Discussion Paper

CHUNG-HUA INSTITUTION FOR ECONOMIC RESEARCH

75 Chang-Hsing St., Taipei, Taiwan, 106

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An Analysis of the Effects of Economic Policies on Taiwan's Economic Growth and Stability

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Regardless of the political basis or administrative approach a country adopts, its government must play some role in stimulating economic activities in order to reduce recession and to curb inflation. However, there are many policy measures to choose amongst as for which are more effective. No one can give an all-encompassing answer, even though the policy-makers are usually confident in what they are going to undertake. For determining why "X" policy is preferred to "Y" policy, past experiences usually provide an important basis, but this is not enough, because economic conditions and social backgrounds are changeable. Economic problems are quite different from natural science problems and it is extremely expensive to take the whole of society or the whole economy as an experiment for one economic policy. To overcome this problem, a model-building approach has been herewith employed to look at the period following World War Two. The purpose of this paper is an attempt to examine the effects of economic policies on economic growth and price stability through a model building approach so as to see which policy measure is more effective than others in achieving the goals set by the government.

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The paper consists of five points: (1) the selection of model-building approaches, and we selected a quarterly econometric model as a tool since it is easy to manage under data constraints and efficient to find the answers we need, in a short time; (2) the nature of Taiwan's economy and building of the model. Taiwan is a trade-oriented economy and the government has played an important role in the process of economic development, and the model structure has to take this into account; (3) the design of the quarterly econometric model includes theoretical consideration and the evaluation of the performance of the model. To assess the performance of the model, we make use of a turning point test and AAPE (average absolute percentage error) to evaluate the performance of its structural equations. The AAPE and the Theil inequality coefficient evaluate the performance of its simultaneous equations; (4) a comparison of the effects of policy measures on economic growth and price fluctuations. We simply use a one-period effect comparison, and the findings are interesting and significant; and (5) finally, concluding remarks.

I. The Selection of Model-building Approaches

Usually, model-building approaches can be used as a tool for testing the validity of economic theories, predicting economic activities, and simulating the impact of an economic policy. Many models have been employed for forecasting, but they may not be an appropriate tool for evaluating the impact of an economic policy, such as time series models, since they are primarily based on historical patterns and do not relate the endogenous variables to a large number of exogenous variables and policy variables. They are thus unable to help policy-makers know the direction of the relationships, and the magnitudes involved. As compared with time series models,

an econometric model not only can verify economic theories and predict the value of economic magnitudes, but can also enable the policy-maker to judge whether it is necessary to implement policy measures in order to influence the relevant economic variables, and which policy measure is more effective to take if it is necessary.[1]

During the last two decades, additional model-building approaches have been developed and elaborated on, such as the computational general equilibrium model (CGE Model) and INFORUM approach. The former model attempts to convert the Walrasian general-equilibrium structure from an abstract representation of an economy into a realistic model of an actual economy. This can then be used to evaluate policy options by specifying production and demand parameters and incorporating data reflective of real economies.[2] The shortcoming of this approach is that it ignores the existence of residuals and the influence of other factors. Furthermore, it also has the difficulty of choosing appropriate elasticities and parameter values. The latter model is primarily used to combine input-output and regression-based econometrics which can then be used for business forecasting and government policy analysis. Final demands are determined by behavioral equations and estimated with econometric techniques and input-output coefficients are projected to change.[3] The shortcoming of this approach is the data problem. An input-output table is usually prepared every five years and the detailed classification of trade data may be not available. Particularly for short-term economic policy analysis, or involving a rapid growth of industrial sectors, this approach is not appropriate. In view of these three main approaches, we still prefer to use the econometric model as a tool for policy analysis.

II. The Nature of Taiwan's Economy and Model-building

To see the effects of economic policies on economic growth and price stability, any attempt at model-building must be based on the characteristics of the economy in question. Taiwan, as an island endowed with limited natural resources and a dense population, has achieved high economic growth and a relatively stable price level over the last forty years. The leading sector in Taiwan's economic development has been its foreign trade. During this period of time, foreign trade underwent the most rapid growth.[4] It can be seen that without the expansion of its foreign trade, it would have been impossible for Taiwan's economy to have had such a remarkable achievement. Since Taiwan's economy can not be self-sufficient, imports are urgently required. To finance its imports, Taiwan has had to strengthen its exports. In turn, most of these imports are used for industrial and agricultural production, and this then comprises exports and domestic consumption.

However, during the same period of time, the Chinese government on Taiwan has adopted many policy measures in order to stimulate economic growth and reduce price fluctuation. Particularly, in the early stages of Taiwan's economic development, the government played a leading role in many economic activities not only because the majority of the people in Taiwan were poor and not well-educated, but because there were no large firms to support infrastructure and public utilities. The government thus made use of monetary policy, fiscal policy and other administrative measures to influence the private sector for achieving the expected goals.

Based on the above consideration, we built a quarterly econometric model which can reflect the characteristics of Taiwan's economy and can help us explore the simulated effects of economic policies on economic growth and price stability. Due

to the limitation of data, some of the functions in the model have to be tailored so as to fit available data.

III. The Design of the Quarterly Econometric Model

In designing the quarterly econometric model, first, we took into account the theoretical framework for this model which includes domestic product, domestic demand, foreign trade, money and public finance, the labor force and unemployment, wages and prices, and definitions and identities. Except for definitions and identities, we constructed structural equations for each item and estimated their relationships. Secondly, we evaluated the performance of this model in order to see whether they meet the requirements statistically and theoretically. In this regard, we have used a turning point test [5] and AAPE to evaluate the performance of the structural equations, and further, the AAPE and Theil inequality coefficient[6] to evaluate the performance of the simultaneous equations.

1. The Theoretical Framework of the Model

Domestic Product

To explain the production function, we do not follow the traditional approach emphasizing the effective combination of factors. Rather, we pay special attention to the importance of final demand instead.

$$GDP = GDPAG + GDPIN + GDPSE$$

Where gross domestic product (GDP) is composed of gross agricultural product (GDPAG), gross industrial product (GDPIN), and gross service product (GDPSE).

GDPAG is assumed to be a function of private consumption expenditure on food and GDPAG lagged for one period. GDPIN is a function of domestic demand, and exports, indicating industrial production not only for domestic demand but also for exports. And lastly, GDPSE is a residual of GDP. As for the estimate of GDP, we still follow the Keynesian approach.

$$GDP = C + CG + I + J + X - M$$

Which means that GDP consists of private consumption expenditure, government consumption expenditure, gross fixed capital formation, increase in stock, exports of goods and services and imports of goods and services. Though the factors of production were not constraints before 1980, since then, they have been subject to some constraints.[7] To display the possible influence of the constraints, we constructed a potential production function in which potential capital and potential labor are utilized as explanatory variables. In addition, technology, the exchange rate of the Japanese Yen to the U.S. dollar, and oil prices are used as explanatory variables, of which, the last two variables are used to stand for foreign imports on the production function because Taiwan's economy is heavily dependent on its exports and imports.

Domestic Demand

Domestic demand includes private consumption expenditure, government consumption expenditure, gross fixed capital formation, and increase in stock. Gross fixed capital formation can be divided into components of gross private, gross public and gross government fixed capital formation. The last two are considered to be exogenous, while gross private fixed capital formation is mainly explained by gross industrial product, real market interest rate,[8] and gross private fixed capital formation lagged one period. Increase in stock is mainly determined by consumption

expenditure (private and government) and gross fixed capital formation, the real interest rate, increase in stock lagged one period, and stock of inventory lagged one period. Private consumption expenditure is separated into two parts, namely, consumption expenditure on food, and consumption expenditure on non-food items. The former is mainly explained by disposable personal income and private consumption expenditure on food lagged one period, while the latter is explained by liquid assets, average tariffs, and private consumption expenditure on non-food items lagged one period. As for the stock of inventory, it is determined by domestic demand and the rate of change in the price deflator of GDP.

Foreign Trade

As mentioned above, foreign trade has been the leading sector in Taiwan's economic development, and it not only closely relates to domestic activities but also links to foreign markets. For the purpose of explanation, we divide the exports of goods and services into the export of goods and the export of services respectively. Similarly, we also divide the import of goods and services into the import of goods and the import of services respectively. Since the import and export of goods in the customs data are different from those in the national income account, it is necessary to build a relation between them, i.e., the import (or export) of goods in the national income account is a function of the import (or export) of goods in the customs data.

Here, the import of goods through customs is mainly explained by gross industrial product, price deflator of imports and the import of goods through customs lagged one period. The import of services is explained by GNP and the import of services lagged one period. When dealing with exports, we explain them by importing countries which include the United States, Japan, Hong Kong and Mainland

China, and the rest of the world. Since the trade with Mainland China is mainly through Hong Kong and no direct trade is so far permitted, we have to combine these areas together. In explaining the export of goods to each country (or area), their GNP, export prices and lag variables are the main explanatory variables. However, when dealing with the exports to the U.S., we add the wholesale price index as an explanatory variable. When dealing with the exports to Japan, we add the exchange rate as an explanatory variable. And finally, when dealing with the exports to Hong Kong and Mainland China, we add two more variables as explanatory variables, i.e., total imports of goods of mainland China, and the exchange rate. The export of goods to the rest of the world are explained by the world trade volume index. As for the export of services, this is explained by the GNP of the U.S. and Japan and the export of services lagged one period.

The adoption of a lag variable is to express the continuation of transactions in a short-period of time, such as a quarter, and the use of dummy variables is for seasonal adjustment.

Money and Public Finance

In order to see the effects of economic policies, such as monetary and fiscal policy measures, we take into consideration the sector of money and public finance. In this sector, the demand for money and the supply of money are equal, but these should be explained. The demand for money is determined by GNP and the market interest rate, while the supply of money (M_{1B}) is equal to the amount of currency in circulation and demand deposits. Usually, the currency is issued by the Central Bank, and should be completely controlled by the Central Bank, but the currency in circulation can not be totally controlled by the Central Bank. Accordingly, the

amount of currency in circulation is assumed to be explained by foreign exchange reserves of all banks and gross domestic fixed capital formation and demand deposits which in turn is explained by the market interest rate, savings, and demand deposits lagged one period.

In order to estimate liquid assets, we need to add YDD and quasi-money together, and quasi-money is explained by GNP and the market interest rate which in turn, is mainly explained by savings and the rediscount rate of the Central Bank lagged one period. Foreign exchange reserves is primarily explained by the balance of trade and foreign exchange reserves lagged one period. As for the foreign exchange rate, i.e., the amount of N.T. dollars that one U.S. dollar can be exchanged for, it is explained by the amount of the previous year's balance of trade, and foreign exchange rate lagged one period.

Tax revenue, either through direct taxes or indirect taxes, is closely related to GNP. In this regard, we can explain net indirect taxes as a function of GNP, and net indirect taxes lagged one period. Net indirect tax is the difference between indirect tax and subsidies. Total tax and monopoly revenue of public enterprises are explained by GNP, and GNP lagged one period. Income from government property and enterprises is also a source of government revenue and is explained by domestic demand lagged one period.

Labor Force and Unemployment

For this paper, labor force is explained by only population, while the unemployment rate is assumed to be related to gross industrial product, and the unemployment rate lagged one period. With regard to unemployment rate, only its data in industrial sector is reliable.

Wages and Prices

In estimating the wage rate, we only consider the average wage index in manufacturing because of the availability of data and assume the wage rate is a function of labor productivity, consumer price index lagged one period, and the difference between labor force and the level of employment, which implies the level of unemployment.

In the determination of prices, we assume the wholesale price index is a function of import prices, the ratio of the wage rate to potential labor productivity which indicates the net effect of the wage cost, and the wholesale price index lagged one period. As for the consumer price index, it is related to the wholesale price index, and the ratio of money supply to gross domestic product, lagged one period which indicates the net effect of the money supply lagged one period, and the wholesale price index lagged one period. With regard to import prices, we have two terms: one is the price deflator of imports; and the other is the unit value index of imports. The former is explained by the latter, while the latter is explained by the weighted average price index of exports of the U.S. and Japan, oil prices, and the foreign exchange rate. Similarly, the export prices also have two different definitions: the price deflator of exports is explained by import prices since Taiwan's exports have been greatly influenced by its imports of raw materials and machinery equipment; and the unit value of exports is explained by the wholesale price index and foreign exchange rate. In this model, either export prices or import prices are substantially affected by the change in the foreign exchange rate. As for the price deflators of other factors of GDP, either they are related to the consumer price index or to the wholesale price index.

Others

Only fixed capital consumption allowance is left here for explanation. This variable is assumed to depend on GDP which reflects economic activities.

2. Evaluation of the Performance of the Model

Though robust performance of a model can not absolutely guarantee a high accuracy of its forecasts, a model which performs well is likely to be much more accurate than one which has a poor performance. In order to evaluate the performance of the model, usually, two approaches have been taken: one is to test the performance of the structural equations by means of the turning point test and the average absolute percentage error (AAPE); and the other is to test the performance of the simultaneous equations by means of comparisons of the average absolute percentage error and the their inequality coefficient as mentioned before.

Firstly, we evaluate the performance of the structural equations. From Table 1.A, it can be found that among the 31 important variables of the model, the structural equalities for 15 variables reach 50 percent of their turning points, and those for gross agricultural products, private consumption expenditure on non-food items, exports of goods, exports of goods to Hong Kong and Mainland China, imports of goods, gross private fixed capital formation, increases in stock and the demand for money have the best performance, since the percentage of their turning points hit is higher than 70 percent, while the structural equations for exchange rate, foreign exchange reserves of all banks, market interest rate, potential GDP, exports of services, exports of goods to the rest of the world and fixed capital consumption allowance each have a poor performance since the percentage of their turning points reached is lower than 30 percent.

Table 1. Evaluation of the Model Performance

(A) Evaluation of the Estimates of Structural Equations

Item	Turning Point Test				AAPE(%) (1980.1-1990.4)	RANK
	Number of Actual Turning Points	Number of Turning Points Hit	Percentage of Turning Points Hit(%)	Rank		
	(1)	(2)	(3)	(4)	(5)	(6)
Domestic Product						
1. Potential GDP	59	7	11.86	27	4.73	20
2. Gross industrial product	43	22	51.16	16	1.62	8
3. Gross agricultural product	93	93	100.00	1	3.37	12
Domestic Demand						
4. Private consumption expenditure on food	56	34	60.71	12	1.52	6
5. Private consumption expenditure on non-food	96	87	90.63	2	4.08	16
6. Gross private fixed capital formation		40	76.92	6	11.92	31
7. Increase in stock	69	53	76.81	7	126.77	32
Foreign Trade						
8. Imports of goods	60	47	78.33	5	1.89	9
9. Imports of goods through customs	63	27	42.86	19	5.32	23
10. Imports of services	51	18	35.29	21	7.30	27
11. Exports of goods	51	45	88.24	3	0.97	4
12. Exports of goods to the U.S.	46	25	53.90	15	5.26	22
13. Exports of goods to Japan	57	27	47.37	17	4.97	21
14. Exports of goods to Hong Kong & Mainland China	76	61	80.26	4	5.67	25
15. Exports of goods to the rest of the world	47	13	27.66	25	4.33	19
16. Exports of services	62	9	14.52	26	5.45	24

(A) Evaluation of the Estimates of Structural Equations (continued)

Item	Turning Point Test				AAPE(%) (1980.1-1990.4) (5)	RANK (6)
	Number of Actual Turning Points (1)	Number of Turning Points Hit (2)	Percentage of Turning Points Hit(%) (3)	Rank (4)		
Money and Public Finance						
17.Demand for money (M_{1B})	70	51	72.86	8	4.11	12
18.Demand for quasi-money	18	11	61.11	11	3.21	11
19.Demand deposit	48	28	58.33	14	3.59	14
20.Net amount of currency in circulation	42	13	30.95	23	5.83	26
21.Market interest rate	27	3	11.11	28	1.59	7
22.Exchange rate	16	1	6.25	30	0.96	3
23.Foreign exchange reserves of all banks	30	3	10.00	29	3.46	13
24.Net indirect tax	87	59	67.82	9	9.81	28
25.Total tax and monopoly revenue of public enterprises	55	34	61.82	10	11.24	30
Labor force and Unemployment						
26.Labor force	62	22	35.48	20	0.66	1
27.Unemployment rate	57	19	33.33	22	9.96	29
Wages and Prices						
28.Wholesale price index	30	13	43.33	18	0.78	2
29.Consumer price index	36	12	33.33	22	1.02	5
30.Average wage index in manufacturing	45	27	60.00	13	4.25	18
31.Fixed capital consumption allowance	50	14	28.00	24	1.91	10

It should be noted that when we compare the AAPEs, most of these give us different pictures for their performances. The structural equations which have a smaller AAPE are those for the labor force, wholesale price index, exchange rate, exports of goods, consumer price index, private consumption expenditure on food, market interest rate, gross industrial product, and imports of goods since their AAPEs are less than 2 percent, indicating these have the best performance. As for the structural equations for the increase in stock, gross private fixed capital formation, total tax and monopoly revenue of public enterprises, unemployment rate, net indirect tax, imports of services, net amount of currency in circulation, exports of goods to Hong Kong and Mainland China and exports of services, these have larger AAPEs indicating their performance is poor.

One may wonder why the two measures provide so different and inconsistent results, and which one is more reasonable. From the standpoint of forecasting, when determining the direction of change and producing smaller estimate errors, both are concerned, the direction of change is more important to policy-making. The turning point test provides information as to how many turning points have been reached, while the AAPE only tells us the magnitude of the error of estimate. However, it should be mentioned that the structural equations for the financial sector are poor in terms of the turning points reached. For instance, the structural equations for the market interest rate, exchange rate and foreign exchange reserves of all banks also have poor performance. One of the reasons for this is that all three structural equations have no apparent increasing or decreasing trend during the period of observation. Even so, their AAPEs are rather small.

Then, we evaluate the performance of the simultaneous equations by the two measures as mentioned above. For using each measure, there are two conditions: a

static condition; and a dynamic condition. When utilizing the AAPE, the estimates of the simultaneous equations have a larger AAPE in the dynamic condition than in the static condition. This is because we use actual values for endogenous variables in the static condition, while we only use estimated values for endogenous variables which are determined by the model in the dynamic condition. Roughly speaking, all 32 equations (except for the one regarding an increase in stock which has a high AAPE) have performed very well under both conditions. In the estimation of structural equations, the increase in stock has the highest AAPE. The structural equation and the simultaneous equation for the labor force both have the smallest AAPEs. When utilizing the Theil inequality coefficient, we also found that the simultaneous equation for the increase in stock has the largest coefficient under both conditions indicating the poorest performance, which is consistent with the measure of AAPE. Similarly, the Theil inequality coefficient under static conditions is smaller than that under dynamic conditions for the same reason mentioned above. (See Table 1.B)

Obviously, the results of the two measures of the AAPE and the Theil inequality coefficient are not precisely consistent with each other. However, most simultaneous equations which have small (or large) AAPEs still have small (or large) Theil inequality coefficients. If we compare the performance of structural equations for a variable, with the performance of its simultaneous equation by the measure of an AAPE, we do not reach the conclusion that the structural equation necessarily has a smaller AAPE than the simultaneous equation.

So far as the performance of the model is concerned, it is robust and can be used as a tool to measure the effect of policy changes on economic activities. Needless to say, some individual equations which have poor performance should be further refined.

(B) Evaluation of the Estimates of the Simultaneous Equations
Test Period: 1988.1-1990.4

ITEM	AAPE(%)				Theil inequality coefficiet			
	Static		Dynamic		Static		Dynamic	
	value	rank	value	rank	value	rank	value	rank
Domestic Product								
1. Potential GDP	1.23	3	1.40	3	0.60	3	0.66	8
2. Gross industrial product	3.36	12	4.67	8	0.94	11	0.82	12
3. Gross agricultural product	3.88	14	4.27	7	0.20	1	0.18	1
Domestic Demand								
4. Private consumption expenditure on food	1.27	4	1.13	2	1.01	14	0.63	6
5. Private consumption expenditure on non-food	5.66	21	9.33	20	0.63	4	0.58	5
6. Gross private fixed capital formation	16.25	31	16.67	29	0.65	5	0.65	7
7. Increase in stock	145.70	32	145.37	31	999.99	28	999.99	25
Foreign Trade								
8. Imports of goods	3.92	15	6.90	15	1.27	22	0.96	18
9. Imports of goods through customs	3.63	13	6.93	17	1.36	24	0.99	19
10. Imports of services	6.50	25	6.81	13	0.97	13	0.68	9
11. Exports of goods	2.76	8	2.99	5	0.79	7	0.54	3
12. Exports of goods to the U.S.	5.93	15	9.66	22	0.94	11	0.68	9
13. Exports of goods to Japan	5.31	20	7.48	18	1.25	21	0.80	11
14. Exports of goods to Hong Kong & Mainland China	5.98	23	11.05	24	0.58	2	0.49	2
15. Exports of goods to the rest of the world	2.93	9	6.86	14	0.95	12	0.56	4
16. Exports of services	5.09	19	5.35	10	1.07	16	0.90	16

(B) Evaluation of the Estimates of the Simultaneous Equations
Test Period: 1988.1-1990.4 (continued)

ITEM	AAPE(%)				Theil inequality coefficiet			
	Static		Dynamic		Static		Dynamic	
	value	rank	value	rank	value	rank	value	rank
Money and Public Finance								
17.Demand for money (M_{1B})	6.22	24	9.36	21	1.30	23	0.95	17
18.Demand for quasi-money	4.03	16	11.94	25	1.49	25	1.02	20
19.Demand deposit	4.71	18	10.52	23	1.05	15	0.87	14
20.Net amount of currency in circulation	4.12	17	5.90	11	1.18	19	1.34	23
21.Market interest rate	2.95	10	5.00	9	1.67	27	0.89	15
22.Exchange rate ($NT/$US)	1.37	5	2.21	4	1.01	14	0.96	18
23.Foreign exchange reserves of all bank	2.68	7	4.25	6	1.15	18	1.05	21
24.Net indirect tax	6.61	27	7.62	19	0.76	6	0.66	8
25.Total tax and monopoly revenue of public enterprises	10.34	29	14.91	27	0.80	8	0.72	10
Labor Force and Unemployment								
26.Labor force	0.55	1	0.62	1	0.85	9	0.65	7
27.Unemployment rate	11.28	30	21.11	30	1.08	17	0.83	13
Wages and Prices								
28.Wholesale price index	1.08	2	6.23	12	1.54	26	1.49	24
29.Consumer price index	1.51	6	9.36	21	1.19	20	1.24	22
30.Average wage index in manufacturing	6.83	28	6.92	16	0.86	10	0.65	7
31.Fixed capital consumption allowance (at current prices)	3.35	11	13.23	26	1.05	15	0.96	18

IV. The Comparison of the Effects of Policy Measures

In the realm of economics, experimentation of policy changes can have large impacts on society. Therefore, the best way of testing the effect of a policy is through the simulation of the model designed for the purpose of testing the effect of a policy. According to the evaluation of the model performance, we found the above model can be used for this purpose. In order to compare the effects of the policy measures on economic growth and price stability, we take the first quarter of 1993 as the simulation period.

The Effect on Economic Growth

First of all, we observe the effect of fiscal policy on economic growth. Table II provides a clear picture. If the government consumption expenditure increases by NT$ 10 billion, gross national product will increase by NT$12.711 billion; gross agricultural product will increase by NT$0.026 billion; gross industrial product will increase by NT$2.306 billion; and gross service product will increase by NT$9.777 billion. If the government fixed capital formation and fixed capital formation of public enterprises each increase by NT$10 billion, they will have a greater effect on economic growth than government consumption expenditure. The sequence of their effects on economic growth is as follows:

The effect of government consumption expenditure	<	The effect of government fixed capital formation	<	The effect of fixed capital formation of public enterprises

Table II. Multiplier Effects of Policy Changes
(A)

On the following variables (NT$Million; at 1986 prices)	The Multiplier Effects of			
	The increase in gov't consumption expenditure by NT$ 10 billion	The increase in gov't fixed capital formation by NT$10 billion	The increase in fixed capital formation of public enterprise by NT$10 billion	The increase in rediscount rate by 10%
1. Gross national product	12,711	12,790	13,512	-881
2. Gross agricultural product	26	26	27	-1
3. Gross industrial product	2,306	2,321	2,485	-167
4. Gross service product	9,777	9,840	10,423	-73
5. Private consumption expenditure on food	185	186	192	-9
6. Private consumption expenditure on non-food	1,944	1,956	2,065	-128
7. Gross private fixed capital formation	538	539	553	-34.75
8. Increase in stock	167	163	128	-756
9. Imports of goods	359	361	382	-25
10. Imports of services	387	390	412	-27
11. Exports of goods	0	0	0	0
12. Exports of services	0	0	0	0
13. Balance of trade (US$M)	-27	-27	-28	-1.37
14. Demand for money (M_{1B})	14,510	14,596	15,394	-993
15. Demand for quasi-money	32,614	32,833	34,734	-2.167
16. Exchange rate (NT$/US$)	0.002	0	0	0
17. Total taxes and monopoly revenue of public enterprises	814	814	816	-36
18. Labor force (1,000 persons)	0	0	0	0
19. Unemloyment rate(%)	-0.006	-0.006	-0.006	0
20. Wholesale price index (%)	0.017	0.017	0.018	-0.001
21. Consumer price index (%)	0.051	0.051	0.049	0.003
22. Average wage inde in manufacturing(%)	2.505	2.521	2.663	-0.171
23. Fixed capital consumption	-58	-141	-3	-61

Table II. Multiplier Effects of Policy Changs
(B)

On the following variables (NT$Million; at 1986 prices)	The Multiplier Effects of				
	The fall of exchange rate by 10%(N.T.$ appreciates)	The rise of deposit reserve ratio by 10%	The decrease in tax by NT$ 10 billion	The increase in exports of goods by NT$10 billion	The increase in oil price by 10%
1. Gross national product	-4,449	-73	736	12,903	-1,221
2. Gross agricultural product	0.309	-0.11	20	25	-1
3. Gross industrial product	-3,201	-13.62	142	5,216	-356
4. Gross service product	-2,262	-58	590	7,059	-992
5. Private consumption expenditure on food	-2	-0.75	145	183	-8.12
6. Private consumption expenditure on non-food	-608	-10.75	598	1,959	-243.5
7. Gross private fixed capital formation	-459	-2.87	38	1,126	-116
8. Increase in stock	492	-62.90	8	118	-160
9. Imports of goods	203	-2.03	20	794	-217
10. Imports of services	-135	-2.25	22	393	-37
11. Exports of goods	-7,993	0	0	1,000	-245
12. Exports of services	4.3	0	0	0	0.14
13. Balance of trade (US$M)	92	0.12	-1	261	-118
14. Demand for money (M_{1B})	-4,679	-82	1,136	-14,677	-1,464
15. Demand for quasi-money	-11,681	-180	-2,116	33,091	-3,668
16. Exchange rate (NT$/US$)	-2.95	0	0	0	0
17. Total taxes and monopoly revenue of public enterprises	244	-2.93	-997	741	-145
18. Labor force (1,000 persons)	0	0	0	0	0
19. Unemloyment rate(%)	0.008	0	0	-.0130	0.001
20. Wholesale price index (%)	-1.031	0	0.001	0.017	0.263
21. Consumer Price index (%)	-0.309	0	-0.005	0.050	0.142
22. Average wage in manufacturing(%)	-0.878	-0.014	0.145	-2.535	0.232
23. Fixed capital consumption allowance	-318	-5.13	51	903	-84

In the initial period, the change in the government expenditures on foreign trade has different effects, namely, it has no any effect on exports in the same period, but it has a positive effect on imports because the government needs goods for consumption, equipment for infrastructure and materials and machinery for public enterprises' production.[9] As a result, it causes a trade deficit.

If the tax level decreases by NT$10 billion, it has a positive effect on economic growth, which means that gross national product increases by NT$0.736 billion, gross agricultural product increases by NT$0.020 billion, gross industrial product increases by NT$0.142 billion and gross services product increases by NT$0.590 billion. Regarding the effect of the change in taxes, it is less than that of the change in government expenditures.

As for the effect of monetary policy, such as an increase in the rediscount rate, the fall of the exchange rate (i.e., the New Taiwan dollar appreciates against the U.S. dollar) or the rise of the deposit reserve ratio, these are unfavorable for economic growth. If we compare the effects of a change in the rediscount rate with the effect of a change in the deposit reserve ratio on economic growth, we find that the former has a larger effect than the latter. But the effect of a change in the rediscount rate on gross industrial production is less than the effect of a change in the deposit reserve ratio on gross industrial production. If the N.T. dollar either appreciates or depreciates against the U.S. dollar, this has a substantial effect on economic growth.

In reality, exports can not be controlled. If exports can increase by NT$10 billion, this has a larger effect on economic growth than government expenditure. Since Taiwan does not produce oil, but heavily depends on the import of oil, the increase in oil price also has a significant effect on economic growth.

The Effects on Price Fluctuations

Price fluctuations are always of great concern and a condition of hyperinflation not only worsens income distribution but also deteriorates the investment climate. When the government undertakes various policy measures, the consumer price index or wholesale price index must be taken into consideration. The information that the model has provided is that, the increase in government consumption expenditure, the increase in government fixed capital formation and the increase in fixed capital formation of public enterprises, have rather similar effects on wholesale prices, on consumer prices and on the wage index, respectively. However, the increase in government consumption expenditure has a different effect on wholesale prices, consumer prices and the wage index, as does the increase in government fixed capital formation and the increase in fixed capital formation of public enterprises. Their increases have a greater effect on consumer prices than on wholesale prices, but they have the greatest effect on the wage index. The change in taxes has smaller effect on price fluctuations than the change in government expenditures.

As for the effect of monetary policies, the increase in the rediscount rate has a positive effect on consumer prices but a negative effect on wholesale prices and on the wage index. The rise of deposit reserve ratio has no effect on wholesale prices and consumer prices but has a negative effect on the wage index. The fall of the exchange rate has a substantial negative effect on prices and wages, but it has a larger negative effect on wholesale prices than on consumer prices because wholesale prices are more closely related to import prices and the change in exchange rate has a direct and large impact on import prices.

V. Concluding Remarks

When building an econometric model for an intended purpose, theoretical consideration and data limitation must both be taken into account. In fact, so far, no model-building approaches can be completely free from data limitation. In order to make the model more suitable for the data, usually, we have to tailor the model to some extent. In Taiwan, as in many developing countries, for many variables, the quarterly data are not available; when they are available, they may be not reliable; and when they are reliable, they may be not suitable. Accordingly, the structure of the model has to be simplified in its scale.

In this paper, we only tested the effect of one policy in one short period and let all other policies remain unchanged. Actually, the government sometimes takes more than one policy in the same period of time. Furthermore, any policy is likely to have a successive effect and not a once-and-for-all effect. What we have done in this paper is only to utilize one period. Apparently, this is not enough for us to see the cumulative effect of a particular policy we observe.

From the evaluation of the model, it can be seen that the performance of the model is fairly good. Thus, the model can be used as a tool to test the effect of a policy. And, from the comparison of the effects of various policies, we found that the effect of a change in government expenditure on economic growth is much larger than that from a change in taxes; and the effect of a change in the rediscount rate on economic growth is larger than that from a change in the deposit reserve ratio; and the effect of a change in the rediscount rate on price fluctuations is larger than that from a change in the deposit reserve ratio.

It should be noted that when a country's economy becomes more liberalized, its government has several policy measures to choose from. As far as the monetary policy is concerned, if the central bank changes the rediscount rate by some percentage in order to influence the market interest rate, but private banks do not follow, such a policy would lose its effectiveness. Comparatively speaking, it is easier to implement monetary policies than to adopt fiscal policies, and it is also easier to reduce taxes than to increase taxes in a very short period, and when the government wants to increase its expenditure, how to increase its revenue must be taken into consideration.

APPENDIX

This is a nonlinear model including 113 equations, of which, there are 46 behavioral equations and 67 definitions and identities. The estimate of the structural equations is made by means of the OLS method and the solution to the simultaneous equations for the estimation is obtained through an approximation of the Gauss-Seidel method. The figures in parentheses are in t-value, where $\bar{R}^2$ stands for the corrected coefficient of determination and RHO is the serial correlation coefficient.

DOMESTIC PRODUCT

1. LNQF/KF = 11.6651 + 1.0708 LNNF/KF + 0.0126 LNETIME
(12.31) (15.41) (22.86)
- 0.0969 LNEJA - 0.0047 LNPO
(-3.04) (-0.62)

$\bar{R}^2$: 0.990 SEE: 0.36474E-01 D-W: 1.90
F(4,99): 2,454.005 Period of Fit: 1966.1 - 1991.4

2. GDPIN = 14,463.6094 + 0.1794 (C+CG+I+J) + 0.4590X
(0.95) (6.51) (13.76)
+ 3,419.0068 Q1 - 1,643.4727 Q2 + 6,346.4102 Q3
(2.67) (-1.27) (5.46)

$\bar{R}^2$: 0.998 SEE: 6,318.6 D-W: 2.32
RHO(1): 0.948
F(5,97): 9,044.562 Period of fit: 1966.1 - 1991.4

3. GDPAG = 34,183.9297 + 0.1410 CF - 0.1328 $GDPAG_{-1}$
(17.59) (10.32) (-1.38)
- 7,931.4883 Q1 + -4,361.0664 Q2 - 11,465.6211 Q3
(-6.07) (-6.49) (-12.32)

$\bar{R}^2$: 0.899 SEE: 2,106.7 D-W: 1.74
F(5,98): 185.190 Period of fit: 1966.1 - 1991.4

DOMESTIC DEMAND

4. $CF = 2{,}642.6760 + 0.0132\ YDD + 0.9275\ CF_{-1} + 2{,}507.1531\ Q1$
(2.11) (2.07) (22.59) (4.66)
$-3{,}531.8115\ Q2 + 1{,}045.5571\ Q3$
(-5.81) (2.00)

$\bar{R}^2$: 0.997 SEE: 1,882.9 D-W: 2.43
F(5,98): 6,355.609 Period of fit: 1966.1 - 1991.4

5. $CO = 90{,}790.7500 + 0.0452\ LA + 0.2517\ CO_{-1} - 5{,}183.1523\ TAF$
(5.85) (7.36) (2.59) (-5.51)
$+ 35{,}455.2227\ Q1 - 4{,}413.2695\ Q2 + 18{,}992.9570\ Q3$
(8.72) (-0.98) (4.48)

$\bar{R}^2$: 0.982 SEE: 14,486 D-W: 2.53
F(6,97): 911.771 Period of fit: 1966.1 - 1991.4

6. $IBF = 19{,}866.0391 + 0.2168\ GDPIN - 264.3958\ IRRB + 0.1662\ IBF_{-1}$
(4.65) (9.32) (1.50) (1.87)
$- 28{,}359.9687\ Q1 - 19{,}455.6680\ Q2 - 6{,}245.7181\ Q3$
(-8.49) (-5.20) (-1.73)

$\bar{R}^2$: 0.903 SEE: 11,695 D-W: 1.71
F(6,96): 159.073 Period of fit: 1966.2 - 1991.4

7. $J = 36{,}522.5000 + 0.0108\ (TD-J) + 0.0988\ J_{-1} - 0.0197\ KJ_{-1}$
(1.71) (1.33) (0.98) (-1.25)
$-718.9329\ (IR-PGDP^*) - 8{,}455.5859\ Q1 + 2{,}243.5435\ Q2$
(-3.82) (-2.72) (0.73)
$-4{,}981.0039\ Q3$
(-1.59)

$\bar{R}^2$: 0.218 SEE: 11,041 D-W: 1.97
F(7,96): 5.106 Period of fit: 1966.1 - 1991.4

FOREIGN TRADE

8. $MG = 3034,5642 + 0.9860\ TVM$
(2.74) (182.83)

$\bar{R}^2$: 0.997 SEE: 6,909.1 D-W: 2.03
F(1,102): 33,428.098 Period of fit: 1966.1 - 1991.4

9. $TVM = 7,167.7695 + 0.1516\ GDPIN + 0.9036\ TVM_{-1} - 214.2607\ PM$
(2.08) (4.04) (26.44) (-3.74)
$- 8,259.8984\ Q1 + 7,332.8984\ Q2 - 7,876.0430\ Q3$
(-2.12) (2.32) (-2.03)

$\bar{R}^2$: 0.991 SEE: 11,769 D-W: 2.09
RHO(1): -0.271
F(6,95): 1,933.869 Period of fit: 1966.2 - 1991.4

10. $MS = - 7,382.2227 + 0.0305\ GNP + 0.6538\ MS_{-1}$
(-6.30) (4.97) (9.01)
$+ 1112.3967\ Q1 + 4946.4180\ Q2 + 5202.2148\ Q3$
(1.18) (5.06) (5.56)

$\bar{R}^2$: 0.982 SEE: 3335.9 D-W: 1.94
F(5,98): 1,105.436 Period of fit: 1966.1 - 1991.4

11. $XG = - 647.2305 + 1.0314\ TVX$
(-1.04) (444.08)

$\bar{R}^2$: 0.999 SEE: 4052.4 D-W: 1.62
F(1,102): 197,231.437 Period of fit: 1966.1 - 1991.4

12. $TVXUS = - 52,878.1523 + 781.5330\ GNPUS - 21,762.5234\ PXROC\$$
(-3.13) (2.61) (-3.46)
$+ 489.4080\ WPIUS + 0.8567\ TVXUS_{-1} - 3,946.1938\ Q1$
(3.89) (17.87) (-1.80)
$+ 14,840.5586\ Q2 + 8,609.8320\ Q3$
(6.62) (3.97)

$\bar{R}^2$: 0.986 SEE: 7,784.8 D-W: 1.92
F(7,95): 1019.527 Period of fit: 1966.2 - 1991.4

13. TVXJA = 11,999.0820 + 94.1967 GNPJA - 2,952.6589 PXROC$
(2.25) (1.82) (-2.35)
- 36.5692 EJA + 0.8851 $TVXJA_{-1}$ - 2811.9661 Q1
(-2.99) (22.76) (-3.52)
+ 2733.6467 Q2 - 1,590.1829 Q3
(3.45) (-2.01)

$\bar{R}^2$: 0.983 SEE: 2845.0 D-W: 2.66
RHO(1): 0.830
F(7,95): 840.977 Period of fit: 1966.2 - 1991.4

14. TVXHKM = 7,382.9297 + 1.9097 GNPHK - 2,522.9453 PXROC$
(2.46) (6.77) (-4.05)
+ 0.5050 $TVXHKM_{-1}$ + 133.7929 TMMC$$ - 688.9944 EHK
(7.05) (0.66) (-1.32)
- 1,437.3132 Q1 + 1,442.8296 Q2 - 973.4329 Q3
(-1.93) (2.11) (-1.42)

$\bar{R}^2$: 0.988 SEE: 2399.0 D-W: 1.60
F(8,94): 1070.556 Period of fit: 1966.2 - 1991.4

15. TVXOT = - 8,122.5312 + 82.3420 TW + 0.9861 $TVXOT_{-1}$
(-1.81) (1.45) (43.01)
- 2,370.6951 Q1 + 8,684.8320 Q2 + 6,512.5352 Q3
(-1.24) (4.65) (3.43)

$\bar{R}^2$: 0.990 SEE: 6,715.9 D-W: 2.10
F(5,97): 2,057.001 Period of fit: 1966.2 - 1991.4

16. XS = - 7,608.5312 + 170.5690 GNPIUSJA + 0.6753 XS_{-1}
(-3.90) (4.60) (9.62)
- 1,232.1162 Q1 - 414.7576 Q2 - 654.6948 Q3
(-2.64) (-0.89) (-1.41)

$\bar{R}^2$: 0.975 SEE: 1674.2 D-W: 2.01
RHO(1): -0.099
F(5,98): 796.621 Period of fit: 1966.1 - 1991.4

MONEY AND FINANCE

17. MOND = 494,862.937 + 1.1084 GNP - 10,554.6406 IRB
(1.20) (3.40) (-1.73)
-18668.7383 Q1 - 11263.9453 Q2 - 32656.8242 Q3
(-1.68) (-0.95) (-3.28)

$\bar{R}^2$: 0.991 SEE: 57441 D-W: 2.36
RHO(1): 0.990
F(5,97): 2135.184 Period of fit: 1966.1 - 1991.4

18. MQM = 521581.187 + 2.6963 GNP - 6276.3906 IRB
(1.03) (6.73) (-0.83)
+ 6223.8789 Q1 + 19671.7500 Q2 + 465.3557 Q3
(0.45) (1.35) (0.04)

$\bar{R}^2$: 0.997 SEE: 70,737 D-W: 2.04
RHO(1): 0.990
F(5,97): 6005.289 Period of fit: 1966.1 - 1991.4

19. MDD = 53084.6328 - 2743.7419 IRB + 0.4406 (YDD$ -C$)
(1.64) (-2.16) (4.88)
+ 0.9508 MDD_{-1} + 43,318.8164 Q1 - 12515.7383 Q2
(61.91) (4.19) (-1.24)
+ 6213.7109 Q3
(0.62)

$\bar{R}^2$: 0.996 SEE: 35,565 D-W: 1.88
F(6,96): 3851.946

20. CUR = - 2,709.2395 + 0.0757 AFR$ + 0.7932 I$
(-0.96) (24.04) (24.47)
+ 14,408.1445 Q1 - 3741.5945 Q2 + 2555.0320 Q3
(4.55) (-1.21) (0.82)

$\bar{R}^2$: 0.991 SEE: 11,113 D-W: 1.68
F(5,98): 2,193.038 Period of fit: 1966.1 - 1991.4

21. IRB = 19.7388 - 0.00001 (YDD-C$) + 0.5512 IR_{-1}
(10.30) (-0.82) (4.08)
- 0.1520 Q1 + 0.1089 Q2 + 0.0324 Q3
(-0.79) (0.57) (0.20)

$\bar{R}^2$: 0.916 SEE: 0.87251 D-W: 2.14
RHO(1): 0.945
F(5,97): 224.626 Period of fit: 1966.1 - 1991.4

22. $E = 1.3714 - 0.00001 \sum_{i=-1}^{4} BOT\$ + 0.9659\ E_{-1}$

(1.60) (-3.95) (43.57)

$\bar{R}^2$: 0.991 SEE: 0.42691 D-W: 1.69
RHO(1): 0.496
F(2,96): 5501.281 Period of fit: 1967.1 - 1991.4

23. $AFR\$ = 17{,}763.6680 + 1.0326\ BOT\$ + 0.9693\ AFR_{-1}$

(2.54) (8.71) (135.99)

$- 13{,}887.0664\ Q1 - 29{,}645.3125\ Q2 - 3{,}349.7246\ Q3$

(-1.51) (-3.23) (-0.36)

$\bar{R}^2$: 0.998 SEE: 33089 D-W: 1.83
F(5,98): 11170.156 Period of fit: 1966.1 - 1991.4

24. $(TI\text{-}SUB)\$ = 3{,}704.7998 - 0.0320\ GNP\$ + 0.0694\ GNP\$_{-1}$

(2.08) (-0.48) (1.04)

$+ 0.6495\ (TI\text{-}SUB)\$_{-1} - 3{,}176.4990\ Q1 + 8731.8633\ Q2$

(7.53) (-1.16) (4.45)

$- 7959.2773\ Q3$

(-2.74)

$\bar{R}^2$: 0.958 SEE: 7551.4 D-W: 2.00
RHO(1): -0.380
F(6,96): 388.490 Period of fit: 1966.1 - 1991.4

25. $TAXTT\$ = - 9{,}314.2305 + 0.0499\ GNP\$ + 0.1291\ GNP\$_{-1}$

(-2.83) (0.47) (1.18)

$+ 8368.6562\ Q1 + 21671.8711\ Q2 + 7180.8867\ Q3$

(2.08) (5.40) (1.74)

$\bar{R}^2$: 0.951 SEE: 14.448 D-W: 1.34
RHO(1): 0.317
F(5,98): 397.147 Period of fit: 1966.1 - 1991.4

26. GOVPROA$ = - 7,459.5664 + 0.0321 $(C+CG+I+J)_{-1}$ + 8675.9883 Q1
(-2.81) (8.60) (2.68)
+ 24167.8086 Q2 - 1209.1252 Q3
(7.46) (-0.38)

$\bar{R}^2$: 0.595 SEE: 11,561 D-W: 2.06
RHO(1): 0.317
F(4,97): 38.102 Period of fit: 1966.3 - 1991.4

LABOR FORCE AND UNEMPLOYMENT

27. NF = - 4.7707 + 0.6527 N - 0.0407 Q1 - 0.0827 Q2 + 0.0842 Q3
(-20.73) (48.92) (-3.18) (-5.67) (6.66)

$\bar{R}^2$: 0.998 SEE: 0.67084E-01 D-W: 2.10
RHO(1): 0.799
F(4,98): 12,266.680 Period of fit: 1966.1 - 1991.4

28. U = 0.5615 - 0.0121 GDPIN$ + 0.7422 U_{-1} - 0.1339 Q1
(4.17) (-2.58) (13.93) (-1.37)
- 0.0632 Q2 + 0.3206 Q3
(-0.65) (3.25)

$\bar{R}^2$: 0.663 SEE: 0.35100 D-W: 2.53
F(5,98): 41.446 Period of fit: 1966.1 - 1991.4

WAGES AND PRICES

29. WPI = 3.3461 + 0.3314 PM + 874.8000 PWM/PDT + 0.6120 WPI_{-1}
(2.80) (6.04) (0.57) (9.06)
+ 0.7933 Q1 + 0.5702 Q2 + 0.3946 Q3
(2.38) (1.67) (1.33)

$\bar{R}^2$: 0.997 SEE: 1.4163 D-W: 1.81
RHO(1): 0.634
F(6,96): 6,238.172 Period of fit: 1966.1 - 1991.4

30. CPI = 18.3262 + 0.4866 WPI + 2.1767 $(MON/GDP)_{-1}$
(2.29) (7.00) (1.33)
+ 0.2532 WPI_{-1} - 0.8699 Q1 - 0.6804 Q2 - 0.1849 Q3
(3.61) (-3.35) (-2.93) (-0.87)

$\bar{R}^2$: 0.999 SEE: 1.1517 D-W: 0.90
RHO(1): 0.990
F(6,95): 12,885.535 Period of fit: 1966.2 - 1991.4

31. PWM = - 66.0569 + 0.0017 PGT + 0.1338 CPI_{-1} - 11.6856 (NF-NE)
(-12.65) (9.58) (0.88) (-0.51)
+ 11.7311 Q1 - 0.1896 Q2 + 2.5217 Q3
(5.56) (-0.08) (1.25)

$\bar{R}^2$: 0.968 SEE: 9.0455 D-W: 2.05
RHO(1): 0.491
F(6,96): 513.167 Period of fit: 1966.1 - 1991.4

32. PM = 7.1942 + 90.3326 UVIM + 1.2079 $UVIM_{-1}$ - 0.0297 Q1
(3.08) (62.73) (0.83) (-0.40)
+ 0.0429 Q2 + 0.0065 Q3
(0.57) (0.10)

$\bar{R}^2$: 1.000 SEE: 0.36982 D-W: 1.96
RHO(1): 0.990
F(5,96): 134,591.125 Period of fit: 1966.2 - 1991.4

33. UVIM = 0.0933 + 0.0012 PXIUSJA + 0.0045 PO + 0.0118 E
(0.36) (2.13) (3.02) (2.30)
- 0.0149 Q1 - 0.0085 Q2 - 0.0066 Q3
(-2.77) (-1.38) (-1.24)

$\bar{R}^2$: 0.991 SEE: 0.28635E-01 D-W: 1.34
RHO(1): 0.990
F(6,87): 1651.696 Period of fit: 1968.2 - 1991.4

34. PX = 9.0780 + 0.3232 PM + 0.5219 PM_{-1}
(3.65) (5.13) (8.32)

$\bar{R}^2$: 0.995 SEE: 1.8055 D-W: 2.17
RHO(1): 0.831
F(2,100): 10,997.086 Period of fit: 1966.1 - 1991.4

35. UVIX = - 0.1144 + 0.0099 WPI + 0.0026 E
(-1.99) (43.87) (1.96)

$\bar{R}^2$: 0.993 SEE: 0.22132 E-01 D-W: 1.71
RHO(1): 0.615
F(2,100): 7482.328 Period of fit: 1966.1 - 1991.4

36. PCF = - 0.9701 + 1.3728 CPI - 0.3399 PCF_{-1}
(-0.34) (21.43) (-5.97)

$\bar{R}^2$: 0.999 SEE: 1.1592 D-W: 1.68
RHO(1): 0.930
F(2,100): 39,545.051 Period of fit: 1966.1 - 1991.4

37. PCO = 0.3009 + 0.5274 CPI + 0.4670 PCO_{-1}
(0.36) (8.23) (7.18)

$\bar{R}^2$: 0.999 SEE: 0.86884 D-W: 2.20
RHO(1): 0.774
F(2,100): 68311.187 Period of fit: 1966.1 - 1991.4

38. PCG = - 11.3906 + 1.1016 CPI + 6.3383 Q1 + 0.4331 Q2 + 0.1828 Q3
(-6.95) (56.90) (5.83) (0.36) (0.17)

$\bar{R}^2$: 0.984 SEE: 4.4709 D-W: 2.09
RHO(1): 0.126
F(4,98): 1,590.430 Period of fit: 1966.1 - 1991.4

39. PIBF = 17.1396 + 0.9269 WPI - 0.1248 WPI_{-1}
(1.97) (12.00) (-1.61)

$\bar{R}^2$: 0.998 SEE: 1.2962 D-W: 1.89
RHO(1): 0.990
F(2,100): 25,399.328 Period of fit: 1966.1 - 1991.4

40. PIPC = 19.9183 + 0.8799 WPI - 0.1185 WPI_{-1}
(2.02) (10.03) (-1.35)

$\bar{R}^2$: 0.997 SEE: 1.4718 D-W: 2.32
RHO(1): 0.990
F(2,100): 17,101.457 Period of fit: 1966.1 - 1991.4

41. PIG = 16.0337 + 1.0274 WPI - 0.1857 WPI_{-1}
(1.37) (9.85) (-1.78)

$\bar{R}^2$: 0.997 SEE: 1.7504 D-W: 1.91
RHO(1): 0.990
F(2,100): 16,759.488 Period of fit: 1966.1 - 1991.4

42. PJ = 2.3530 + 0.9502 WPI
(0.97) (31.01)

$\bar{R}^2$: 0.924 SEE: 7.4233 D-W: 1.99
RHO(1): 0.119
F(1,101): 1234.274 Period of fit: 1966.1 - 1991.4

43. PFIA = 18.2633 + 0.8152 CPI
(9.84) (34.09)

$\bar{R}^2$: 0.998 SEE: 1.2791 D-W: 2.49
RHO(1): 0.859
F(1,101): 43,958.871 Period of fit: 1966.1 - 1991.4

44. PD = 15.7139 + 0.8253 WPI
(1.77) (13.34)

$\bar{R}^2$: 0.998 SEE: 1.3576 D-W: 1.93
RHO(1): 0.990
F(1,101): 46,143.707 Period of fit: 1966.1 - 1991.4

45. PTISUB = 34.4534 + 0.3939 PM + 0.0351 PWM + 2.2867 Q1
(2.42) (4.59) (0.91) (4.84)
+ 1.5481 Q2 + 0.8440 Q3
(3.28) (2.03)

$\bar{R}^2$: 0.994 SEE: 2.2243 D-W: 2.15
RHO(1): 0.990
F(5,88): 3,063.229 Period of fit: 1966.1 - 1989.3

OTHERS

46. D = 6,534.0586 + 0.0701 GDP + 553.9236 Q1 + 476.9839 Q2
(0.92) (11.31) (2.56) (2.17)
- 89.2071 Q3
(-0.48)

$\bar{R}^2$: 0.998 SEE: 1.079.5 D-W: 2.16
RHO(1): 0.990
F(4,98): 14,926.277 Period of fit: 1966.1 - 1991.4

DEFINITIONS AND IDENTITIES

47. Private consumption expenditure at 1986 prices

$$C = CF + CO$$

48. Government consumption expenditure at 1986 prices

$$CG = 100 \times CG\$/PCG$$

49. Gross government fixed capital formation at 1986 prices

$$IG = 100 \times IG\$/PIG$$

50. Gross fixed capital formation of public enterprises at 1986 prices

$$IPC = 100 \times IPC\$/PIPC$$

51. Gross domestic fixed capital formation at 1986 prices

$$I = IBF + IG + IPC$$

52. Exports of goods through customs

$$TVX = TVXUS + TVXJA + TVXHKM + TVXOT$$

53. Exports of goods and services at 1986 prices

$$X = XG + XS$$

54. Imports of goods and services at 1986 prices

$$M = MG + MS$$

55. Gross domestic product at 1986 prices

$$GDP = C + CG + I + J + X - M$$

56. Total demand at 1986 prices

$$TD = C + CG + I + J + X$$

57. Domestic demand at current prices

$$TD\$ = C\$ + CG\$ + I\$ + J\$ + X\$$$

58. Net indirect tax

$$TI - SUB = 100 \times (TI - SUB)\$/PTISUB$$

59. Number of employment

$$NE = NF \times (1-0.01U)$$

60. Domestic fixed capital consumption allowance at current prices

$$D\$ = 0.01\ PD \times D$$

61. Capital stock at 1986 prices

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

62. Stock of inventory at 1986 prices

$$KJ = KJ_{-1} + J$$

63. Capital stock being utilized

$$KE = KF \times (1-0.01U)$$

64. Private consumption expenditure on food at current prices

$$CF\$ = 0.01\ PCF \times CF$$

65. Private consumption expenditure on non-food at current prices

$$CO\$ = 0.01\ PCO \times CO$$

66. Private consumption expenditure at current prices

$$C\$ = CF\$ + CO\$$$

67. Price deflator of private consumption expenditure

$$PC = 100\ C\$/C$$

68. Gross private fixed capital formation at current prices

$$1BF\$ = 0.01\ PIBF \times IBF$$

69. Gross domestic fixed capital formation at current prices

$$I\$ = IBF\$ + IG\$ + IPC\$$$

70. Price deflator of gross domestic fixed capital formation

$$PI = 100\ I\$/I$$

71. Increase in stock at current prices

$$J\$ = 0.01\ PJ \times J$$

72. Imports of goods and services at current prices

$$M\$ = 0.01\ PM \times M$$

73. Exports of goods and services at current prices

$$X\$ = 0.01\ PX \times X$$

74. Balance of trade in terms of NT$ at current prices

$$BOT\$ = X\$ - M\$$$

75. Balance of trade in terms of US$ at current prices

$$BOT\$\$ = BOT\$/E$$

76. Gross domestic product at current prices

$$GDP\$ = C\$ + CG\$ + I\$ + J\$ + X\$ - M\$$$

77. Price deflator of GDP

$$PGDP = 100\ GDP\$/GDP$$

78. Rate of change in GDP price deflator

$$PGDP^* = 100(PGDP-PGDP_{-4})/PGDP_{-4}$$

79. Real rediscount rate

$$IRR = IR - PGDP^*$$

80. Real market interest rate

$$IRRB = IRB - PGDP^*$$

81. Potential labor productivity

$$PDT = QF/NE$$

82. Labor productivity

$$PGT = GDP/NE$$

83. Net factor income from abroad at 1986 prices

$$FIA = 100\ FIA\$/PFIA$$

84. Gross national product at 1986 prices

$$GNP = GDP + FIA$$

85. Gross national product at current prices

$$GNP\$ = GDP\$ + FIA\$$$

86. Price deflator of gross national product

$$PGNP = 100\ GNP\$/GNP$$

87. Rate of change in price deflator of gross national product

$$PGNP^* = 100\ (PGNP-PGNP_{-4})/PGNP_{-4}$$

88. Personal disposable income (approximate value) at 1986 prices

$$YDD = 100\ YDD\$/PGDP$$

89. Personal disposable income (approximate value) at current prices

$$YDD\$ = GNP\$ - TAXTT\$ - D\$$$

90. Liquid assets at 1986 prices

$$LA = YDD + MQM$$

91. Direct tax

$$TAXDD\$ = TAXTT\$ - (TI\text{-}SUB)\$ + SUB\$$$

92. Private savings at current prices

$$PS\$ = YDD\$ - C\$$$

93. Supply of Money at current prices

$$MON\$ = CUR + MDD$$

94. Demand for money equals supply money

$$MOND\$ = MON\$$$

95. Supply of money at 1986 prices

$$MON = MON\$/(0.01 \times PGDP)$$

96. Demand for quasi-money at current prices

$$MQM\$ = 0.01\ MQM \times PGDP$$

97. Rate of change in GDP at 1986 prices

$$GDP^* = 100\ (GDP\text{-}GDP_{-4})/GDP_{-4}$$

98. Rate of change in GNP at 1986 prices

$$GNP^* = 100\ (GNP\text{-}GNP_{-4})/GNP_{-4}$$

99. Rate of change in GDPIN at 1986 prices

$$GDPIN^* = 100\ (GDPIN\text{-}GDPIN_{-4})/GDPIN_{-4}$$

100. Prices of exports of goods of Japan in terms of US dollars

$$PXJA\$ = PXJA/EJA$$

101. Prices of exports of goods of Hong Kong in terms of US dollars

$$PXHK\$ = CPIHK / EHK$$

102. Prices of exports of goods of the U.S. in terms of NT$

$$PXUSNT\$ = PXUS\$ \times E$$

103. Prices of exports of goods of Japan in terms of NT$

PXJANT$ = PXJA$ x E

104. Prices of exports of goods of Hong Kong in terms of the NT$

PXHKNT$ = PXHK$ x E

105. PXUS/WPI = PXUSNT$/WPI

106. Prices of exports of goods and services

PXROC = PX

107. Prices of exports of goods and services in terms of U.S. dollars

PXROC$ = PX / E

108. Total exports of goods to the U.S. and Japan

TVXUSJA = TVXUS + TVXJA

109. The weighted average export price index of the U.S. and Japan

PXIUSJA$ = RXUS x PXUS$ + RXJA x PXJA$

110. The ratio of exports of goods to the U.S. to total exports of goods to the U.S. and Japan

RXUS = TVXUS/TVXUSJA

111. The ratio of exports of goods to Japan to total exports of goods to the U.S. and Japan

RXJA = TVXJA/TVXUSJA

112. The weighted average GNP index of the U.S. and Japan

GNPIUSJA = RXUS x GNPIUS + RXJA x GNPIJA

113. Gross service product at 1986 prices

GDPSE = GDP - GDPIN - GDPAG

Definitions of Variables

Value unit: NT$ million
US$ million

1.	**AFR$**	Foreign exchange reserves of all banks
2.	**BOT$**	Balance of trade in terms of NT$ at current prices
3.	**BOT$$**	Balance of trade in terms of the U.S. dollar
4.	**C**	Private consumption expenditure at 1986 prices
5.	**C$**	Private consumption expenditure at current prices
6.	**CF**	Private consumption expenditure on food at 1986 prices
7.	**CF$**	Private consumption expenditure on food at current prices
8.	**CG**	Government consumption expenditure at 1986 prices
9.	**CG$**	Government consumption expenditure at current prices
10.	**CO**	Private consumption expenditure on non-food at 1986 prices
11.	**CO$**	Private consumption expenditure on non-food at current prices
12.	**CPI**	Consumer price index
13.	**CPIHK**	Consumer price index of Hong Kong
14.	**CUR**	Net amount of currency in circulation
15.	**D**	Fixed capital consumption allowance at 1986 prices
16.	**D$**	Fixed capital consumption allowance at current prices
17.	**E**	Exchange rate: New Taiwan dollar/U.S. dollar
18.	**EHK**	Exchange rate: Hong Kong dollar/U.S. dollar
19.	**EJA**	Exchange rate: Japanese yen/U.S. dollar
20.	**FIA**	Net factor income abroad at 1986 prices
21.	**FIA$**	Net factor income abroad at current prices
22.	**GDP**	Gross domestic product at 1986 prices
23.	**GDP$**	Gross domestic product at current prices
24.	**GDPAG**	Gross agriculatural product at 1986 prices
25.	**GDPIN**	Gross industrial product at 1986 prices
26.	**GDPIN***	Gross industrial product at current prices
27.	**GNP**	Gross national product at 1986 prices
28.	**GNP$**	Gross national product at current prices
29.	**GNP***	Rate of change in GNP
30.	**GNPHK**	Real gross national product of Hong Kong
31.	**GNPJA**	Real GNP of Japan

32.	**GNPUS**	Real GNP of the U.S.
33.	**GNPIUSJA**	Weighted average GNP index of Japan and the U.S.
34.	**GOVPROA$**	Income from government property and enterprises
35.	**I**	Gross domestic fixed capital formation at 1986 prices
36.	**I$**	Gross domestic fixed capital formation at current prices
37.	**IBF**	Gross private fixed capital formation at 1986 prices
38.	**IBF$**	Gross private fixed capital formation at current prices
39.	**IG**	Gross government fixed capital formation at 1986 prices
40.	**IG$**	Gross government fixed capital formation at current prices
41.	**IPC**	Gross public enterprise fixed capital formation at 1986 prices
42.	**IPC$**	Gross public enterprise fixed capital formation at current price
43.	**IR**	Rediscount rate of the Central Bank of China
44.	**IRB**	Market interest rate
45.	**IRR**	Real rediscount rate
46.	**IRRB**	Real market interest rate
47.	**J**	Increase in stock at 1986 prices
48.	**J$**	Increase in stock at current prices
49.	**K**	Capital stock at 1986 prices
50.	**KE**	Capital stock being utilized at 1986 prices
51.	**KF**	Potential capital stock at 1986 prices
52.	**KJ**	Stock of inventory at 1986 price
53.	**LA**	Liquid assets at 1986 prices
54.	**M**	Imports of goods and services at 1986 prices
55.	**M$**	Imports of goods and services at current prices
56.	**MDD**	Demand deposit
57.	**MG**	Imports of goods at 1986 prices
58.	**MON**	Supply of money at 1986 prices
59.	**MON$**	Supply of money
60.	**MOND**	Demand for money at 1986 prices
61.	**MOND$**	Demand for money
62.	**MQM**	Demand for quasi-money at 1986 prices
63.	**MQM$**	Demand for quasi-money
64.	**MS**	Imports of services at 1986 prices
65.	**N**	Population in Taiwan
66.	**NE**	Number of employment (millions)
67.	**NF**	Labor force (millions)
68.	**PC**	Price deflator of private consumption expenditure
69.	**PCF**	Price deflator of private consumption expenditure on food
70.	**PCG**	Price deflator of government consumption expenditure

71.	**PCO**	Price deflator of private consumption expenditure on nonfood
72.	**PD**	Price deflator of fixed capital consumption allowance at 1986 prices
73.	**PDT**	Potential labor productivity
74.	**PFIA**	Price deflator of net income abroad
75.	**PGDP**	Price deflator of GDP
76.	**PGDP***	Rate of change in the price deflator of GDP
77.	**PGNP**	Price deflator of GNP
78.	**PGNP***	Rate of change in the price deflator of GNP
79.	**PGT**	Labor productivity
80.	**PHA**	Price deflator of net factor income from abroad
81.	**PI**	Price deflator of gross domestic fixed capital formation
82.	**PIBF**	Price deflator of gross private fixed capital formation
83.	**PIG**	Price deflator of gross government fixed capital formation
84.	**PIPC**	Price deflator of gross public enterprise fixed capital formation
85.	**PJ**	Price deflator of the increase in stock
86.	**PM**	Price deflator of imports of goods and services
87.	**PO**	Oil price (US$/per barrel) of Saudi Arabia
88.	**PS$**	Private savings at current prices
89.	**PTISUB**	Price deflator of net indirect taxes
90.	**PX**	Price deflator of exports of goods and services
91.	**PXHK$**	Price of exports of goods of Hong Kong in terms of the U.S. dollar
92.	**PXHKNT$**	Price of exports of goods of Hong Kong in terms of the N.T. dollar
93.	**PXIUSJA**	Weighted average price index of exports of the U.S. and Japan
94.	**PXJA**	Price of exports of Japan
95.	**PXJA$**	Price of exports of goods of Japan in terms of the U.S. dollar
96.	**PXJANT$**	Price of exports of goods of Japan in terms of the N.T. dollar
97.	**PXROC**	Price of Taiwan's exports of goods and services in terms of the N.T. dollar
98.	**PXROC$**	Price of Taiwan's exports of goods and services in terms of the U.S. dollar
99.	**PXUS**	Price of exports of the U.S.
100.	**PXUSNT$**	Price of exports of the U.S. in terms of the N.T. dollar
101.	**PWM**	Average wage index in manufacturing
102.	**Q1**	Dummy Variable, 1 for the first quarter and 0 for other quarters
103.	**Q2**	Dummy Variable, 1 for the second quarter and 0 for other quarters
104.	**Q3**	Dummy Variable, 1 for the third quarter and 0 for other quarters
105.	**QF**	Potential GDP
106.	**RR**	Reserve ratio for deposits
107.	**RXJA**	Exports of goods to Japan/Taiwan's total exports of goods to the

		U.S. and Japan
108.	**RXUS**	Exports of goods to the U.S./Taiwan's total exports of goods to the U.S. and Japan
109.	**SUB**	Government subsidies at 1986 prices
110.	**SUB$**	Government subsidies at current prices
111.	**TAF**	Average tariff rate
112.	**TAXDD$**	Direct taxes at current prices
113.	**TAXTT$**	Total tax and monoply revenue of public enterprises
114.	**TD**	Domestic demand at 1986 prices
115.	**TD$**	Domestic demand at current prices
116.	**(TI-SUB)**	Net indirect taxes at 1986 prices
117.	**(TI-SUB)$**	Net indirect taxes at current prices
118.	**TMMC$$**	Total imports of goods of Mainland China in terms of U.S.dollar
119.	**TVM**	Imports of goods through customs at 1986 prices
120.	**TVX**	Exports of goods through customs at 1986 prices
121.	**TVXHKM**	Exports of goods to Hong Kong and Mainland China at 1986 prices
122.	**TVXJA**	Exports of goods to Japan at 1986 prices
123.	**TVXOT**	Exports of goods to the rest of the world than the U.S., Japan and Hong Kong
124.	**TVXUS**	Exports of goods to the U.S. at 1986 prices
125.	**TVXUSJA**	Total exports of goods to the U.S. and Japan at 1986 prices
126.	**TW**	World trade volume index
127.	**U**	Unemployment rate
128.	**UVIM**	Unit value index of imports
129.	**UVIX**	Unit value index of exports
130.	**WPI**	Wholesale price index
131.	**WPIUS**	Wholesale price index of the U.S.
132.	**X**	Exports of goods and services at 1986 prices
133.	**X$**	Exports of goods and services at current prices
134.	**XG**	Exports of goods at 1986 prices
135.	**XS**	Exports of services at 1986 prices
136.	**YDD**	Disposable personal income at 1986 prices
137.	**YDD$**	Disposable personal income at current prices

References

Bryant, Ralph C., Henderson, Dale W., Holtham, Gerald, Hooper, Peter and Symansky, Steven A. (ed.), "Empirical Macroeconomics for Interdependent Economics," The Brookings Institution, 1988.

Klein, Lawrence R., "Use of Econometric Models in the Policy Process," In Economic Modelling, edited by P. Ormerod, London: Heinemann, 1979. 309-29.

Koutsoyiannis, A. "Theory of Econometrics," 2nd ed., Macmillan Press, 8-9, 1977.

Lo, Joan C., Li, Hung-Yi and Yu, Tzong-shian, "A Trade-oriented Macroeconometric Model of Taiwan," Academia Economic Papers, Vol. 20, No. 2, Part II. September 1992, 625-677.

McCarthy, Margaret Buckler, "LIFT: INFORUM's Model of the U.S. Economy," Economic Systems Research, 1991, 3, 15-36.

Prachowny, Martin F. J., "Macroeconomic Analysis for Small Open Economies," Oxford: Clarendon Press, 1984.

Shoven, John B. and Whalley John, "Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey," *Journal of Economic Literature,* Vol. XXII, September 1984, 1007-1051.

Tarkka, Juha and Willman, Alpo, (ed.), "The BOF & Quarterly Model of the Finish Economy," Bank of Finland, 1985.

Theil, Henri, "Who Forecasts Best," *International Economic Papers,* 1955, 5, 194-199.

_____, "Applied Economic Forecasting," North-Holland, 1966, 26-36.

Toida, Mitsurn and Liang, Youcai (ed.), "Econometric Link Model of China and Japan," Institute of Developing Economies, 1990.

Yu, Tzong-shian and Ho, Chin-Sheun, "The Effect of Changes in the Foreign Exchange Rate on Taiwan's Foreign Trade," to be appeared in a book in celebration of Professor S. C. Tsiang's 70th birthday.

Footnotes

1. see Koutsoyiannis (1977).

2. see Shoven and Whalley (1984).

3. see McCarthy (1991).

4. Among the components of GNP, the average growth rate of exports (1952-90) was 15.01 percent, and this was the highest component.

5. For the detailed analysis, see Theil (1955).

6. A systematic measure of the accuracy of the forecasts obtained from an econometric model was suggested by H. Theil. The value that the inequality coefficient is assumed to lie between is 0 and ∞, and the smaller the value of the inequality coefficient, the better is the forecasting performance of the model. See Theil (1966).

7. Labor is no longer an abundant factor, and the shortage of labor has been found in several sectors.

8. In Taiwan, there are the official interest rate and the market interest rate. The former is controlled by the Central Bank of China and the latter is determined by market forces. Actually, the official interest rate has had a dominant influence on the market interest rate.

9. Another reason is that we only used one quarter as the experimental period, thus, the effects of many policies are lagged and can not appear in the same period in which the policies are taken.

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