0.000	45.000	58034.074	45.000	48144.937
46.000	5100.145	46.000	0.000	46.000	58118.039	46.000	48134.443
47.000	5098.773	47.000	0.000	47.000	58196.117	47.000	48124.684
48.000	5097.504	48.000	0.000	48.000	58268.723	48.000	48115.637
49.000	5096.320	49.000	0.000	49.000	58336.246	49.000	48107.213
50.000	5095.223	50.000	0.000	50.000	58399.035	50.000	48099.387

X VARIABLE	Y
1.000	68471.500
2.000	69737.125
3.000	69582.375
4.000	68994.362
5.000	68000.437
6.000	67043.250
7.000	66125.812
8.000	65293.629
9.000	64553.820
10.000	63937.815
11.000	63408.777
12.000	62956.012
13.000	62597.309
14.000	62292.633
15.000	62040.023
16.000	61830.312
17.000	61657.160
18.000	61512.512
19.000	61391.496
20.000	61289.699
21.000	61203.512
22.000	61130.039
23.000	61066.996
24.000	61012.480
25.000	60965.000
26.000	60923.352
27.000	60886.306
28.000	60853.918
29.000	60824.727
30.000	60798.430
31.000	60774.797
32.000	60753.316
33.000	60733.777
34.000	60715.902
35.000	60699.574
36.000	60684.539
37.000	60670.742
38.000	60658.035
39.000	60646.329
40.000	60635.445
41.000	60625.414
42.000	60616.117
43.000	60607.504
44.000	60599.543
45.000	60592.145
46.000	60585.277
47.000	60578.891
48.000	60572.984
49.000	60567.473
50.000	60562.359

X VARIABLE	Z
1.000	48.654
2.000	44.477
3.000	41.709
4.000	39.709
5.000	38.437
6.000	37.453
7.000	36.727
8.000	36.155
9.000	35.773
10.000	35.470
11.000	35.237
12.000	35.058
13.000	34.922
14.000	34.818
15.000	34.739
16.000	34.676
17.000	34.629
18.000	34.592
19.000	34.564
20.000	34.543
21.000	34.526
22.000	34.513
23.000	34.503
24.000	34.496
25.000	34.490
26.000	34.485
27.000	34.482
28.000	34.479
29.000	34.477
30.000	34.475
31.000	34.474
32.000	34.473
33.000	34.473
34.000	34.472
35.000	34.472
36.000	34.471
37.000	34.471
38.000	34.471
39.000	34.471
40.000	34.470
41.000	34.470
42.000	34.470
43.000	34.470
44.000	34.470
45.000	34.470
46.000	34.470
47.000	34.470
48.000	34.470
49.000	34.470
50.000	34.470

X VARIABLE	Z3
1.000	105.649
2.000	115.814
3.000	123.501
4.000	129.430
5.000	134.004
6.000	137.502
7.000	140.253
8.000	142.352
9.000	143.972
10.000	145.221
11.000	146.184
12.000	146.928
13.000	147.501
14.000	147.943
15.000	148.284
16.000	148.547
17.000	148.750
18.000	148.907
19.000	149.028
20.000	149.121
21.000	149.193
22.000	149.248
23.000	149.291
24.000	149.324
25.000	149.349
26.000	149.369
27.000	149.384
28.000	149.395
29.000	149.405
30.000	149.412
31.000	149.417
32.000	149.421
33.000	149.424
34.000	149.427
35.000	149.429
36.000	149.430
37.000	149.431
38.000	149.432
39.000	149.433
40.000	149.433
41.000	149.434
42.000	149.434
43.000	149.434
44.000	149.435
45.000	149.435
46.000	149.435
47.000	149.435
48.000	149.435
49.000	149.435
50.000	149.435

```
      SUBROUTINE USER (PRINT,RHS,II,M)
      DIMENSION PRINT (50,50), RHS (50)
      COMMON IN,IO,IP
      RHS(4)=RHS(2)/PRINT(II,7)
      RHS(16)=PRINT(II,7)/RHS(13)
      RHS(5)=100.*PRINT(II,7)/RHS(3)
      RETURN
      END
```

```
                    SIMULATION          TAIWAN FORECASTING MODEL
SIMULATION TYPE IS    5.
THERE ARE  15. ENDOGENOUS VARIABLES AND  16. EXOGENOUS VARIABLES IN THE SYSTEM
THE SIMULATION PARAMETERS ARE         0.0          0.0          0.0          50.000          99.000
THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68
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MODEL STRUCTURE

```
C     =      0.395 YD        2554.185 CNST       0.460 CL1
IP    =    -18.236 R           18.236 INFL       0.124 Y      -6128.922 CNST      0.370 IPL1
T     =      0.180 Y        -3152.602 CNST
D     =   1894.030 CNST         0.354 KL1
M     =      0.414 Y       -62441.430 CNST     181.738 RHP
W     =      0.441 Y        -5657.660 CNST
PY    =      6.802 CNST         0.000 MS         0.121 PM          0.771 PYL1
R     =      0.030 Y           29.433 CNST      -0.019 MS/P        0.115 ZL1      -0.000 YL1
I     =      1.000 IP           1.000 IG
INFL  =   -100.000 CNST       100.000 Z2
K     =     -1.000 D            1.000 I          1.000 KL1
YD    =     -1.000 T           -1.000 D          1.000 Y           1.000 TR
Y     =      1.000 C           -1.000 M          1.000 I           1.000 G          1.000 X
Z     =      1.000 MS/P
Z3    =      1.000 RHP
```

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	MS	1654.0000	PM	32.1100	MS/P	45.0310	RHP	114.3900		
IG	3433.2000	TR	301.8701	G	19312.0000	X	6006.0000	CL1	39931.0781		
IPL1	1662.0210	KL1	58398.9336	PYL1	47.9840	ZL1	34.4700	YL1	60562.3396		
Z2	1.2309										

LAGGED ENDOGENOUS VARIABLES

PRIOR LOCATION	POSTERIOR LOCATION
1	25
2	26
11	27
7	28
14	29
13	30
0	0
0	0

DETERMINANT = 0.1000000E+01*10** 0

X VARIABLE	C
1.000	39925.324
2.000	39920.012
3.000	39915.086
4.000	39910.523
5.000	39906.289
6.000	39902.344
7.000	39898.580
8.000	39895.256
9.000	39892.094
10.000	39889.145
11.000	39886.402
12.000	39883.848
13.000	39881.473
14.000	39879.266
15.000	39877.207
16.000	39875.293
17.000	39873.516
18.000	39871.863
19.000	39870.324
20.000	39868.895
21.000	39867.566
22.000	39866.324
23.000	39865.176
24.000	39864.109
25.000	39863.109
26.000	39862.184
27.000	39861.320
28.000	39860.523
29.000	39859.777
30.000	39859.082
31.000	39858.437
32.000	39857.840
33.000	39857.281
34.000	39856.762
35.000	39856.281
36.000	39855.832
37.000	39855.414
38.000	39855.027
39.000	39854.668
40.000	39854.328
41.000	39854.016
42.000	39853.727
43.000	39853.461
44.000	39853.211
45.000	39852.980
46.000	39852.758
47.000	39852.551
48.000	39852.363
49.000	39852.187
50.000	39852.027

X VARIABLE	IP
1.000	1660.987
2.000	1660.034
3.000	1659.156
4.000	1658.339
5.000	1657.584
6.000	1656.881
7.000	1656.227
8.000	1655.621
9.000	1655.056
10.000	1654.530
11.000	1654.041
12.000	1653.585
13.000	1653.161
14.000	1652.766
15.000	1652.399
16.000	1652.057
17.000	1651.739
18.000	1651.444
19.000	1651.169
20.000	1650.914
21.000	1650.676
22.000	1650.455
23.000	1650.249
24.000	1650.057
25.000	1649.880
26.000	1649.714
27.000	1649.560
28.000	1649.417
29.000	1649.284
30.000	1649.160
31.000	1649.045
32.000	1648.937
33.000	1648.838
34.000	1648.745
35.000	1648.659
36.000	1648.579
37.000	1648.505
38.000	1648.436
39.000	1648.371
40.000	1648.311
41.000	1648.255
42.000	1648.203
43.000	1648.155
44.000	1648.110
45.000	1648.068
46.000	1648.030
47.000	1647.994
48.000	1647.960
49.000	1647.929
50.000	1647.899

X VARIABLE	T
1.000	7731.438
2.000	7730.699
3.000	7729.969
4.000	7729.281
5.000	7728.652
6.000	7728.062
7.000	7727.512
8.000	7727.004
9.000	7726.527
10.000	7726.086
11.000	7725.676
12.000	7725.289
13.000	7724.937
14.000	7724.609
15.000	7724.301
16.000	7724.016
17.000	7723.746
18.000	7723.500
19.000	7723.266
20.000	7723.055
21.000	7722.855
22.000	7722.668
23.000	7722.492
24.000	7722.336
25.000	7722.187
26.000	7722.047
27.000	7721.918
28.000	7721.801
29.000	7721.687
30.000	7721.582
31.000	7721.488
32.000	7721.398
33.000	7721.316
34.000	7721.234
35.000	7721.164
36.000	7721.098
37.000	7721.035
38.000	7720.977
39.000	7720.926
40.000	7720.875
41.000	7720.824
42.000	7720.781
43.000	7720.738
44.000	7720.703
45.000	7720.668
46.000	7720.641
47.000	7720.605
48.000	7720.578
49.000	7720.555
50.000	7720.527

X VARIABLE	D
1.000	5035.809
2.000	5038.949
3.000	5041.871
4.000	5044.585
5.000	5047.109
6.000	5049.461
7.000	5051.645
8.000	5053.676
9.000	5055.566
10.000	5057.324
11.000	5058.961
12.000	5060.480
13.000	5061.898
14.000	5063.211
15.000	5064.437
16.000	5065.574
17.000	5066.633
18.000	5067.617
19.000	5068.531
20.000	5069.383
21.000	5070.176
22.000	5070.914
23.000	5071.598
24.000	5072.234
25.000	5072.829
26.000	5073.379
27.000	5073.891
28.000	5074.371
29.000	5074.812
30.000	5075.227
31.000	5075.609
32.000	5075.965
33.000	5076.297
34.000	5076.605
35.000	5076.895
36.000	5077.156
37.000	5077.406
38.000	5077.641
39.000	5077.852
40.000	5078.055
41.000	5078.238
42.000	5078.410
43.000	5078.570
44.000	5078.723
45.000	5078.859
46.000	5078.988
47.000	5079.109
48.000	5079.223
49.000	5079.324
50.000	5079.422

X VARIABLE	M
1.000	9780.102
2.000	9778.230
3.000	9776.520
4.000	9774.926
5.000	9773.453
6.000	9772.098
7.000	9770.832
8.000	9769.645
9.000	9768.543
10.000	9767.527
11.000	9766.586
12.000	9765.703
13.000	9764.883
14.000	9764.121
15.000	9763.418
16.000	9762.758
17.000	9762.141
18.000	9761.566
19.000	9761.039
20.000	9760.547
21.000	9760.086
22.000	9759.656
23.000	9759.262
24.000	9758.895
25.000	9758.551
26.000	9758.230
27.000	9757.934
28.000	9757.656
29.000	9757.398
30.000	9757.160
31.000	9756.941
32.000	9756.727
33.000	9756.539
34.000	9756.359
35.000	9756.191
36.000	9756.039
37.000	9755.891
38.000	9755.758
39.000	9755.637
40.000	9755.520
41.000	9755.410
42.000	9755.312
43.000	9755.223
44.000	9755.129
45.000	9755.051
46.000	9754.980
47.000	9754.910
48.000	9754.848
49.000	9754.781
50.000	9754.723

X VARIABLE	W
1.000	21027.141
2.000	21025.233
3.000	21023.402
4.000	21021.730
5.000	21020.184
6.000	21018.730
7.000	21017.387
8.000	21016.148
9.000	21014.980
10.000	21013.895
11.000	21012.891
12.000	21011.953
13.000	21011.074
14.000	21010.266
15.000	21009.512
16.000	21008.809
17.000	21008.152
18.000	21007.551
19.000	21006.980
20.000	21006.457
21.000	21005.969
22.000	21005.516
23.000	21005.090
24.000	21004.695
25.000	21004.332
26.000	21003.988
27.000	21003.672
28.000	21003.383
29.000	21003.109
30.000	21002.855
31.000	21002.613
32.000	21002.398
33.000	21002.191
34.000	21002.000
35.000	21001.824
36.000	21001.660
37.000	21001.520
38.000	21001.363
39.000	21001.227
40.000	21001.109
41.000	21000.992
42.000	21000.887
43.000	21000.785
44.000	21000.695
45.000	21000.609
46.000	21000.531
47.000	21000.457
48.000	21000.383
49.000	21000.320
50.000	21000.258

X VARIABLE	PY
1.000	47.984
2.000	47.984
3.000	47.984
4.000	47.984
5.000	47.984
6.000	47.984
7.000	47.984
8.000	47.984
9.000	47.984
10.000	47.984
11.000	47.984
12.000	47.984
13.000	47.984
14.000	47.984
15.000	47.984
16.000	47.984
17.000	47.984
18.000	47.984
19.000	47.984
20.000	47.984
21.000	47.984
22.000	47.984
23.000	47.984
24.000	47.984
25.000	47.984
26.000	47.984
27.000	47.984
28.000	47.984
29.000	47.984
30.000	47.984
31.000	47.984
32.000	47.984
33.000	47.984
34.000	47.984
35.000	47.984
36.000	47.984
37.000	47.984
38.000	47.984
39.000	47.984
40.000	47.984
41.000	47.984
42.000	47.984
43.000	47.984
44.000	47.984
45.000	47.984
46.000	47.984
47.000	47.984
48.000	47.984
49.000	47.984
50.000	47.984

X VARIABLE	R
1.000	17.914
2.000	17.915
3.000	17.916
4.000	17.917
5.000	17.918
6.000	17.919
7.000	17.920
8.000	17.921
9.000	17.921
10.000	17.922
11.000	17.923
12.000	17.923
13.000	17.924
14.000	17.924
15.000	17.925
16.000	17.925
17.000	17.926
18.000	17.925
19.000	17.926
20.000	17.927
21.000	17.927
22.000	17.927
23.000	17.928
24.000	17.928
25.000	17.928
26.000	17.928
27.000	17.929
28.000	17.929
29.000	17.929
30.000	17.929
31.000	17.929
32.000	17.929
33.000	17.930
34.000	17.930
35.000	17.930
36.000	17.930
37.000	17.930
38.000	17.930
39.000	17.930
40.000	17.930
41.000	17.930
42.000	17.930
43.000	17.930
44.000	17.931
45.000	17.931
46.000	17.931
47.000	17.931
48.000	17.931
49.000	17.931
50.000	17.931

X VARIABLE	I
1.000	5094.180
2.000	5093.227
3.000	5092.348
4.000	5091.531
5.000	5090.777
6.000	5090.074
7.000	5089.418
8.000	5088.812
9.000	5088.250
10.000	5087.723
11.000	5087.234
12.000	5086.777
13.000	5086.352
14.000	5085.957
15.000	5085.590
16.000	5085.250
17.000	5084.930
18.000	5084.637
19.000	5084.363
20.000	5084.105
21.000	5083.867
22.000	5083.648
23.000	5083.441
24.000	5083.257
25.000	5083.074
26.000	5082.906
27.000	5082.754
28.000	5082.609
29.000	5082.477
30.000	5082.352
31.000	5082.238
32.000	5082.129
33.000	5082.031
34.000	5081.937
35.000	5081.852
36.000	5081.770
37.000	5081.695
38.000	5081.629
39.000	5081.562
40.000	5081.504
41.000	5081.449
42.000	5081.395
43.000	5081.348
44.000	5081.301
45.000	5081.262
46.000	5081.223
47.000	5081.187
48.000	5081.152
49.000	5081.121
50.000	5081.094

X VARIABLE	INFL
1.000	-0.000
2.000	-0.000
3.000	-0.000
4.000	0.000
5.000	0.000
6.000	0.000
7.000	0.000
8.000	0.000
9.000	0.000
10.000	0.000
11.000	0.000
12.000	0.000
13.000	0.000
14.000	0.000
15.000	0.000
16.000	0.000
17.000	0.000
18.000	0.000
19.000	0.000
20.000	0.000
21.000	0.000
22.000	0.000
23.000	0.000
24.000	0.000
25.000	0.000
26.000	0.000
27.000	0.000
28.000	0.000
29.000	0.000
30.000	0.000
31.000	0.000
32.000	0.000
33.000	0.000
34.000	0.000
35.000	0.000
36.000	0.000
37.000	0.000
38.000	0.000
39.000	0.000
40.000	0.000
41.000	0.000
42.000	0.000
43.000	0.000
44.000	0.000
45.000	0.000
46.000	0.000
47.000	0.000
48.000	0.000
49.000	0.000
50.000	0.000

X VARIABLE	K
1.000	58457.309
2.000	58511.586
3.000	58562.066
4.000	58609.016
5.000	58652.680
6.000	58693.293
7.000	58731.062
8.000	58766.195
9.000	58798.875
10.000	58829.270
11.000	58857.543
12.000	58883.844
13.000	58908.301
14.000	58931.047
15.000	58952.273
16.000	58971.879
17.000	58990.180
18.000	59007.199
19.000	59023.031
20.000	59037.754
21.000	59051.449
22.000	59064.187
23.000	59076.031
24.000	59087.047
25.000	59097.293
26.000	59106.324
27.000	59115.637
28.000	59123.930
29.000	59131.598
30.000	59138.727
31.000	59145.359
32.000	59151.523
33.000	59157.258
34.000	59162.590
35.000	59167.551
36.000	59172.163
37.000	59176.457
38.000	59180.449
39.000	59184.160
40.000	59187.609
41.000	59190.820
42.000	59193.809
43.000	59196.586
44.000	59199.168
45.000	59201.566
46.000	59203.801
47.000	59205.879
48.000	59207.309
49.000	59209.605
50.000	59211.273

X VARIABLE	YD
1.000	48091.950
2.000	48085.238
3.000	48078.965
4.000	48073.137
5.000	48067.727
6.000	48062.680
7.000	48057.938
8.000	48053.648
9.000	48049.566
10.000	48045.312
11.000	48042.301
12.000	48039.031
13.000	48035.995
14.000	48033.158
15.000	48030.539
16.000	48028.090
17.000	48025.820
18.000	48023.703
19.000	48021.734
20.000	48019.906
21.000	48018.203
22.000	48016.625
23.000	48015.148
24.000	48013.777
25.000	48012.508
26.000	48011.329
27.000	48010.215
28.000	48009.191
29.000	48008.246
30.000	48007.355
31.000	48006.527
32.000	48005.752
33.000	48005.051
34.000	48004.391
35.000	48003.773
36.000	48003.199
37.000	48002.660
38.000	48002.168
39.000	48001.707
40.000	48001.277
41.000	48000.875
42.000	48000.504
43.000	48000.160
44.000	47999.840
45.000	47999.543
46.000	47999.270
47.000	47999.008
48.000	47998.762
49.000	47998.543
50.000	47998.332

X VARIABLE	Y
1.000	60557.445
2.000	60553.043
3.000	60548.753
4.000	60545.153
5.000	60541.645
6.000	60538.367
7.000	60535.305
8.000	60532.488
9.000	60529.844
10.000	60527.379
11.000	60525.098
12.000	60522.965
13.000	60520.992
14.000	60519.145
15.000	60517.434
16.000	60515.836
17.000	60514.352
18.000	60512.973
19.000	60511.695
20.000	60510.504
21.000	60509.395
22.000	60508.363
23.000	60507.402
24.000	60506.512
25.000	60505.680
26.000	60504.910
27.000	60504.187
28.000	60503.516
29.000	60502.992
30.000	60502.320
31.000	60501.785
32.000	60501.235
33.000	60500.823
34.000	60500.397
35.000	60499.984
36.000	60499.613
37.000	60499.260
38.000	60498.941
39.000	60498.637
40.000	60498.363
41.000	60498.093
42.000	60497.855
43.000	60497.533
44.000	60497.426
45.000	60497.234
46.000	60497.051
47.000	60496.883
48.000	60496.723
49.000	60496.578
50.000	60496.441

X VARIABLE	Z
1.000	34.470
2.000	34.470
3.000	34.470
4.000	34.470
5.000	34.470
6.000	34.470
7.000	34.470
8.000	34.470
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16.000	34.470
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32.000	34.470
33.000	34.470
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37.000	34.470
38.000	34.470
39.000	34.470
40.000	34.470
41.000	34.470
42.000	34.470
43.000	34.470
44.000	34.470
45.000	34.470
46.000	34.470
47.000	34.470
48.000	34.470
49.000	34.470
50.000	34.470

X VARIABLE	Z3
1.000	149.436
2.000	149.436
3.000	149.436
4.000	149.435
5.000	149.435
6.000	149.435
7.000	149.435
8.000	149.435
9.000	149.435
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19.000	149.435
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28.000	149.435
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37.000	149.435
38.000	149.435
39.000	149.435
40.000	149.435
41.000	149.435
42.000	149.435
43.000	149.435
44.000	149.435
45.000	149.435
46.000	149.435
47.000	149.435
48.000	149.435
49.000	149.435
50.000	149.435

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FORTRAN IV G1  RELEASE 2.0              USER              DATE = 77135          21/06/24              PAGE 0001

                    SUBROUTINE USER (PRINT,RHS,II,M)
                    DIMENSION PRINT (50,50), RHS (50)
                    COMMON IN,IO,IP
                    RHS(4)=RHS(2)/PRINT(II,7)
                    RHS(16)=PRINT(II,7)/RHS(13)
                    RHS(5)=100.*PRINT(II,7)/RHS(3)
                    RETURN
                    END


                              SIMULATION          TAIWAN FORECASTING MODEL
          SIMULATION TYPE IS    5.
          THERE ARE  15. ENDOGENOUS VARIABLES AND  16. EXOGENOUS VARIABLES IN THE SYSTEM
          THE SIMULATION PARAMETERS ARE              0.0            0.0            0.0            50.000          99.000
          THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

                                                  MODEL STRUCTURE

C     =      0.395 YD       2554.185 CNST        0.460 CL1
IP    =    -18.236 R          18.236 INFL        0.124 Y      -6128.922 CNST       0.370 IPL1
T     =      0.180 Y       -3152.600 CNST
D     =   1894.030 CNST        0.054 KL1
M     =      0.414 Y      -42441.430 CNST      181.738 RMP
#     =      0.441 Y       -5657.660 CNST
PY    =      6.802 CNST        0.000 MS          0.121 PM          0.771 PYL1
R     =      0.000 Y          29.433 CNST       -0.019 MS/P        0.118 ZL1        -0.000 YL1
I     =      1.000 IP          1.000 IG
INFL  =   -100.000 CNST      100.000 Z2
K     =     -1.000 D           1.000 I           1.000 KL1
YD    =     -1.000 T          -1.000 D           1.000 Y           1.000 TR
Y     =      1.000 C          -1.000 M           1.000 I           1.000 G          1.000 X
Z     =      1.000 MS/P
Z3    =      1.000 RMP


        INITIAL VALUES OF EXOGENOUS VARIABLES


   CNST          1.0000     MS          1654.0000    PM           32.1100    MS/P         45.0310    RMP         114.3900
   IG         3433.2000     TR           301.8701    G         19312.0000    X          6006.0000    CL1       39852.0703
   IPL1       1647.8860     KL1        59211.1952    PYL1         47.9840    ZL1          34.4700    YL1       60496.4297
   Z2            1.2309


                         LAGGED ENDOGENOUS VARIABLES
                   PRIOR LOCATION          POSTERIOR LOCATION
                         1                         25
                         2                         26
                        11                         27
                         7                         28
                        14                         29
                        13                         30
                         0                          0
                         0                          0
DETERMINANT =     0.1000000E+01*10** 0
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X VARIABLE	C	X VARIABLE	IP	X VARIABLE	T	X VARIABLE	D
1.000	39851.863	1.000	1647.850	1.000	7720.480	1.000	5079.508
2.000	39851.737	2.000	1647.822	2.000	7720.469	2.000	5079.590
3.000	39851.570	3.000	1647.801	3.000	7720.445	3.000	5079.668
4.000	39851.457	4.000	1647.781	4.000	7720.434	4.000	5079.738
5.000	39851.352	5.000	1647.765	5.000	7720.418	5.000	5079.805
6.000	39851.250	6.000	1647.750	6.000	7720.402	6.000	5079.867
7.000	39851.152	7.000	1647.735	7.000	7720.391	7.000	5079.925
8.000	39851.070	8.000	1647.723	8.000	7720.383	8.000	5079.980
9.000	39850.992	9.000	1647.711	9.000	7720.367	9.000	5080.027
10.000	39850.918	10.000	1647.698	10.000	7720.359	10.000	5080.074
11.000	39850.848	11.000	1647.687	11.000	7720.348	11.000	5080.121
12.000	39850.781	12.000	1647.676	12.000	7720.340	12.000	5080.160
13.000	39850.719	13.000	1647.665	13.000	7720.332	13.000	5080.199
14.000	39850.664	14.000	1647.655	14.000	7720.323	14.000	5080.234
15.000	39850.605	15.000	1647.645	15.000	7720.312	15.000	5080.270
16.000	39850.555	16.000	1647.636	16.000	7720.305	16.000	5080.297
17.000	39850.508	17.000	1647.628	17.000	7720.297	17.000	5080.328
18.000	39850.469	18.000	1647.620	18.000	7720.293	18.000	5080.355
19.000	39850.426	19.000	1647.613	19.000	7720.289	19.000	5080.379
20.000	39850.387	20.000	1647.606	20.000	7720.281	20.000	5080.402
21.000	39850.352	21.000	1647.600	21.000	7720.273	21.000	5080.422
22.000	39850.320	22.000	1647.593	22.000	7720.270	22.000	5080.441
23.000	39850.285	23.000	1647.588	23.000	7720.266	23.000	5080.461
24.000	39850.258	24.000	1647.583	24.000	7720.262	24.000	5080.480
25.000	39850.230	25.000	1647.578	25.000	7720.258	25.000	5080.496
26.000	39850.207	26.000	1647.573	26.000	7720.254	26.000	5080.508
27.000	39850.184	27.000	1647.569	27.000	7720.250	27.000	5080.523
28.000	39850.164	28.000	1647.566	28.000	7720.250	28.000	5080.535
29.000	39850.145	29.000	1647.562	29.000	7720.246	29.000	5080.547
30.000	39850.125	30.000	1647.559	30.000	7720.242	30.000	5080.559
31.000	39850.105	31.000	1647.556	31.000	7720.242	31.000	5080.570
32.000	39850.090	32.000	1647.552	32.000	7720.238	32.000	5080.578
33.000	39850.074	33.000	1647.550	33.000	7720.234	33.000	5080.590
34.000	39850.062	34.000	1647.548	34.000	7720.230	34.000	5080.598
35.000	39850.051	35.000	1647.545	35.000	7720.227	35.000	5080.605
36.000	39850.039	36.000	1647.543	36.000	7720.227	36.000	5080.613
37.000	39850.027	37.000	1647.541	37.000	7720.227	37.000	5080.617
38.000	39850.016	38.000	1647.540	38.000	7720.227	38.000	5080.625
39.000	39850.004	39.000	1647.538	39.000	7720.223	39.000	5080.629
40.000	39850.000	40.000	1647.536	40.000	7720.223	40.000	5080.637
41.000	39849.992	41.000	1647.535	41.000	7720.223	41.000	5080.641
42.000	39849.984	42.000	1647.534	42.000	7720.219	42.000	5080.645
43.000	39849.977	43.000	1647.532	43.000	7720.219	43.000	5080.652
44.000	39849.969	44.000	1647.531	44.000	7720.215	44.000	5080.656
45.000	39849.961	45.000	1647.530	45.000	7720.215	45.000	5080.660
46.000	39849.953	46.000	1647.529	46.000	7720.215	46.000	5080.660
47.000	39849.949	47.000	1647.527	47.000	7720.215	47.000	5080.664
48.000	39849.941	48.000	1647.526	48.000	7720.215	48.000	5080.668
49.000	39849.937	49.000	1647.525	49.000	7720.215	49.000	5080.672
50.000	39849.930	50.000	1647.525	50.000	7720.215	50.000	5080.676

X VARIABLE	M	X VARIABLE	W	X VARIABLE	PY	X VARIABLE	R
1.000	9754.746	1.000	21000.152	1.000	47.984	1.000	17.931
2.000	9754.664	2.000	21000.105	2.000	47.984	2.000	17.931
3.000	9754.605	3.000	21000.070	3.000	47.984	3.000	17.931
4.000	9754.547	4.000	21000.031	4.000	47.984	4.000	17.931
5.000	9754.504	5.000	20999.996	5.000	47.984	5.000	17.931
6.000	9754.455	6.000	20999.965	6.000	47.984	6.000	17.931
7.000	9754.434	7.000	20999.930	7.000	47.984	7.000	17.931
8.000	9754.391	8.000	20999.906	8.000	47.984	8.000	17.931
9.000	9754.367	9.000	20999.883	9.000	47.984	9.000	17.931
10.000	9754.340	10.000	20999.852	10.000	47.984	10.000	17.931
11.000	9754.320	11.000	20999.828	11.000	47.984	11.000	17.931
12.000	9754.293	12.000	20999.805	12.000	47.984	12.000	17.931
13.000	9754.277	13.000	20999.781	13.000	47.984	13.000	17.931
14.000	9754.250	14.000	20999.762	14.000	47.984	14.000	17.931
15.000	9754.238	15.000	20999.742	15.000	47.984	15.000	17.931
16.000	9754.215	16.000	20999.723	16.000	47.984	16.000	17.931
17.000	9754.199	17.000	20999.703	17.000	47.984	17.000	17.931
18.000	9754.187	18.000	20999.687	18.000	47.984	18.000	17.931
19.000	9754.172	19.000	20999.672	19.000	47.984	19.000	17.931
20.000	9754.160	20.000	20999.660	20.000	47.984	20.000	17.931
21.000	9754.148	21.000	20999.648	21.000	47.984	21.000	17.931
22.000	9754.137	22.000	20999.633	22.000	47.984	22.000	17.931
23.000	9754.121	23.000	20999.621	23.000	47.984	23.000	17.931
24.000	9754.113	24.000	20999.613	24.000	47.984	24.000	17.931
25.000	9754.105	25.000	20999.605	25.000	47.984	25.000	17.931
26.000	9754.098	26.000	20999.594	26.000	47.984	26.000	17.931
27.000	9754.094	27.000	20999.578	27.000	47.984	27.000	17.931
28.000	9754.082	28.000	20999.574	28.000	47.984	28.000	17.931
29.000	9754.074	29.000	20999.566	29.000	47.984	29.000	17.931
30.000	9754.070	30.000	20999.562	30.000	47.984	30.000	17.931
31.000	9754.066	31.000	20999.555	31.000	47.984	31.000	17.931
32.000	9754.059	32.000	20999.547	32.000	47.984	32.000	17.931
33.000	9754.055	33.000	20999.539	33.000	47.984	33.000	17.931
34.000	9754.047	34.000	20999.535	34.000	47.984	34.000	17.931
35.000	9754.047	35.000	20999.535	35.000	47.984	35.000	17.931
36.000	9754.039	36.000	20999.527	36.000	47.984	36.000	17.931
37.000	9754.031	37.000	20999.523	37.000	47.984	37.000	17.931
38.000	9754.031	38.000	20999.523	38.000	47.984	38.000	17.931
39.000	9754.027	39.000	20999.516	39.000	47.984	39.000	17.931
40.000	9754.027	40.000	20999.516	40.000	47.984	40.000	17.931
41.000	9754.020	41.000	20999.512	41.000	47.984	41.000	17.931
42.000	9754.020	42.000	20999.512	42.000	47.984	42.000	17.931
43.000	9754.020	43.000	20999.508	43.000	47.984	43.000	17.931
44.000	9754.016	44.000	20999.500	44.000	47.984	44.000	17.931
45.000	9754.016	45.000	20999.500	45.000	47.984	45.000	17.931
46.000	9754.012	46.000	20999.496	46.000	47.984	46.000	17.931
47.000	9754.008	47.000	20999.496	47.000	47.984	47.000	17.931
48.000	9754.008	48.000	20999.496	48.000	47.984	49.000	17.931
49.000	9754.004	49.000	20999.492	49.000	47.984	49.000	17.931
50.000	9754.004	50.000	20999.488	50.000	47.984	50.000	17.931

X VARIABLE	I	X VARIABLE	INFL	X VARIABLE	K	X VARIABLE	YD
1.000	5081.043	1.000	-0.000	1.000	59212.734	1.000	47998.347
2.000	5081.016	2.000	-0.000	2.000	59214.156	2.000	47997.979
3.000	5080.992	3.000	0.0	3.000	59215.484	3.000	47997.727
4.000	5080.973	4.000	0.000	4.000	59216.723	4.000	47997.594
5.000	5080.957	5.000	0.000	5.000	59217.875	5.000	47997.469
6.000	5080.941	6.000	0.000	6.000	59218.953	6.000	47997.336
7.000	5080.926	7.000	0.000	7.000	59219.953	7.000	47997.215
8.000	5080.914	8.000	0.000	8.000	59220.891	8.000	47997.121
9.000	5080.902	9.000	0.000	9.000	59221.762	9.000	47997.020
10.000	5080.891	10.000	0.000	10.000	59222.578	10.000	47996.922
11.000	5080.879	11.000	0.000	11.000	59223.340	11.000	47996.832
12.000	5080.867	12.000	0.000	12.000	59224.051	12.000	47996.746
13.000	5080.859	13.000	0.000	13.000	59224.715	13.000	47996.654
14.000	5080.846	14.000	0.000	14.000	59225.328	14.000	47996.586
15.000	5080.840	15.000	0.000	15.000	59225.898	15.000	47996.516
16.000	5080.828	16.000	0.000	16.000	59226.430	16.000	47996.453
17.000	5080.820	17.000	0.000	17.000	59226.922	17.000	47996.391
18.000	5080.812	18.000	0.000	18.000	59227.383	18.000	47996.332
19.000	5080.805	19.000	0.000	19.000	59227.812	19.000	47996.281
20.000	5080.797	20.000	0.000	20.000	59228.211	20.000	47996.230
21.000	5080.793	21.000	0.000	21.000	59228.586	21.000	47996.184
22.000	5080.785	22.000	0.000	22.000	59228.930	22.000	47996.141
23.000	5080.781	23.000	0.000	23.000	59229.250	23.000	47996.102
24.000	5080.773	24.000	0.000	24.000	59229.547	24.000	47996.065
25.000	5080.770	25.000	0.000	25.000	59229.820	25.000	47996.035
26.000	5080.766	26.000	0.000	26.000	59230.074	26.000	47996.000
27.000	5080.762	27.000	0.000	27.000	59230.316	27.000	47995.973
28.000	5080.758	28.000	0.000	28.000	59230.539	28.000	47995.941
29.000	5080.754	29.000	0.000	29.000	59230.746	29.000	47995.918
30.000	5080.750	30.000	0.000	30.000	59230.937	30.000	47995.895
31.000	5080.750	31.000	0.000	31.000	59231.117	31.000	47995.875
32.000	5080.746	32.000	0.000	32.000	59231.285	32.000	47995.852
33.000	5080.742	33.000	0.000	33.000	59231.441	33.000	47995.832
34.000	5080.738	34.000	0.000	34.000	59231.586	34.000	47995.816
35.000	5080.738	35.000	0.000	35.000	59231.723	35.000	47995.801
36.000	5080.734	36.000	0.000	36.000	59231.848	36.000	47995.781
37.000	5080.734	37.000	0.000	37.000	59231.965	37.000	47995.762
38.000	5080.730	38.000	0.000	38.000	59232.074	38.000	47995.750
39.000	5080.730	39.000	0.000	39.000	59232.176	39.000	47995.738
40.000	5080.727	40.000	0.000	40.000	59232.270	40.000	47995.727
41.000	5080.727	41.000	0.000	41.000	59232.359	41.000	47995.719
42.000	5080.727	42.000	0.000	42.000	59232.441	42.000	47995.711
43.000	5080.727	43.000	0.000	43.000	59232.516	43.000	47995.699
44.000	5080.723	44.000	0.000	44.000	59232.586	44.000	47995.691
45.000	5080.723	45.000	0.000	45.000	59232.652	45.000	47995.680
46.000	5080.723	46.000	0.000	46.000	59232.711	46.000	47995.672
47.000	5080.719	47.000	0.000	47.000	59232.770	47.000	47995.664
48.000	5080.719	48.000	0.000	48.000	59232.824	48.000	47995.656
49.000	5080.719	49.000	0.000	49.000	59232.875	49.000	47995.652
50.000	5080.719	50.000	0.000	50.000	59232.922	50.000	47995.645

X VARIABLE	Y
1.000	60496.199
2.000	60496.090
3.000	60495.996
4.000	60495.918
5.000	60495.848
6.000	60495.770
7.000	60495.691
8.000	60495.645
9.000	60495.578
10.000	60495.520
11.000	60495.453
12.000	60495.402
13.000	60495.352
14.000	60495.301
15.000	60495.258
16.000	60495.211
17.000	60495.172
18.000	60495.137
19.000	60495.109
20.000	60495.074
21.000	60495.039
22.000	60495.012
23.000	60494.988
24.000	60494.961
25.000	60494.941
26.000	60494.922
27.000	60494.902
28.000	60494.887
29.000	60494.867
30.000	60494.852
31.000	60494.840
32.000	60494.824
33.000	60494.812
34.000	60494.801
35.000	60494.789
36.000	60494.781
37.000	60494.770
38.000	60494.762
39.000	60494.758
40.000	60494.746
41.000	60494.742
42.000	60494.734
43.000	60494.730
44.000	60494.723
45.000	60494.719
46.000	60494.711
47.000	60494.707
48.000	60494.707
49.000	60494.699
50.000	60494.691

X VARIABLE	Z
1.000	34.470
2.000	34.470
3.000	34.470
4.000	34.470
5.000	34.470
6.000	34.470
7.000	34.470
8.000	34.470
9.000	34.470
10.000	34.470
11.000	34.470
12.000	34.470
13.000	34.470
14.000	34.470
15.000	34.470
16.000	34.470
17.000	34.470
18.000	34.470
19.000	34.470
20.000	34.470
21.000	34.470
22.000	34.470
23.000	34.470
24.000	34.470
25.000	34.470
26.000	34.470
27.000	34.470
28.000	34.470
29.000	34.470
30.000	34.470
31.000	34.470
32.000	34.470
33.000	34.470
34.000	34.470
35.000	34.470
36.000	34.470
37.000	34.470
38.000	34.470
39.000	34.470
40.000	34.470
41.000	34.470
42.000	34.470
43.000	34.470
44.000	34.470
45.000	34.470
46.000	34.470
47.000	34.470
48.000	34.470
49.000	34.470
50.000	34.470

X VARIABLE	Z3
1.000	149.436
2.000	149.436
3.000	149.436
4.000	149.436
5.000	149.435
6.000	149.435
7.000	149.435
8.000	149.435
9.000	149.435
10.000	149.435
11.000	149.435
12.000	149.435
13.000	149.435
14.000	149.435
15.000	149.435
16.000	149.435
17.000	149.435
18.000	149.435
19.000	149.435
20.000	149.435
21.000	149.435
22.000	149.435
23.000	149.435
24.000	149.435
25.000	149.435
26.000	149.435
27.000	149.435
28.000	149.435
29.000	149.435
30.000	149.435
31.000	149.435
32.000	149.435
33.000	149.435
34.000	149.435
35.000	149.435
36.000	149.435
37.000	149.435
38.000	149.435
39.000	149.435
40.000	149.435
41.000	149.435
42.000	149.435
43.000	149.435
44.000	149.435
45.000	149.435
46.000	149.435
47.000	149.435
48.000	149.435
49.000	149.435
50.000	149.435

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      SUBROUTINE USER (PRINT,RHS,II,M)
      DIMENSION PRINT (50,50), RHS (50)
      COMMON IN,IO,IP
      RHS(4)=RHS(2)/PRINT(II,7)
      RHS(16)=PRINT(II,7)/RHS(13)
      RHS(5)=100.*PRINT(II,7)/RHS(3)
      RETURN
      END
```

SIMULATION TAIWAN FORECASTING MODEL

SIMULATION TYPE IS 5.
THERE ARE 15. ENDOGENOUS VARIABLES AND 16. EXOGENOUS VARIABLES IN THE SYSTEM
THE SIMULATION PARAMETERS ARE 0.0 0.0 0.0 50.000 99.000
THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

MODEL STRUCTURE

C	=	0.395 YD	2554.185 CNST	0.460 CL1		
IP	=	-18.236 R	18.236 INFL	0.124 Y	-6128.922 CNST	0.370 IPL1
T	=	0.130 Y	-3152.500 CNST			
D	=	1894.000 CNST	0.054 KL1			
M	=	0.414 Y	-42441.430 CNST	181.738 RHP		
W	=	0.441 Y	-5657.660 CNST			
PY	=	5.302 CNST	0.000 MS	0.121 PM	0.771 PYL1	
R	=	0.000 Y	29.433 CNST	-0.019 MS/P	0.113 ZL1	-0.000 YL1
I	=	1.000 IP	1.000 IG			
INFL	=	-100.000 CNST	100.000 Z2			
K	=	-1.000 D	1.000 I	1.000 KL1		
YD	=	-1.000 T	-1.000 D	1.000 Y	1.000 TR	
Y	=	1.000 C	-1.000 M	1.000 I	1.000 G	1.000 X
Z	=	1.000 MS/P				
Z3	=	1.000 RHP				

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	MS	1654.0000	PM	32.1100	MS/P	45.0310	RHP	114.3900
IG	3433.2000	TR	301.8701	G	19312.0000	X	8006.0000	CL1	39849.9687
IPL1	1647.5110	KL1	59232.8477	PYL1	47.9840	ZL1	34.4700	YL1	60494.6758
Z2	1.2339								

LAGGED ENDOGENOUS VARIABLES

PRIOR LOCATION	POSTERIOR LOCATION
1	25
2	26
11	27
7	28
14	29
13	30
0	0
0	0

DETERMINANT = 0.1000000E+01*10** 0

X VARIABLE	C	X VARIABLE	IP	X VARIABLE	T	X VARIABLE	D
1.000	39849.910	1.000	1647.501	1.000	7720.187	1.000	5080.672
2.000	39849.883	2.000	1647.497	2.000	7720.195	2.000	5080.672
3.000	39849.871	3.000	1647.499	3.000	7720.195	3.000	5080.676
4.000	39849.871	4.000	1647.500	4.000	7720.199	4.000	5080.676
5.000	39849.879	5.000	1647.504	5.000	7720.203	5.000	5080.676
6.000	39849.891	6.000	1647.506	6.000	7720.203	6.000	5080.676
7.000	39849.898	7.000	1647.508	7.000	7720.207	7.000	5080.680
8.000	39849.906	8.000	1647.513	8.000	7720.211	8.000	5080.680
9.000	39849.906	9.000	1647.516	9.000	7720.211	9.000	5080.680
10.000	39849.906	10.000	1647.517	10.000	7720.211	10.000	5080.684
11.000	39849.906	11.000	1647.519	11.000	7720.211	11.000	5080.684
12.000	39849.906	12.000	1647.519	12.000	7720.211	12.000	5080.687
13.000	39849.906	13.000	1647.519	13.000	7720.211	13.000	5080.687
14.000	39849.902	14.000	1647.519	14.000	7720.211	14.000	5080.687
15.000	39849.902	15.000	1647.519	15.000	7720.211	15.000	5080.691
16.000	39849.902	16.000	1647.519	16.000	7720.211	16.000	5080.691
17.000	39849.902	17.000	1647.519	17.000	7720.211	17.000	5080.691
18.000	39849.902	18.000	1647.519	18.000	7720.211	18.000	5080.695
19.000	39849.902	19.000	1647.519	19.000	7720.211	19.000	5080.695
20.000	39849.898	20.000	1647.519	20.000	7720.211	20.000	5080.695
21.000	39849.895	21.000	1647.518	21.000	7720.211	21.000	5080.695
22.000	39849.891	22.000	1647.518	22.000	7720.211	22.000	5080.699
23.000	39849.891	23.000	1647.517	23.000	7720.211	23.000	5080.699
24.000	39849.891	24.000	1647.517	24.000	7720.207	24.000	5080.699
25.000	39849.891	25.000	1647.517	25.000	7720.207	25.000	5080.699
26.000	39849.891	26.000	1647.517	26.000	7720.207	26.000	5080.699
27.000	39849.891	27.000	1647.517	27.000	7720.207	27.000	5080.699
28.000	39849.891	28.000	1647.517	28.000	7720.207	28.000	5080.703
29.000	39849.891	29.000	1647.516	29.000	7720.207	29.000	5080.703
30.000	39849.891	30.000	1647.516	30.000	7720.207	30.000	5080.703
31.000	39849.887	31.000	1647.516	31.000	7720.207	31.000	5080.703
32.000	39849.883	32.000	1647.516	32.000	7720.203	32.000	5080.703
33.000	39849.883	33.000	1647.515	33.000	7720.203	33.000	5080.703
34.000	39849.883	34.000	1647.515	34.000	7720.203	34.000	5080.703
35.000	39849.883	35.000	1647.515	35.000	7720.203	35.000	5080.703
36.000	39849.883	36.000	1647.515	36.000	7720.203	36.000	5080.707
37.000	39849.883	37.000	1647.515	37.000	7720.203	37.000	5080.707
38.000	39849.883	38.000	1647.515	38.000	7720.203	38.000	5080.707
39.000	39849.883	39.000	1647.515	39.000	7720.203	39.000	5080.707
40.000	39849.883	40.000	1647.515	40.000	7720.203	40.000	5080.707
41.000	39849.883	41.000	1647.515	41.000	7720.203	41.000	5080.707
42.000	39849.883	42.000	1647.515	42.000	7720.203	42.000	5080.707
43.000	39849.883	43.000	1647.515	43.000	7720.203	43.000	5080.707
44.000	39849.883	44.000	1647.515	44.000	7720.203	44.000	5080.707
45.000	39849.883	45.000	1647.515	45.000	7720.203	45.000	5080.707
46.000	39849.883	46.000	1647.515	46.000	7720.203	46.000	5080.707
47.000	39849.883	47.000	1647.515	47.000	7720.203	47.000	5080.707
48.000	39849.883	48.000	1647.515	48.000	7720.203	48.000	5080.707
49.000	39849.883	49.000	1647.515	49.000	7720.203	49.000	5080.707
50.000	39849.883	50.000	1647.515	50.000	7720.203	50.000	5080.707

X VARIABLE	W
1.000	9754.078
2.000	9754.039
3.000	9754.016
4.000	9754.008
5.000	9753.996
6.000	9753.996
7.000	9754.000
8.000	9753.988
9.000	9753.992
10.000	9753.992
11.000	9753.996
12.000	9753.996
13.000	9753.992
14.000	9753.992
15.000	9753.988
16.000	9753.988
17.000	9753.988
18.000	9753.988
19.000	9753.988
20.000	9753.988
21.000	9753.988
22.000	9753.988
23.000	9753.988
24.000	9753.988
25.000	9753.988
26.000	9753.988
27.000	9753.988
28.000	9753.988
29.000	9753.988
30.000	9753.988
31.000	9753.988
32.000	9753.988
33.000	9753.984
34.000	9753.984
35.000	9753.984
36.000	9753.984
37.000	9753.984
38.000	9753.984
39.000	9753.984
40.000	9753.984
41.000	9753.984
42.000	9753.984
43.000	9753.984
44.000	9753.984
45.000	9753.984
46.000	9753.984
47.000	9753.984
48.000	9753.984
49.000	9753.984
50.000	9753.984

X VARIABLE	W
1.000	20999.430
2.000	20999.437
3.000	20999.441
4.000	20999.449
5.000	20999.457
6.000	20999.451
7.000	20999.461
8.000	20999.477
9.000	20999.480
10.000	20999.480
11.000	20999.480
12.000	20999.480
13.000	20999.480
14.000	20999.480
15.000	20999.480
16.000	20999.480
17.000	20999.480
18.000	20999.480
19.000	20999.477
20.000	20999.477
21.000	20999.477
22.000	20999.477
23.000	20999.473
24.000	20999.473
25.000	20999.473
26.000	20999.473
27.000	20999.473
28.000	20999.473
29.000	20999.473
30.000	20999.473
31.000	20999.473
32.000	20999.473
33.000	20999.473
34.000	20999.473
35.000	20999.473
36.000	20999.473
37.000	20999.473
38.000	20999.473
39.000	20999.473
40.000	20999.473
41.000	20999.473
42.000	20999.473
43.000	20999.473
44.000	20999.473
45.000	20999.473
46.000	20999.473
47.000	20999.473
48.000	20999.473
49.000	20999.473
50.000	20999.473

X VARIABLE	PY
1.000	47.984
2.000	47.984
3.000	47.984
4.000	47.984
5.000	47.984
6.000	47.984
7.000	47.984
8.000	47.984
9.000	47.984
10.000	47.984
11.000	47.984
12.000	47.984
13.000	47.984
14.000	47.984
15.000	47.984
16.000	47.984
17.000	47.984
18.000	47.984
19.000	47.984
20.000	47.984
21.000	47.984
22.000	47.984
23.000	47.984
24.000	47.984
25.000	47.984
26.000	47.984
27.000	47.984
28.000	47.984
29.000	47.984
30.000	47.984
31.000	47.984
32.000	47.984
33.000	47.984
34.000	47.984
35.000	47.984
36.000	47.984
37.000	47.984
38.000	47.984
39.000	47.984
40.000	47.984
41.000	47.984
42.000	47.984
43.000	47.984
44.000	47.984
45.000	47.984
46.000	47.984
47.000	47.984
48.000	47.984
49.000	47.984
50.000	47.984

X VARIABLE	R
1.000	17.931
2.000	17.931
3.000	17.931
4.000	17.931
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44.000	17.931
45.000	17.931
46.000	17.931
47.000	17.931
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49.000	17.931
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X VARIABLE	I
1.000	5080.695
2.000	5080.691
3.000	5080.691
4.000	5080.691
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49.000	5080.707
50.000	5080.707

X VARIABLE	INFL
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5.000	0.000
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41.000	0.000
42.000	0.000
43.000	0.000
44.000	0.000
45.000	0.000
46.000	0.000
47.000	0.000
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49.000	0.000
50.000	0.000

X VARIABLE	K
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9.000	59233.043
10.000	59233.070
11.000	59233.098
12.000	59233.125
13.000	59233.152
14.000	59233.176
15.000	59233.199
16.000	59233.223
17.000	59233.242
18.000	59233.262
19.000	59233.281
20.000	59233.297
21.000	59233.312
22.000	59233.328
23.000	59233.344
24.000	59233.355
25.000	59233.367
26.000	59233.379
27.000	59233.391
28.000	59233.402
29.000	59233.414
30.000	59233.422
31.000	59233.430
32.000	59233.437
33.000	59233.445
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35.000	59233.461
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37.000	59233.477
38.000	59233.480
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44.000	59233.504
45.000	59233.508
46.000	59233.512
47.000	59233.516
48.000	59233.520
49.000	59233.523
50.000	59233.527

X VARIABLE	YD
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2.000	47995.551
3.000	47995.562
4.000	47995.578
5.000	47995.594
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7.000	47995.594
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47.000	47995.578
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49.000	47995.578
50.000	47995.574

X VARIABLE	Y
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2.000	60494.574
3.000	60494.586
4.000	60494.602
5.000	60494.621
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7.000	60494.637
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X VARIABLE	Z
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44.000	34.470
45.000	34.470
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49.000	34.470
50.000	34.470

X VARIABLE	Z3
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3.000	149.436
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45.000	149.435
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47.000	149.435
48.000	149.435
49.000	149.435
50.000	149.435

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FORTRAN IV G1  RELEASE 2.0            USER             DATE = 77135          21/12/52              PAGE 0001

                 SUBROUTINE USER (PRINT,RHS,II,M)
                 DIMENSION PRINT (50,50), RHS (50)
                 COMMON IN,IG,IP
                 RHS(4)=RHS(2)/PRINT(II,7)
                 RHS(16)=PRINT(II,7)/RHS(13)
                 RHS(5)=100.*PRINT(II,7)/RHS(3)
                 RETURN
                 END


                          SIMULATION          TAIWAN FORECASTING MODEL
       SIMULATION TYPE IS   5.
       THERE ARE  15. ENDOGENOUS VARIABLES AND  16. EXOGENOUS VARIABLES IN THE SYSTEM
       THE SIMULATION PARAMETERS ARE            0.0          0.0          0.0          50.000          99.000
       THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-58
                                                      MODEL STRUCTURE

C     =      0.395 YD       2554.195 CNST      0.460 CL1
IP    =    -18.236 R          18.236 INFL      0.124 Y     -6128.922 CNST      0.370 IPL1
T     =      0.190 Y       -3152.600 CNST
D     =   1894.030 CNST        0.054 KL1
M     =      0.414 Y      -42441.430 CNST    181.738 RMP
W     =      0.441 Y       -5657.650 CNST
PY    =      5.302 CNST        0.000 MS        0.121 PM       0.771 PYL1
R     =      0.000 Y          29.433 CNST     -0.019 MS/P     0.118 ZL1     -0.000 YL1
I     =      1.000 IP          1.000 IG
INFL  =   -100.000 CNST      100.000 Z2
K     =     -1.000 D           1.000 I         1.000 KL1
YD    =     -1.000 T          -1.000 D         1.000 Y        1.000 TR
Y     =      1.000 C          -1.000 M         1.000 I        1.000 G       1.000 X
Z     =      1.000 MS/P
Z3    =      1.000 RMP


      INITIAL VALUES OF EXOGENOUS VARIABLES


  CNST       1.0000    MS      1654.0000   PM       32.1100   MS/P     45.0310   RMP     114.3900
  IG      3433.2000    TR       301.8791   G     19312.0000   X      6006.0000   CL1   39849.9141
  IPL1    1647.5010    KL1    59233.4609   PYL1     47.9840   ZL1      34.4700   YL1   60494.6289
  Z2         1.2309

                         LAGGED ENDOGENOUS VARIABLES
                     PRIOR LOCATION          POSTERIOR LOCATION
                           1                        25
                           2                        26
                          11                        27
                           7                        28
                          14                        29
                          13                        30
                           0                         0
                           0                         0
DETERMINANT =     0.19000000E+01*10** 0
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X VARIABLE	C	X VARIABLE	IP	X VARIABLE	T	X VARIABLE	D
1.000	39849.855	1.000	1647.492	1.000	7720.180	1.000	5080.707
2.000	39849.828	2.000	1647.489	2.000	7720.184	2.000	5080.703
3.000	39849.820	3.000	1647.490	3.000	7720.184	3.000	5080.703
4.000	39849.828	4.000	1647.491	4.000	7720.187	4.000	5080.703
5.000	39849.840	5.000	1647.496	5.000	7720.191	5.000	5080.703
6.000	39849.848	6.000	1647.500	6.000	7720.191	6.000	5080.699
7.000	39849.852	7.000	1647.502	7.000	7720.199	7.000	5080.699
8.000	39849.867	8.000	1647.507	8.000	7720.203	8.000	5080.699
9.000	39849.875	9.000	1647.510	9.000	7720.203	9.000	5080.699
10.000	39849.879	10.000	1647.512	10.000	7720.203	10.000	5080.699
11.000	39849.883	11.000	1647.514	11.000	7720.203	11.000	5080.699
12.000	39849.887	12.000	1647.515	12.000	7720.203	12.000	5080.699
13.000	39849.887	13.000	1647.516	13.000	7720.203	13.000	5080.699
14.000	39849.887	14.000	1647.516	14.000	7720.203	14.000	5080.703
15.000	39849.887	15.000	1647.516	15.000	7720.203	15.000	5080.703
16.000	39849.887	16.000	1647.516	16.000	7720.203	16.000	5080.703
17.000	39849.883	17.000	1647.516	17.000	7720.203	17.000	5080.703
18.000	39849.883	18.000	1647.515	18.000	7720.203	18.000	5080.703
19.000	39849.883	19.000	1647.515	19.000	7720.203	19.000	5080.703
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22.000	39849.883	22.000	1647.515	22.000	7720.203	22.000	5080.707
23.000	39849.883	23.000	1647.515	23.000	7720.203	23.000	5080.707
24.000	39849.883	24.000	1647.515	24.000	7720.203	24.000	5080.707
25.000	39849.883	25.000	1647.515	25.000	7720.203	25.000	5080.707
26.000	39849.883	26.000	1647.515	26.000	7720.203	26.000	5080.707
27.000	39849.883	27.000	1647.515	27.000	7720.203	27.000	5080.707
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37.000	39849.883	37.000	1647.515	37.000	7720.203	37.000	5080.707
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42.000	39849.883	42.000	1647.515	42.000	7720.203	42.000	5080.711
43.000	39849.883	43.000	1647.515	43.000	7720.203	43.000	5080.711
44.000	39849.883	44.000	1647.515	44.000	7720.203	44.000	5080.711
45.000	39849.883	45.000	1647.515	45.000	7720.203	45.000	5080.711
46.000	39849.883	46.000	1647.515	46.000	7720.203	46.000	5080.711
47.000	39849.883	47.000	1647.515	47.000	7720.203	47.000	5080.711
48.000	39849.883	48.000	1647.515	48.000	7720.203	48.000	5080.711
49.000	39849.883	49.000	1647.515	49.000	7720.203	49.000	5080.711
50.000	39849.883	50.000	1647.515	50.000	7720.203	50.000	5080.711

X VARIABLE	M
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44.000	9753.980
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49.000	9753.980
50.000	9753.980

X VARIABLE	W
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2.000	20999.422
3.000	20999.426
4.000	20999.437
5.000	20999.445
6.000	20999.449
7.000	20999.449
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X VARIABLE	PY
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46.000	47.984
47.000	47.984
48.000	47.984
49.000	47.984
50.000	47.984

X VARIABLE	R
1.000	17.931
2.000	17.931
3.000	17.931
4.000	17.931
5.000	17.931
6.000	17.931
7.000	17.931
8.000	17.931
9.000	17.931
10.000	17.931
11.000	17.931
12.000	17.931
13.000	17.931
14.000	17.931
15.000	17.931
16.000	17.931
17.000	17.931
18.000	17.931
19.000	17.931
20.000	17.931
21.000	17.931
22.000	17.931
23.000	17.931
24.000	17.931
25.000	17.931
26.000	17.931
27.000	17.931
28.000	17.931
29.000	17.931
30.000	17.931
31.000	17.931
32.000	17.931
33.000	17.931
34.000	17.931
35.000	17.931
36.000	17.931
37.000	17.931
38.000	17.931
39.000	17.931
40.000	17.931
41.000	17.931
42.000	17.931
43.000	17.931
44.000	17.931
45.000	17.931
46.000	17.931
47.000	17.931
48.000	17.931
49.000	17.931
50.000	17.931

X VARIABLE	I
1.000	5080.684
2.000	5080.680
3.000	5080.684
4.000	5080.684
5.000	5080.687
6.000	5080.691
7.000	5080.695
8.000	5080.699
9.000	5080.703
10.000	5080.703
11.000	5080.707
12.000	5080.707
13.000	5080.707
14.000	5080.707
15.000	5080.707
16.000	5080.707
17.000	5080.707
18.000	5080.707
19.000	5080.707
20.000	5080.707
21.000	5080.707
22.000	5080.707
23.000	5080.707
24.000	5080.707
25.000	5080.707
26.000	5080.707
27.000	5080.707
28.000	5080.707
29.000	5080.707
30.000	5080.707
31.000	5080.707
32.000	5080.707
33.000	5080.707
34.000	5080.707
35.000	5080.707
36.000	5080.707
37.000	5080.707
38.000	5080.707
39.000	5080.707
40.000	5080.707
41.000	5080.707
42.000	5080.707
43.000	5080.707
44.000	5080.707
45.000	5080.707
46.000	5080.707
47.000	5080.707
48.000	5080.707
49.000	5080.707
50.000	5080.707

X VARIABLE	INFL
1.000	-0.000
2.000	-0.000
3.000	0.0
4.000	0.000
5.000	0.000
6.000	0.000
7.000	0.000
8.000	0.000
9.000	0.000
10.000	0.000
11.000	0.000
12.000	0.000
13.000	0.000
14.000	0.000
15.000	0.000
16.000	0.000
17.000	0.000
18.000	0.000
19.000	0.000
20.000	0.000
21.000	0.000
22.000	0.000
23.000	0.000
24.000	0.000
25.000	0.000
26.000	0.000
27.000	0.000
28.000	0.000
29.000	0.000
30.000	0.000
31.000	0.000
32.000	0.000
33.000	0.000
34.000	0.000
35.000	0.000
36.000	0.000
37.000	0.000
38.000	0.000
39.000	0.000
40.000	0.000
41.000	0.000
42.000	0.000
43.000	0.000
44.000	0.000
45.000	0.000
46.000	0.000
47.000	0.000
48.000	0.000
49.000	0.000
50.000	0.000

X VARIABLE	K
1.000	59233.445
2.000	59233.422
3.000	59233.398
4.000	59233.383
5.000	59233.367
6.000	59233.355
7.000	59233.348
8.000	59233.348
9.000	59233.352
10.000	59233.355
11.000	59233.363
12.000	59233.371
13.000	59233.383
14.000	59233.395
15.000	59233.406
16.000	59233.418
17.000	59233.426
18.000	59233.434
19.000	59233.441
20.000	59233.449
21.000	59233.457
22.000	59233.465
23.000	59233.473
24.000	59233.480
25.000	59233.484
26.000	59233.488
27.000	59233.492
28.000	59233.496
29.000	59233.500
30.000	59233.504
31.000	59233.508
32.000	59233.512
33.000	59233.516
34.000	59233.520
35.000	59233.523
36.000	59233.527
37.000	59233.531
38.000	59233.535
39.000	59233.539
40.000	59233.543
41.000	59233.547
42.000	59233.547
43.000	59233.547
44.000	59233.547
45.000	59233.547
46.000	59233.547
47.000	59233.547
48.000	59233.547
49.000	59233.547
50.000	59233.547

X VARIABLE	YD
1.000	47995.473
2.000	47995.498
3.000	47995.496
4.000	47995.516
5.000	47995.535
6.000	47995.543
7.000	47995.551
8.000	47995.574
9.000	47995.578
10.000	47995.586
11.000	47995.586
12.000	47995.586
13.000	47995.586
14.000	47995.586
15.000	47995.586
16.000	47995.586
17.000	47995.582
18.000	47995.582
19.000	47995.582
20.000	47995.582
21.000	47995.582
22.000	47995.582
23.000	47995.582
24.000	47995.578
25.000	47995.578
26.000	47995.578
27.000	47995.578
28.000	47995.578
29.000	47995.578
30.000	47995.578
31.000	47995.578
32.000	47995.578
33.000	47995.578
34.000	47995.578
35.000	47995.578
36.000	47995.574
37.000	47995.574
38.000	47995.574
39.000	47995.574
40.000	47995.574
41.000	47995.574
42.000	47995.574
43.000	47995.574
44.000	47995.574
45.000	47995.574
46.000	47995.574
47.000	47995.574
48.000	47995.574
49.000	47995.574
50.000	47995.574

X VARIABLE	Y	X VARIABLE	Z	X VARIABLE	Z3
1.000	60494.529	1.000	34.470	1.000	149.436
2.000	60494.531	2.000	34.470	2.000	149.436
3.000	60494.543	3.000	34.470	3.000	149.436
4.000	60494.552	4.000	34.470	4.000	149.436
5.000	60494.586	5.000	34.470	5.000	149.435
6.000	60494.598	6.000	34.470	6.000	149.435
7.000	60494.605	7.000	34.470	7.000	149.435
8.000	60494.633	8.000	34.470	8.000	149.435
9.000	60494.645	9.000	34.470	9.000	149.435
10.000	60494.648	10.000	34.470	10.000	149.435
11.000	60494.648	11.000	34.470	11.000	149.435
12.000	60494.648	12.000	34.470	12.000	149.435
13.000	60494.648	13.000	34.470	13.000	149.435
14.000	60494.648	14.000	34.470	14.000	149.435
15.000	60494.648	15.000	34.470	15.000	149.435
16.000	60494.648	16.000	34.470	16.000	149.435
17.000	60494.648	17.000	34.470	17.000	149.435
18.000	60494.648	18.000	34.470	18.000	149.435
19.000	60494.648	19.000	34.470	19.000	149.435
20.000	60494.648	20.000	34.470	20.000	149.435
21.000	60494.648	21.000	34.470	21.000	149.435
22.000	60494.648	22.000	34.470	22.000	149.435
23.000	60494.648	23.000	34.470	23.000	149.435
24.000	60494.648	24.000	34.470	24.000	149.435
25.000	60494.648	25.000	34.470	25.000	149.435
26.000	60494.648	26.000	34.470	26.000	149.435
27.000	60494.648	27.000	34.470	27.000	149.435
28.000	60494.648	28.000	34.470	28.000	149.435
29.000	60494.648	29.000	34.470	29.000	149.435
30.000	60494.648	30.000	34.470	30.000	149.435
31.000	60494.648	31.000	34.470	31.000	149.435
32.000	60494.648	32.000	34.470	32.000	149.435
33.000	60494.648	33.000	34.470	33.000	149.435
34.000	60494.648	34.000	34.470	34.000	149.435
35.000	60494.648	35.000	34.470	35.000	149.435
36.000	60494.648	36.000	34.470	36.000	149.435
37.000	60494.648	37.000	34.470	37.000	149.435
38.000	60494.648	38.000	34.470	38.000	149.435
39.000	60494.648	39.000	34.470	39.000	149.435
40.000	60494.645	40.000	34.470	40.000	149.435
41.000	60494.645	41.000	34.470	41.000	149.435
42.000	60494.645	42.000	34.470	42.000	149.435
43.000	60494.645	43.000	34.470	43.000	149.435
44.000	60494.645	44.000	34.470	44.000	149.435
45.000	60494.645	45.000	34.470	45.000	149.435
46.000	60494.645	46.000	34.470	46.000	149.435
47.000	60494.645	47.000	34.470	47.000	149.435
48.000	60494.645	48.000	34.470	48.000	149.435
49.000	60494.645	49.000	34.470	49.000	149.435
50.000	60494.645	50.000	34.470	50.000	149.435

APPENDIX F

EX POST SIMULATION--TAIWAN FORECASTING MODEL

The revised MACROSIM is used in the ex post simulation for the Taiwan forecasting model. The 1953's actual exogenous values are provided as the initial values (for the lagged endogenous variables, 1952's actual values of endogenous values are provided). In addition, the actual series of the exogenous variable values are also provided to specify the time paths for the exogenous variables. After 1953, no re-initialization of endogenous variable values is needed, since the system will up-date itself by including the dynamic cards in the program. Actually, the values for endogenous variables are determined by the simulation solutions. Notice that to produce 21 period forecast values, the parameter on column 80 of the problem control card has to be changed to 3 and the control parameter 4 must be specified as 70 (50 plus 20 new RHS cards). In addition, immediately following the RHS cards, a control card with a format of I2 is added to specify the number of actual data to be included. Then, it is followed by a series of actual data for all endogenous variables with a format of (8F10.0). In addition, the MACROSIM is revised to allow both actual and simulated series to be printed side by side with all five accuracy measures provided. Furthermore, the actual and simulated series are plotted. The results of the ex post simulation are given as follows.

```
      SUBROUTINE USER (PRINT,RHS,II,K)
      DIMENSION PRINT (50,50), RHS (50)
      COMMON IN,IO,IP
      RHS(4)=RHS(2)/PRINT(II,7)
      RHS(16)=PRINT(II,7)/RHS(13)
      RHS(5)=100.*PRINT(II,7)/RHS(3)
      RETURN
      END
```

```
                 EX POST SIMULATION---TAIWAN FORECASTING MODEL
SIMULATION TYPE IS   5.
THERE ARE  15. ENDOGENOUS VARIABLES AND  16. EXOGENOUS VARIABLES IN THE SYSTEM
THE SIMULATION PARAMETERS ARE        0.0        0.0        0.0        70.000        99.000
THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

                                  MODEL STRUCTURE

C    =      0.395 YD      2554.185 CNST      0.460 CL1
IP   =    -18.236 R         18.236 INFL      0.124 Y      -6128.922 CNST      0.370 IPL1
T    =      0.180 Y      -3152.600 CNST
D    =   1894.030 CNST       0.054 KL1
M    =      0.414 Y     -42441.430 CNST    181.738 RMP
W    =      0.441 Y      -5657.660 CNST
PY   =      6.802 CNST       0.000 MS        0.121 PM         0.771 PYL1
R    =      0.000 Y         29.433 CNST     -0.019 MS/P       0.118 ZL1      -0.000 YL1
I    =      1.000 IP         1.000 IG
INFL =   -100.000 CNST     100.000 Z2
K    =     -1.000 D          1.000 I         1.000 KL1
YD   =     -1.000 T         -1.000 D         1.000 Y          1.000 TR
Y    =      1.000 C         -1.000 M         1.000 I          1.000 G         1.000 X
Z    =      1.000 MS/P
Z3   =      1.000 RMP
```

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	MS	1654.0000	PM	32.1100	MS/P	45.0310	RMP	114.3900
IG	3433.2000	TR	301.8701	G	19312.0000	X	6006.0000	CL1	36276.0000
IPL1	3120.3000	KL1	8002.0000	PYL1	29.8400	ZL1	43.9340	YL1	57809.0000
Z2	1.2309								

```
                           LAGGED ENDOGENOUS VARIABLES
                       PRIOR LOCATION              POSTERIOR LOCATION
                              1                            25
                              2                            26
                             11                            27
                              7                            28
                             14                            29
                             13                            30
                              0                             0
                              0                             0
DETERMINANT =     0.1000000E+01*10** 0
NEW RHS POSITIONS AND VALUES ARE
  17    2096.00 18     36.36 21    3141.30 22     411.89 23   21822.00 24     4510.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    2523.00 18     43.26 21    3505.30 22     393.86 23   23130.00 24     5563.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    3161.00 18     50.42 21    4109.70 22     317.02 23   26577.00 24     6012.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    3740.00 18     51.96 21    4607.80 22     401.95 23   28533.00 24     6809.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    5041.00 18     63.58 21    6029.60 22    1405.40 23   28129.00 24     8288.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    5486.00 18     78.56 21    6310.90 22    1054.00 23   29933.00 24     8680.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    6037.00 18     79.07 21    6552.00 22     711.13 23   30014.00 24     9975.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    7231.00 18     84.27 21    6864.40 22    1191.60 23   30502.00 24    11395.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17    7832.00 18     82.17 21    7755.20 22    1406.50 23   32558.00 24    12331.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   10060.00 18     84.69 21    7150.00 22    1311.30 23   32383.00 24    16380.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   13259.00 18     83.09 21    7603.20 22    1188.70 23   32890.00 24    20009.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   14595.00 18     85.40 21    8882.10 22    1333.00 23   35104.00 24    25016.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   17004.00 18     90.43 21   10312.00 22    1638.00 23   36487.00 24    29693.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   21875.00 18     91.31 21   14274.00 22    1959.80 23   39370.00 24    34652.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   24649.00 18     91.63 21   16531.00 22    1273.40 23   42008.00 24    43619.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   28984.00 18     92.69 21   20425.00 22     987.12 23   44321.00 24    54575.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   34508.00 18     96.11 21   23684.00 22    1383.40 23   45492.00 24    68713.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   40914.00 18    100.00 21   27855.00 22    1549.00 23   46411.00 24    91747.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   55066.00 18    110.54 21   29820.00 22    1604.80 23   48468.00 24   121611.00  0      0.0  0      0.0  0      0.0  0      0.0
NEW RHS POSITIONS AND VALUES ARE
  17   80938.00 18    137.14 21   31018.00 22    1226.50 23   49070.00 24   150582.00  0      0.0  0      0.0  0      0.0  0      0.0
```

VARIABLE C

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	39311.000	42008.539	-2697.539	6.86
2.	43337.000	45865.012	-2528.012	5.83
3.	46043.000	49547.719	-3504.719	7.61
4.	46952.000	53596.922	-6644.922	14.15
5.	50006.000	56947.477	-6941.477	13.88
6.	54110.000	60951.086	-6841.086	12.64
7.	56584.000	64458.398	-7874.398	13.92
8.	58910.000	66512.125	-7602.125	12.90
9.	63378.000	68531.000	-5153.000	8.13
10.	68572.000	70565.937	-1993.937	2.91
11.	73132.000	72681.937	450.062	0.62
12.	83676.000	74722.687	8953.312	10.70
13.	90460.000	78558.750	11901.250	13.16
14.	93842.000	83440.937	10401.062	11.08
15.	102671.000	90124.687	12546.312	12.22
16.	111157.000	97966.125	13190.875	11.87
17.	119953.000	107847.312	12105.687	10.09
18.	129964.000	119853.125	10110.875	7.78
19.	141096.000	136138.312	4957.687	3.51
20.	154814.000	157148.625	-2334.625	1.51
21.	170398.000	180182.062	-9284.062	5.43

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

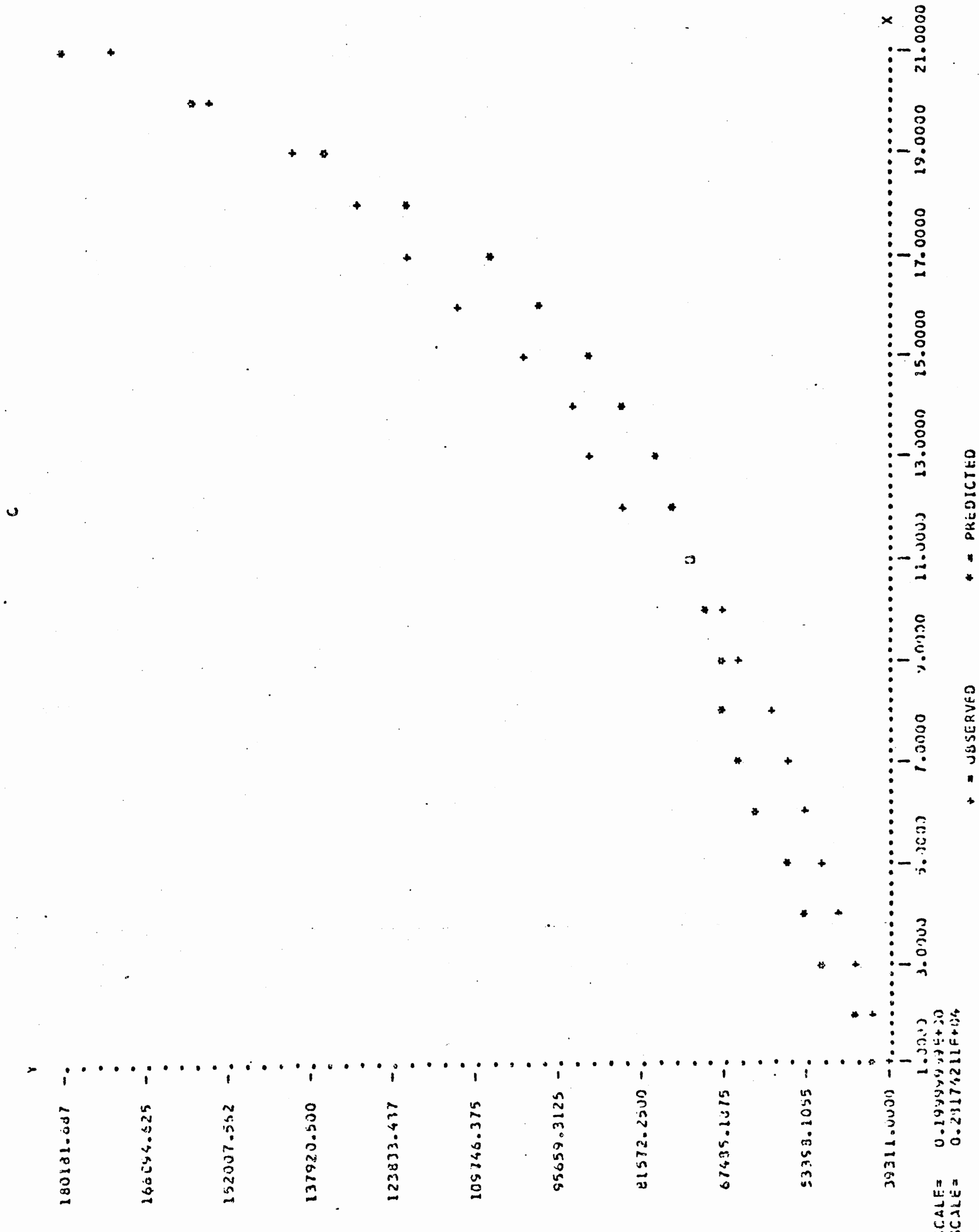
MEAN-ABSOLUTE-ERROR = 7048.4258 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 8.8958 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 1744.4424 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 2.1477 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.2509 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)


Y
180181.687
166094.625
152007.562
137920.500
123833.437
109746.375
95659.3125
81572.2500
67485.1875
53398.1055
39311.0000
X
1.0000
3.0000
5.0000
7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
+ = OBSERVED
* = PREDICTED
XSCALE= 0.19999999E+00
YSCALE= 0.28174211E+04

VARIABLE IP

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	4379.789	3411.562	968.227	22.11
2.	5503.219	4026.327	1476.892	26.84
3.	3736.520	5000.625	-1264.105	33.83
4.	4332.719	6320.430	-1987.762	45.88
5.	3919.340	7414.723	-3495.383	89.18
6.	4178.141	8709.406	-4531.266	108.45
7.	5643.102	9977.355	-4334.254	76.81
8.	7906.643	10761.000	-2854.352	36.10
9.	9365.238	11482.340	-2117.102	22.61
10.	9769.672	12194.492	-2424.820	24.82
11.	11636.898	13045.484	-1408.586	12.10
12.	14816.281	13860.508	955.773	6.45
13.	19913.941	15274.465	4639.477	23.30
14.	21409.172	17098.652	4310.520	21.96
15.	25807.988	19570.848	6237.141	24.17
16.	31095.320	22549.441	8545.879	27.48
17.	29453.031	26337.656	3115.375	10.58
18.	36500.609	30845.590	5655.020	15.49
19.	39710.000	36911.332	2798.668	7.05
20.	38830.789	44805.496	-5974.707	15.39
21.	50563.969	53465.395	-2901.426	5.74

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

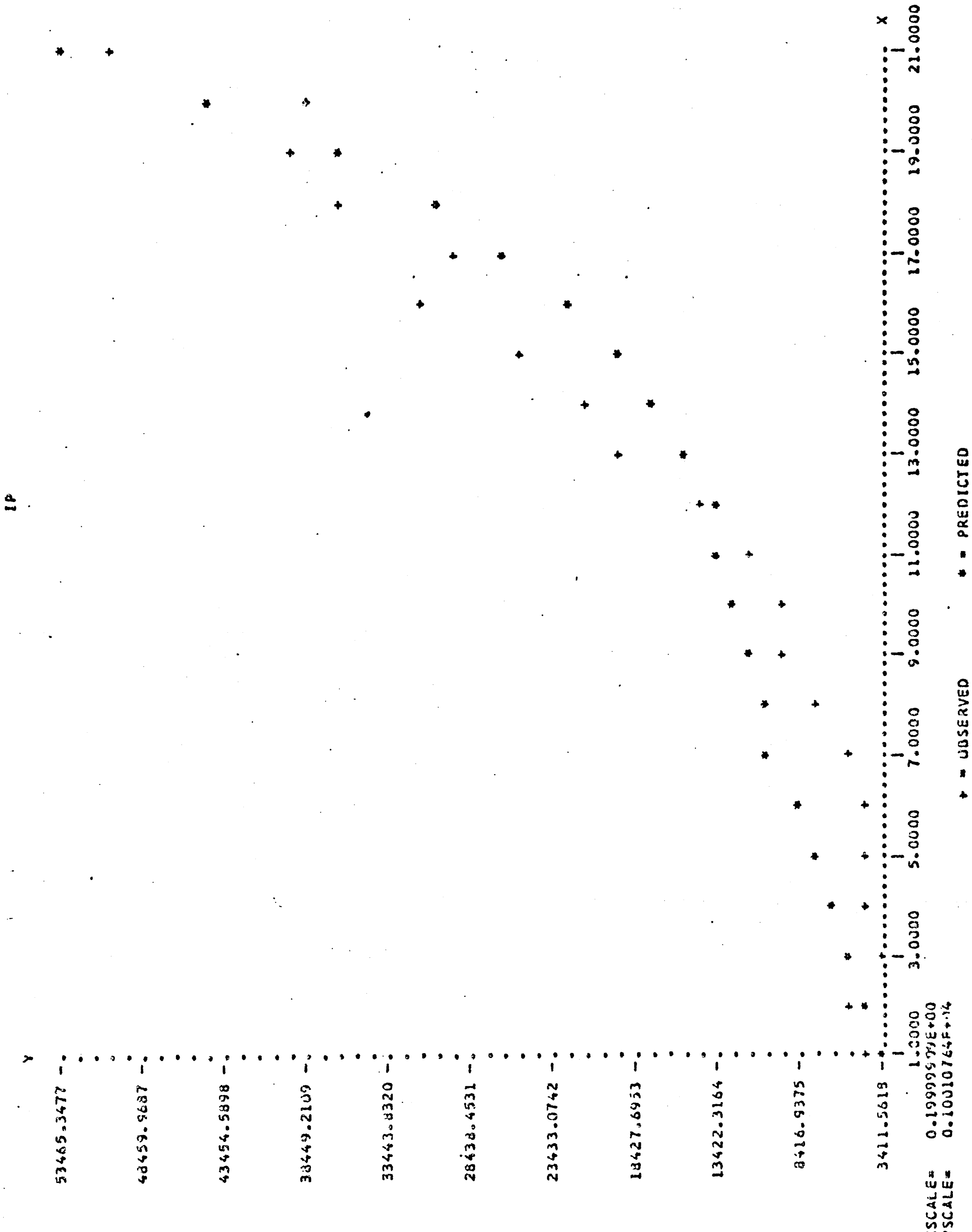
MEAN-ABSOLUTE-ERROR = 3452.2202 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 31.2534 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 867.4509 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 9.0007 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.5315 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)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1.0000
3.0000
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11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
+ = OBSERVED
* = PREDICTED
XSCALE=
YSCALE=

VARIABLE Y

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	7968.961	9225.801	-1256.840	15.77
2.	10552.359	9930.992	621.367	5.89
3.	11517.289	11047.625	469.664	4.08
4.	12282.781	12437.633	-154.852	1.26
5.	13196.891	13330.207	-133.316	1.01
6.	14151.969	14576.207	-424.238	3.00
7.	14785.422	15703.733	-918.316	6.21
8.	14519.219	16161.305	-1642.086	11.31
9.	14925.328	16794.664	-1869.336	12.52
10.	17474.559	17508.555	-33.996	0.19
11.	17871.781	18342.203	-470.422	2.63
12.	17483.430	19113.816	-1630.387	9.33
13.	21646.781	20848.684	798.098	3.69
14.	23444.469	22693.543	750.926	3.20
15.	25597.500	25295.527	301.973	1.18
16.	31249.289	28365.258	2884.031	9.23
17.	36838.121	32230.187	4607.934	12.51
18.	39788.000	36676.625	3111.375	7.82
19.	43647.000	43075.320	571.680	1.31
20.	50513.281	51122.352	-609.070	1.21
21.	57692.629	59266.684	-1574.055	2.73

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

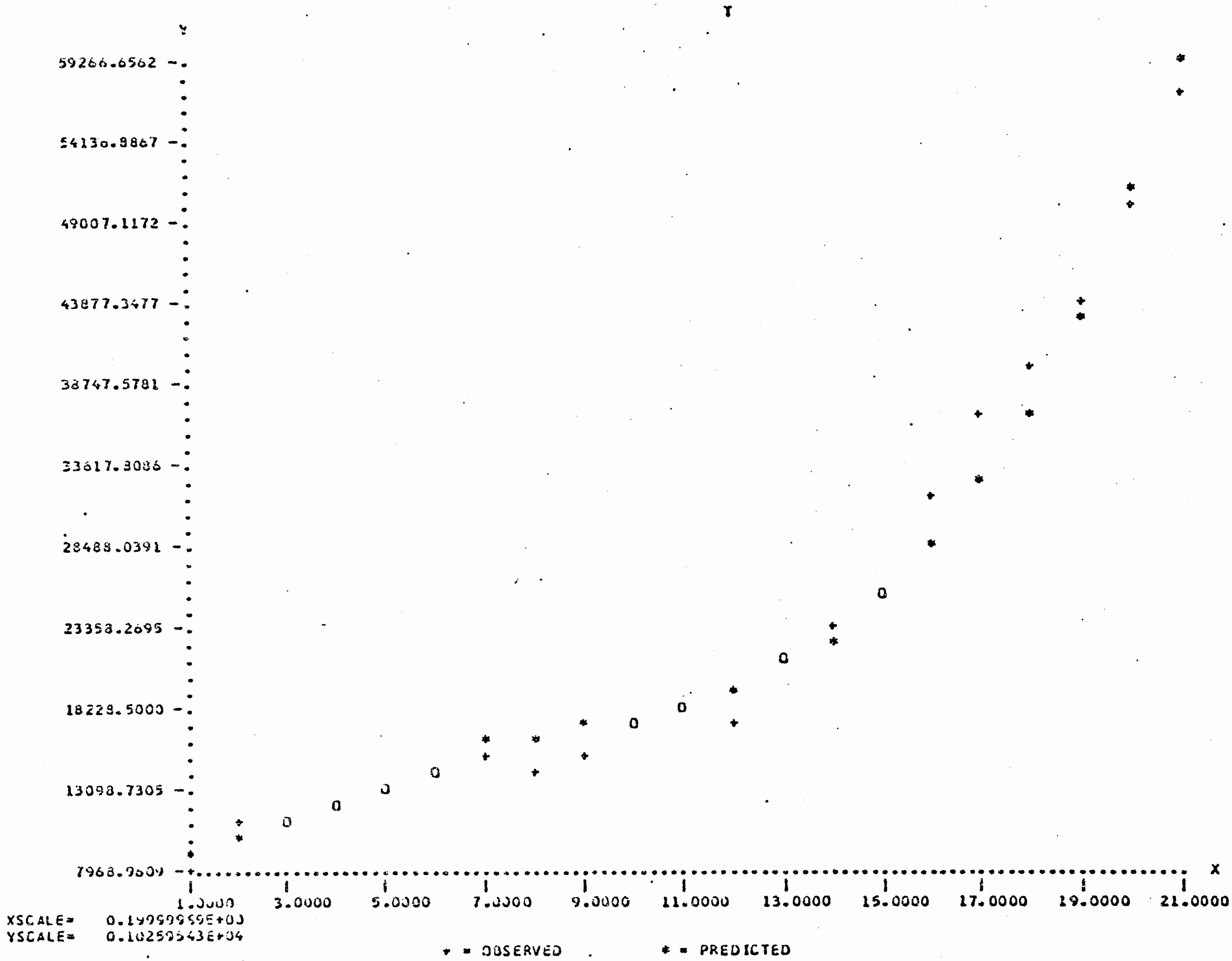
MEAN-ABSOLUTE-ERROR = 1182.5933 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 5.5276 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 356.4170 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 1.5559 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.3347 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)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X
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17.0000
19.0000
21.0000
XSCALE= 0.19999999E+03
YSCALE= 0.10259543E+04
+ = OBSERVED
* = PREDICTED

VARIABLE D

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	2682.000	2324.526	357.474	13.33
2.	2756.000	2567.708	188.292	6.83
3.	2788.000	2815.177	-27.177	0.97
4.	2858.000	3121.332	-263.332	9.21
5.	3121.000	3514.537	-393.537	12.61
6.	3351.000	3972.255	-621.255	18.54
7.	3896.000	4551.488	-655.488	16.82
8.	4613.000	5182.910	-563.910	12.35
9.	5153.000	5835.434	-682.484	13.24
10.	5873.000	6508.559	-635.559	10.82
11.	6715.000	7231.668	-516.668	7.69
12.	7536.000	7929.094	-393.094	5.22
13.	7908.000	8657.230	-749.230	9.47
14.	8685.000	9491.066	-806.066	9.28
15.	10133.000	10455.109	-322.109	3.18
16.	11533.000	11713.437	-180.437	1.56
17.	13114.000	13185.738	-71.738	0.55
18.	15750.000	14992.117	757.883	4.81
19.	18273.000	17119.176	1153.824	6.31
20.	21146.000	19682.520	1463.460	6.92
21.	22953.000	22638.367	314.633	1.37

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

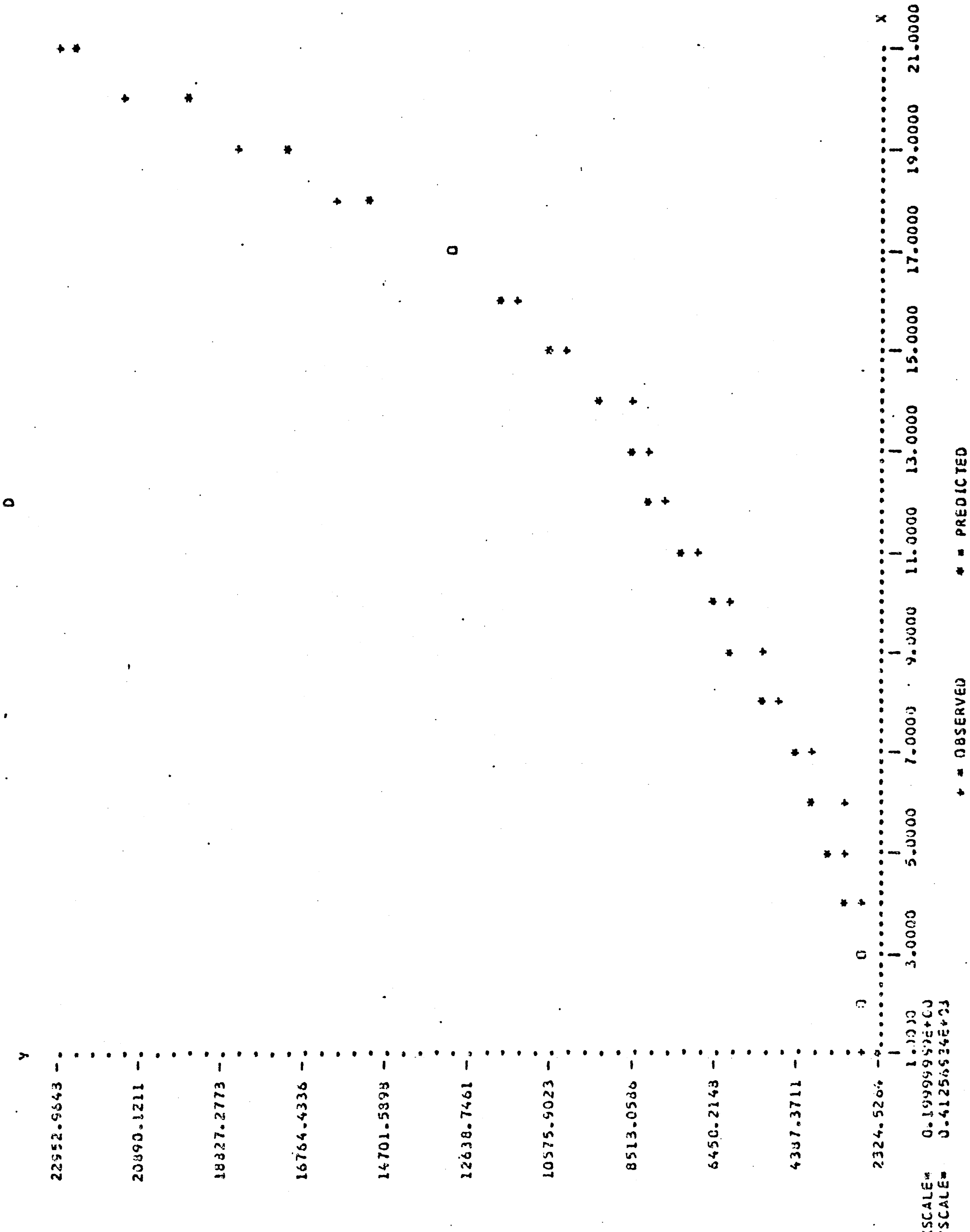
MEAN-ABSOLUTE-ERROR = 529.6982 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 8.1484 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 137.3446 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 2.0915 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.1894 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)



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3.0000
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7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
+ = OBSERVED
* = PREDICTED
XSCALE=
YSCALE=

VARIABLE M

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	9849.000	5299.766	4549.234	46.19
2.	10281.000	6569.523	3711.477	36.10
3.	8701.000	7738.762	962.238	11.06
4.	10821.000	9874.437	946.562	8.75
5.	11314.000	12604.219	-1290.219	11.40
6.	13514.000	13466.777	47.223	0.35
7.	13849.000	14445.934	-596.934	4.31
8.	14830.000	16354.715	-1524.715	10.28
9.	16456.000	17791.383	-1335.383	8.11
10.	18242.000	20449.367	-2207.367	12.10
11.	18796.000	22546.898	-3750.898	19.96
12.	22641.000	25198.793	-2557.793	11.30
13.	28680.000	29296.137	-616.137	2.15
14.	29895.000	33227.957	-3332.957	11.15
15.	37772.000	39710.836	-1938.836	5.13
16.	49304.000	47313.355	1990.645	4.04
17.	57140.000	56641.945	498.055	0.87
18.	69782.000	66984.375	2797.625	4.01
19.	85261.000	81857.875	3403.125	3.99
20.	100918.000	99875.937	1042.062	1.03
21.	124433.000	117026.437	7406.562	5.95

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

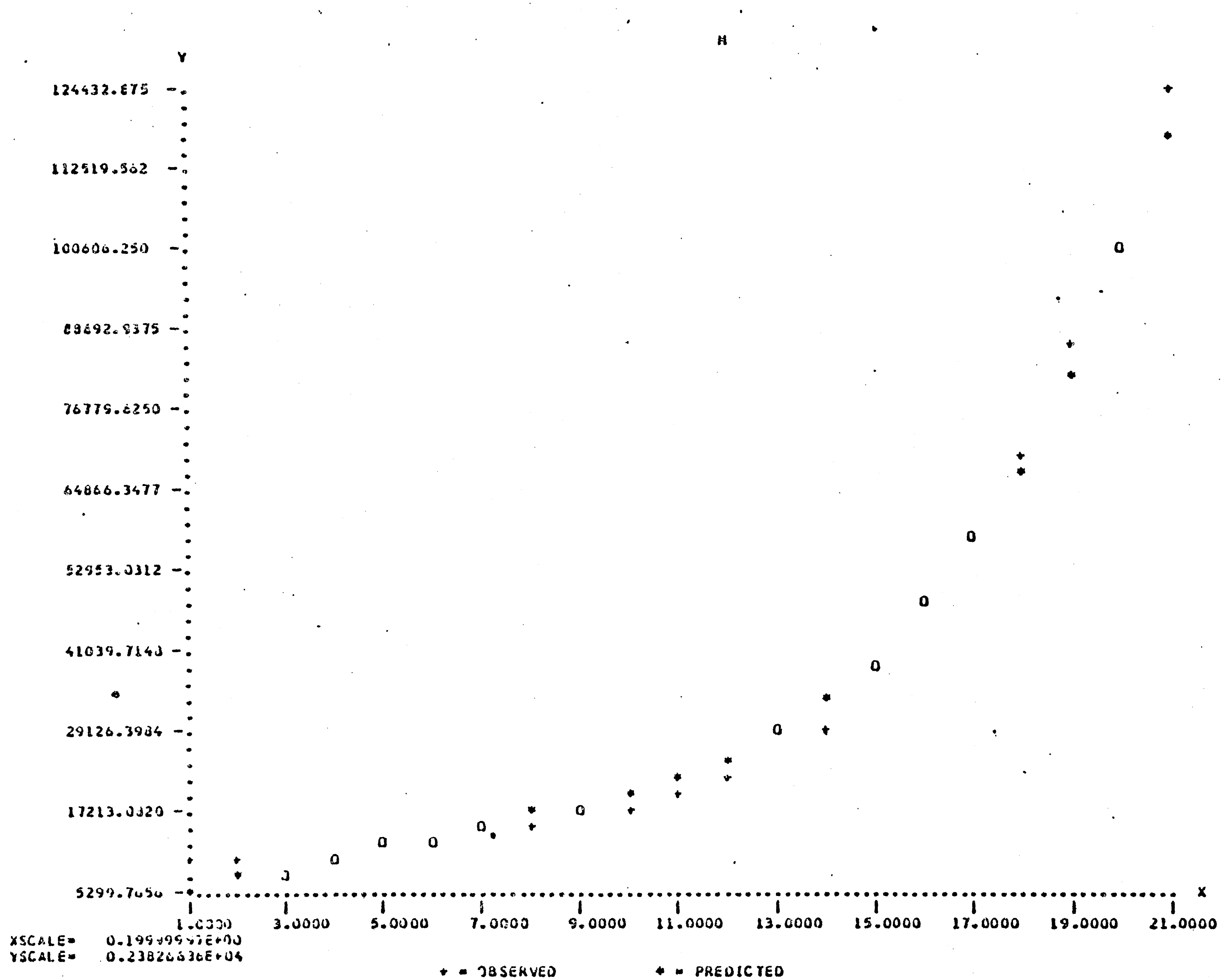
MEAN-ABSOLUTE-ERROR = 2214.5759 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 10.3921 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 607.4292 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 3.3227 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.3326 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)



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XSCALE= 0.19999997E+00
YSCALE= 0.23826636E+04
+ = OBSERVED
* = PREDICTED

VARIABLE M

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	21619.102	24690.793	-3071.691	14.21
2.	26082.922	26419.730	-336.309	1.29
3.	27889.520	29157.406	-1267.887	4.55
4.	30165.398	32565.312	-2399.914	7.96
5.	31392.000	34753.664	-3361.664	10.71
6.	33210.609	37808.512	-4597.902	13.84
7.	34682.531	40572.898	-5890.367	16.98
8.	36833.121	41694.742	-4861.621	13.20
9.	39846.730	43247.562	-3400.832	8.53
10.	43603.262	44997.309	-1394.047	3.20
11.	47739.172	47041.684	697.488	1.46
12.	54212.770	48933.488	5279.281	9.74
13.	59225.539	53186.898	6038.641	10.20
14.	64537.871	57709.965	6827.906	10.58
15.	72453.125	64089.312	8363.812	11.54
16.	79963.312	71615.312	8348.000	10.44
17.	86685.937	81091.062	5594.875	6.45
18.	97150.000	91992.437	5157.562	5.31
19.	111903.000	107680.250	4222.750	3.77
20.	124458.437	127409.312	-2950.875	2.37
21.	138718.437	147376.937	-8658.500	6.24

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

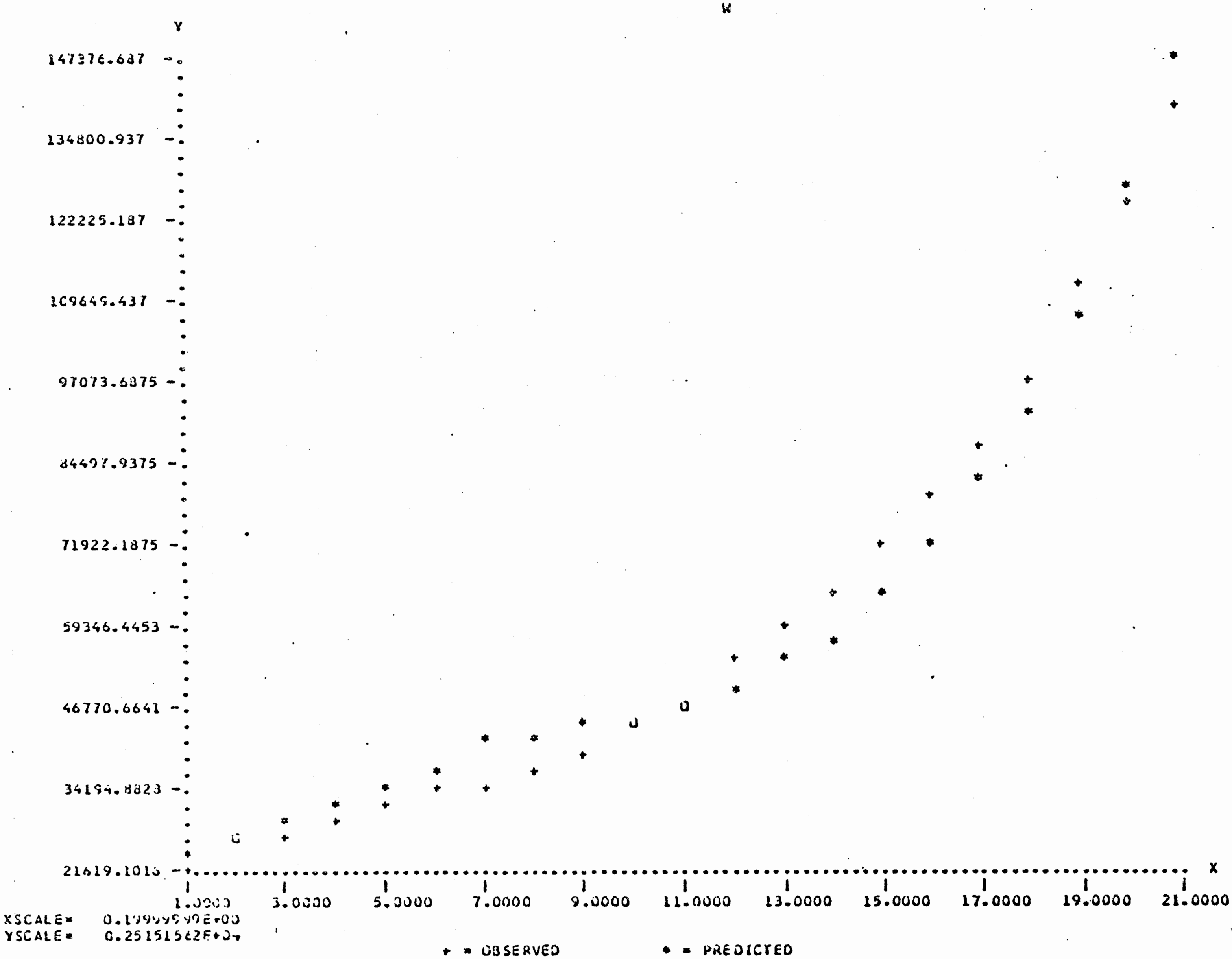
MEAN-ABSOLUTE-ERROR = 4415.3477 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 8.2179 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 1098.0173 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 2.0334 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.2415 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)



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17.0000
19.0000
21.0000
XSCALE= 0.19999999E+00
YSCALE= 0.25151562E+04
+ = OBSERVED
* = PREDICTED

VARIABLE PY

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	36.730	33.988	2.742	7.46
2.	37.080	37.778	-0.698	1.88
3.	41.060	41.610	-0.550	1.34
4.	44.770	45.542	-0.772	1.72
5.	48.860	48.861	-0.001	0.00
6.	51.590	53.100	-1.510	2.93
7.	55.690	58.209	-2.519	4.52
8.	63.750	62.307	1.443	2.26
9.	66.960	66.304	0.656	0.98
10.	68.780	69.237	-0.457	0.66
11.	71.750	72.189	-0.439	0.61
12.	75.420	74.826	0.594	0.79
13.	75.420	77.337	-1.967	2.61
14.	77.980	80.370	-2.390	3.07
15.	81.590	83.620	-2.030	2.49
16.	87.810	86.651	1.159	1.32
17.	92.540	89.792	2.748	2.97
18.	96.700	93.652	3.048	3.15
19.	100.000	98.208	1.792	1.79
20.	105.010	105.443	-0.433	0.41
21.	118.620	118.714	-0.094	0.08

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

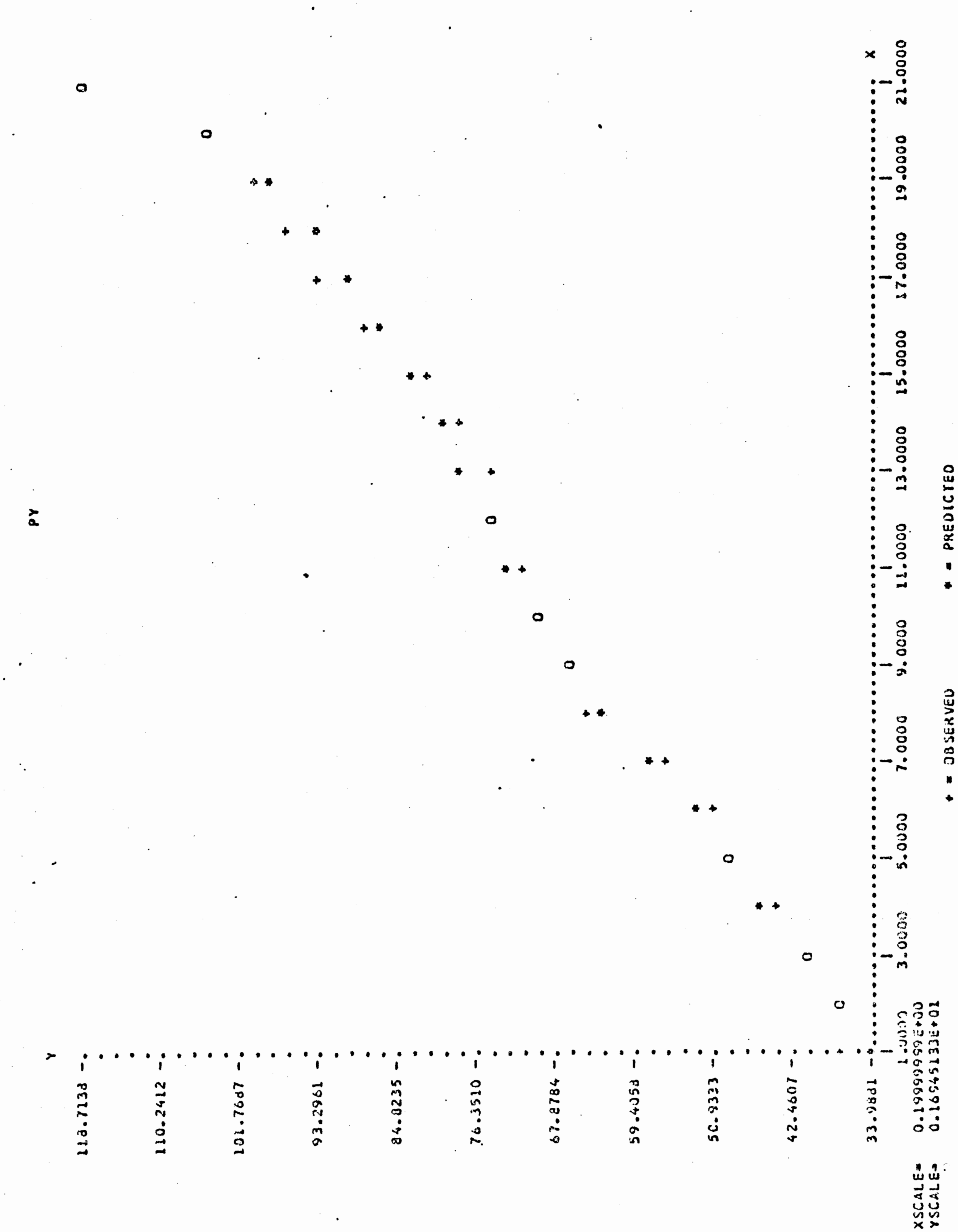
MEAN-ABSOLUTE-ERROR = 1.3353 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 2.0502 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 0.3566 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 0.5770 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.2348 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)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9.0000
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17.0000
19.0000
21.0000
X
+ = OBSERVED
* = PREDICTED
XSCALE= 0.19999999E+00
YSCALE= 0.16945133E+01

VARIABLE R

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	21.600	21.908	-0.308	1.43
2.	21.600	18.012	3.588	16.61
3.	21.600	18.262	3.338	15.45
4.	18.000	17.510	0.490	2.72
5.	18.000	15.881	2.119	11.77
6.	14.400	15.584	-1.184	8.22
7.	18.000	15.907	2.093	11.63
8.	18.000	13.396	4.604	25.58
9.	16.200	13.065	3.135	19.35
10.	15.800	13.651	2.149	13.60
11.	14.000	12.795	1.205	8.61
12.	14.000	13.934	0.066	0.47
13.	14.000	18.285	-4.285	30.61
14.	14.000	17.121	-3.121	22.29
15.	13.300	17.124	-3.824	28.75
16.	14.000	19.588	-5.588	39.92
17.	13.300	18.411	-5.111	38.43
18.	12.500	16.861	-4.361	34.89
19.	12.000	18.173	-6.173	51.44
20.	11.300	15.089	-3.789	33.53
21.	13.300	13.543	-0.243	1.82

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

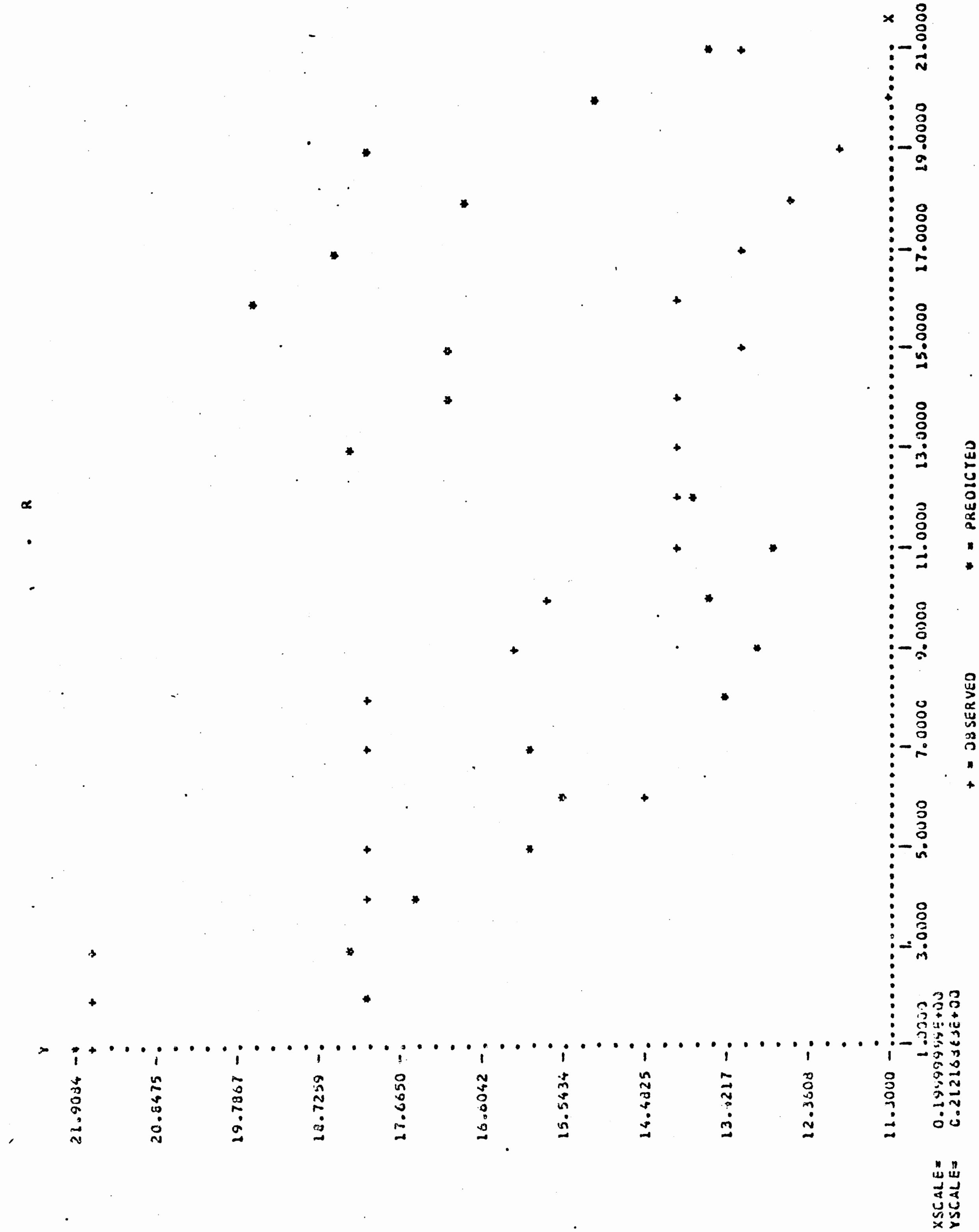
MEAN-ABSOLUTE-ERROR = 2.8939 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 19.8629 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 0.7428 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 5.3186 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.6633 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)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9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
X
R
+ = OBSERVED
* = PREDICTED
XSCALE= 0.19999999E+00
YSCALE= 0.21216838E+00

VARIABLE I

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	7813.000	6844.754	968.246	12.39
2.	8644.000	7167.613	1476.387	17.08
3.	7242.000	8505.910	-1263.910	17.45
4.	8442.000	10430.168	-1988.168	23.55
5.	8527.000	12022.520	-3495.520	40.99
6.	10208.000	14738.996	-4530.996	44.39
7.	11954.000	16288.242	-4334.242	36.26
8.	14959.000	17312.992	-2353.992	19.74
9.	16229.000	18346.727	-2117.727	13.05
10.	17525.000	19949.680	-2424.680	13.84
11.	18788.000	20195.473	-1407.473	7.49
12.	22420.000	21463.703	956.297	4.27
13.	28796.000	24156.559	4639.441	16.11
14.	32221.000	27410.645	4810.355	14.93
15.	40082.000	33844.844	6237.156	15.56
16.	47626.000	39080.437	8545.562	17.94
17.	49879.000	46762.656	3116.344	6.25
18.	60186.000	54529.586	5656.414	9.40
19.	67565.000	64766.328	2798.672	4.14
20.	68650.000	74625.312	-5975.312	8.70
21.	81581.000	84483.312	-2902.312	3.56

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

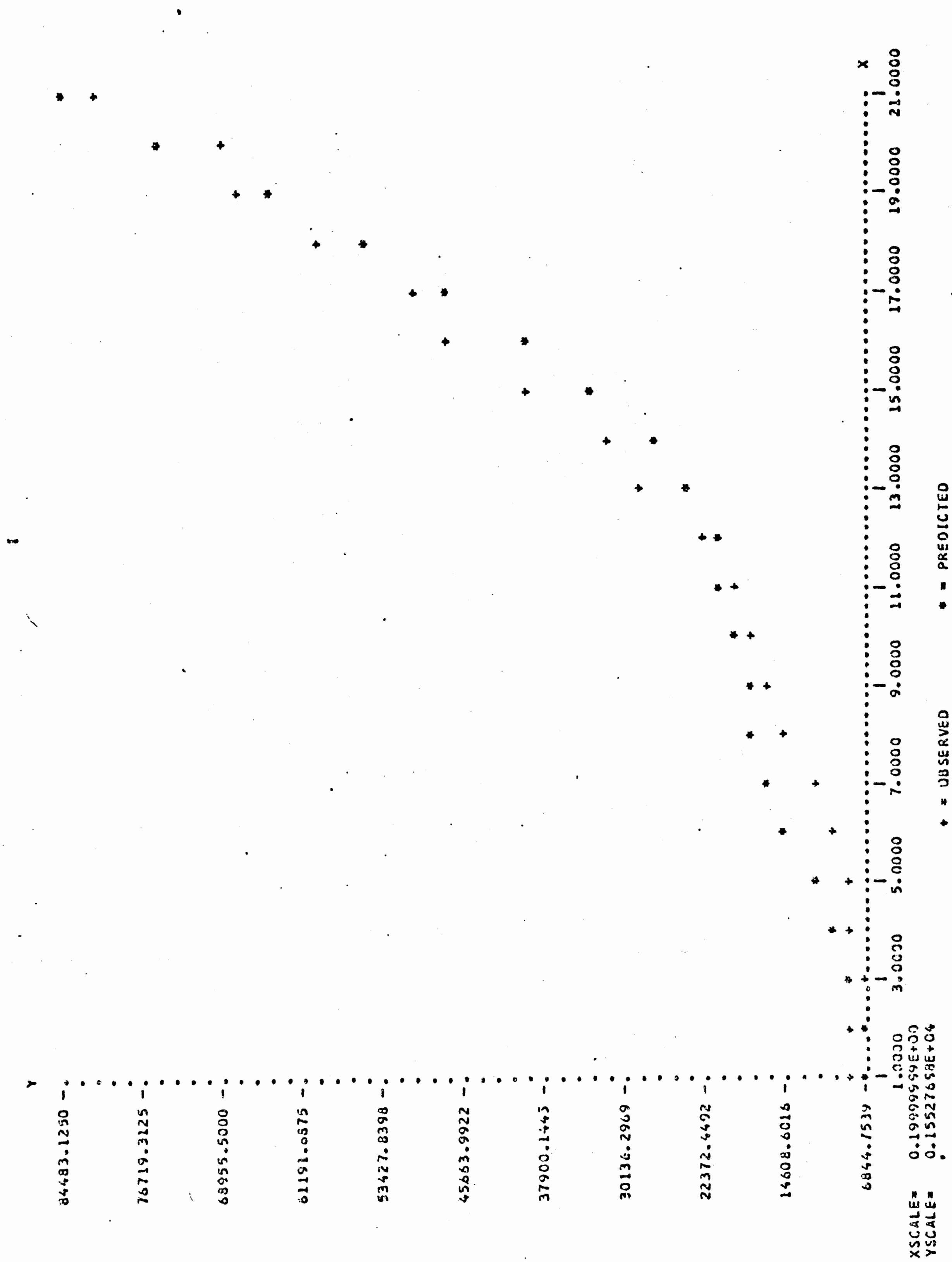
MEAN-ABSOLUTE-ERROR = 3452.3420 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 16.5280 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 867.4841 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 4.3578 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.3773 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)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XSCALE= 0.19999999E+00
YSCALE= 0.15527658E+04
+ = OBSERVED
* = PREDICTED

VARIABLE INFL

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	23.090	13.901	9.189	39.80
2.	0.953	11.151	-10.198	9999.99
3.	10.734	10.143	0.591	5.51
4.	9.036	9.449	-0.413	4.57
5.	9.136	7.288	1.848	20.23
6.	5.587	8.675	-3.088	55.27
7.	7.947	9.622	-1.675	21.08
8.	14.473	7.040	7.433	51.36
9.	5.035	6.414	-1.379	27.39
10.	2.713	4.423	-1.705	62.73
11.	4.318	4.264	0.054	1.26
12.	5.115	3.652	1.463	23.59
13.	0.0	3.423	-3.423	9999.99
14.	3.394	3.855	-0.461	13.57
15.	4.629	4.043	0.586	12.66
16.	7.623	3.624	3.999	52.46
17.	5.387	3.624	1.763	32.73
18.	4.495	4.298	0.197	4.38
19.	3.413	4.863	-1.450	42.50
20.	5.010	7.366	-2.356	47.03
21.	12.961	12.584	0.377	2.91

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

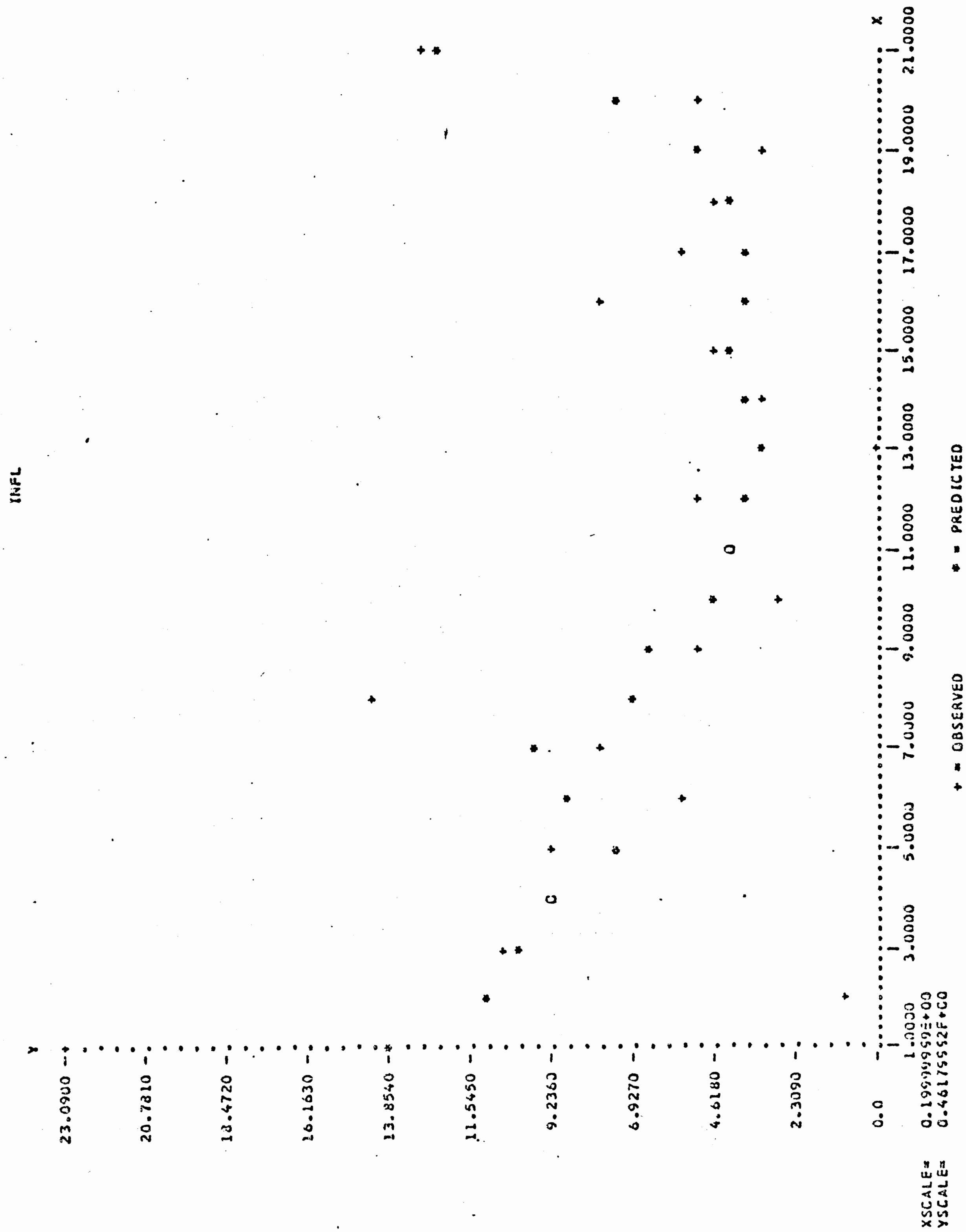
MEAN-ABSOLUTE-ERROR = 2.5546 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 27.6342 (IBID., PP 316-317)
DF (19.)

ROOT-MEAN-SQUARE ERROR = 0.8331 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 7.7882 (IBID., PP 316-317)
DF (19.)

INEQUALITY COEFFICIENT = 0.6301 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (18.)


INFL
Y
X
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20.7810
18.4720
16.1630
13.8540
11.5450
9.2360
6.9270
4.6180
2.3090
0.0
1.0000
3.0000
5.0000
7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
+ = OBSERVED
* = PREDICTED
XSCALE= 0.19999959E+00
YSCALE= 0.46175552E+00

VARIABLE K

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	13133.000	12522.230	610.770	4.65
2.	19021.000	17122.148	1898.852	9.98
3.	23475.000	22812.891	662.109	2.82
4.	29059.000	30121.734	-1062.734	3.66
5.	34465.000	38629.719	-4164.719	12.08
6.	41322.000	49396.469	-8074.469	19.54
7.	49380.000	61133.223	-11753.223	23.80
8.	59226.000	73263.187	-14037.187	23.70
9.	70302.000	85774.250	-15472.250	22.01
10.	81954.000	99215.250	-17261.250	21.06
11.	94027.000	112178.937	-18151.937	19.31
12.	108911.000	125713.375	-16802.375	15.43
13.	129799.000	141212.625	-11413.625	8.79
14.	153335.000	159132.062	-5797.062	3.78
15.	183284.000	182521.687	762.312	0.42
16.	219377.000	209888.562	9488.437	4.33
17.	256142.000	243465.312	12676.687	4.95
18.	300581.000	283002.687	17578.312	5.85
19.	349873.000	330649.750	19223.250	5.49
20.	397377.000	385592.562	11784.437	2.97
21.	456005.000	447437.500	8567.500	1.88

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

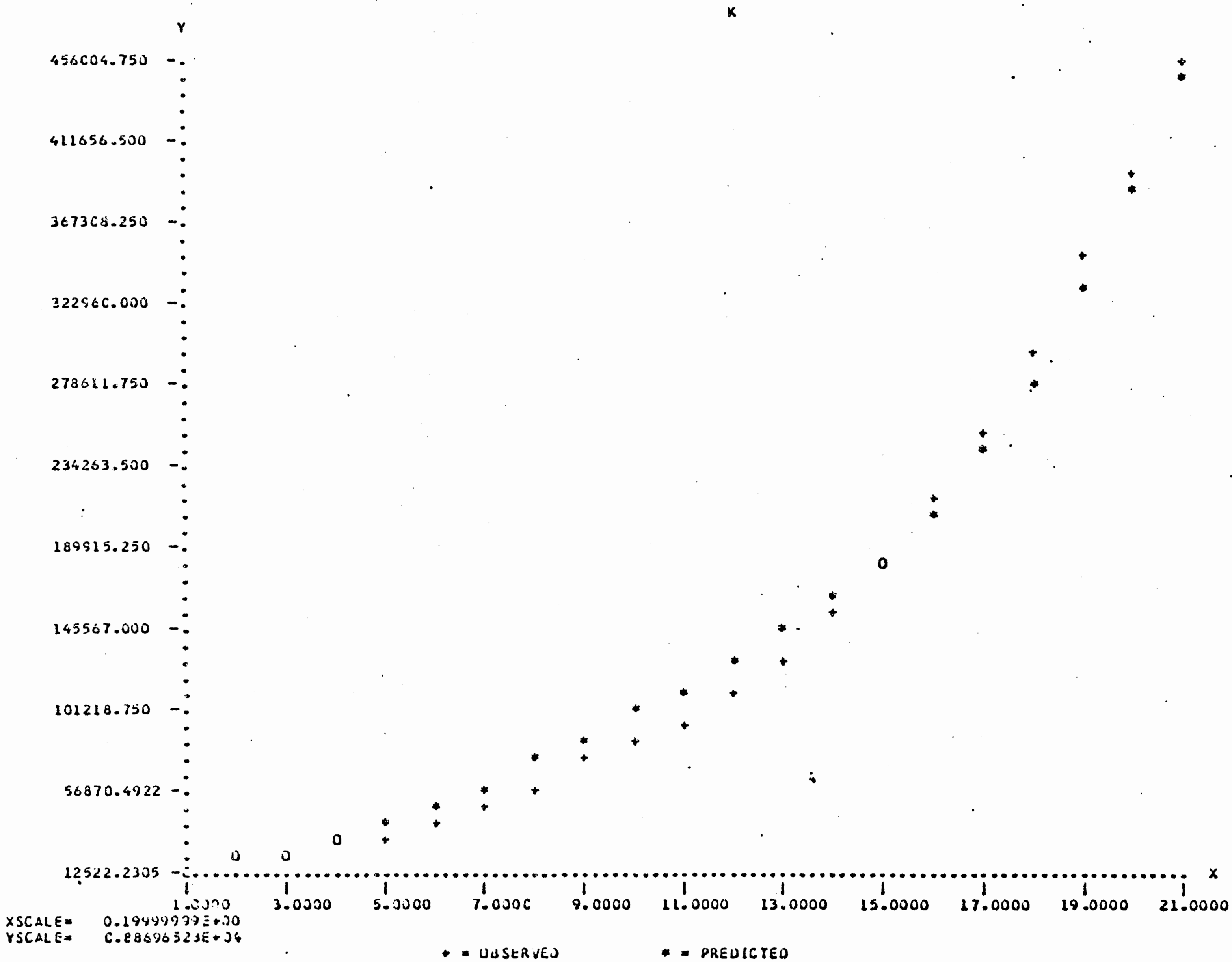
MEAN-ABSOLUTE-ERROR = 9868.7344 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 10.3091 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 2554.7936 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 2.8369 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.1268 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)



Y
K
456004.750
411656.500
367308.250
322960.000
278611.750
234263.500
189915.250
145567.000
101218.750
56870.4922
12522.2305
X
1.0000
3.0000
5.0000
7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
XSCALE= 0.19999999E+00
YSCALE= 0.88696523E+04
+ = OBSERVED
* = PREDICTED

VARIABLE YO

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	52243.910	57623.036	-5379.176	10.30
2.	55135.031	60708.312	-5573.281	10.11
3.	59365.570	65538.937	-6173.367	10.40
4.	62338.238	71499.562	-9161.324	14.70
5.	66645.062	75264.937	-8619.875	12.93
6.	71123.437	81497.125	-10373.687	14.59
7.	75674.562	85712.375	-10037.812	13.26
8.	80106.937	86826.312	-6719.375	8.39
9.	86161.250	89544.812	-3383.562	3.93
10.	90803.000	92344.562	-1541.562	1.70
11.	99111.500	95331.000	3780.500	3.81
12.	112523.312	98032.500	14490.812	12.38
13.	122474.187	105366.375	17107.812	13.97
14.	131856.500	113257.062	18599.437	14.11
15.	145232.312	124489.875	20742.437	14.28
16.	153597.062	136554.875	17042.187	11.10
17.	162623.000	152435.312	10187.687	6.26
18.	180418.375	171318.062	9100.312	5.04
19.	201187.000	198559.187	2627.312	1.31
20.	222570.562	232777.125	-10206.562	4.59
21.	248278.812	266612.375	-18333.562	7.38

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

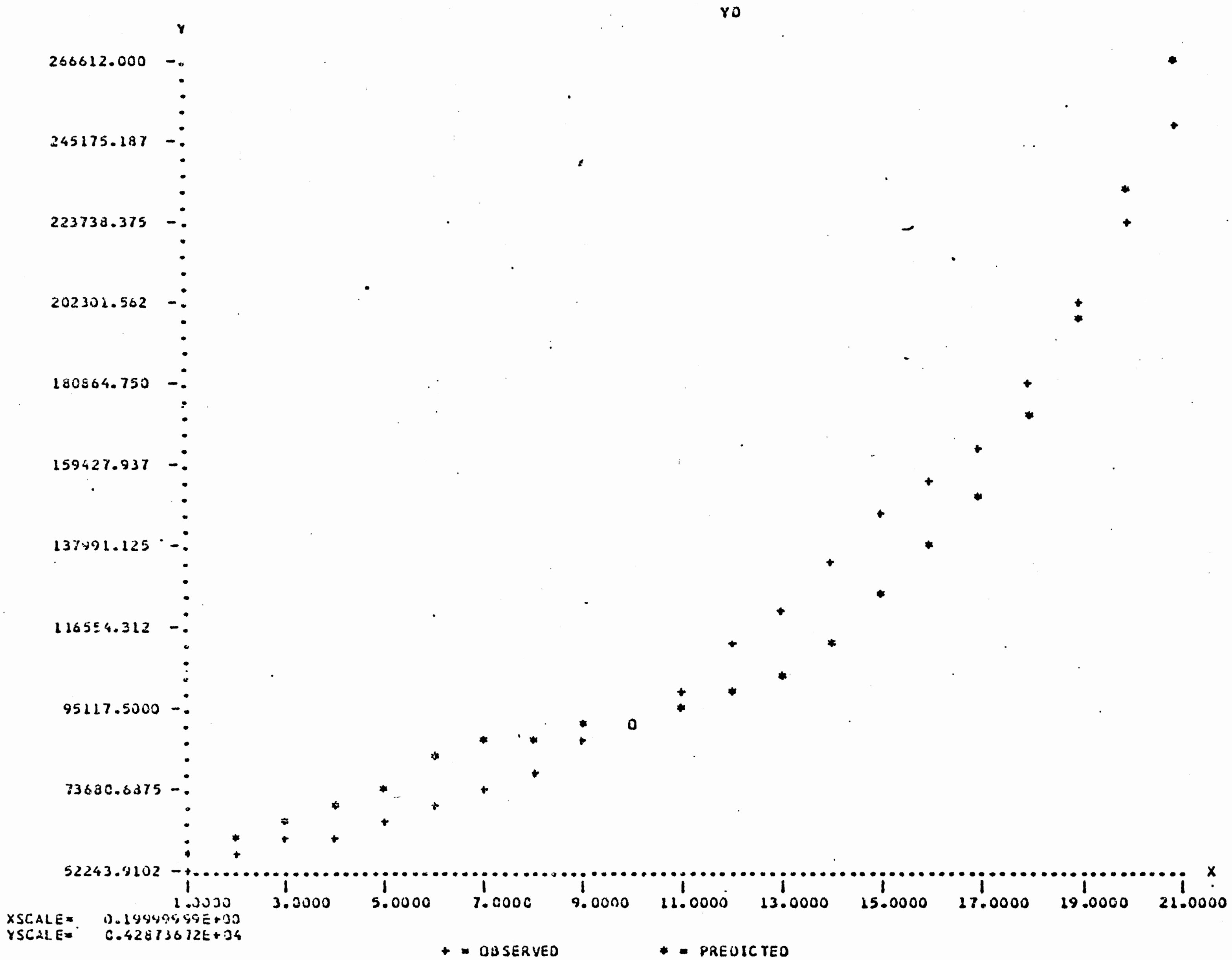
MEAN-ABSOLUTE-ERROR = 9961.0308 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
OF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 9.2869 (IBID., PP 316-317)
OF (21.)

ROOT-MEAN-SQUARE ERROR = 2493.1047 (IBID., PP 316-317)
OF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 2.2439 (IBID., PP 316-317)
OF (21.)

INEQUALITY COEFFICIENT = 0.2341 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
OF (20.)


YO
Y
266612.000
245175.187
223738.375
202301.562
180864.750
159427.937
137991.125
116554.312
95117.5000
73680.6875
52243.9102
X
1.0000
3.0000
5.0000
7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
XSCALE= 0.19999999E+00
YSCALE= 0.42873672E+04
+ = OBSERVED
* = PREDICTED

VARIABLE Y

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	62593.000	68871.500	-6278.500	10.03
2.	68032.000	72794.937	-4762.937	7.00
3.	73277.000	79007.812	-5730.812	7.82
4.	77162.000	86741.500	-9579.500	12.41
5.	82561.000	91707.687	-9146.687	11.08
6.	87221.000	98640.187	-11419.187	13.09
7.	93302.000	104913.625	-11611.625	12.45
8.	98528.000	107459.437	-8931.437	9.06
9.	105048.000	110983.312	-5935.312	5.65
10.	112744.000	114955.312	-2211.312	1.96
11.	122387.000	119593.500	2793.500	2.28
12.	136354.000	123886.750	12467.250	9.14
13.	150696.000	133539.312	17156.687	11.38
14.	162348.000	143803.750	18544.250	11.42
15.	179003.000	158280.750	20722.250	11.58
16.	195106.000	175360.312	19745.687	10.12
17.	211588.000	196864.187	14723.812	6.96
18.	234573.000	221603.375	12969.625	5.53
19.	261558.000	257204.750	4353.250	1.66
20.	292625.000	301977.125	-9352.125	3.20
21.	327693.000	347290.937	-19592.937	5.98

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

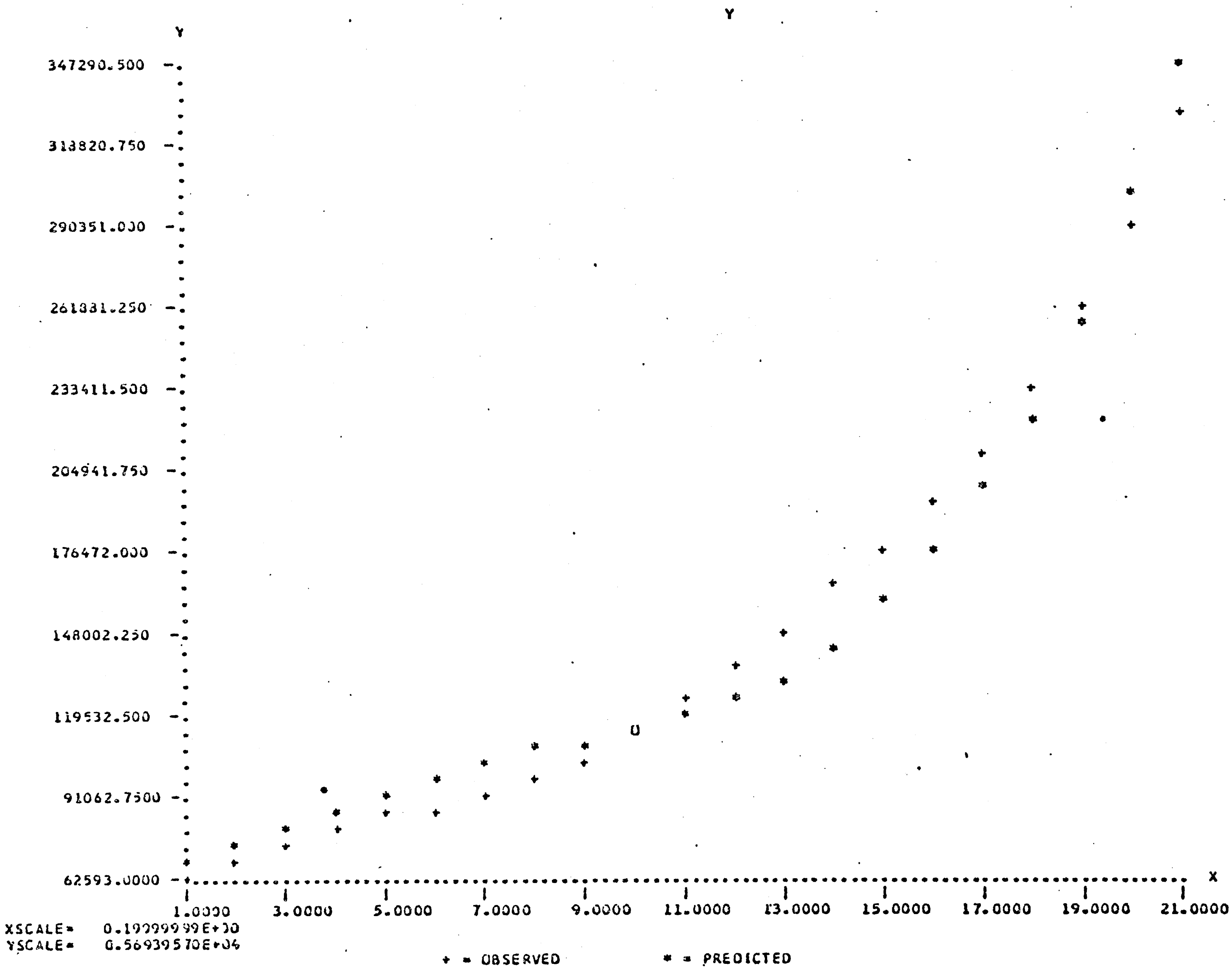
MEAN-ABSOLUTE-ERROR = 10358.5078 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (21.)

MEAN-ABSOLUTE-PERCENT ERROR = 8.0865 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE ERROR = 2673.2625 (IBID., PP 316-317)
DF (21.)

ROOT-MEAN-SQUARE PERCENT ERROR = 1.9313 (IBID., PP 316-317)
DF (21.)

INEQUALITY COEFFICIENT = 0.1881 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (20.)


Y
Y
347290.500
318820.750
290351.000
261881.250
233411.500
204941.750
176472.000
148002.250
119532.500
91062.7500
62593.0000
X
1.0000
3.0000
5.0000
7.0000
9.0000
11.0000
13.0000
15.0000
17.0000
19.0000
21.0000
XSCALE= 0.19999999E+00
YSCALE= 0.56939570E+04
+ = OBSERVED
* = PREDICTED

APPENDIX G

EX POST FORECAST--TAIWAN FORECASTING MODEL

```
      SUBROUTINE USER (PRINT,RHS,II,M)
      DIMENSION PRINT (50,50), RHS (50)
      COMMON IN,IO,IP
      RHS(4)=RHS(2)/PRINT(II,7)
      RHS(16)=PRINT(II,7)/RHS(13)
      RHS(5)=100.*PRINT(II,7)/RHS(3)
      RETURN
      END
```

EX POST FORECAST---TAIWAN FORECASTING MODEL

SIMULATION TYPE IS 5.

THERE ARE 15. ENDOGENOUS VARIABLES AND 16. EXOGENOUS VARIABLES IN THE SYSTEM

THE SIMULATION PARAMETERS ARE 0.0 0.0 0.0 52.000 99.000

THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

MODEL STRUCTURE

```
C     =     0.395 YD       2554.185 CNST      0.460 CL1
IP    =   -18.236 R          18.236 INFL      0.124 Y      -6128.922 CNST      0.370 IPL1
T     =     0.180 Y       -3152.600 CNST
D     =  1894.030 CNST        0.054 KL1
M     =     0.414 Y      -42441.430 CNST    181.738 RMP
W     =     0.441 Y       -5657.660 CNST
PY    =     6.802 CNST        0.000 MS        0.121 PM         0.771 PYL1
R     =     0.000 Y          29.433 CNST     -0.019 MS/P       0.118 ZL1       -0.000 YL1
I     =     1.000 IP          1.000 IG
INFL  =  -100.000 CNST      100.000 Z2
K     =    -1.000 D           1.000 I         1.000 KL1
YD    =    -1.000 T          -1.000 D         1.000 Y          1.000 TR
Y     =     1.000 C          -1.000 M         1.000 I          1.000 G          1.000 X
Z     =     1.000 MS/P
Z3    =     1.000 RMP
```

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	MS	86617.0000	PM	192.4700	MS/P	544.2820	RMP	82.6830
IG	45400.4219	TR	1310.1499	G	49238.0000	X	136744.000	CL1	170898.000
IPL1	50563.9687	KL1	456005.000	PYL1	118.6200	ZL1	682.3301	YL1	327698.000
Z2	1.3416								

LAGGED ENDOGENOUS VARIABLES

PRIOR LOCATION	POSTERIOR LOCATION
1	25
2	26
11	27
7	28
14	29
13	30
0	0
0	0

DETERMINANT = 0.1000000E+01*10** 0

NEW RHS POSITIONS AND VALUES ARE

17 109303.00 18 173.82 21 57580.00 22 1552.20 23 55215.00 24 142047.00 0 0.0 0 0.0 0 0.0 0 0.0

NEW RHS POSITIONS AND VALUES ARE

17 130560.00 18 183.18 21 47444.00 22 1199.40 23 56842.00 24 202274.00 0 0.0 0 0.0 0 0.0 0 0.0

VARIABLE C

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	175520.000	189204.875	-13684.375	7.80
2.	185218.000	205625.250	-20407.250	11.02
3.	196606.000	230605.812	-33999.312	17.29

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 22697.3125 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 12.0360 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 13983.0117 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 7.3124 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.2922 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE IP

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	66628.062	57042.184	9585.879	14.39
2.	37872.641	63308.621	-25435.980	67.16
3.	55048.988	72911.812	-17862.824	32.45

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 17628.2266 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 37.9993 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 10842.0625 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 25.3216 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.7621 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE T

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	60753.422	61573.961	-820.539	1.35
2.	65630.000	66852.562	-1222.562	1.86
3.	61427.559	77660.562	-16233.004	26.43

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 6092.0352 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 9.8799 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 5433.2109 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 8.8421 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.7903 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE D

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	21191.000	26426.457	-5235.457	24.71
2.	23850.000	30516.008	-6666.008	27.95
3.	27047.000	35377.918	-8330.918	30.60

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = DF	6744.1250 (3.)	(SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
MEAN-ABSOLUTE-PERCENT ERROR = DF	27.8191 (3.)	(IBID., PP 316-317)
ROOT-MEAN-SQUARE ERROR = DF	3561.6118 (3.)	(IBID., PP 316-317)
ROOT-MEAN-SQUARE PERCENT ERROR = DF	16.1256 (3.)	(IBID., PP 316-317)
INEQUALITY COEFFICIENT = DF	0.0953 (2.)	(SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)

VARIABLE M

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	145835.000	119501.250	26333.750	18.06
2.	138071.000	134277.625	3793.375	2.75
3.	177980.000	160445.562	17534.437	9.85

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 15887.1375 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 10.2188 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 10621.2500 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 6.9175 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.3819 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE W

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	140762.312	153033.875	-12271.562	8.72
2.	146481.500	165975.875	-19494.375	13.31
3.	162784.875	192474.000	-29689.125	18.24

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 20485.0195 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 13.4215 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 12525.7812 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 8.0674 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.2184 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE PY

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	159.140	136.550	22.590	14.19
2.	164.920	152.653	12.267	7.44
3.	172.700	169.276	3.424	1.98

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 12.7604 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 7.8719 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 8.6443 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 5.3826 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.4650 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE R

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	14.800	24.080	-9.280	62.70
2.	13.300	8.186	5.112	38.44
3.	12.000	16.391	-4.391	36.59

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 6.2610 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 45.9098 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 3.0229 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 27.3817 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.9201 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE I

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	112030.000	102442.375	9587.625	8.56
2.	95454.000	120888.500	-25434.500	26.65
3.	102493.000	120355.750	-17862.750	17.43

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 17628.2891 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 17.5440 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 10841.8164 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 10.9898 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.9762 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE INFL

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	34.160	15.114	19.046	55.76
2.	3.632	11.790	-8.158	224.62
3.	4.717	10.888	-6.171	130.82

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 11.1251 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 137.0670 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 7.2064 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 88.6185 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.6563 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE K

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	546844.000	532020.937	14823.062	2.71
2.	613448.000	622393.375	-3945.375	0.64
3.	693894.000	707371.250	-13477.250	1.94

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 10748.5625 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 1.7636 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 6806.2031 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 1.1317 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.1047 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE YD

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	249062.750	273437.937	-24375.187	9.79
2.	251935.250	293681.812	-41746.562	16.57
3.	292959.375	337793.000	-44833.125	15.30

TEST CRITERIA* FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 36984.9570 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 13.8869 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 21977.0625 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 8.1959 (IBID., PP 316-317)
DF (3.)

INEQUALITY COEFFICIENT = 0.1928 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

VARIABLE Y

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	329697.000	360128.062	-30431.062	9.23
2.	339863.000	389493.375	-49635.375	14.60
3.	380235.000	449632.062	-69397.062	18.25

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

MEAN-ABSOLUTE-ERROR = 49321.1641 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (3.)

MEAN-ABSOLUTE-PERCENT ERROR = 14.0285 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE ERROR = 30194.8750 (IBID., PP 316-317)
DF (3.)

ROOT-MEAN-SQUARE PERCENT ERROR = 6.5771 (IBID., PP 316-317)
DF (3.)

INECUALITY COEFFICIENT = 0.2084 (SEE THEIL,(1965),"ECCNOMIC FORECASTS AND POLICY", PP 32-38)
DF (2.)

APPENDIX H

EX POST SIMULATION--THE SEAKS MODEL

```
0001      SUBROUTINE USER (PRINT,RHS,II,M)
0002      DIMENSION PRINT (50,50), RHS (50)
0003      COMMON IN,IO,IP
0004      RETURN
0005      END
```

EX POST SIMULATION (1953-1970)---SEAKS MODEL(2SLS)

SIMULATION TYPE IS 5.
THERE ARE 11. ENDOGENOUS VARIABLES AND 15. EXOGENOUS VARIABLES IN THE SYSTEM
THE SIMULATION PARAMETERS ARE 0.0 0.0 0.0 17.000 0.0
THIS IS VERSION 4 OF THIS PACKAGE DATED 10-15-68

MODEL STRUCTURE

C	=	0.492 W	0.492 P	2761.000 CNST	0.410 CL1	
IP	=	0.233 GDP	-3955.000 CNST	-0.098 KL1	0.651 IPL1	
W	=	0.277 NI	-4243.000 CNST	0.282 NIL1		
M	=	0.296 I	-1459.000 CNST	0.925 ML1		
X	=	-71050.000 CNST	0.358 IWT	0.589 WPI	-0.149 PTE	1.702 IGL1
D	=	0.001 GDP	-225.900 CNST	0.947 DL1		
I	=	1.000 IP	1.000 IG			
NI	=	-1.000 D	1.000 GDP	-1.000 T		
P	=	-1.000 W	1.000 NI	-1.000 Z		
GDP	=	1.000 C	-1.000 M	1.000 X	1.000 I	1.000 G
K	=	-1.000 D	1.000 I	1.000 KL1		

INITIAL VALUES OF EXOGENOUS VARIABLES

CNST	1.0000	IWT	50000.0000	WPI	99000.0000	PTE	34350.0000	IG	2605.0000
T	5672.0000	Z	1395.0000	G	9193.0000	CL1	28628.0000	KL1	7036.0000
IPL1	3841.0000	NIL1	34308.0000	ML1	7655.0000	DL1	1892.0000	IGL1	2197.0000

```
                    LAGGED ENDOGENOUS VARIABLES
               PRIOR LOCATION           POSTERIOR LOCATION
                    1                        20
                   11                        21
                    2                        22
                    3                        23
                    4                        24
                    6                        25
                    0                         0
                    0                         0
DETERMINANT =    0.1000000E+01*10** 0
NEW RHS POSITIONS AND VALUES ARE
  1353000.0000 1498000.0000 1537750.0000 16 2224.0000 17 7196.0000 18 1335.0000 1910838.0000 26 2605.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1357000.0000 1498000.0000 1546300.0000 16 2820.0000 17 7640.0000 18 2006.0000 1911183.0000 26 2224.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1363000.0000 14********** 1553590.0000 16 3100.0000 17 8070.0000 18 2776.0000 1913285.0000 26 2820.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1366000.0000 14********** 1558410.0000 16 3393.0000 17 8768.0000 18 2974.0000 1913974.0000 26 3100.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1365000.0000 1495000.0000 1565070.0000 16 4417.0000 17 9317.0000 18 3274.0000 1914121.0000 26 3393.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1369000.0000 1497000.0000 1577210.0000 16 4762.0000 1710673.0000 18 3666.0000 1914852.0000 26 4417.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1376000.0000 1498000.0000 1573350.0000 16 4777.0000 1711110.0000 18 4052.0000 1914776.0000 26 4752.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1380000.0000 1497000.0000 1582130.0000 16 5634.0000 1711613.0000 18 3928.0000 1915493.0000 26 4777.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1385000.0000 1497000.0000 1585010.0000 16 5703.0000 1713273.0000 18 3523.0000 1916797.0000 26 5634.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  1391000.0000 1498000.0000 1598120.0000 16 6234.0000 1712125.0000 18 5128.0000 1917014.0000 26 5703.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 15********** 16 5816.0000 1711384.0000 18 7127.0000 1916651.0000 26 6234.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 1536550.0000 16 6291.0000 1717904.0000 18 7225.0000 1918167.0000 26 5816.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 1591200.0000 16 8458.0000 1720716.0000 18 7538.0000 1919095.0000 26 6291.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 1594520.0000 1611144.0000 1723142.0000 18 8470.0000 1920587.0000 26 8458.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 1596090.0000 1613662.0000 1727591.0000 1810176.0000 1922682.0000 2611144.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 15********** 1615071.0000 1730994.0000 1812815.0000 1924837.0000 2613662.0000  0     0.0     0     0.0
NEW RHS POSITIONS AND VALUES ARE
  13********** 14********** 15********** 1620434.0000 1733565.0000 1815528.0000 1925717.0000 2615071.0000  0     0.0     0     0.0
```

VARIABLE C

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	31057.000	30799.918	257.082	0.83
2.	33916.000	33883.664	32.336	0.10
3.	36359.000	36801.437	-442.437	1.22
4.	36359.000	46510.043	-9651.043	26.18
5.	39683.000	59617.055	-19934.055	50.23
6.	42976.000	66986.375	-24010.375	55.87
7.	44951.000	69445.937	-24494.937	54.49
8.	46624.000	69574.062	-22950.062	49.22
9.	49764.000	63041.523	-13277.523	26.68
10.	53753.000	53702.289	50.711	0.09
11.	57543.000	41901.434	15641.566	27.18
12.	65683.000	34224.262	31458.738	47.89
13.	70772.000	31992.930	38779.070	54.79
14.	75345.000	43485.531	31859.469	42.28
15.	80723.000	72403.750	8319.250	10.31
16.	88377.000	117673.312	-29296.312	33.15
17.	93928.000	173045.375	-79117.375	84.23
18.	100945.000	228881.250	-127936.250	126.74

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

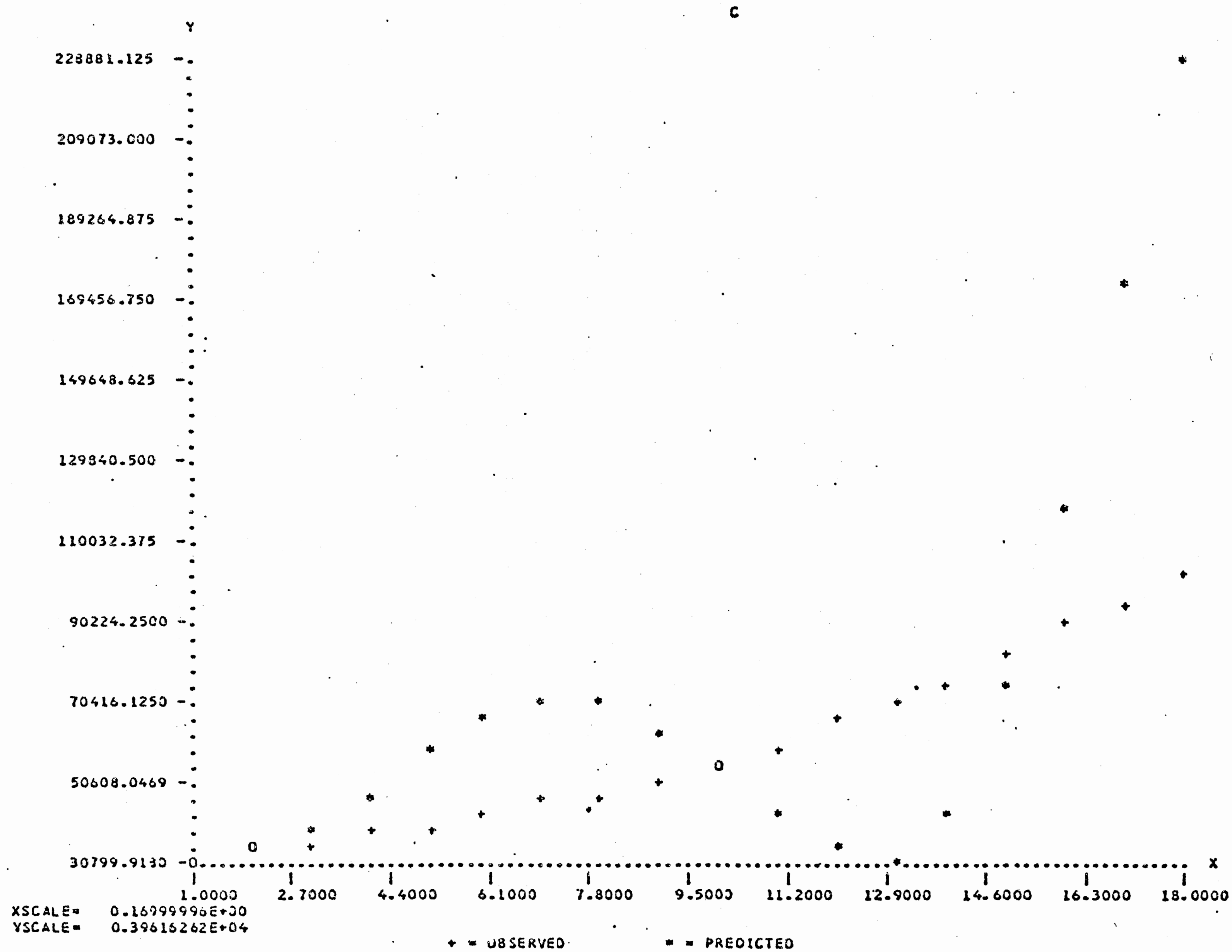
MEAN-ABSOLUTE-ERROR = 26528.2461 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 38.4166 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 9570.7500 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 11.7356 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.7357 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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11.2000
12.9000
14.6000
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18.0000
XSCALE= 0.16999996E+00
YSCALE= 0.39616262E+04
+ = OBSERVED
* = PREDICTED

VARIABLE IP

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	4057.000	2614.038	1442.962	35.57
2.	5107.000	2795.127	2311.873	45.27
3.	3303.000	3530.324	-227.324	6.88
4.	4201.000	7766.211	-3565.211	84.87
5.	4057.000	14044.785	-9987.785	246.19
6.	4350.000	17733.809	-13383.809	307.79
7.	5634.000	17989.953	-12355.953	219.31
8.	7789.000	15701.660	-7912.660	101.59
9.	8614.000	9157.043	-543.043	6.30
10.	9440.000	577.547	8862.453	93.88
11.	9676.000	-9365.520	19041.520	196.79
12.	13826.000	-16639.941	30465.941	220.35
13.	19651.000	-18401.363	38052.363	193.64
14.	20171.000	-11814.918	31985.918	158.57
15.	23738.000	5003.352	18734.648	78.92
16.	26949.000	31603.102	-4654.102	17.27
17.	28599.000	63320.828	-34721.828	121.41
18.	30237.000	93247.500	-63010.500	208.39

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

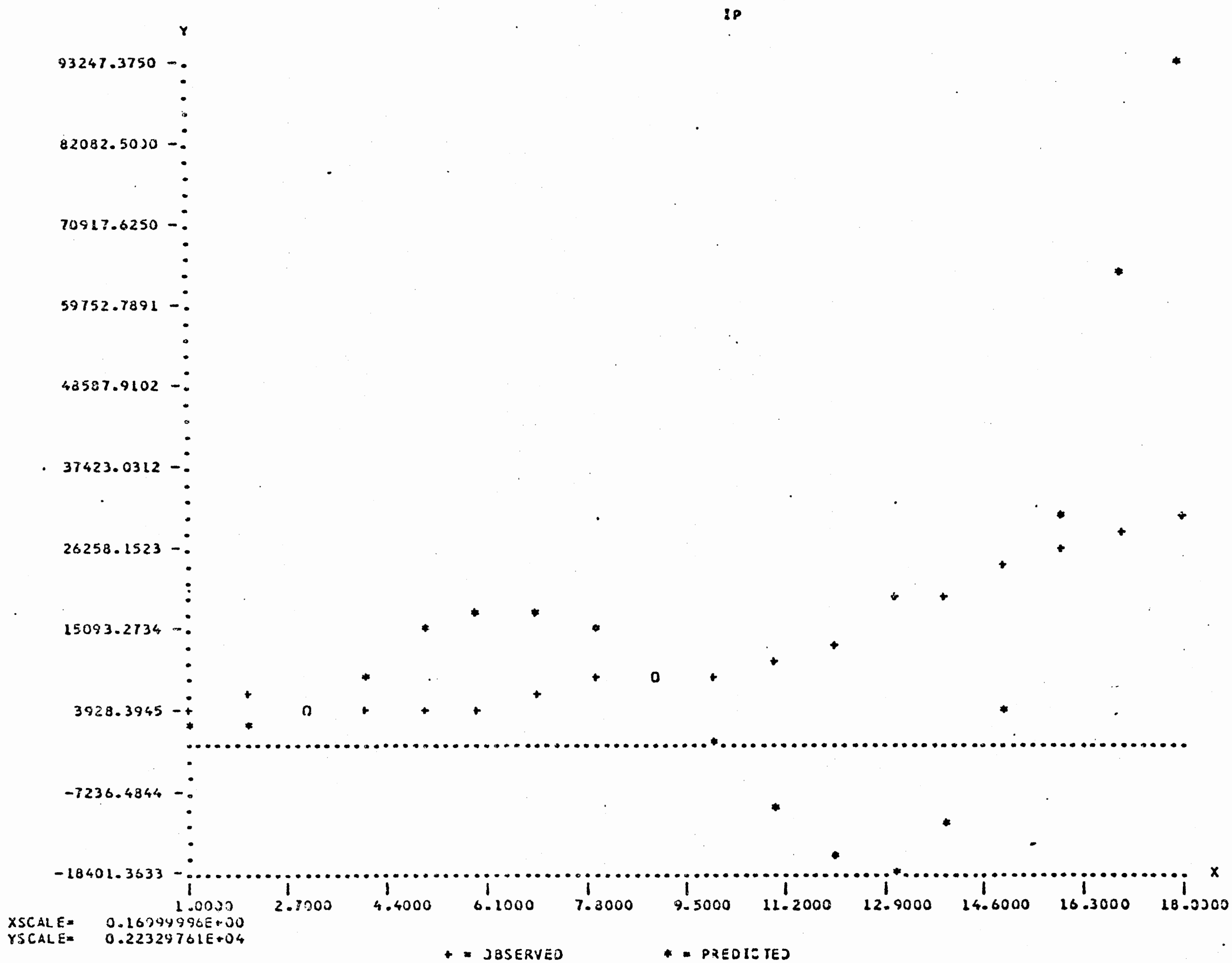
MEAN-ABSOLUTE-ERROR = 16736.9258 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
OF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 130.1661 (IBID., PP 316-317)
OF (18.)

ROOT-MEAN-SQUARE ERROR = 5528.7383 (IBID., PP 316-317)
OF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 37.1763 (IBID., PP 316-317)
OF (18.)

INEQUALITY COEFFICIENT = 0.9602 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
OF (17.)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2.7000
4.4000
6.1000
7.8000
9.5000
11.2000
12.9000
14.6000
16.3000
18.0000
XSCALE= 0.16999996E+00
YSCALE= 0.22329761E+04
+ = OBSERVED
* = PREDICTED

VARIABLE W

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL*	ABSOLUTE PERCENTAGE ERROR
1.	14745.000	14972.785	-227.785	1.54
2.	17645.000	16271.801	1373.199	7.78
3.	19067.000	18627.551	439.449	2.30
4.	20441.000	24752.066	-4311.066	21.09
5.	21434.000	35035.844	-13601.844	63.46
6.	22859.000	41525.773	-18666.773	81.66
7.	23858.000	42544.977	-18686.977	78.33
8.	25472.000	41944.414	-16472.414	64.67
9.	27742.000	37809.141	-10067.141	35.29
10.	30363.000	30168.953	194.047	0.64
11.	33854.000	22197.965	11656.035	34.43
12.	38988.000	17010.699	21977.301	56.37
13.	43268.000	16490.859	26777.141	61.89
14.	47324.000	24111.773	23212.227	49.05
15.	52377.000	45186.734	7190.266	13.73
16.	57317.000	78589.750	-21272.750	37.11
17.	63614.000	119654.812	-56040.812	88.10
18.	70141.000	160879.375	-90738.375	129.37

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

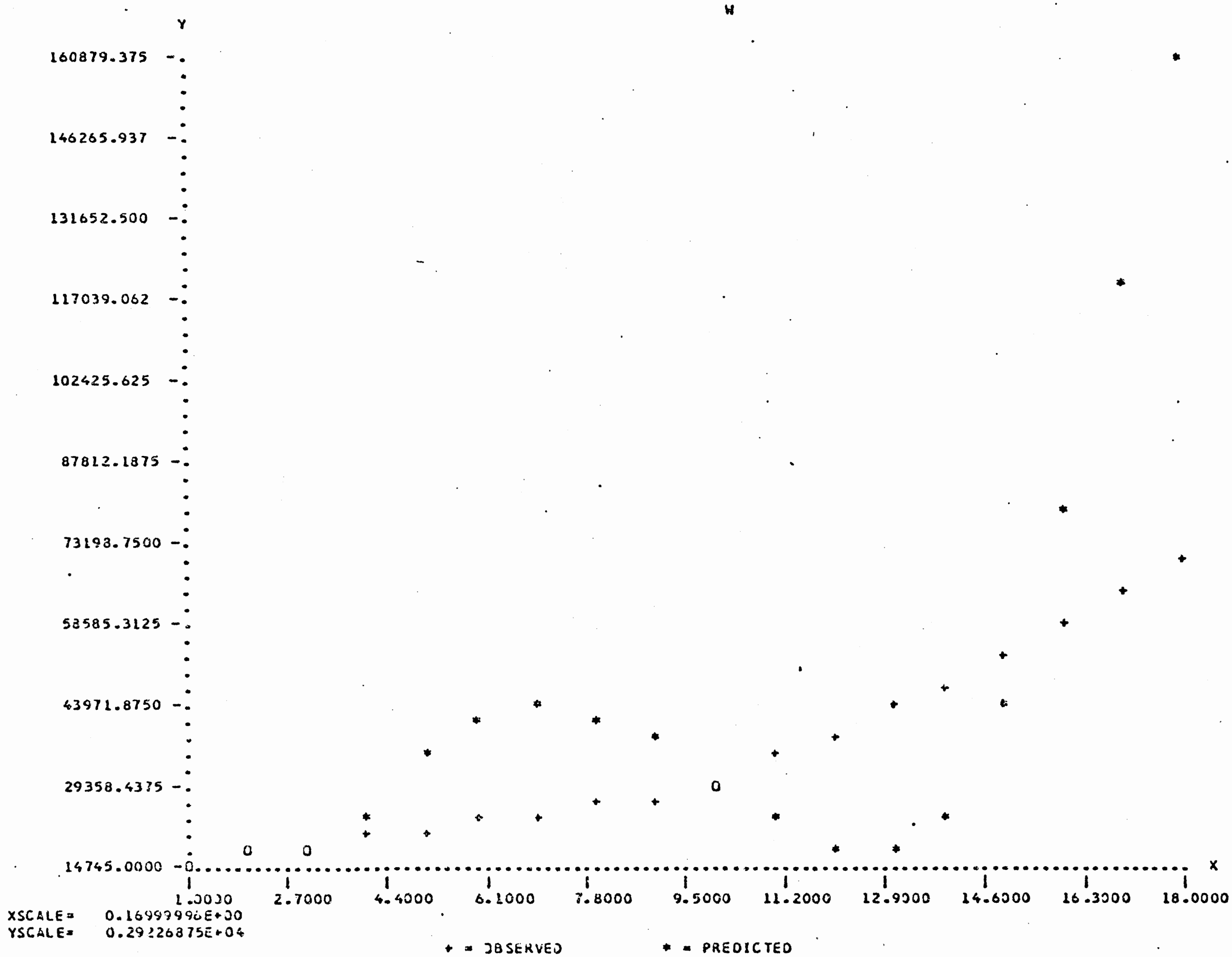
MEAN-ABSOLUTE-ERROR = 19050.2969 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 45.9890 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 6810.6953 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 13.5519 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.7197 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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14745.0000
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2.7000
4.4000
6.1000
7.8000
9.5000
11.2000
12.9000
14.6000
16.3000
18.0000
XSCALE= 0.16999996E+00
YSCALE= 0.29226875E+04
+ = OBSERVED
* = PREDICTED

VARIABLE M

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	8181.000	7165.906	1015.094	12.41
2.	8619.000	6654.340	1964.660	22.79
3.	7246.000	6574.723	671.277	9.26
4.	9011.000	7836.406	1174.594	13.04
5.	9397.000	10946.805	-1549.305	16.49
6.	11288.000	15219.352	-3931.352	34.83
7.	11550.000	19348.152	-7798.152	67.52
8.	12372.000	22495.496	-10123.496	81.83
9.	13642.000	23725.281	-10083.281	73.91
10.	15121.000	22346.398	-7225.398	47.78
11.	15606.000	18287.648	-2681.648	17.18
12.	18812.000	12258.250	6553.750	34.84
13.	23830.000	6300.051	17529.949	73.56
14.	24793.000	3376.528	21415.465	86.38
15.	31063.000	6439.375	24623.625	79.27
16.	41803.000	17882.930	23920.070	57.22
17.	47915.000	38264.937	9650.062	20.14
18.	60818.000	67555.500	-6737.500	11.08

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

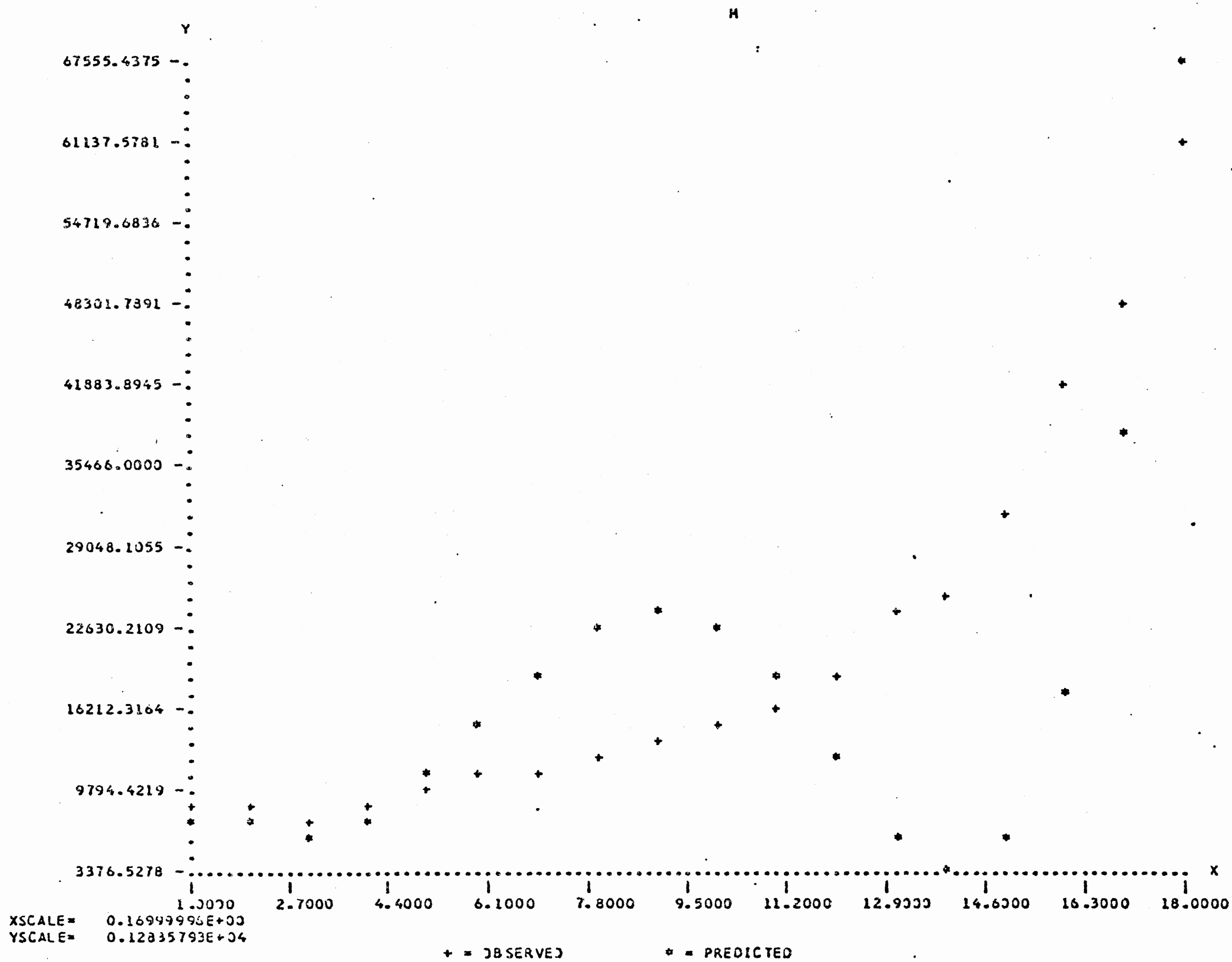
MEAN-ABSOLUTE-ERROR = 8813.8945 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 42.1964 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 2763.7627 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 11.9002 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.6738 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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6.1000
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9.5000
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12.9000
14.6000
16.3000
18.0000
XSCALE= 0.16999996E+00
YSCALE= 0.12835793E+04
+ = OBSERVED
* = PREDICTED

VARIABLE X

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	5753.000	3788.035	1964.965	34.16
2.	4320.000	4464.828	-144.828	3.35
3.	5333.000	3979.493	1353.507	25.38
4.	5768.000	7223.270	-1455.270	25.23
5.	6545.000	9251.109	-2706.109	41.35
6.	7968.000	6636.187	1331.812	16.71
7.	8327.000	6831.445	1495.555	17.96
8.	9588.000	11088.043	-1500.043	15.65
9.	10947.000	10653.742	293.258	2.68
10.	11838.000	13475.676	-1637.676	13.83
11.	15740.000	14384.281	1355.719	8.61
12.	19202.000	19410.266	-208.265	1.08
13.	24038.000	23792.352	245.648	1.02
14.	28579.000	27953.477	625.523	2.19
15.	33333.000	33656.090	-323.090	0.97
16.	42809.000	42778.711	30.289	0.07
17.	51236.000	53553.320	-2317.320	4.52
18.	65996.000	63817.109	2178.891	3.30

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

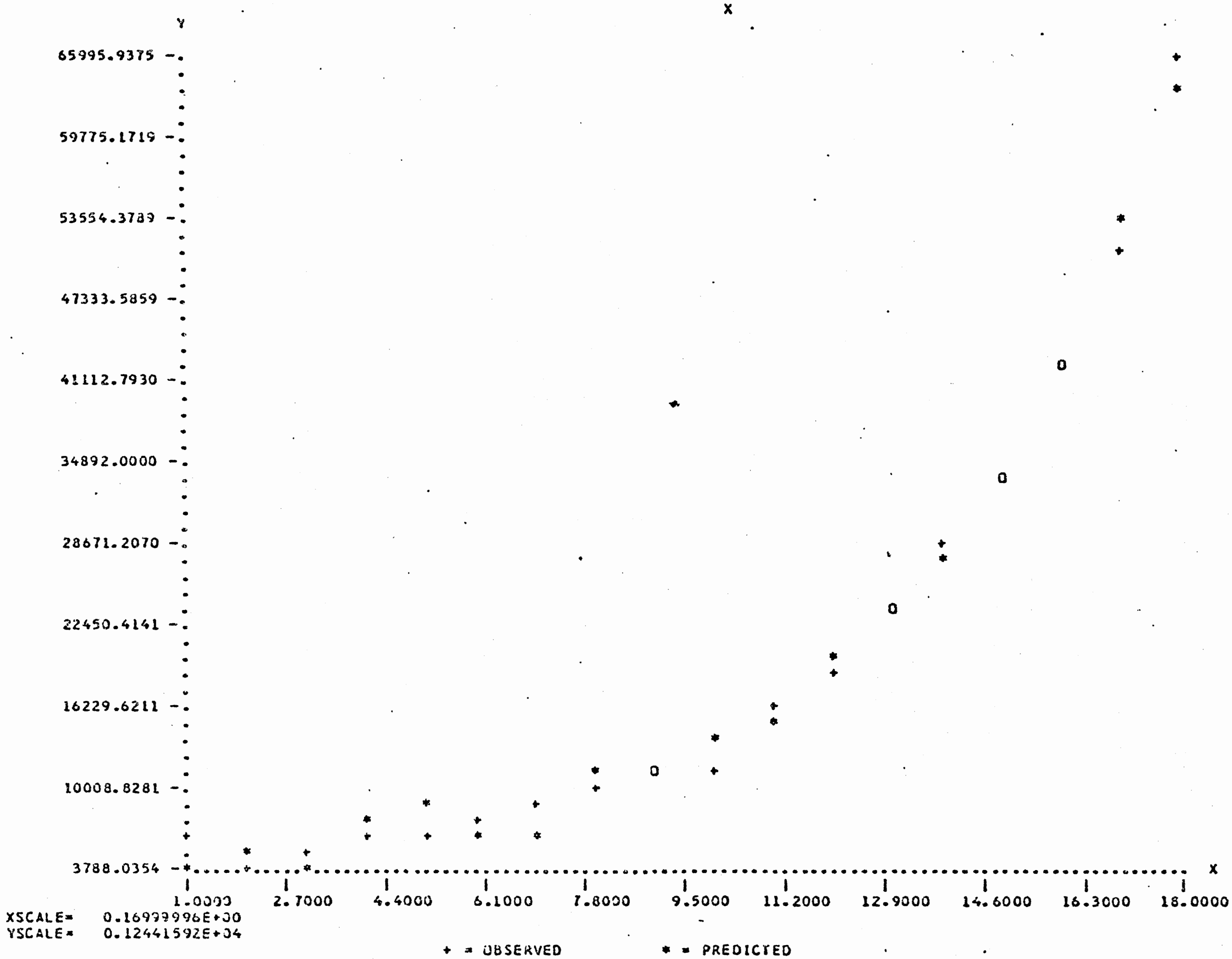
MEAN-ABSOLUTE-ERROR = 1175.9868 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 12.1150 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 336.7361 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 4.0547 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.5628 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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1.0000
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4.4000
6.1000
7.8000
9.5000
11.2000
12.9000
14.6000
16.3000
18.0000
XSCALE= 0.16999996E+00
YSCALE= 0.12441592E+04
+ = OBSERVED
* = PREDICTED

VARIABLE D

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	2236.000	1613.056	622.944	27.86
2.	2278.000	1355.244	922.756	40.51
3.	2310.000	1115.735	1194.265	51.70
4.	2422.000	909.378	1512.622	62.45
5.	2674.000	735.515	1938.485	72.49
6.	2832.000	576.822	2255.178	79.63
7.	3340.000	426.343	2913.657	87.24
8.	3928.000	282.563	3645.437	92.81
9.	4416.000	131.628	4284.371	97.02
10.	4925.000	-25.163	4950.160	100.51
11.	5628.000	-191.628	5819.625	103.40
12.	6417.000	-354.542	6771.539	105.52
13.	6934.000	-499.515	7433.512	107.20
14.	7637.000	-605.184	8242.184	107.92
15.	8517.000	-646.413	9163.413	107.59
16.	9649.000	-602.404	10251.402	106.24
17.	10588.000	-469.946	11057.945	104.44
18.	11990.000	-262.746	12252.742	102.19

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

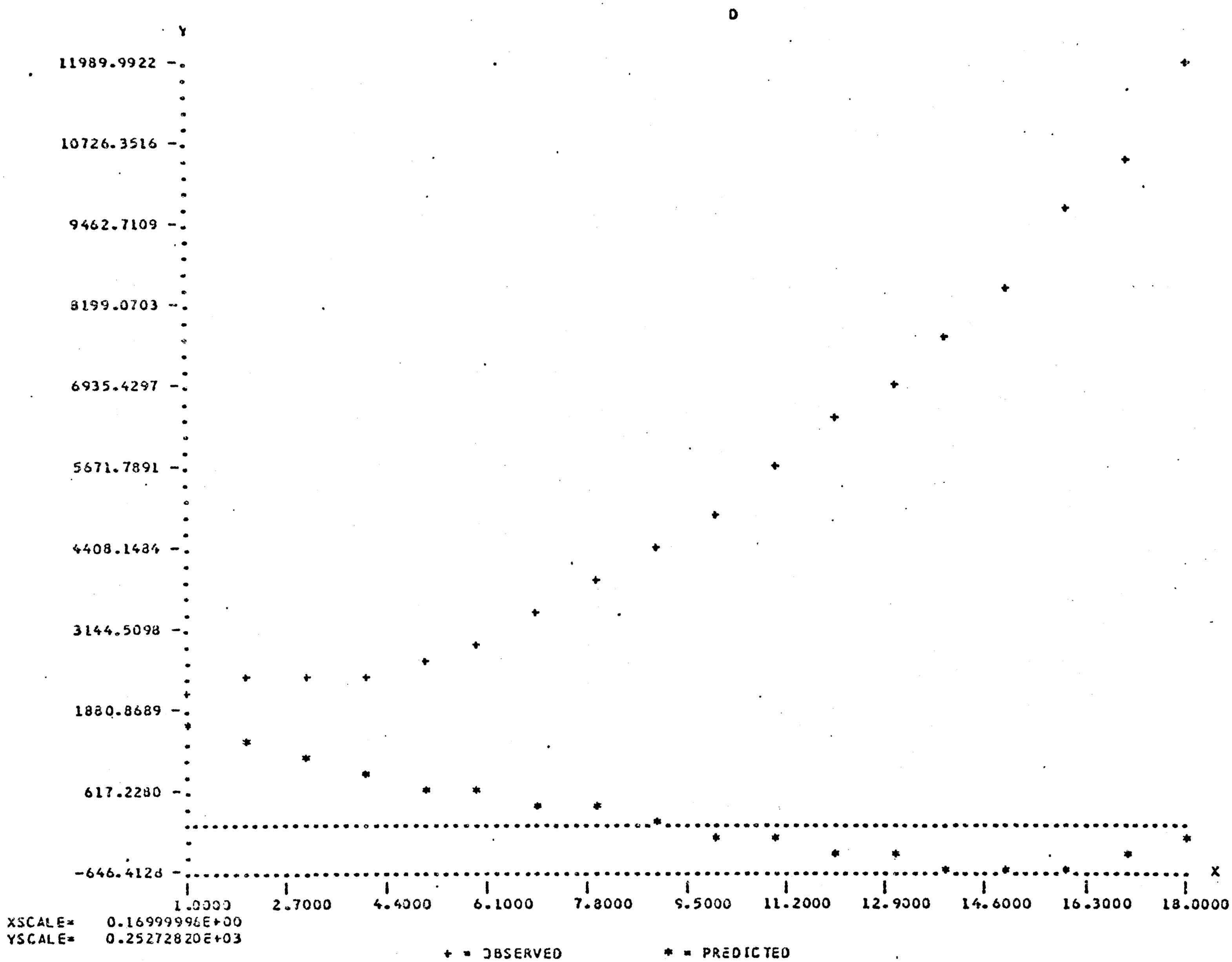
MEAN-ABSOLUTE-ERROR = 5290.5719 (SEE PINDYCK & RUBINFELD,(1975),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 86.4854 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 1514.1396 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 21.1918 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.9617 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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YSCALE= 0.25272820E+03
+ = OBSERVED
* = PREDICTED

VARIABLE 1

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	6662.000	5219.031	1442.969	21.66
2.	7331.000	5019.125	2311.875	31.54
3.	5123.000	6350.316	-1227.316	23.96
4.	7301.000	10866.203	-3565.203	48.83
5.	7450.000	17437.781	-9987.781	134.06
6.	8767.000	22155.805	-13388.805	152.72
7.	10396.000	22751.945	-12355.945	118.85
8.	12566.000	20478.656	-7912.656	62.97
9.	14243.000	14791.035	-543.035	3.81
10.	15143.000	6280.535	8862.465	58.53
11.	15910.000	-3131.539	19041.539	119.68
12.	19642.000	-10823.953	30465.953	155.11
13.	25942.000	-12110.375	38052.375	146.68
14.	28629.000	-3356.922	31985.922	111.73
15.	34882.000	16147.340	18734.660	53.71
16.	40611.000	45265.094	-4654.094	11.46
17.	43670.000	78391.812	-34721.812	79.51
18.	50671.000	113681.500	-63010.500	124.35

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

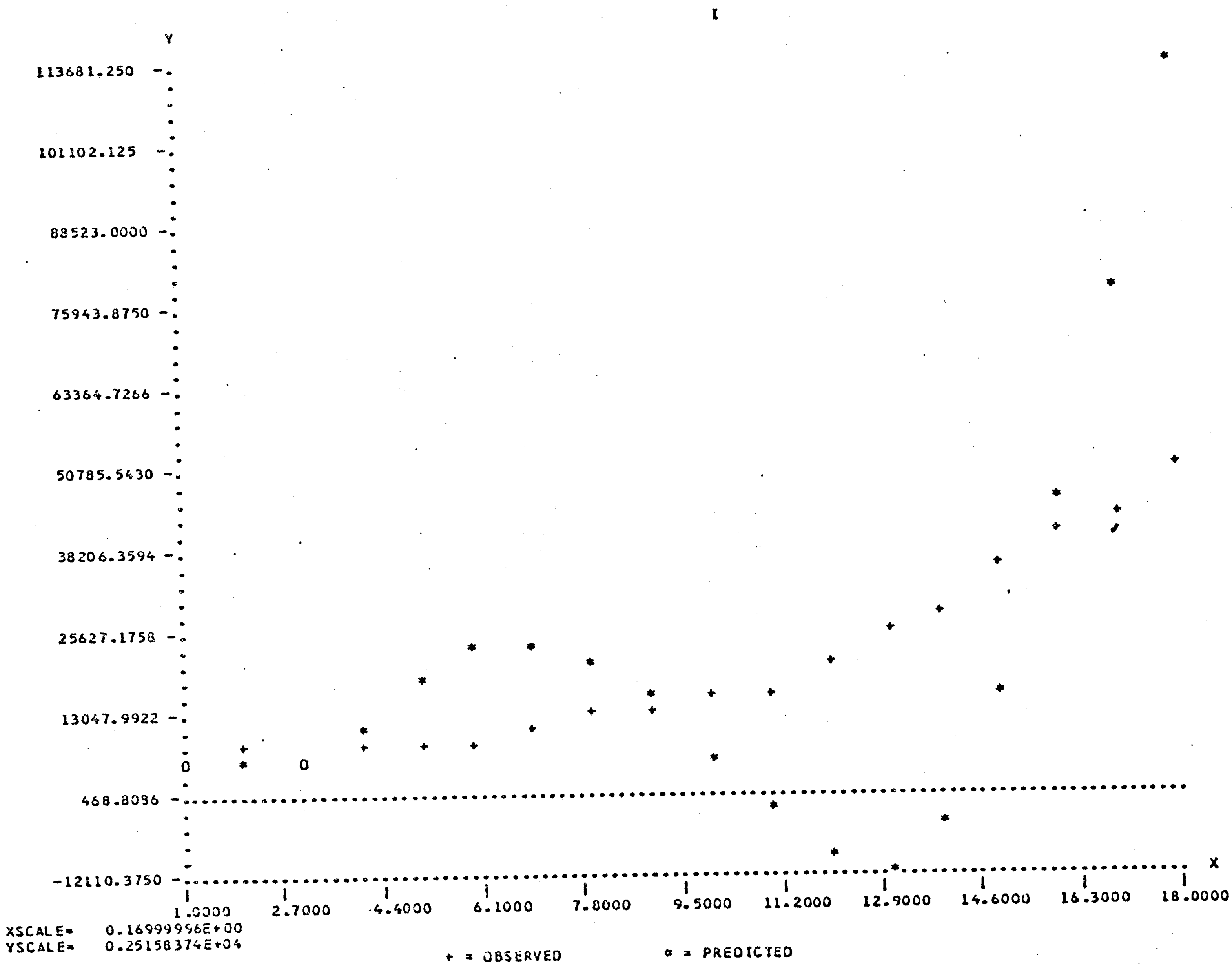
MEAN-ABSOLUTE-ERROR = 16792.4844 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 81.0639 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 5529.1211 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 22.5278 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.7689 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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XSCALE= 0.16999996E+00
YSCALE= 0.25158374E+04
+ = OBSERVED
* = PREDICTED

VARIABLE NI

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	36576.000	34548.934	2027.066	5.54
2.	38312.000	38999.910	-687.910	1.80
3.	41802.000	42983.672	-1181.672	2.83
4.	43710.000	61068.605	-17358.605	39.71
5.	46813.000	79829.187	-33016.187	70.53
6.	49615.000	84185.937	-34570.937	69.68
7.	52963.000	83433.687	-30470.687	57.53
8.	56144.000	82028.562	-25884.562	46.10
9.	60781.000	68509.250	-7728.250	12.71
10.	64207.000	54656.059	9550.941	14.88
11.	72848.000	39946.949	32901.051	45.16
12.	84565.000	36173.621	48391.379	57.22
13.	90251.000	38137.187	52113.812	57.74
14.	97502.000	63689.477	33812.523	34.68
15.	106803.000	113858.812	-7055.812	6.61
16.	115436.000	183527.375	-68091.375	58.99
17.	124174.000	261038.187	-136864.187	110.22
18.	136856.000	331133.937	-194282.937	141.96

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

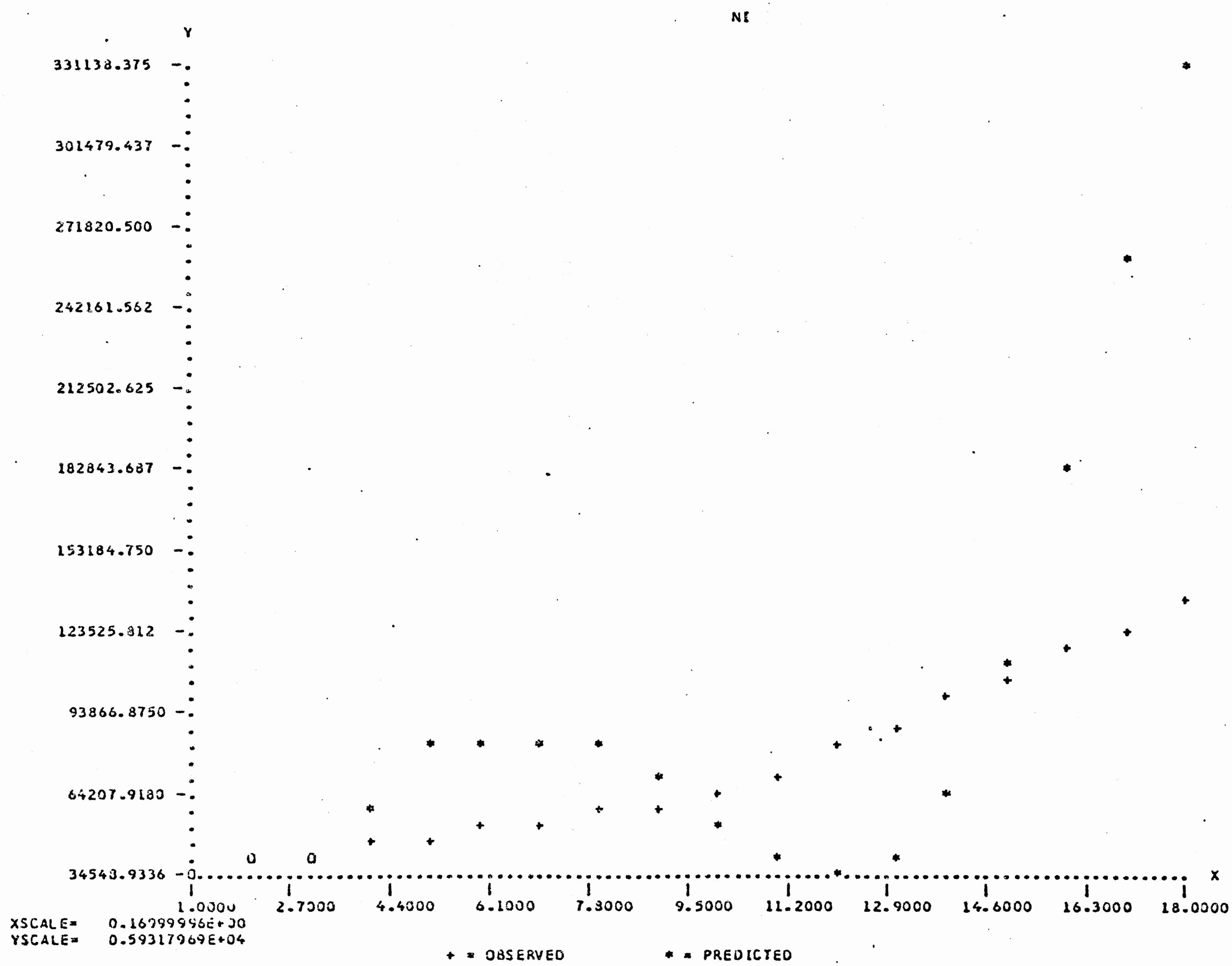
MEAN-ABSOLUTE-ERROR = 40388.3203 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 315-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 46.3273 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 14988.5937 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 13.9380 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.7426 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)



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XSCALE= 0.16999996E+00
YSCALE= 0.59317969E+04
+ = OBSERVED
* = PREDICTED

VARIABLE P

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	20436.000	18181.133	2254.867	11.03
2.	19282.000	21343.121	-2061.121	10.69
3.	20729.000	22350.156	-1621.156	7.82
4.	20493.000	33540.504	-13047.504	63.67
5.	22405.000	41819.621	-19414.621	86.65
6.	23482.000	39386.359	-15904.359	67.73
7.	25439.000	37222.891	-11783.891	46.32
8.	26620.000	36032.324	-9412.324	35.36
9.	29111.000	26772.215	2338.785	8.03
10.	30221.000	20864.223	9356.777	30.96
11.	33866.000	12621.059	21244.941	62.73
12.	38450.000	12035.953	26414.047	68.70
13.	39758.000	14421.348	25336.652	63.73
14.	42640.000	32039.816	10600.184	24.86
15.	45956.000	60202.289	-14246.289	31.00
16.	47943.000	94761.750	-46818.750	97.66
17.	47745.000	128568.562	-80823.562	169.28
18.	51187.000	154731.562	-103544.562	202.29

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

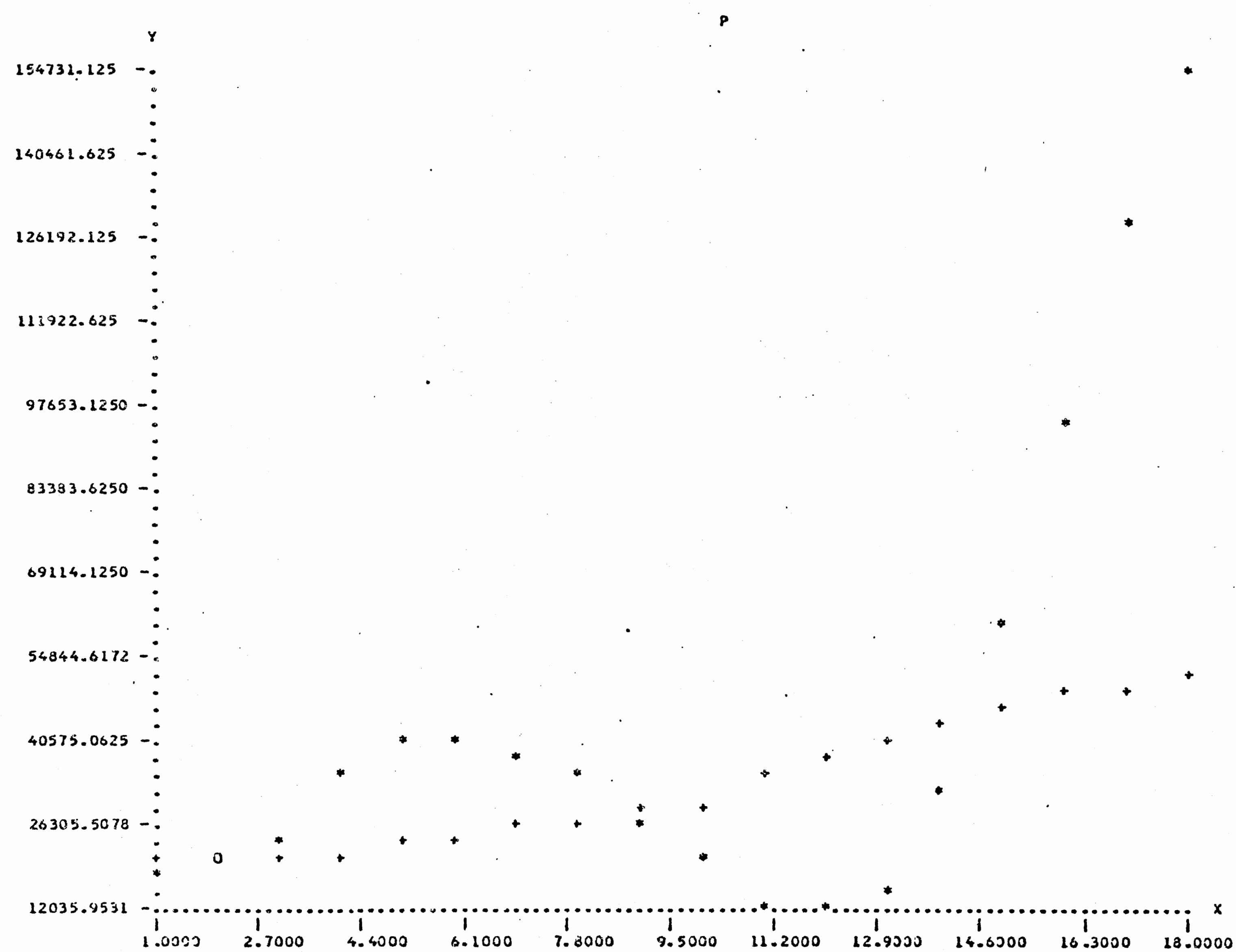
MEAN-ABSOLUTE-ERROR = 23123.5625 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 60.4727 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 8367.4609 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 18.7802 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.8413 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)



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YSCALE= 0.28539111E+04

+ = OBSERVED   * = PREDICTED

VARIABLE GDP

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	44484.000	41833.879	2650.121	5.95
2.	47786.000	47551.105	234.895	0.49
3.	51752.000	51739.391	12.609	0.02
4.	54202.000	70047.875	-15845.875	29.23
5.	58255.000	89332.750	-31077.750	53.35
6.	62364.000	94679.687	-32315.687	51.82
7.	66976.000	94532.875	-27556.875	41.14
8.	71182.000	93420.937	-22238.937	31.24
9.	76810.000	80253.812	-3443.812	4.48
10.	82410.000	67908.812	14501.187	17.60
11.	90601.000	51880.254	38720.746	42.74
12.	102366.000	47203.008	55162.992	53.89
13.	115089.000	55541.582	59547.418	51.74
14.	125855.000	83800.250	42054.750	33.42
15.	138462.000	136354.312	2107.687	1.52
16.	152676.000	210515.937	-57839.937	37.88
17.	165756.000	291562.250	-125806.250	75.90
18.	182511.000	364541.062	-182030.062	99.74

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

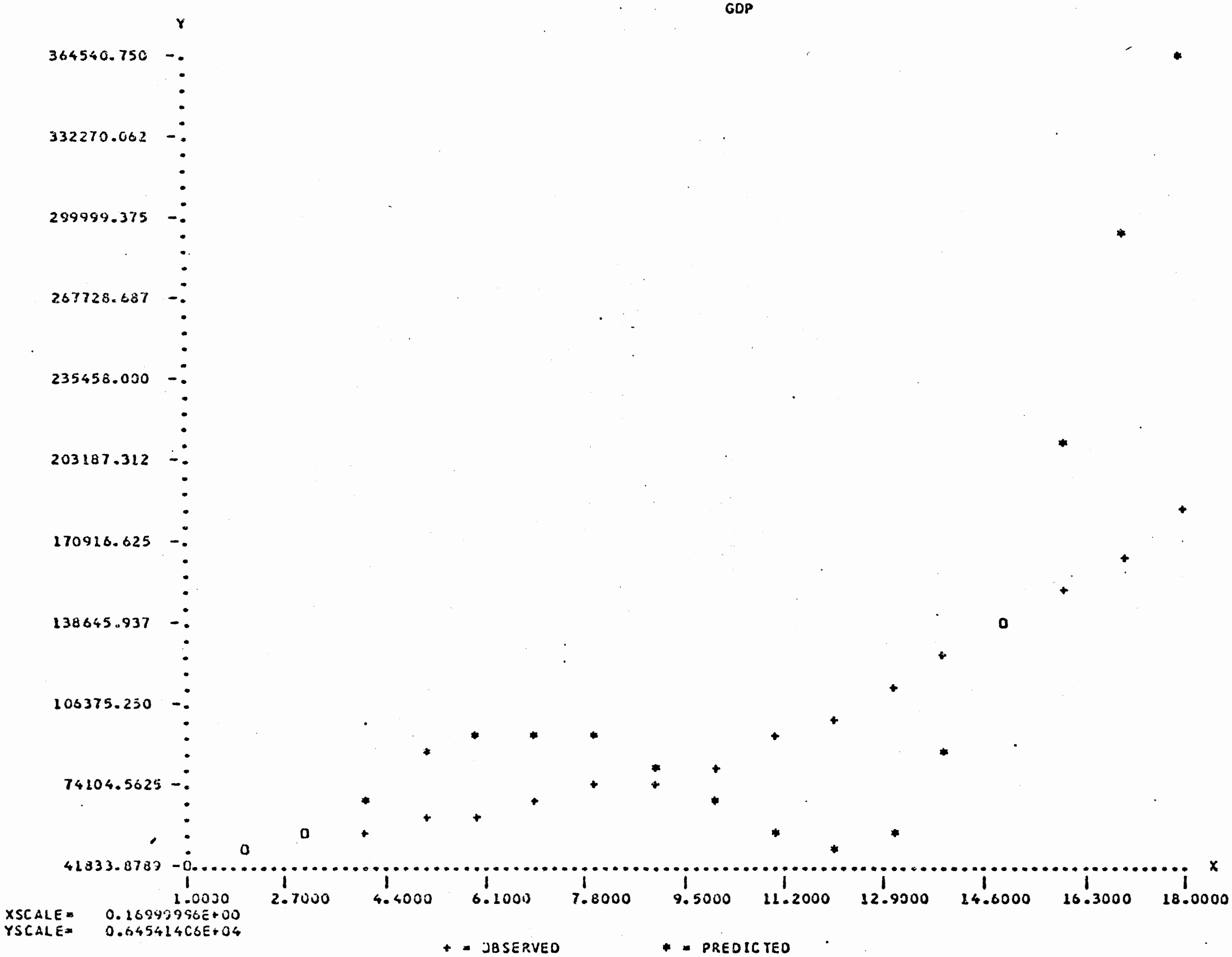
MEAN-ABSOLUTE-ERROR = 39619.3008 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 35.1201 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 14263.0977 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 10.4068 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.6742 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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XSCALE= 0.16999996E+00
YSCALE= 0.64541406E+04
+ = OBSERVED
* = PREDICTED

VARIABLE K

	OBSERVED VALUE	FORECASTED VALUE	RESIDUAL	ABSOLUTE PERCENTAGE ERROR
1.	11462.000	10641.973	820.027	7.15
2.	16515.000	14305.844	2209.156	13.38
3.	19328.000	19540.414	-212.414	1.10
4.	24207.000	29497.238	-5290.238	21.85
5.	28983.000	46199.496	-17216.496	59.40
6.	34913.000	67773.375	-32860.375	94.11
7.	41974.000	90103.875	-48129.875	114.67
8.	50612.000	110299.687	-59687.687	117.93
9.	60444.000	124958.937	-64514.937	106.74
10.	70662.000	131264.437	-60602.437	85.76
11.	80944.000	128324.312	-47380.312	58.53
12.	94169.000	117854.687	-23685.687	25.15
13.	113177.000	106243.687	6933.312	6.13
14.	134169.000	103491.750	30677.250	22.86
15.	160534.000	120285.437	40248.562	25.07
16.	191496.000	166152.750	25343.250	13.23
17.	224578.000	245014.312	-20436.312	9.10
18.	263259.000	358958.437	-95699.437	36.35

TEST CRITERIA FOR EVALUATING MULTI-EQUATION SIMULATION MODELS.

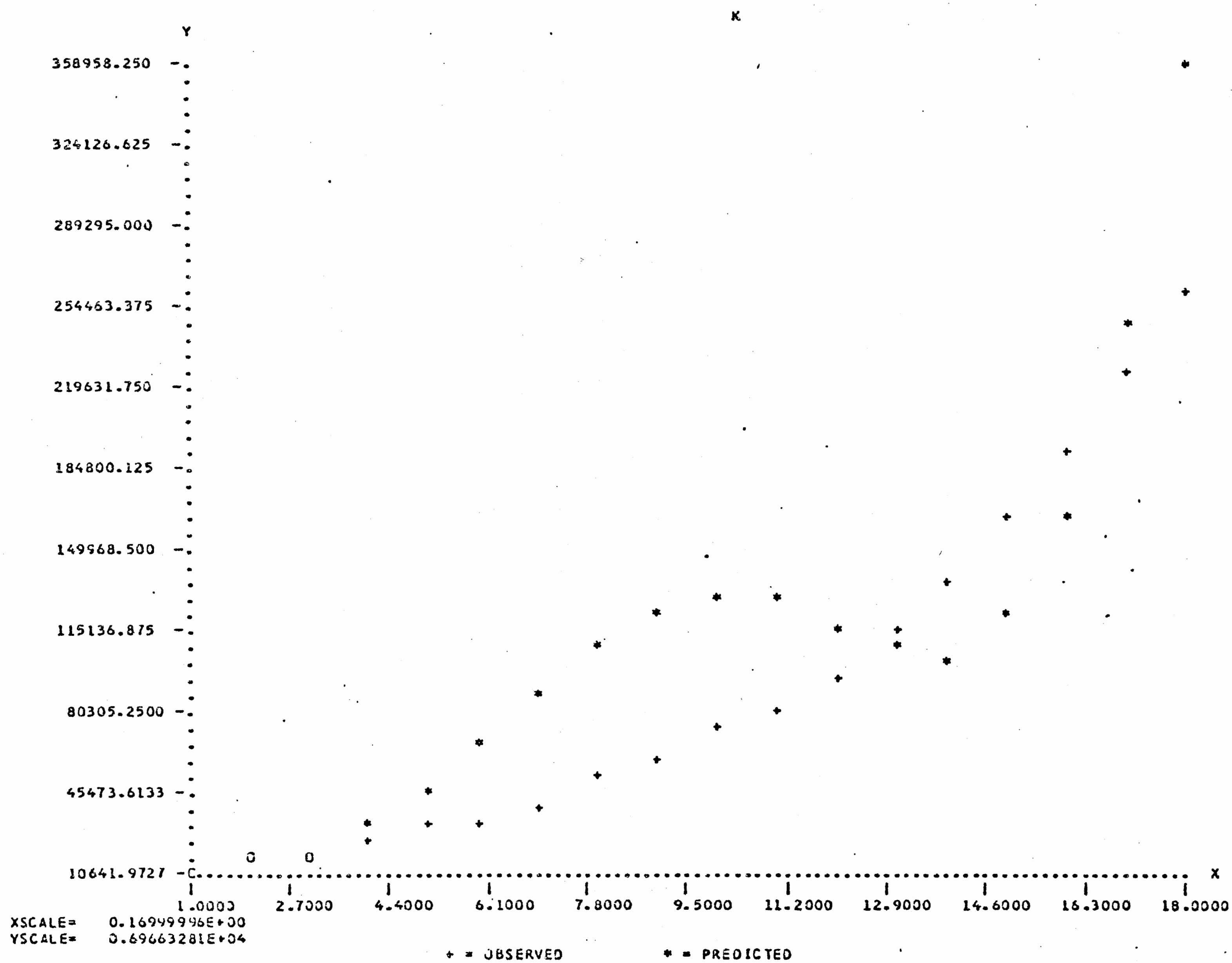
MEAN-ABSOLUTE-ERROR = 32330.4297 (SEE PINDYCK & RUBINFELD,(1976),"ECONOMETRIC MODELS AND ECONOMIC FORECASTS", PP 316-317)
DF (18.)

MEAN-ABSOLUTE-PERCENT ERROR = 45.4735 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE ERROR = 9743.1523 (IBID., PP 316-317)
DF (18.)

ROOT-MEAN-SQUARE PERCENT ERROR = 14.2427 (IBID., PP 316-317)
DF (18.)

INEQUALITY COEFFICIENT = 0.3959 (SEE THEIL,(1965),"ECONOMIC FORECASTS AND POLICY", PP 32-38)
DF (17.)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XSCALE= 0.16999996E+00
YSCALE= 0.69663281E+04
+ = OBSERVED
* = PREDICTED

VITA

Peter Tsu-Yuan Chang

Candidate for the Degree of

Doctor of Philosophy

Thesis: A MACROECONOMETRIC FORECASTING MODEL OF TAIWAN

Major Field: Economics

Biographical:

Personal Data: Born in Taipei, Taiwan, June 2, 1935, the son of Mr. and Mrs. A. S. Chang.

Education: Bachelor of Arts degree in Business Administration, National Taiwan University, June, 1961; Master of Arts degree in Economics, College of Chinese Culture, 1964; Master of Science degree in Statistics, Brigham Young University, 1969; completed requirements for the Doctor of Philosophy degree at Oklahoma State University in December, 1977.

Professional Experience: Lab Instructor in Business Mathematics, National Taiwan University, 1959-1960; Chief Accountant and Instructor in Economics, College of Chinese Culture, 1964-1965; Graduate Teaching Assistant (Lab Instructor) in Introductory Statistical Inference, Brigham Young University, 1967-1969; Graduate Assistant in Economics, Oklahoma State University, 1973-1976.