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<th>COULD WE NOT HAVE REDUCED THE INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS? : Some Simulation Results of the JERC Model</th>
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<tr>
<td>Author</td>
<td>蓆谷, 千凰彦(MINOTANI, Chiohiko)</td>
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Chapter 2

COULD WE NOT HAVE REDUCED THE INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS?
—Some Simulation Results of the JERC Model—

Chiohiko Minotani

1. INTRODUCTION*

Would the inflation rate in 1973 and 1974 have been reduced and the balance of payments surplus have decreased, if appropriate fiscal policies and/or monetary policies had been taken?

In this paper, we report some results of simulation analysis of simple fiscal and monetary policy adjustment rules using the Japan Economic Research Center (JERC) Econometric Model for the period 1967-1 through 1975-IV.

The importance of policy adjustment rules (derivative, proportional and integral rules), policy lags and magnitude were already analyzed in [1], therefore this paper does not intend to analyze the stabilizing effect of each policy adjustment rule.

In Section 2 we will sketch major aspects of the performance of the Japanese economy. In Section 3 the model used for these simulations and the simulation techniques will be described. In Section 4 the results of the simulations will be presented.

Concluding remarks will be given in Section 5 where we will comment on limitations of this research and directions for future efforts.

2. A REVIEW

We will sketch in what follows the main movements in Japanese economy in the 1967-1976 period. Table 1 provides a summary annual rates of change in the following key macroeconomic variables: real GNP (Y), wholesale price index (PWI), consumer price index (PCI), government fixed investment (IG) and money supply (M2). Moreover, a set of variables are added such as reserves of current account (R), its ratio to GNP (R/V × 100), the ratio of job offers to applicants (JOA) and the discount rate (DELT). Figures 1-3 present annual rates of change in prices (PWI, PCI), annual values of real GNP and private fixed capital formation at 1970 prices (IF), JOA and (R/V) × 100. Figure 4 presents combinations of monetary policy as represented by the discount rate (DELT) and fiscal policy as represented by the annual rate of change in the government fixed

* I am indebted to Masayo Nishikawa and Yoshie Takamura, the staff members of the Japan Economic Research Center, who helped with the computations and the drawings.
TABLE 1. **Key Macroeconomic Variables**

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<tr>
<th>Year</th>
<th>$\dot{Y}$ (%)</th>
<th>$PWI$ (%)</th>
<th>$PCI$ (%)</th>
<th>$R$ (billions of yen)</th>
<th>$R/V \times 100$ (%)</th>
<th>$JOA$ (ratio)</th>
<th>$\dot{I}$ (%)</th>
<th>$DELT$ (%)</th>
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Note: (1) • denotes annual rate of change.  
(2) $R$ and $(R/V) \times 100$ are the values of the IVth quarter of each fiscal year, not the average value of four quarters.  
(3) $M_2$ is currency plus demand and time deposits.

Investment ($I\dot{G}$) for fiscal years 1966 to 1976. As indicated in Figure 4, due-north, due-east, due-south and due-west directions respectively show a tight monetary policy (TM), an expansionary fiscal policy (EF), an expansionary monetary policy (EM) and a tight fiscal policy comparing with the previous year.

The time period 1966 to 1976 may be divided into two sub-periods. The first, 1967 through 1972, may be characterized by the following facts:

1. High growth rates of real GNP (the average annual rate of increase was 10.7 percent).
2. Stable wholesale prices (the average annual rate of increase was 1.7 percent) and the rapid increase in consumer prices (the average annual rate of increase was 5.7 percent) and a large discrepancy between the rates of increase of wholesale and consumer prices.
3. The sizeable increase in the balance of payments surplus since 1968.
4. The acceleration in the growth rate of money supply.
5. Revaluation of the yen in 1971, and
6. Expansionary fiscal and monetary policies in 1971 and 1972 which were adopted partially because of a fear of the depressive effect of the revaluation of the yen.

The second period since 1973 may be characterized by the following facts:

1. The galloping inflation which proceeded partially because of the increased import prices and in part because of such domestic factors as flexibly increased money supply, increased government expenditures and tax reductions, restrictive supplies of basic materials and so on. (See Komiya and Suzuki [2]).
(2) The end of the period of high growth rate of real GNP. The main reason for this is regarded to be a sharp decline of private fixed capital formation. (3) The large balance of payments surplus and the continuous increase in the value of yen.

![Graph showing annual rate of change in wholesale price and consumer price](image-url)

Fig. 1. Annual Rate of Change in Wholesale Price $PW/I$ and Consumer Price $P\hat{C}I$
(4) The steady increase in unemployment from 615 thousands in 1967 to 1067 thousands in 1976.
(5) Tight monetary policy especially in 1974.
(6) The rapid reduction in the rate of increase of wholesale prices since 1975.

Fig. 2. Real GNP $V$ and Private Fixed Capital Formation $IF$
Fig. 3. The Ratio of Job Offers to Applicants JOA and the Ratio of Reserves of Current Account to GNP
3. THE MODEL AND THE SIMULATIONS

The model used here is the JERC model with 82 endogenous variables (41 stochastic equations and 41 identity equations) and 40 exogenous variables. All data are seasonally adjusted. Equations of the model will be presented below. The channels of the effects of the fiscal policy variables and monetary policy variable (i.e. discount rate) are shown in Figure 5.

It is assumed, in this paper, that the target of the policy maker is to stabilize consumer prices and to equilibrate the balance of payments. The target variables are consumer price index (PCI) and reserves of current account (R). The desired levels of these variables are assumed as follows:

\[(PCI)^* = 0.014 \text{ (quarter-to-quarter change)}\]
\[\left( \frac{4R}{\sum_{t=0}^{4} V_{t-i}} \right)^* = 0.01\]

where \(V\) denotes gross national product. The rate of change from the previous quarter of consumer price index, 0.014, is equal to 5.7 percent of annual rate of change, which is the average annual rate from 1967 to 1972 fiscal year. The target of
reserves of current account, $R=0.014 \sum_{t=0}^T V_{-t}$, is a hypothetical value. Policy variables for these targets are government fixed investment ($IG$) for fiscal policy and the discount rate ($DELT$) for monetary policy. These two policy variables are automatically adjusted proportionally to the deviation between previous quarter level and desired level of the target variable (proportional policy) and in response to the rate of change of target variable in the previous quarter (derivative policy).

**Fig. 5. Flow Chart of the JERC Model**

**TABLE 2. CONTROL PARAMETERS**

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Note: $P$ means proportional policy and $D$ means derivative policy.
The rate of change of government fixed investment from the previous quarter, \( g \), is controlled by the combination of proportional and derivative rules of the following type:

\[
g = a_0 + a_1 (PCI_{t-1} - 0.014) + a_2 (PCI_{t-1} - PCI_{t-2}) + a_3 \left[ \frac{4R}{\sum_{i=0}^{3} V_{i-1}} - 0.01 \right] + a_4 \left[ \left( \frac{4R}{\sum_{i=0}^{3} V_{i-1}} \right) - \left( \frac{4R}{\sum_{i=0}^{3} V_{i-2}} \right) \right]
\]

Using this rule, government fixed investment \( IG \) becomes an endogenous variable in our simulation.

\[
IG = (1 + g)IG_{t-1}
\]

The discount rate, \( DELT \), is controlled in the same way as \( g \).

\[
DELT = b_0 + b_1 (PCI_{t-1} - 0.014) + b_2 (PCI_{t-1} - PCI_{t-2}) + b_3 \left[ \frac{4R}{\sum_{i=0}^{3} V_{i-1}} - 0.01 \right] + b_4 \left[ \left( \frac{4R}{\sum_{i=0}^{3} V_{i-1}} \right) - \left( \frac{4R}{\sum_{i=0}^{3} V_{i-2}} \right) \right]
\]

The values of control parameters \( a_0 - a_4 \) and \( b_0 - b_4 \) used in the simulation are given in Table 2. Run 1 represents the case in which the constant growth rate rule is adopted for government fixed investment. The value \( a_0 = 0.04 \) corresponds to the annual growth rate of about 17 percent. Runs 2 to 4 are the cases of proportional control, runs 5 to 6 are the cases of derivative control and runs 7 to 9 are the cases in which proportional and derivative controls are combined for government fixed investment. Runs 10 to 11 are the cases of combined proportional and derivative controls for the discount rate. Run 12 is the case of the combination of the fiscal and monetary policy or the combination of run 7 and run 11.

4. THE RESULTS OF SIMULATIONS

The results of our simulations are presented in Tables 3–7 and Figures 6–14 for run 3 and run 7.

We can see the following results.
(1) The results of almost all simulations are not very different from the actual economy until 1971. However, a notable difference arises in fiscal policy in the 1972–1974 period. Growth rates of government fixed investment of run 3 and run 7, comparing with actual growth rates, are shown in Table 8.

Both run 3 and run 7, which bring the value of reserves of current account in 1975-1 close to the desired level, as will be mentioned later, suggest that strong expansionary fiscal policies should have been taken in 1972 and 1973 but a strong tight fiscal policy in 1974.
(2) The monetary policy as represented by the control of discount rate did not
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TABLE 3. RESERVES OF CURRENT ACCOUNT (BILLIONS OF YEN) \( R \)
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have a desired effect on stabilizing inflation and reducing the balance of payments surplus (see run 10 and run 11).

(3) The policy adjustment rules discussed in this paper do not successfully reduce the rate of inflation in 1973 and 1974. There are two main reasons for this. The first is that one of the sources of this galloping inflation was the rise in import prices. The policy maker cannot control this external factor. The second is that since the JERC Model used in these simulations does not contain a money supply variable we could not analyze the effect of control of the money supply. Money supply would have been more important than discount rate in the analysis of inflation in 1973 and 1974. Komiya and Suzuki [2] say as follows: The high level of liquidity created by the increased money supply during 1971 through 1973 gave rise to strong inflationary pressures in 1972 and 1973. The unexpectedly quick recovery of the economy in 1972 from the preceding recession, purchase of land and stocks by large firms and speculative purchases of raw materials and intermediate products were the result of the high level of

Note: $V_I$, $C_I$ and $IF_I$, trillions of yen; $BG$, billions of yen; $PWI$, annual percent change.

### TABLE 7. MAIN VARIABLES FOR THREE SIMULATIONS

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liquidity. Thus the unusually rapid increase in money supply that proceeded throughout 1971, 1972 and the first half of 1973 resulted in the rapid increase in expenditures and consequently in price levels.

(4) On the other hand, we could have reduced the reserve of balance of payments surplus to the desired level in 1975. If we had controlled the government fixed investment by the proportional policy (run 3) or the combination of proportional and the derivative policies (run 7). The reserve of current account $R$ is approximately equal to the desired value, 1439 billions
of yen (one percent of GNP), in the first quarter of 1975 for run 3, run 7
and run 12 (see Table 3). From the policy maker's point of view, run 3
which assumes fewer numbers for control parameters than runs 7 and 12
might be prefered to these runs. The main variables for run 3 and run 7
are shown in Table 7. The annual values of target variables $\Delta C$ and $R/V$
for run 3 and run 7 are given in Figure 14.

(5) The differences among policy adjustment rules are large. Runs 5 and 6
which represent derivative policies increase the reserve of current account

![Fig. 7. Reserves of Current Account $R$](image-url)
(6) The intensity of a policy represented by the value of control parameters is also important, especially for IG. The difference in the intensity of policy measures may be found by comparing run 2 with run 4 for the case of proportional policy and run 8 with run 9 for the case of combined proportional and derivative policy.
5. CONCLUSIONS AND LIMITATIONS

It is doubtful whether run 3 could have been feasible. As shown in Table 7, run 3 has an expansionary effect on the aggregate demand and consequently on labor demand throughout 1973-1975. Run 3 shows a more rapid rate of increase in consumer price since the second quarter of 1973 (see Table 4) and in wholesale prices since 1973 (see Table 7). The deficit in the balance of government sector $BG$ increases since 1971 (see Table 7). Considering that the primary target of policy in 1973-1975 was to stabilize prices, run 3 which increases more rapidly both consumer prices and wholesale prices than other policies would not have been chosen. Furthermore, because the policy makers have long held the position of a balanced budget, run 3 would not have been chosen.

So far we have not attempted simulations of effects of various cases of policy mix of a tight monetary policy (i.e. money supply control) and an expansionary fiscal policy (run 3 or run 7) for years 1971 to 1974. We were unable to do this.

Fig. 9. Discount Rate $DELT$
because, as mentioned earlier, this model does not contain a money supply variable.

The latest version of the JERC Model (JERC-SFM-SA5) has the following interest rate function which includes a money supply variable.

\[
SRLO - SRLO_{-1} = 0.30858 \times 10^{-1} + 0.67739 \times 10^{-5} \sum_{i=1}^{4} [IF + DKJP - (SC + DF)/PI]_{-i} - 0.50313 \times 10^{-4} [M2/P - (M2/P)_{-1}] + 0.60762 (DELT - DELT_{-1})
\]

(billions of yen)

Fig. 10. Real GNP $V'$
Another limitation of our results is that foreign exchange rate $EXV$ is treated as an exogeneous variable in the simulation. $EXV$ becomes an endogeneous variable in the JERC-SFM-SAJS, which has a repercussion effect of $R$ on $EXV$. $EXV$ function is as follows:

$$EXV = 300.41 - 0.16700 \times 10^{-1} R_2 - 0.13942 \times 10^{-1} (R_{-1} - R_{-3}) + 83.579 \frac{1}{4} \sum_{i=1}^{8} \left( \frac{P_E}{P_E W} \right)_{-i}$$

$$P = (7101 - 7604)$$

$$\bar{R}^2 = 0.8839 \quad S = 7.77 \quad d = 1.395$$

Fig. 11. Private Consumption Expenditure at 1970 Prices $C/$
### Table 8. Growth Rates of Government Fixed Investment (percent)

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<td>6.7</td>
<td>15.2</td>
<td>21.3</td>
<td>36.5</td>
<td>57.4</td>
<td>35.6</td>
<td>-0.1</td>
<td>8.7</td>
</tr>
</tbody>
</table>

Fig. 12. Private Fixed Capital Formation at 1970 Prices IF/
We do not necessarily mean to assert that the Japanese government should have taken such expansionary policies as represented by run 3 or run 7 for years 1972 to 1974. This is because such policies would probably not have been acceptable since they would certainly have aggravated the rate of inflation by a few percentage points and also the government deficit considerably. It should be born in mind that the results of all these simulations should be interpreted under the condition of "other things being equal".
Fig. 14. Annual Rates of Change in Consumer Prices $PCI$ and the Ratio of Reserves of Current Account to GNP $(R/V) \times 100$

Finally, let us add that we are currently working with the latest version of the JERC Model to make further improvements and refinements of analysis.

Keio University

REFERENCES


CHIOHIKO MINOTANI

JERC-SFM-SA3

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LIST OF VARIABLES

\( BCR \)  Balance on current account (I.M.F., a million dollars)
\( BF \)  Balance of payments
\( BF$ \)  Balance of payments (a million dollars)
\( BG \)  Balance of government sector
\( BSRV \)  Services (I.M.F.)
\( BTR \)  Balance of trade (I.M.F., a million dollars)
\( BTRF \)  Transfers (I.M.F.)
\( C \)  Private consumption expenditure
\( C/ \)  Private consumption expenditure at 1970 prices
\( CG \)  Government consumption
\( CG/ \)  Government consumption at 1970 prices
\( D \)  Capital consumption allowance, total
\( DELT \)  Discount rate
\( DF \)  Capital consumption allowance for private fixed capital stock
\( DF/ \)  Capital consumption allowance for private fixed capital stock at 1970 prices
\( DG \)  Capital consumption allowance for government fixed stock
\( DH \)  Capital consumption allowance for private residential fixed capital stock
\( DH/ \)  Capital consumption allowance for private residential fixed capital stock at 1970 prices
\( DI\!* \)  Dividend and other transfer payments from corporation to persons
\( DKJA \)  Inventory investment in agricultural sector at 1970 prices
\( DKJN \)  Inventory investment in private non-agricultural sector at 1970 prices
\( E \)  Exports and income from abroad
INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS

\( E \)  Exports and income from abroad at 1970 prices
\( EC^*D \)  Exports of goods (C.C.B., a million dollars)
\( ECD/ \)  Exports of goods at 1970 prices (C.C.B., a million dollars)
\( EIMF \)  Exports of goods (I.M.F., a million dollars)
\( EPS \)  Statistical discrepancy
\( ETA \)  Labor productivity
\( E\bar{X} \)  Ratio of exchange rate (360 yen per U.S. dollar/New rate per U.S. dollar)
\( E\bar{X}V \)  Exchange rate (yen per U.S. dollar)
\( FI \)  Personal financial assets
\( FV \)  Gross national product less inventory investments
\( H \)  Total working hours per worker
\( HFB \)  New loans of housing funds (all banks and mutual loan & saving banks)
\( HFL \)  New loans of housing funds (Housing Loan Corporation)
\( HL \)  Man-hours
\( HT \)  Standard hours of work
\( IF \)  Private fixed capital formation
\( IF/ \)  Private fixed capital formation at 1970 prices
\( \bar{IG} \)  Government fixed investment
\( IG/ \)  Government fixed investment at 1970 prices
\( IH \)  Private residential fixed capital formation
\( IH/ \)  Private residential fixed capital formation at 1970 prices
\( \bar{JG} \)  Government inventory investment
\( \bar{JG}/ \)  Government inventory investment at 1970 prices
\( JOA \)  Job offers to applicants, ratio
\( JPA \)  Inventory investment in agricultural sector
\( JPN \)  Inventory investment in private non-agricultural sector
\( KF \)  Private fixed capital stock (start basis)
\( KF^* \)  Private fixed capital stock (installation basis)
\( KH \)  Private residential fixed capital stock
\( KJPN \)  Inventories in private non-agricultural sector
\( L \)  Employed persons
\( LFU2 \)  Full employment employed persons
\( LW \)  Employees
\( M \)  Imports and income payments to abroad
\( M/ \)  Imports and income payments to abroad at 1970 prices
\( MC^*D \)  Imports of goods (C.C.B. a million dollars)
\( MCD/ \)  Imports of goods at 1970 prices (C.C.B., a million dollars)
\( MIMF \)  Imports of goods (I.M.F., a million dollars)
\( M1D/ \)  Imports of foods (C.C.B., a million dollars) at 1970 prices
\( M2D/ \)  Imports of raw materials (C.C.B., a million dollars) at 1970 prices
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3D/</td>
<td>Imports of mineral fuels (C.C.B., a million dollars) at 1970 prices</td>
</tr>
<tr>
<td>M4D/</td>
<td>Imports of other goods (C.C.B., a million dollars) at 1970 prices</td>
</tr>
<tr>
<td>NL</td>
<td>Labor forces</td>
</tr>
<tr>
<td>P</td>
<td>Implicit deflator for gross national product (1970=1.0)</td>
</tr>
<tr>
<td>PC</td>
<td>Implicit deflator for private consumption expenditure (1970=1.0)</td>
</tr>
<tr>
<td>PCI</td>
<td>Consumer price index (1970=1.0)</td>
</tr>
<tr>
<td>PCP</td>
<td>Price index for public services (1970=1.0)</td>
</tr>
<tr>
<td>PE</td>
<td>Implicit deflator for exports and income from abroad (1970=1.0)</td>
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<tr>
<td>PECD</td>
<td>Price index for exports of goods (C.C.B.), (1970=1.0)</td>
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<td>PECY</td>
<td>Price index for exports of goods (1970=1.0)</td>
</tr>
<tr>
<td>PEW</td>
<td>Implicit deflator for world manufactured goods exports (1970=1.0)</td>
</tr>
<tr>
<td>PH</td>
<td>Implicit deflator for private residential fixed capital formation (1970=1.0)</td>
</tr>
<tr>
<td>PI</td>
<td>Implicit deflator for private fixed capital formation (1970=1.0)</td>
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<tr>
<td>PIG</td>
<td>Implicit deflator for government investment (1970=1.0)</td>
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<tr>
<td>PJPN</td>
<td>Implicit deflator for inventory investment in private non-agricultural sector (1970=1.0)</td>
</tr>
<tr>
<td>PM</td>
<td>Implicit deflator for imports and income payments to abroad (1970=1.0)</td>
</tr>
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<td>PMCD</td>
<td>Price index for imports of goods (C.C.B.) (1970=1.0)</td>
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<tr>
<td>PMCY</td>
<td>Price index for imports of goods (1970=1.0)</td>
</tr>
<tr>
<td>PM3D</td>
<td>Price index for imports of mineral fuels (C.C.B.) (1970=1.0)</td>
</tr>
<tr>
<td>PR</td>
<td>Implicit deflator for rent (1970=1.0)</td>
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<tr>
<td>PST</td>
<td>Price index for housing starts (1970=1.0)</td>
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<tr>
<td>PWI</td>
<td>Wholesale price index (1970=1.0)</td>
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<td>Q</td>
<td>Dummy variable for the change in the taxation system</td>
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<td>R</td>
<td>Reserves of current account</td>
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<td>ROH*</td>
<td>Capacity utilization rate</td>
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<td>RTI</td>
<td>Indirect tax rate +1.0</td>
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<td>RW</td>
<td>Wage income per employee</td>
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<tr>
<td>R̄I</td>
<td>Corporate income tax rate</td>
</tr>
<tr>
<td>R̄2</td>
<td>Corporate dividend tax rate</td>
</tr>
<tr>
<td>SG</td>
<td>Government saving</td>
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<tr>
<td>SI</td>
<td>Employer and employee contributions to social insurance</td>
</tr>
<tr>
<td>SIE</td>
<td>New supply of industrial equipment funds</td>
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<tr>
<td>SP</td>
<td>Personal saving</td>
</tr>
<tr>
<td>SRL0</td>
<td>Regulated interest rates</td>
</tr>
<tr>
<td>SRL1</td>
<td>Non-regulated interest rates</td>
</tr>
<tr>
<td>SSP</td>
<td>Accumulated personal income</td>
</tr>
</tbody>
</table>
\( \overline{SUB} \) Subsidies
\( T \) Total taxes
\( TC \) Corporate income taxes
\( TFG \) Transfers from abroad to government
\( TFP \) Transfers from abroad to persons
\( TGF \) Transfers from government to abroad
\( TI \) Indirect taxes
\( TIME \) Time trend
\( TP^* \) Personal income taxes
\( TPF \) Transfers from persons to abroad
\( TR \) Government transfer payments to persons
\( TW/ \) World exports at 1970 prices
\( UCC \) User cost of capital
\( ULC1 \) Unit labor cost
\( V \) Gross national product
\( V/ \) Gross national product at 1970 prices
\( VP3 \) Capacity output
\( W \) Wage income
\( Y \) National income
\( YC^* \) Corporate income before inventory valuation adjustment
\( YD \) Disposable income
\( YG^* \) Government enterprise surplus
\( YP \) Personal income
\( YR^* \) Property income less interest on consumer’s debt

Note: (1) The variables marked "—" denote exogeneous variables.
(2) C.C.B. = Customs Clearance Basis.
NOTATIONS

$\hat{R}^2$; the adjusted coefficient of multiple determination
$S$; standard error
d; Durbin-Watson statistic
$P = (6101, 7604)$; observation period 1961-I to 1976-IV. The first quarter I denotes April to June.
The values in parentheses under coefficients denote $t$-values.
All data are seasonally adjusted.
Log denotes natural logarithms.

I. FINAL DEMAND

1.1. Identity for gross national product, at 1970 prices

$V/ = C/ + CG/ + IF/ + IG/ + IH/ + DKJN/ + DKJA/ + JG/ + E/ - M/

1.2. Private consumption expenditure

$C/ = 4438.7720 + 0.49479583(YD/PC) + 0.14690470(F7_1/PC)$

$(8.61) (6.88) (3.09)$

$\hat{R}^2 = 0.9955$ $S = 728.11$ $d = 0.265$ $P = (6101, 7504)$

1.3. Private fixed capital formation

$IF/ = -7579.8029 + 0.92152667 \sum_{i=0}^{7} (8-i)36 \frac{V}{-1-i}$

$(-3.23)$

$-15718.534 \sum_{i=0}^{7} (8-i)36 UCC_{-1-i} + 27467.315 \sum_{i=0}^{7} (8-i)36(RW/H)_{-1-i}$

$(-1.85)$

$-0.63480866KF_{*1} + 0.29259075(SIE/PI)_{-1}$

$(-4.38)$

$\hat{R}^2 = 0.9748$ $S = 464.32$ $d = 1.584$ $P = (6701, 7504)$

1.4. Identity for government fixed investment

$IG/ = IG + PIG$

1.5. Private residential fixed capital formation

$IH/ = -3252.0139 + \sum_{i=0}^{3} W_{3i} (YD/PC)_{-i} + \sum_{i=0}^{3} W_{3i} (PR/PST)_{-i}$

$(-3.04)$

$+ \sum_{i=0}^{3} W_{3i} ((HFB + HFL)/PH)_{-1-i}$
INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS

<table>
<thead>
<tr>
<th></th>
<th>$W_{1i}$</th>
<th>Second-order t-value</th>
<th></th>
<th>$W_{2i}$</th>
<th>Second-order t-value</th>
<th></th>
<th>$W_{3i}$</th>
<th>Second-order t-value</th>
</tr>
</thead>
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<tr>
<td>-1</td>
<td>0</td>
<td></td>
<td>-1</td>
<td>0</td>
<td></td>
<td>-1</td>
<td>0</td>
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<td>0.020535176</td>
<td>6.84</td>
<td>0</td>
<td>502.54306</td>
<td>4.38</td>
<td>0</td>
<td>0.25446713</td>
<td>5.65</td>
</tr>
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<td>0.030802765</td>
<td>6.84</td>
<td>1</td>
<td>753.81459</td>
<td>4.38</td>
<td>1</td>
<td>0.38170069</td>
<td>5.65</td>
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<tr>
<td>2</td>
<td>0.030802765</td>
<td>6.84</td>
<td>2</td>
<td>753.81459</td>
<td>4.38</td>
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<tr>
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<td>6.84</td>
<td>3</td>
<td>502.54306</td>
<td>4.38</td>
<td>3</td>
<td>0.25446713</td>
<td>5.65</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td></td>
<td>4</td>
<td>0</td>
<td></td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

$\sum W_{1i} = 0.102676$  \hspace{1cm} $\sum W_{2i} = 2512.72$  \hspace{1cm} $\sum W_{3i} = 1.27234$

$\hat{R}^2 = 0.9724$  \hspace{1cm} $d = 0.945$  \hspace{1cm} $P = (6604, 7504)$

1.6. Inventory investment in private non-agricultural sector

$DKJN = -864.21570 + 0.11772415 \sum_{i=0}^{4} \times (4-i)/10 \times \bar{V}_{-i} - 0.28866679KJPN_{-1}$  \hspace{1cm} $(-2.00)$  \hspace{1cm} $(5.79)$  \hspace{1cm} $(-5.11)$

$+ 37.655451 \times [(PJPN/PJPN_{-1})^4 - 1] \times 100 - SRL0]_{-1} \times 100$

$\hat{R}^2 = 0.6317$  \hspace{1cm} $S = 595.13$  \hspace{1cm} $d = 1.073$  \hspace{1cm} $P = (6101, 7504)$

1.7. Identity for exports and income from abroad

$E / = E + PE$

1.8. Identity for imports and income payments to abroad

$M / = M + PM$

1.9. Identity for gross national product

$V = C + CG + IF + G + IH + JPN + JPA + JG + E - M$

1.10. Identity for private consumption expenditure

$C = C / \times PC$

1.11. Identity for private fixed capital formation

$IF = IF / \times PI$

1.12. Identity for private residential fixed capital formation

$IH = IH / \times PH$

1.13. Identity for inventory investment in private non-agricultural sector

$JPN = DKJN \times (PJPN + PJPN_{-1}) + 2$

1.14. Export and income from abroad

$E = 3.3491355 + 0.997861593 \times \bar{EXV} \times (EIMF + SRVC) / 1000$

$(0.12)$  \hspace{1cm} $(354.35)$

$\hat{R}^2 = 0.9995$  \hspace{1cm} $S = 131.44$  \hspace{1cm} $d = 1.717$  \hspace{1cm} $P = (6101, 7504)$
1.15. Export of goods (I.M.F.)

\[ EIMF = -11.402667 + 0.98259236EC*D \]
\[ R^2 = 0.9999 \quad S = 146.82 \quad d = 1.064 \quad P = (6101, 7504) \]

1.16. Identity for export of goods (C.C.B.)

\[ EC*D = ECD/ \times PECD \]

1.17. Export of goods (C.C.B)

\[ \log (ECD/) = 0.23099080 - 1.8048475 \log (PECD/PEW) \]
\[ R^2 = 0.9926 \quad S = 0.052264 \quad d = 1.288 \quad P = (6101, 7504) \]

1.18. Imports and income payments to abroad

\[ M = -6.1047264 + 0.99890461 \{EXV \cdot (MIMF + SRVD)/1000\} \]
\[ R^2 = 0.9995 \quad S = 132.37 \quad d = 1.650 \quad P = (6101, 7504) \]

1.19. Import of goods (I.M.F.)

\[ MIMF = -806.84858 + 0.86681125MC*D \]
\[ R^2 = 0.9994 \quad S = 384.21 \quad d = 0.442 \quad P = (6101, 7504) \]

1.20. Identity for import of goods (C.C.B.)

\[ MC*D = MCD/ \times PMCD \]

1.21. Identity for import of goods (C.C.B.)

\[ MCD/ = M1D/ + M2D/ + M3D/ + M4D/ \]

1.22. Import of food (C.C.B.)

\[ \log (M1D/) = 4.0001591 + 0.23250779 \log (C/) - 0.64025258 \log (KJPA) \]
\[ R^2 = 0.9881 \quad S = 0.053871 \quad d = 2.426 \]

1.23. Import of raw materials (C.C.B.)

\[ \log (M2D/) = -0.19455644 + 0.15570034 \log (V/) \]
\[ R^2 = 0.9999 \quad S = 146.82 \quad d = 1.064 \quad P = (6101, 7504) \]
1.24. Import of mineral fuel (C.C.B.)
\[
\log (M3D) = -9.8576586 + 1.6189716 \log (V) - 0.088665727 \log (PM3D)
\]
\[
(42.23) (75.00) (-6.00)
\]
\[
R^2 = 0.9926 \quad S = 0.052460 \quad d = 0.783 \quad P = (6101, 7504)
\]

1.25. Import of other goods (C.C.B.)
\[
\log (M4D) = -0.72881101 + 0.22281455 \log (C) + 0.36930788 \log (EX)
\]
\[
(-1.20) (2.25) (12.38)
\]
\[
R^2 = 0.9807 \quad S = 0.078299 \quad d = 1.315 \quad P = (6101, 7504)
\]

II. INCOME DISTRIBUTION

2.1. Identity for national income
\[
Y = V - D - TI + SUB - EPS
\]

2.2. Identity for wage income
\[
W = RW \times LW
\]

2.3. Dividend and other transfer payments from corporation to persons
\[
DI* = 58.756188 + 0.0076762032 \frac{(Y - W - YG*) + (Y - W - YG*)_1}{2}
\]
\[
(2.87)
\]
\[
R^2 = 0.9724 \quad S = 62.901 \quad d = 0.730 \quad P = (6101, 7504)
\]

2.4. Personal income
\[
YP = 3242.2649 + 1.1749985(W + YR* + DI* + TR + TFP)
\]
\[
(13.25) (242.69)
\]
\[
R^2 = 0.9990 \quad S = 1118.9 \quad d = 0.245 \quad P = (6101, 7504)
\]

2.5. Identity for disposable income
\[
YD = YP - TP* - SI - TPF
\]

2.6. Corporate income before inventory valuation adjustment
\[
YC* = -206.65633 + 0.63236613 \sum_{i=0}^{2} \frac{(4 - i)/10}{(IF - DF)_{-1} - 2073.1579 SRL1_{-1}}
\]
\[
(-0.05) (8.76) (-4.94)
\]
\[
R^2 = 0.9849 \quad S = 565.48 \quad d = 0.911 \quad P = (6101, 7504)
\]
2.7. Property income less interest on consumer’s debt

\[ YR^* = -201.56869 + 0.11861095 SSP_{-1} \]
\[ (-4.00) (146.92) \]

\[ \hat{R}^2 = 0.9973 \quad S = 233.08 \quad d = 0.221 \quad P = (6101, 7504) \]

2.8. Identity for personal saving

\[ SP = YD - C \]

2.9. Identity for accumulated personal saving

\[ SSP = SSP_{-1} + \frac{1}{2} \times SP \]

III. EMPLOYMENT AND WAGES

3.1. Man-hours

\[ HL = 80146.798 + \sum_{i=0}^{3} W_i \left[ \frac{V}{(RW/H)/P} \right]_{-i} \]

\begin{tabular}{|c|c|c|}
\hline
\( i \) & \( W_i \) & \text{First-order} \\
\hline
\( -1 \) & 0 & \\
0 & 0.084557339 & 13.55 \\
1 & 0.063418004 & 13.55 \\
2 & 0.042278670 & 13.55 \\
3 & 0.021139335 & 13.55 \\
4 & 0 & \\
\hline
\end{tabular}

\[ \sum W_i = 0.211393 \]

\[ R = 0.9082 \quad S = 945.81 \quad d = 1.195 \quad P = (6504, 7504) \]

3.2. Hours of work

\[ H = 2247.5911 + 3.0407953 ROH^* + \sum_{i=0}^{7} W_i ETA_{-i} \]

\begin{tabular}{|c|c|c|}
\hline
\( i \) & \( W_i \) & \text{Second-order} \\
\hline
\( -1 \) & 0 & \\
0 & -0.013504882 & -22.89 \\
1 & -0.023633543 & -22.89 \\
2 & -0.030385983 & -22.89 \\
3 & -0.033762204 & -22.89 \\
4 & -0.033762204 & -22.89 \\
5 & -0.030385983 & -22.89 \\
6 & -0.023633543 & -22.89 \\
7 & -0.013504882 & -22.89 \\
8 & 0 & \\
\hline
\end{tabular}

\[ \sum W_i = -0.202573 \]
INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS

\[ R = 0.9777 \quad S = 17.153 \quad d = 0.666 \quad P = (6501, 7504) \]

3.3. Identity for employed persons

\[ L = HL + H \]

3.4. Employees

\[ LW = -4.4005332 + 0.17095621 L + 0.87731273 LW_{-1} \]

\[ R^2 = 0.9971 \quad S = 0.20402 \quad d = 1.901 \quad P = (6101, 7504) \]

3.5. Job offers to applicants, ratio

\[ JOA = -1.2020962 + 12.952352 \sum_{i=0}^{3} \left( \frac{(4-i)/10}{(10-i)} \right) \]

\[ R^2 = 0.7021 \quad S = 0.18987 \quad d = 0.193 \quad P = (6101, 7504) \]

3.6. Wage income per employee

\[ \frac{RW - RW_{-4}}{RW_{-1}} = -0.019911876 + 0.052523311 \cdot JOA \]

\[ R^2 = 0.7862 \quad S = 0.20772 \]

IV. PRICES

4.1. Wholesale price index

\[ PWI = 0.57325388 + 0.00016714832RW + 0.00042745360ETA \]

\[ R^2 = 0.9849 \quad S = 0.027996 \quad d = 0.355 \quad P = (6101, 7504) \]

4.2. Consumer price index

\[ \frac{PCI - PCI_{-4}}{PCI_{-1}} = \frac{RTI - RTI_{-4}}{RTI_{-1}} \]

\[ R^2 = 0.9455 \quad S = 0.012525 \quad d = 1.370 \quad P = (6201, 7504) \]
4.3. Implicit deflator for private consumption expenditure

\[ PC = 0.061953976 + 0.93229669PCI \]

(18.61)  (291.95)

\( \bar{R}^2 = 0.9993 \quad S = 0.0081926 \quad d = 0.263 \quad P = (6101, 7504) \)

4.4. Implicit deflator for private fixed capital formation

\[ PI = 0.16987046 + 0.81791998PWI \]

(19.77)  (106.72)

\[ + 0.0000203048378 \cdot \frac{1}{4} \cdot \sum_{i=0}^{3} (IF/ - IF/-i)_{-i-1} \]

(4.34)

\( \bar{R}^2 = 0.9960 \quad S = 0.011536 \quad d = 0.338 \quad P = (6101, 7504) \)

4.5. Implicit deflator for private residential fixed capital formation

\[ PH = 0.14574719 + 0.00042200441RW + 0.43702363PWI \]

(2.07)  (11.55)  (4.60)

\[ + 0.00015043620 \cdot \frac{1}{4} \cdot \sum_{i=0}^{3} (IH/ - IH/-i)_{-i-1} \]

(2.49)

\( \bar{R}^2 = 0.9805 \quad S = 0.047417 \quad d = 0.230 \quad P = (6101, 7504) \)

4.6. Implicit deflator for government investment

\[ PIG = 0.21735203 + 0.55673544PWI + 0.00022400361RW \]

(7.76)  (13.81)  (13.74)

\( \bar{R}^2 = 0.9926 \quad S = 0.021991 \quad d = 0.536 \quad P = (6201, 7504) \)

4.7. Implicit deflator for inventory investment in private non-agricultural sector

\[ PJPN = 0.02374632 + 0.98957467PWI \]

(3.22)  (142.94)

\( \bar{R}^2 = 0.9971 \quad S = 0.012124 \quad d = 0.342 \quad P = (6101, 7504) \)

4.8. Price index for exports of goods (C.C.B.)

\[ PECD = -0.95712352 + 1.1742304PWI + 0.77992948EX \]

(−17.56)  (34.02)  (10.92)

\( \bar{R}^2 = 0.9866 \quad S = 0.039392 \quad d = 0.478 \quad P = (6101, 7504) \)

4.9. Implicit deflator for exports and income from abroad

\[ \log (PE) = 0.0038245900 + 0.49138754 \log (PECY) + 0.48448599 \log (PE_{-1}) \]

(1.44)  (5.69)  (4.98)

\( \bar{R}^2 = 0.9872 \quad S = 0.019256 \quad d = 0.830 \quad P = (6101, 7504) \)

4.10. Implicit deflator for imports and income payments to abroad

\[ PM = 0.13996830 + 0.79781253PMCY + 0.081524471(MCD)/18747.8 \]

(12.06)  (63.35)  (6.26)
4.11. Identity for implicit deflator for gross national product

\[ P = V + \bar{V} \]

4.12. Identity for price index for exports of goods

\[ PECY = PECD + \bar{E} \]

4.13. Identity for price index for imports of mineral fuels (C.C.B.)

\[ PM3D = PM3Y \times \bar{E} \]


\[ PMCY = PMCD + \bar{E} \]

V. GOVERNMENT

5.1. Identity for government saving

\[ SG = T + SI + \bar{YG} + TFG - TGF - CG - TR \]

5.2. Identity for total taxes

\[ T = TP + TI + TC - SUB \]

5.3. Personal income taxes

\[ TP = -441.97945 + 0.045858351 \sum_{i=0}^{3} (YP - \bar{TR} - \bar{TFP}) \]

\[ R^2 = 0.9817 \quad S = 399.98 \quad d = 0.462 \quad P = (6101, 7504) \]

5.4. Indirect taxes

\[ TI = -276.43356 + 0.026697759(V + V_{-1}) \]

\[ + 0.013497926(V_{+1} + V_{-1}) \]

\[ R^2 = 0.9941 \quad S = 211.92 \quad d = 0.699 \quad P = (6101, 7504) \]

5.5. Corporate income taxes

\[ TC = -686.37794 + 0.91192196 \cdot \frac{1}{4} \cdot \sum_{i=0}^{3} (RI \cdot (YC - \bar{Q} \cdot DI)) \]

\[ + 8.2971002 \cdot \frac{1}{4} \cdot \sum_{i=0}^{3} (R2 \cdot DI) \]

\[ R^2 = 0.9742 \quad S = 358.52 \quad d = 1.417 \quad P = (6201, 7504) \]

5.6. Identity for balance of government sector

\[ BG = SG + DG - IG - JG \]
VI. FOREIGN TRADE

6.1. Identity for balance of payments (dollars)
\[ BF\$ = 10 \times BF + \bar{EXV} \]

6.2. Identity for balance of payments (yen)
\[ BF = E - M + \bar{TPF} - \bar{TPF} + \bar{TGF} - \bar{TGF} \]

6.3. Identity for balance of trade (IMF, dollars)
\[ BTR = EIMF - MIMF \]

6.4. Identity for balance on current account (IMF, dollars)
\[ BCR = BTR + \bar{BSRV} + BTRF \]

6.5. Identity for ratio of exchange rate
\[ \bar{EX} = 360 \text{ yen} + \text{(exchange rate per U.S. dollar)} \]

6.6. Identity for reserves of current account
\[ R = R_{-1} + \frac{1}{4} BF \]

VII. INTEREST RATES

7.1. Regulated interest rates
\[ SRL0 = 1.3677325 + 0.38341711 \Delta \overline{LT} + 2.9832293(PWI - PWI_{-1}) \]
\[ (9.80) \quad (13.45) \quad (5.02) \]
\[ + 0.48405319 SRL0_{-1} \]
\[ (13.10) \]
\[ R^2 = 0.9844 \quad S = 0.10602 \quad d = 0.981 \quad P = (6101, 7504) \]

7.2. Non-regulated interest rates
\[ SRL1 = 0.99482185 + 0.12898218 SRL0 + 0.77088856 SRL1_{-1} \]
\[ (5.50) \quad (11.43) \quad (29.16) \]
\[ R^2 = 0.9771 \quad S = 0.0055203 \quad d = 1.021 \quad P = (6101, 7504) \]

VIII. CAPACITY OUTPUT

8.1. Capacity output
\[ \log VP3 = -10.827964 + 1.4104756 \log (\bar{HT} \times \bar{LFU2}) \]
\[ (5.74) \]
\[ + 0.29673625 \log (100 \times KF^*_{-1}) + 0.013368494 \bar{TIME} \]
\[ (5.59) \quad (8.87) \]
\[ P = (6501, 7504) \]
8.2. Full employment employed persons
\[ LFU2 = 0.9869 \times NL \]

8.3. Standard hours of work
\[ \bar{HT} = 1930.5015 + 20084.276(1/\text{TIME}) \]
\[ R^2 = 0.7707 \quad S = 38.167 \quad d = 0.1920 \quad P = (6501, 7504) \]

IX. CAPITAL CONSUMPTION ALLOWANCES

9.1. Identity for total capital consumption allowance
\[ D = DF + DH + DG \]

9.2. Identity for capital consumption allowance for private fixed capital stock
\[ DF = DF/ \times PI \]

9.3. Identity for capital consumption allowance for private residential fixed capital stock
\[ DH = DH/ \times PH \]

9.4. Capital consumption allowance for private fixed capital stock
\[ DF/\text{t} = -316.3196 + 0.19104463 \times \sum_{i=0}^{3} \left( \frac{PI/PI_{-1} \cdot KF_{-1}}{PI+PI_{-1}} \right)_{t-i} + 0.19104463 \times \sum_{i=0}^{3} \left( PI \cdot KF \right)_{t-i} \]
\[ R^2 = 0.9718 \quad S = 506.12 \quad d = 0.152 \quad P = (6101, 7504) \]

9.5. Capital consumption allowance for private residential fixed capital stock
\[ DH/\text{t} = -90.452527 + 0.044519528 \times \sum_{i=0}^{3} \left( \frac{PH/PH_{-1} \cdot KH_{-1}}{PH+PH_{-1}} \right)_{t-i} + 0.044519528 \times \sum_{i=0}^{3} \left( PH \cdot KH \right)_{t-i} \]
\[ R^2 = 0.9768 \quad S = 62.546 \quad d = 0.454 \quad P = (6101, 7504) \]

X. OTHER DEFINITIONS

Capital stock accumulation

10.1. Private fixed capital stock (installed base)
\[ KF^* = (KF_{-1} + 0.25 \times IF/) \times (1 - 0.0422)^{i/4} \]

10.2. Private fixed capital stock (started base)
\[ KF = KF_{-1} + \frac{1}{4}(IF/ - DF) \]
10.3. Private residential fixed capital stock

\[ KH = KH_{-1} + \frac{1}{4} (IH/ DH) \]

10.4. Inventories in private non-agricultural sector

\[ KJPN = KJPN_{-1} + \frac{1}{4} DKJN \]

Unit labor cost and user cost of capital

10.5. Unit labor cost

\[ ULC_1 = RW \times LW + V \]

10.6. User cost of capital

\[ UCC = \frac{PI(0.01 \times SRL1 + 0.0422) - (PI - PI_{-1})}{(1 - RTC)} \]

Tax rates

10.7. Indirect tax rate

\[ RTI - 1 = TI/(V - TI) \]

10.8. Corporation income tax rate

\[ RTC = (4 \times TC)/(\sum_{i=0}^{3} YC_{-1-i}) \]

Others

10.9 Labor productivity

\[ ETA = V + L \]

10.10. Gross national product less inventory investments

\[ FV = V - DKJN - DKJA - JG \]

10.11. Capacity utilization ratio

\[ ROH^* = (V/V)\times 100 \]