Title	COULD WE NOT HAVE REDUCED THE INFLATION RATE AND THE BALANCE OF PAYMENTS SURPLUS? : Some Simulation Results of the JERC Model
Sub Title	
Author	蓑谷, 千凰彦(MINOTANI, Chiohiko)
Publisher	Keio Economic Society, Keio University
Publication year	1978
Jtitle	Keio economic studies Vol.15, No.1 (1978.) ,p.53- 88
JaLC DOI	
Abstract	
Notes	
Genre	Journal Article
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AA00260492-19780001-0053

Author	蓑谷, 千凰彦(MINOTANI, Chiohiko)
Publisher	Keio Economic Society, Keio University

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·I 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 ($\dot{V}$/), wholesale price index ($P\dot{W}I$), consumer price index ($P\dot{C}I$), government fixed investment ($I\dot{G}$) and money supply ($\dot{M}2$). Moreover, a set of variables are added such as reserves of current account (R), its ratio to GNP ($R/V \times 100$), the ratio of job offers to applicants (JOA) and the discount rate ($DELT$). Figures 1–3 present annual rates of change in prices ($P\dot{W}I$, $P\dot{C}I$), annual values of real GNP and private fixed capital formation at 1970 prices (IF/), JOA and ($R/V) \times 100$. 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

TABLE 1. Key Macroeconomic Variables

Year	$\dot{V}/$ (%)	$P\dot{W}I$ (%)	$P\dot{C}I$ (%)	R (billions of yen)	$(R/V) \times 100$ (%)	JOA (ratio)	$\dot{IG}$ (%)	$DELT$ (%)	$\dot{M}2$ (%)
1967	13.0	1.5	4.1	−55	−0.12	1.07	9.2	5.78	14.4
68	12.7	0.6	4.9	482	0.91	1.15	14.8	5.97	15.6
69	11.0	3.3	6.8	1230	1.98	1.38	13.3	6.08	17.8
70	10.3	2.4	7.1	2093	2.87	1.37	21.5	6.10	19.1
71	7.3	−0.9	5.8	4234	5.19	1.07	26.6	5.23	24.2
72	9.8	3.3	5.3	6072	6.42	1.33	19.3	4.37	25.4
73	6.5	22.5	16.1	4983	4.32	1.74	12.9	6.94	15.0
74	−0.4	23.5	21.8	4293	3.15	1.01	19.4	9.00	10.9
75	3.6	2.2	10.2	4366	2.92	0.58	10.6	7.36	15.7
76	5.7	5.8	9.4	5742	3.39	0.63	7.2	6.47	12.5

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) $M2$ 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 whole-sale 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.
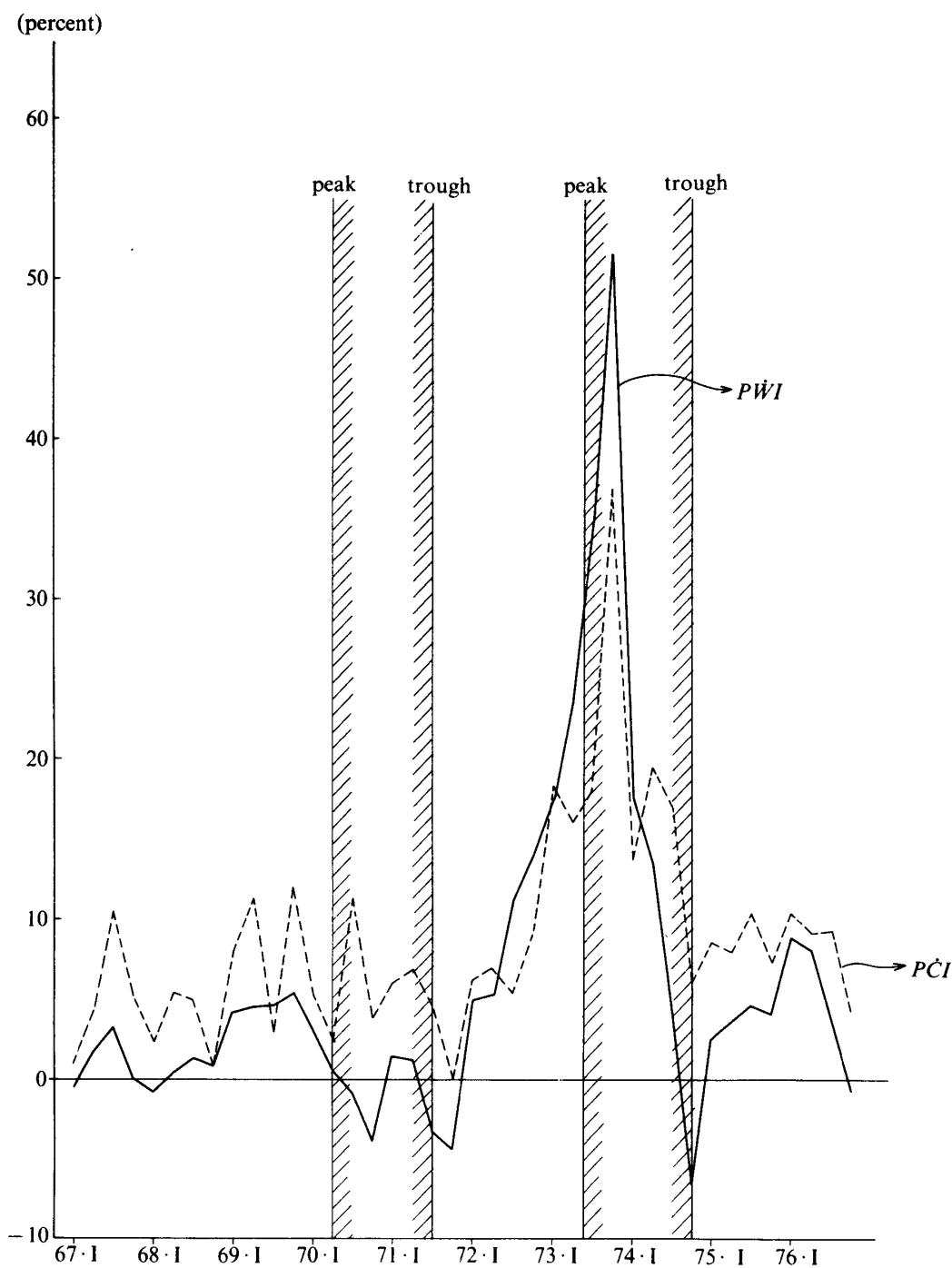

Fig. 1. Annual Rate of Change in Wholesale Price $P\dot{W}I$ and Consumer Price $P\dot{C}I$

(4) The steady increase in unemployment from 615 thousands in 1967 to 1067 thousands in 1976.

(5) Tight monetary policy especially in 1974.

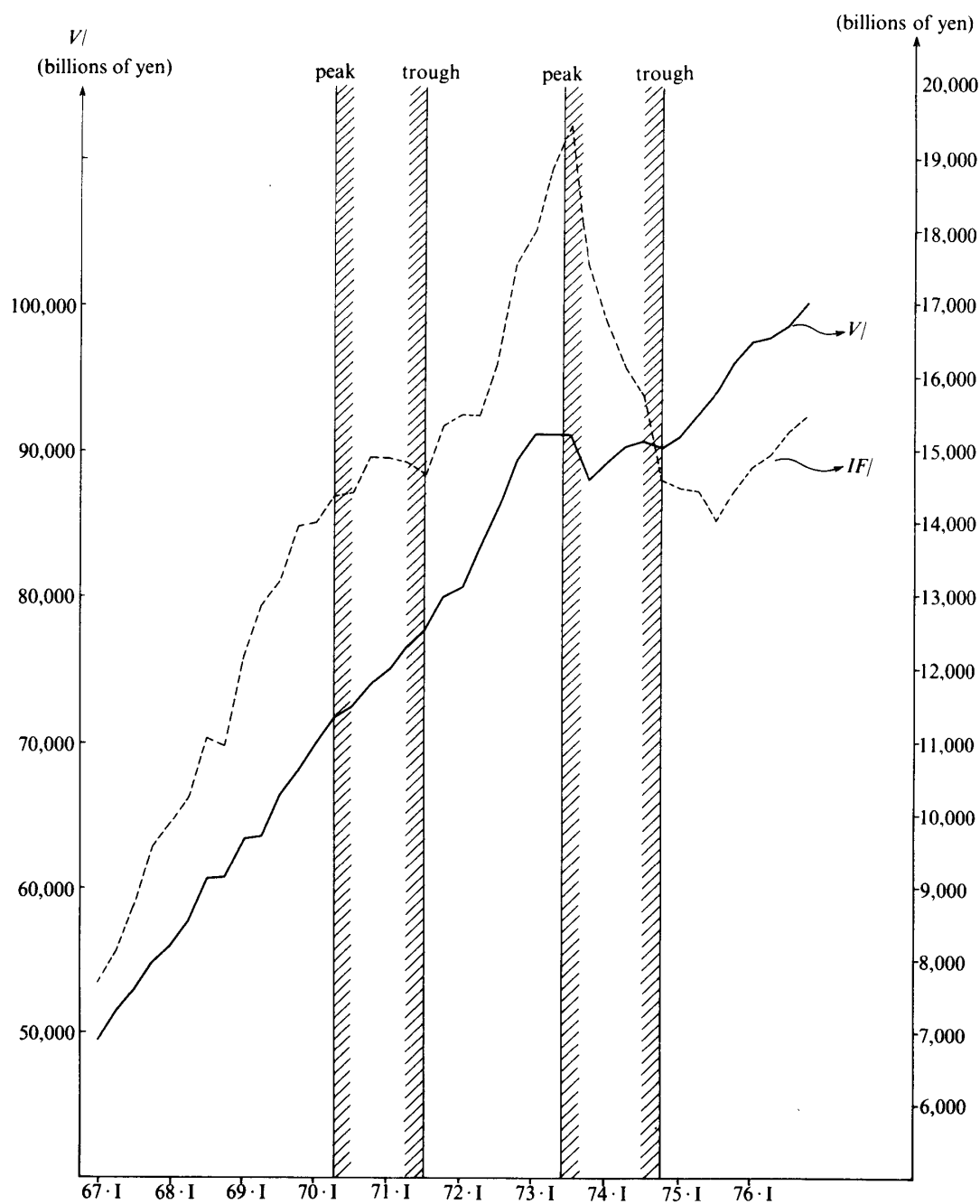(6) The rapid reduction in the rate of increase of wholesale prices since 1975.

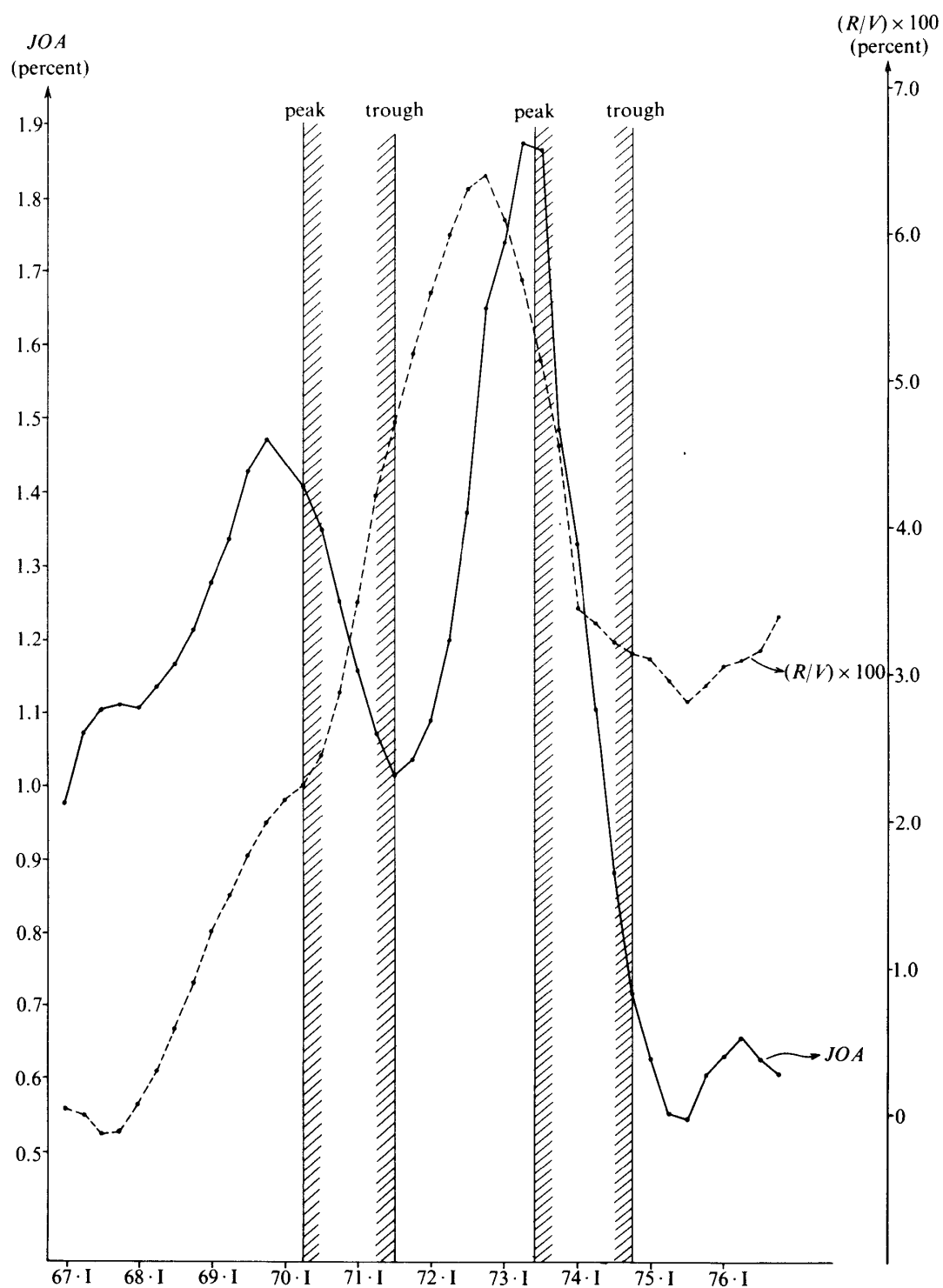Fig. 2. Real GNP $V/$ and Private Fixed Capital Formation $IF/$

Fig. 3.   The Ratio of Job Offers to Applicants *JOA* and the Ratio of
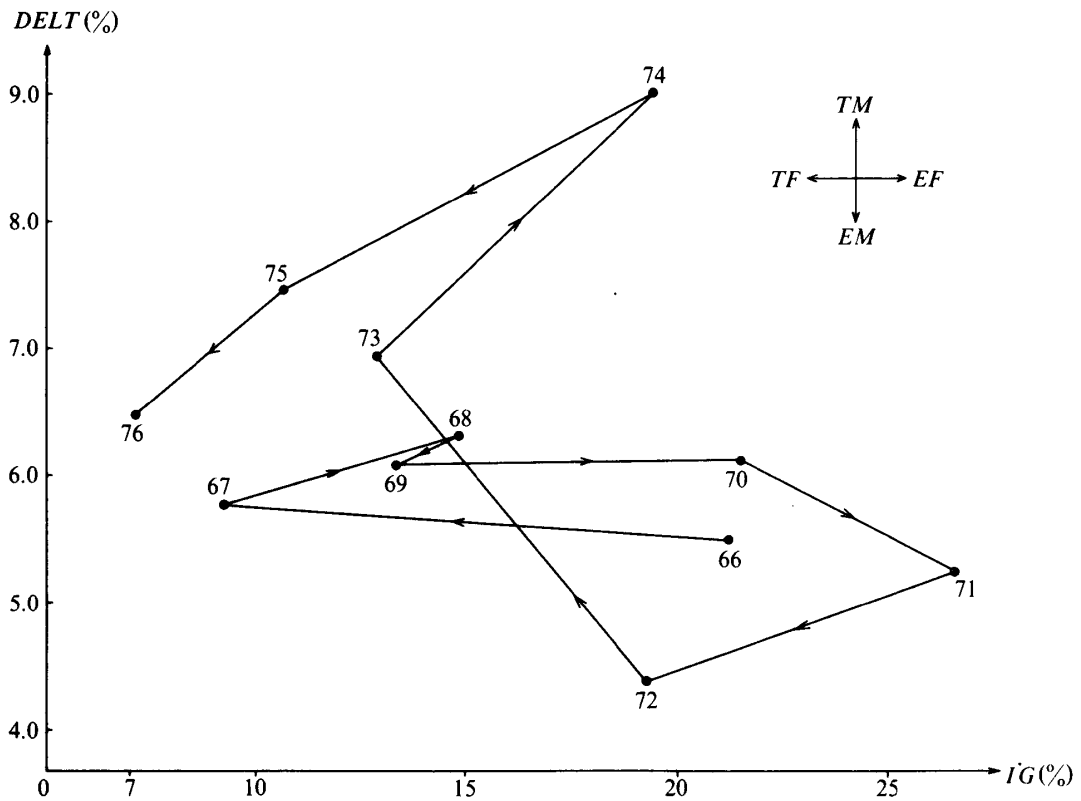Reserves of Current Account to GNP

Fig. 4. Monetary vs. Fiscal Policy (1966–1976)
The two digit numbers indicate respective fiscal years; e.g. 67 represents 1967 fiscal year.

3. THE MODEL AND THE SIMULATIONS

The model used here is the JERC model with 82 endogenous variables (41 stochastic equations and 41 identy 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:

$$(P\dot{C}I)^* = 0.014 \text{ (quarter-to-quarter change)}$$

$$\left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}} \right)^* = 0.01$$

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, $R = 0.01\frac{1}{4} \sum_{i=0}^{3} V_{-i}$, 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).
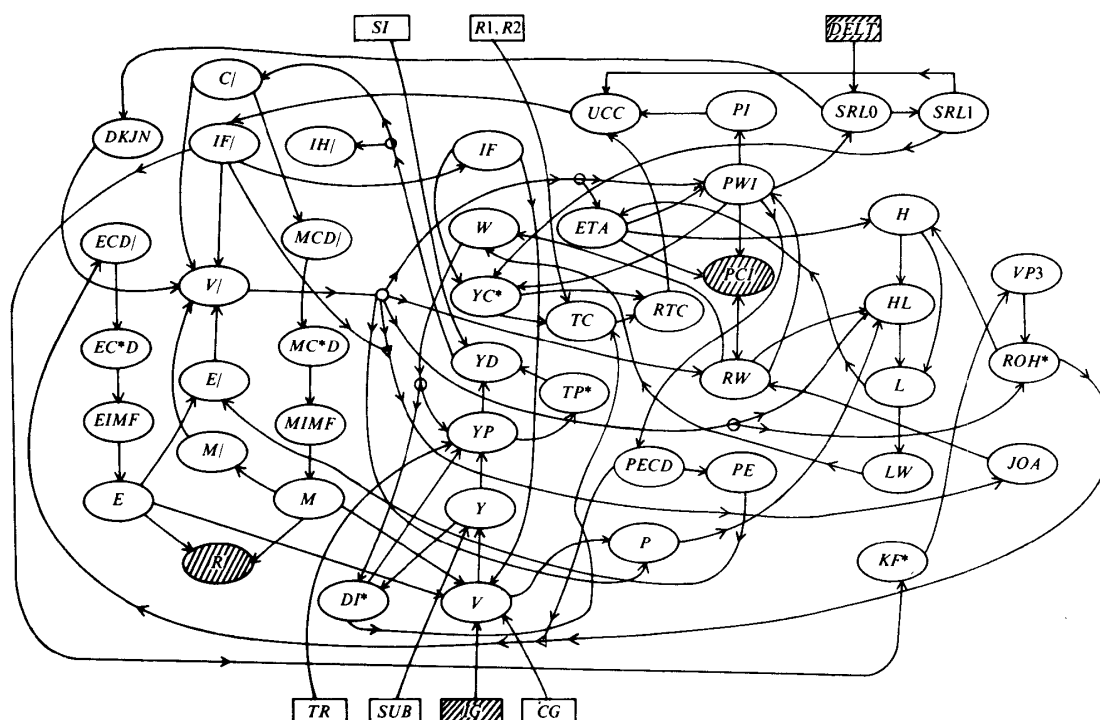
Fig. 5. Flow Chart of the JERC Model

TABLE 2. Control Parameters

	a_0	a_1	a_2	a_3	a_4	b_0	b_1	b_2	b_3	b_4	Rule
RUN 1	0.04	0	0	0	0	0	0	0	0	0	Constant growth rate
" 2	0.025	−0.5	0	0.25	0	0	0	0	0	0	P for IG
" 3	0.03	−1.0	0	1.5	0	0	0	0	0	0	"
" 4	0.03	−2.0	0	2.0	0	0	0	0	0	0	"
" 5	0.025	0	−3.0	0	1.0	0	0	0	0	0	D for IG
" 6	0.03	0	−2.0	0	2.5	0	0	0	0	0	"
" 7	0.03	−1.0	−1.5	1.5	2.0	0	0	0	0	0	P and D for IG
" 8	0.03	−3.0	−0.5	2.5	1.0	0	0	0	0	0	"
" 9	0.025	−0.5	−3.0	0.25	1.0	0	0	0	0	0	"
" 10	0	0	0	0	0	6.3	10.0	30.0	−20.0	−80.0	P and D for $DELT$
" 11	0	0	0	0	0	6.3	10.0	30.0	−8.0	−50.0	"
" 12	0.03	−1.0	1.5	1.5	2.0	6.3	10.0	30.0	−8.0	−50.0	P and D for IG and $DELT$

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:

$$g = a_0 + a_1(P\dot{C}I_{-1} - 0.014) + a_2(P\dot{C}I_{-1} - P\dot{C}I_{-2})$$

$$+ a_3\left[\left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-1} - 0.01\right] + a_4\left[\left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-1} - \left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-2}\right]$$

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

$$IG = (1 + g)IG_{-1}$$

The discount rate, $DELT$, is controlled in the same way as g.

$$DELT = b_0 + b_1(P\dot{C}I_{-1} - 0.014) + b_2(P\dot{C}I_{-1} - P\dot{C}I_{-2})$$

$$+ b_3\left[\left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-1} - 0.01\right] + b_4\left[\left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-1} - \left(\frac{4R}{\sum\limits_{i=0}^{3} V_{-i}}\right)_{-2}\right].$$

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·I 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

TABLE 3. RESERVES OF CURRENT ACCOUNT (BILLIONS OF YEN) R

	Actual	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10	Run 11	Run 12
1972·I	4696	4559	5332	5147	5138	5382	4975	5030	5031	5400	4642	4644	5039
II	5200	5105	5961	5667	5611	6014	5551	5511	5409	6020	5167	5170	5518
III	5723	5697	6643	6206	6081	6706	6177	6006	5748	6696	5729	5733	6012
IV	6073	6226	7264	6645	6428	7340	6740	6398	5921	7309	6222	6229	6402
1972	6073	6226	7264	6645	6428	7340	6740	6398	5921	7309	6222	6229	6402
1973·I	6086	6378	7515	6665	6326	7607	6928	6364	5594	7549	6337	6347	6367
II	5974	6418	7667	6520	6028	7790	7018	6171	5039	7700	6345	6358	6174
III	5666	6274	7648	6130	5462	7810	6933	5742	4234	7681	6163	6180	5745
IV	4983	5780	7312	5288	4400	7534	6524	4865	2913	7355	5618	5641	4867
1973	4983	5780	7312	5288	4400	7534	6524	4865	2913	7355	5618	5641	4867
1974·I	4479	5350	7063	4444	3347	7370	6211	4025	1645	7137	5120	5150	4026
II	4251	5004	6913	3631	2335	7301	5986	3220	457	7010	4698	4736	3220
III	4259	4813	6938	2921	1451	7420	5939	2542	−546	7066	4419	4465	2539
IV	4293	4587	6941	2149	538	7519	5869	1821	−1519	7100	4103	4158	1813
1974	4293	4587	6941	2149	538	7519	5869	1821	−1519	7100	4103	4158	1813
1975·I	4329	4622	7217	1605	−111	7889	6067	1342	−2155	7397	4051	4116	1327
II	4204	4551	7386	964	−800	8153	6165	789	−2733	7588	3899	3974	762
III	4106	4534	7631	344	−1414	8506	6342	287	−3128	7858	3815	3900	245
IV	4366	5137	8491	409	−1258	9483	7150	497	−2648	8752	4356	4451	437
1975	4366	5137	8491	409	−1258	9483	7150	497	−2648	8752	4356	4451	437

TABLE 4. CONSUMER PRICE (ANNUAL RATE OF CHANGE; PERCENT) $P\dot{C}I$

	Actual	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 10	Run 11	Run 12
1972·I	6.3	5.5	5.5	3.0	0.8	5.5	5.2	1.9	−3.0	4.8	6.3	6.3	1.9
II	7.3	8.7	7.6	5.9	4.9	9.0	8.7	7.1	2.3	8.0	6.9	6.9	7.1
III	5.4	5.3	5.0	2.6	1.1	5.3	5.3	2.9	−1.1	4.3	5.4	5.4	2.9
IV	9.2	9.1	8.4	7.2	5.9	8.0	8.4	6.9	3.8	8.8	9.9	9.9	7.3
1972	5.3	5.4	5.1	3.1	1.7	5.2	5.0	2.8	−0.8	5.1	5.1	5.2	2.7
1973·I	18.2	18.6	18.2	17.1	17.1	19.1	19.3	18.6	20.1	17.5	19.0	19.0	19.0
II	16.8	15.1	14.7	15.7	17.4	15.7	16.1	18.0	25.2	13.8	16.8	17.2	17.4
III	17.7	19.9	20.2	20.0	21.1	19.2	19.6	19.7	24.1	13.4	19.0	18.7	19.7
IV	36.6	35.6	34.9	37.8	40.6	36.0	36.4	39.7	43.5	35.1	36.3	36.3	39.7
1973	16.1	16.2	15.6	15.0	15.2	16.2	16.5	16.1	17.4	14.3	16.6	16.7	16.2
1974·I	16.6	16.9	17.7	18.3	21.0	18.4	18.2	20.2	24.5	17.8	16.6	16.6	20.2
II	19.4	18.6	18.0	19.7	20.5	16.3	17.2	17.8	22.0	14.9	18.6	18.6	17.9
III	17.0	16.8	17.2	18.5	20.8	18.2	18.2	20.2	22.9	16.7	16.8	16.8	19.9
IV	6.6	5.8	6.3	7.0	9.2	5.8	5.8	7.4	10.7	6.0	5.9	5.6	7.2
1974	21.8	21.6	21.7	23.2	25.6	21.7	22.1	24.0	28.9	20.0	21.7	21.6	23.9
1975·I	8.6	6.5	6.2	8.6	9.9	5.0	5.7	8.0	11.4	5.7	7.5	7.5	8.0
II	7.3	6.9	7.1	8.9	10.2	7.3	7.5	9.5	12.9	7.8	7.1	7.3	9.3
III	11.1	9.1	8.8	12.2	13.8	8.5	9.0	12.1	15.0	4.8	10.7	10.4	12.3
IV	7.4	8.4	8.6	10.9	12.5	8.8	8.6	11.0	12.7	8.0	7.7	7.7	11.0
1975	10.2	9.1	9.2	11.2	13.0	8.9	9.1	11.4	14.9	8.4	9.7	9.6	11.3

TABLE 5. GOVERNMENT FIXED INVESTMENT (BILLIONS OF YEN) *IG*

	Actual	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9	Run 12
1972 I	8514	8148	6287	8952	10171	6409	7671	10086	12548	6735	10135
II	9119	8474	6537	10006	11804	6318	7784	11158	15308	6753	11214
III	9745	8813	6788	11156	13523	6342	7963	12218	18030	6840	12273
IV	9957	9165	7082	12585	15791	6721	8451	13936	21861	7377	13988
1972	9334	8650	6673	10675	12823	6447	7967	11850	16937	6926	11903
1973 I	10205	9532	7366	14059	18009	6768	8631	15277	25145	7544	15327
II	10117	9913	7567	15262	19323	6362	8377	15556	24946	7080	15612
III	10634	10310	7803	16491	20397	6679	8714	16494	23432	7437	16550
IV	11180	10722	7985	17440	20801	6645	8726	16966	21875	7421	17026
1973	10534	10119	7680	15813	19632	6613	8612	16073	23850	7371	16129
1974 I	11596	11151	8008	17386	18697	5939	8103	15142	16053	6419	15206
II	12382	11597	8196	17959	18307	6844	8980	16312	14503	7376	16386
III	12967	12061	8373	18289	17670	7086	9207	16531	12824	7652	16601
IV	13377	12543	8560	18506	16835	7173	9387	16275	11014	7698	16357
1974	12581	11838	8284	18035	17877	6761	8919	16065	13598	7286	16138
1975 I	13527	13045	8865	19103	16805	8000	10208	17353	10506	8675	17442
II	13957	13567	9184	19538	16591	8273	10541	17583	9736	9091	17671
III	13854	14109	9504	19853	16217	8327	10758	17575	8789	9229	17662
IV	14330	14674	9816	19878	15441	8484	11026	17317	7737	9472	17383
1975	13917	13849	9342	19593	16264	8271	10633	17457	9192	9117	17540

TABLE 6. DISCOUNT RATE (PERCENT) *DELT*

	Acutal	Run 10	Run 11	Run 12
1972 I	4.710	4.527	5.170	5.115
II	4.250	5.575	6.256	5.964
III	4.250	5.037	5.769	6.144
IV	4.250	4.778	5.541	5.390
1972	4.365	4.979	5.684	5.653
1973 I	5.170	5.428	6.174	6.190
II	6.350	6.437	7.003	7.372
III	7.220	5.666	6.182	6.450
IV	9.000	6.240	6.637	6.875
1973	6.935	5.943	6.499	6.722
1974 I	9.000	8.203	8.444	8.901
II	9.000	4.947	5.142	5.491
III	9.000	6.650	6.814	6.675
IV	9.000	6.232	6.405	7.039
1974	9.000	6.508	6.701	7.027
1975 I	8.451	5.347	5.486	5.624
II	7.734	6.162	6.358	6.582
III	6.750	6.104	6.256	6.738
IV	6.500	6.421	6.582	6.898
1975	7.359	6.009	6.171	6.461

TABLE 7.   MAIN VARIABLES FOR THREE SIMULATIONS

Variables	Simulations	Year								
		1967	1968	1969	1970	1971	1972	1973	1974	1975
$V/$	Actual	52.23	58.87	65.35	72.09	77.36	84.91	90.41	90.08	93.29
	Run 3	51.92	57.52	63.17	69.17	74.28	86.20	100.41	103.11	105.98
	Run 7	51.85	57.39	63.20	69.53	75.50	89.03	102.51	101.57	101.56
	Run 10	52.13	58.59	65.00	71.72	76.86	84.56	90.49	89.52	92.58
$C/$	Actual	28.62	31.33	34.27	36.95	39.65	43.45	45.98	47.45	50.15
	Run 3	28.56	31.07	33.74	36.15	38.66	42.95	46.79	49.76	53.30
	Run 7	28.55	31.05	33.73	36.19	38.88	43.50	47.36	50.02	52.89
	Run 10	28.60	31.25	34.11	36.76	39.38	43.04	45.54	47.17	49.61
$IF/$	Actual	8.55	10.55	13.12	14.43	14.93	16.19	18.47	15.83	14.36
	Run 3	8.52	10.12	12.11	13.24	13.70	16.03	22.31	23.30	20.75
	Run 7	8.51	10.47	12.97	14.31	14.70	15.84	18.43	15.99	13.49
	Run 10	8.52	10.40	12.88	14.26	14.75	15.95	18.49	16.10	13.96
JOA	Actual	1.07	1.15	1.38	1.37	1.07	1.33	1.74	1.01	0.58
	Run 3	1.07	1.13	1.28	1.25	0.96	1.24	1.88	1.57	1.18
	Run 7	1.07	1.12	1.27	1.25	0.98	1.30	1.99	1.62	1.04
	Run 10	1.06	1.14	1.35	1.34	1.05	1.30	1.73	1.05	0.57
$P\dot{W}I$	Actual	1.46	0.59	3.25	2.38	−0.90	3.27	22.54	23.49	2.17
	Run 3	1.61	0.42	2.96	2.26	−1.70	1.84	24.29	26.00	2.82
	Run 7	1.61	0.42	2.96	2.26	−2.02	1.94	25.65	25.94	2.28
	Run 10	1.40	0.42	3.28	2.25	−1.31	3.15	23.47	23.24	1.36
BG	Actual	−977	−586	134	443	−872	−1586	377	−2902	−10098
	Run 3	−831	−198	370	659	−899	−3766	−4499	−5029	−10597
	Run 7	−787	−182	279	487	−1315	−4612	−4058	−2429	− 8993
	Run 10	−1000	−739	−116	201	−1121	−1941	57	−2983	−10223

Note: $V/$, $C/$ and $IF/$, trillions of yen; BG, billions of yen; PWI, annual percent change.

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

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·I had we controlled the government fixed investment by the proportional policy (run 3) or the combination of porportional and the derivative policies (run 7). The reserve of current account R is approximately equal to the desired value, 1439 billions
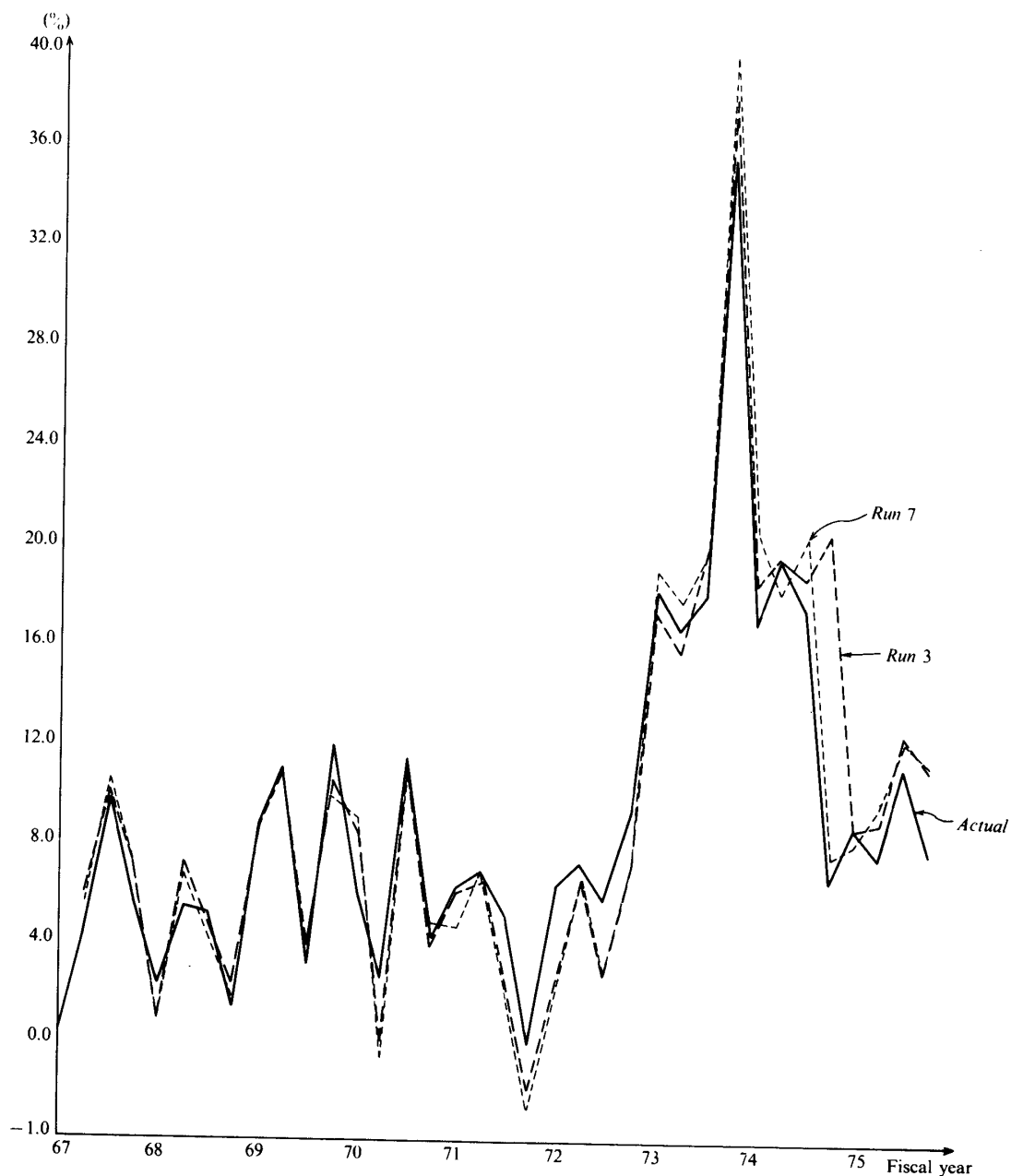
Fig. 6.   Annual Rate of Change in Cousumer Price $P\dot{C}I$

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 $P\dot{C}I$ 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
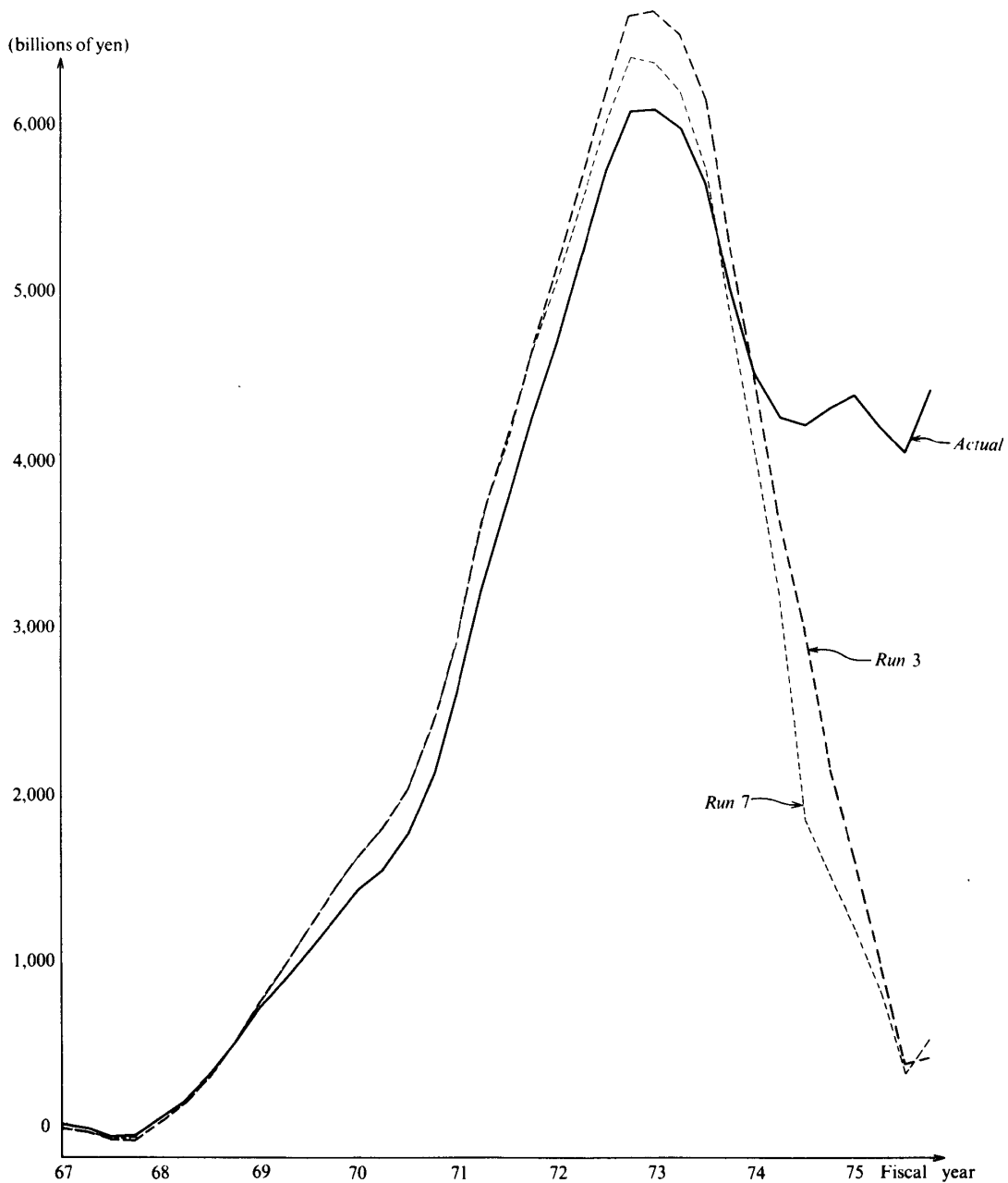
Fig. 7.   Reserves of Current Account R

(see Table 3).

(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.
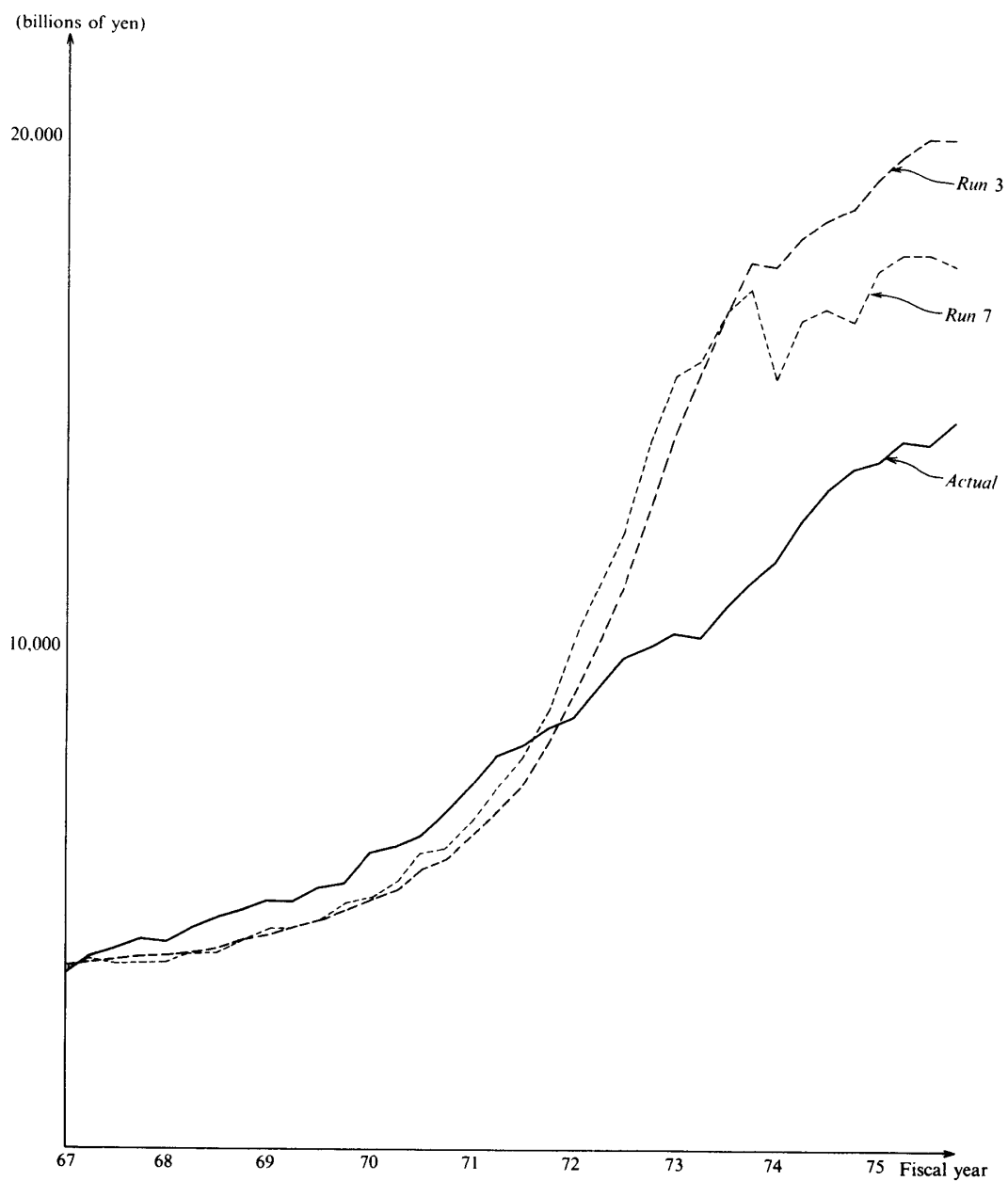
Fig. 8. Government Fixed Investment *IG*

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
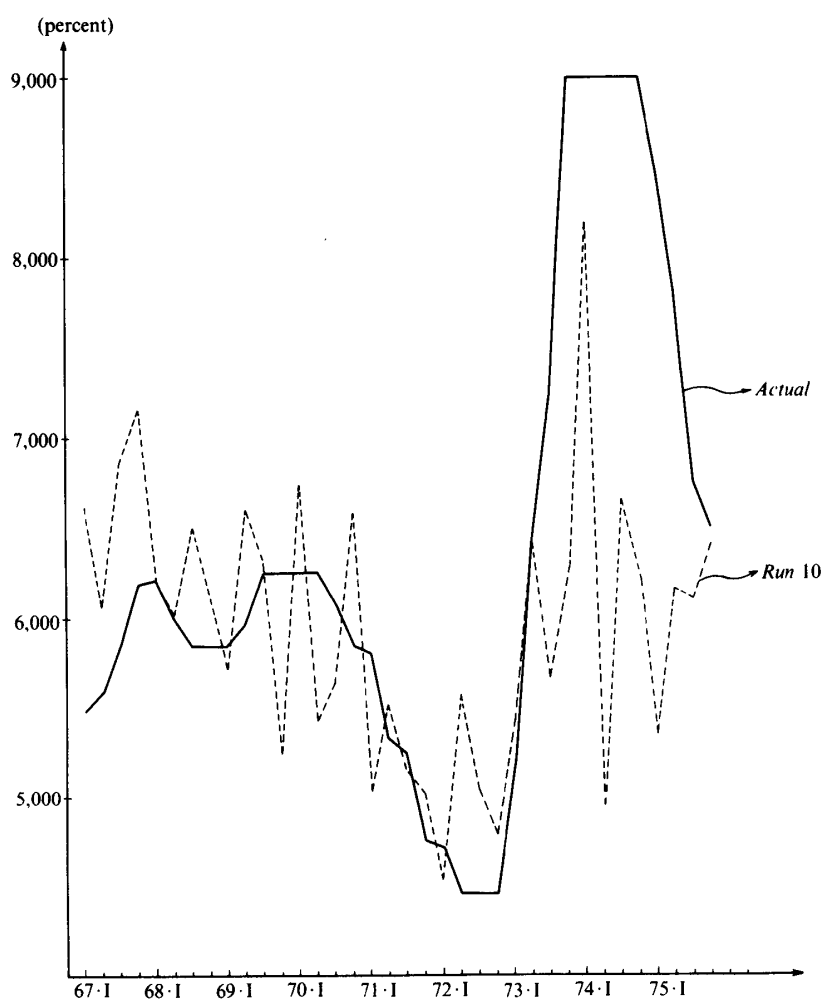

Fig. 9. Discount Rate *DELT*

because, as mentioned earlier, this model does not contain a money supply variable.

The latest version of the JERC Model (JERC-SFM-SAJ5) has the following interest rate function which includes a money supply variable.

$SRL0-SRL0_{-1}$

$$=0.30858\times10^{-1}+0.67739\times10^{-5}\frac{1}{4}\sum_{i=1}^{4}[IF/+DKJP-(SC+DF)/PI]_{-i}$$
$$(1.75)$$

$$-0.50313\times10^{-4}[\overline{M2}/P-(\overline{M2}/P)_{-1}]+0.60762(\overline{DELT}-\overline{DELT}_{-1})$$
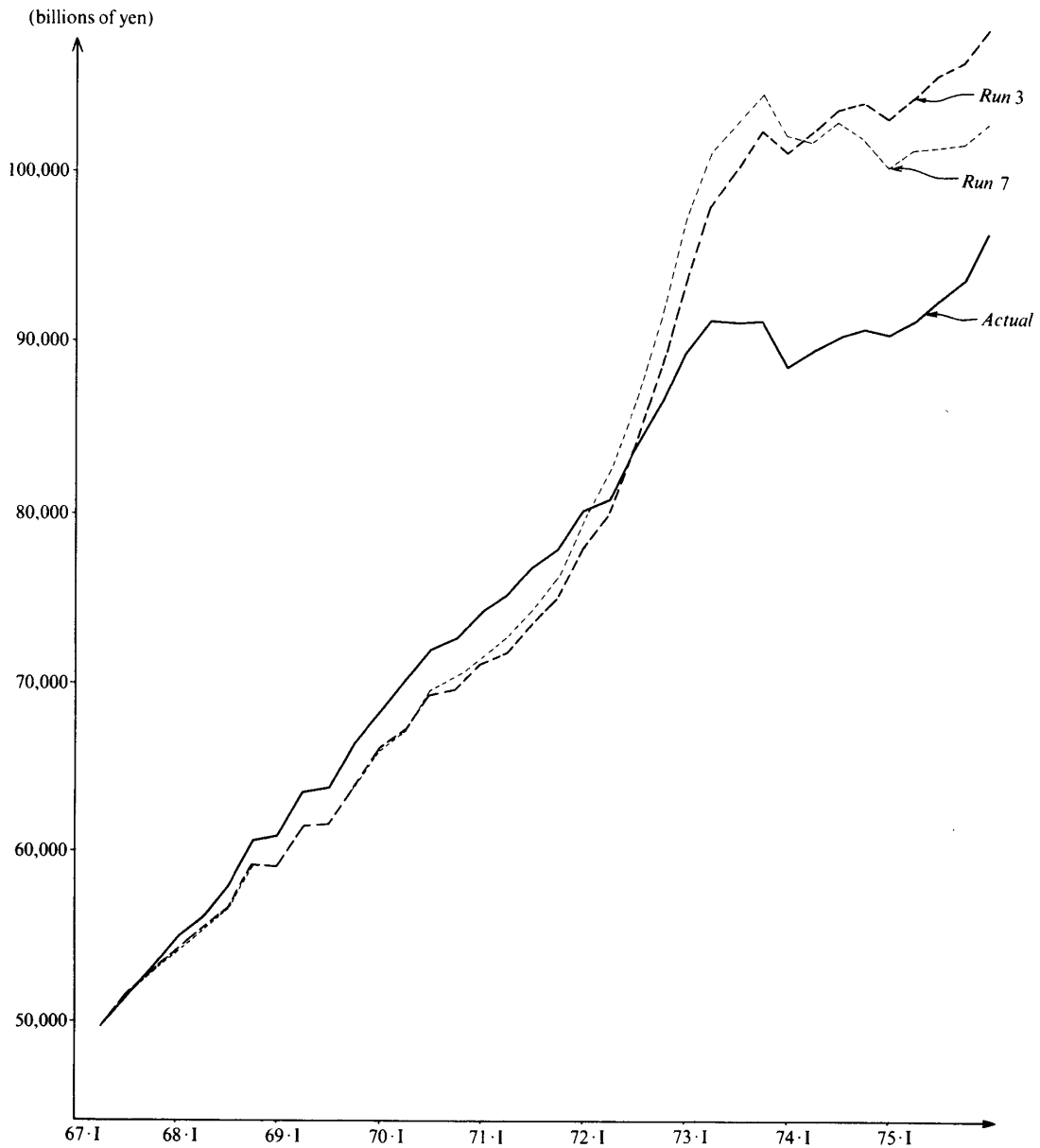$$(4.11) \qquad\qquad (20.97)$$

Fig. 10.   Real GNP $V/$

$$P=(6101-7604)$$

$$\bar{R}^2=0.9388 \qquad S=0.0739 \qquad d=1.296$$

where $M2$ implies currency plus demand and time deposits.

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-SAJ5, which has a repercussion effect of R on EXV. EXV function is as follows:

$$EXV=300.41-0.16700\times10^{-1}R_{-2}-0.13942\times10^{-1}(R_{-2}-R_{-3})+83.579\tfrac{1}{4}\sum_{i=5}^{8}\left(\frac{PE}{PEW}\right)_{-i}$$
$$(10.16) \qquad\qquad (2.31) \qquad\qquad\qquad (2.60)$$

$$P=(7101-7604)$$
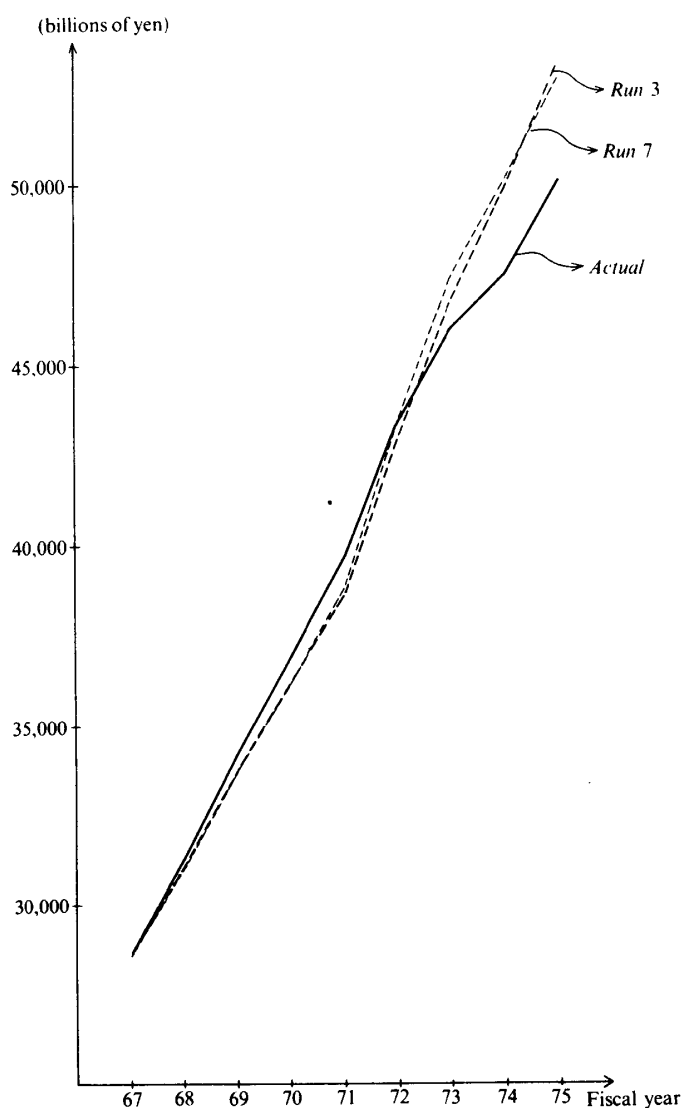
$$\bar{R}^2=0.8839 \qquad S=7.77 \qquad d=1.395$$

Fig. 11. Private Consumption Expenditure at 1970 Prices $C/$

TABLE 8.   GROWTH RATES OF GOVERNMENT FIXED INVESTMENT (PERCENT)

	Year								1975
	1967	1968	1969	1970	1971	1972	1973	1974	
Actual	9.2	14.8	13.3	21.5	26.6	19.3	12.9	19.4	10.6
Run 3	4.5	6.2	12.6	19.1	31.1	52.5	48.1	14.1	8.6
Run 7	3.3	6.7	15.2	21.3	36.5	57.4	35.6	−0.1	8.7

Fig. 12.   Private Fixed Capital Formation at 1970 Prices *IF/*

CHIOHIKO MINOTANI

(ratio)

2.00

1.00

0.00

67   68   69   70   71   72   73   74   75   Fiscal year
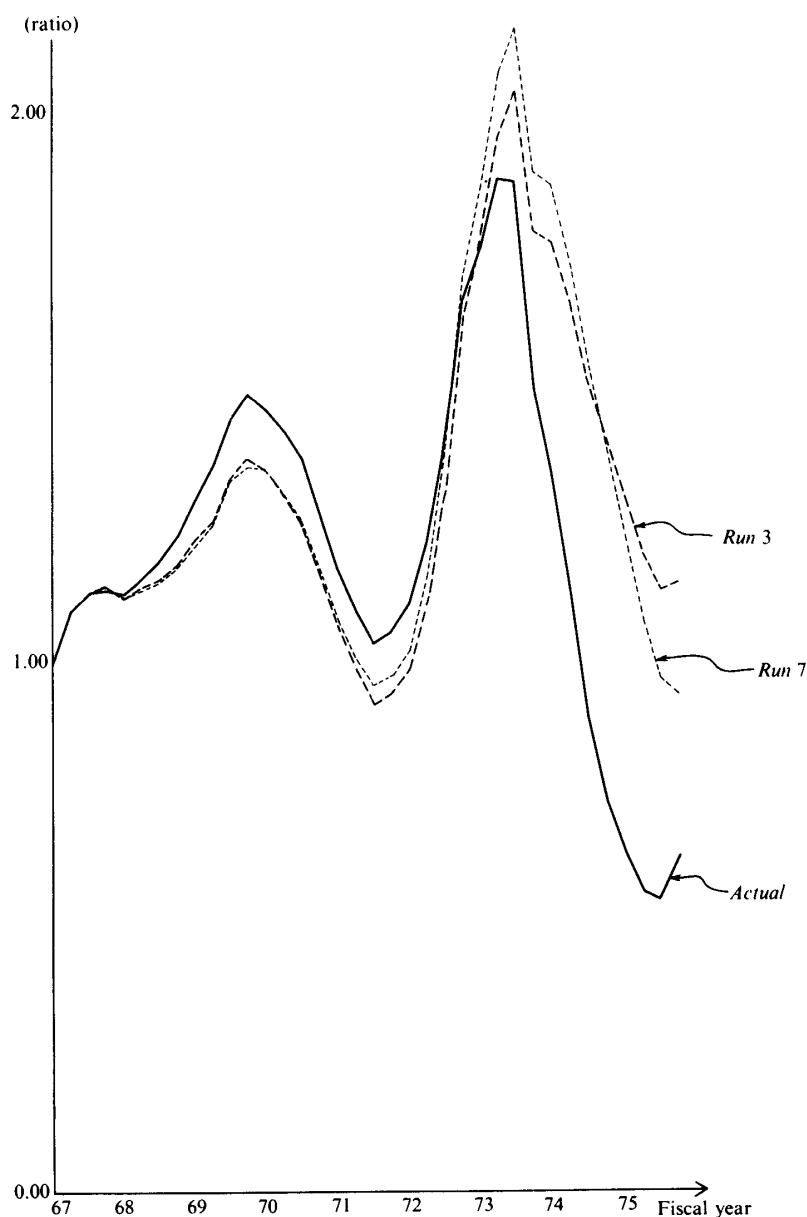
Run 3

Run 7

Actual
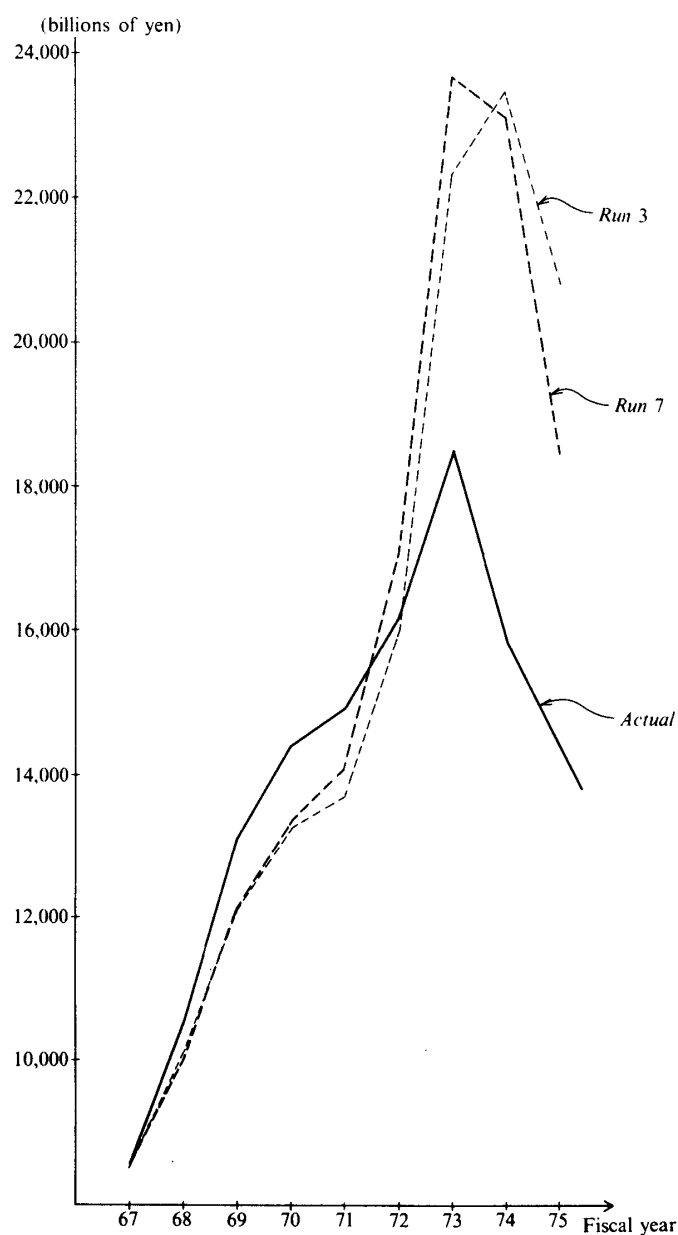
Fig. 13.   The Ratio of Job Offers to Applicants *JOA*

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 aggrevated 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".
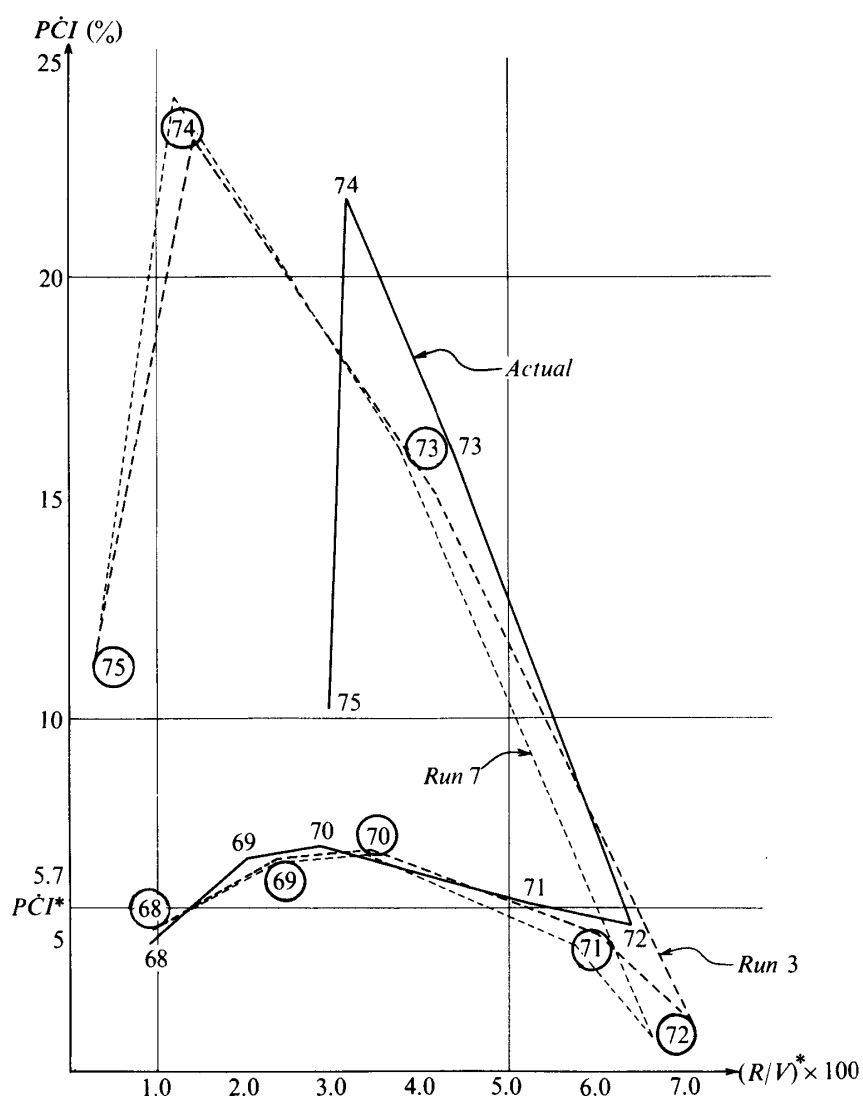
Fig. 14. Annual Rates of Change in Consumer Prices $P\dot{C}I$ and the Ratio of
Reserves of Current Account to GNP $(R/V) \times 100$

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

[1] Chiohiko Minotani. "Optimal Policy Adjustment Rules, Policy Lags and the Stability of the System", *Keio Economic Studies*, Volume 14, No. 2, 1978

[2] Ryutaro Komiya and Yoshio Suzuki. "Inflation in Japan", in Lawrence B. Krause and Walter S. Salant eds. *Worldwide Inflation*, The Brookings Institution, 1977, pp. 316.

JERC-SFM-SAJ3

Contents

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
$\overline{BSRV}$	Services (I.M.F.)
BTR	Balance of trade (I.M.F., a million dollars)
$\overline{BTRF}$	Transfers (I.M.F.)
C	Private consumption expenditure
$C/$	Private consumption expenditure at 1970 prices
$\overline{CG}$	Government consumption
$\overline{CG}/$	Government consumption at 1970 prices
D	Capital consumption allowance, total
$\overline{DELT}$	Discount rate
DF	Capital consumption allowance for private fixed capital stock
$DF/$	Capital consumption allowance for private fixed capital stock at 1970 prices
$\overline{DG}$	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
$\overline{DKJA}$	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

$E/$	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)
$\overline{EPS}$	Statistical discrepancy
ETA	Labor productivity
$\overline{EX}$	Ratio of exchange rate (360 yen per U.S. dollar/New rate per U.S. dollar)
$\overline{EXV}$	Exchange rate (yen per U.S. dollar)
$\overline{FI}$	Personal financial assets
FV	Gross national product less inventory investments
H	Total working hours per worker
$\overline{HFB}$	New loans of housing funds (all banks and mutual loan & saving banks)
$\overline{HFL}$	New loans of housing funds (Housing Loan Corporation)
HL	Man-hours
$\overline{HT}$	Standard hours of work
IF	Private fixed capital formation
$IF/$	Private fixed capital formation at 1970 prices
$\overline{IG}$	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
$\overline{JG}$	Government inventory investment
$\overline{JG}/$	Government inventory investment at 1970 prices
JOA	Job offers to applicants, ratio
$\overline{JPA}$	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
$\overline{LFU2}$	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

$M3D/$	Imports of mineral fuels (C.C.B., a million dollars) at 1970 prices
$M4D/$	Imports of other goods (C.C.B., a million dollars) at 1970 prices
$\overline{NL}$	Labor forces
P	Implicit deflator for gross national product (1970=1.0)
PC	Implicit deflator for private consumption expenditure (1970=1.0)
PCI	Consumer price index (1970=1.0)
$\overline{PCP}$	Price index for public services (1970=1.0)
PE	Implicit deflator for exports and income from abroad (1970=1.0)
$PECD$	Price index for exports of goods (C.C.B.), (1970=1.0)
$PECY$	Price index for exports of goods (1970=1.0)
$\overline{PEW}$	Implicit deflator for world manufactured goods exports (1970=1.0)
PH	Implicit deflator for private residential fixed capital formation (1970=1.0)
PI	Implicit deflator for private fixed capital formation (1970=1.0)
PIG	Implicit deflator for government investment (1970=1.0)
$PJPN$	Implicit deflator for inventory investment in private non-agricultural sector (1970=1.0)
PM	Implicit deflator for imports and income payments to abroad (1970=1.0)
$\overline{PMCD}$	Price index for imports of goods (C.C.B.) (1970=1.0)
$\overline{PMCY}$	Price index for imports of goods (1970=1.0)
$\overline{PM3D}$	Price index for imports of mineral fuels (C.C.B.) (1970=1.0)
$\overline{PR}$	Implicit deflator for rent (1970=1.0)
$\overline{PST}$	Price index for housing starts (1970=1.0)
PWI	Wholesale price index (1970=1.0)
$\bar{Q}$	Dummy variable for the change in the taxation system 1 6101—7504 0 otherwises
R	Reserves of current account
ROH^*	Capacity utilization rate
RTC	Corporation income tax rate
RTI	Indirect tax rate $+1.0$
RW	Wage income per employee
$\overline{R1}$	Corporate income tax rate
$\overline{R2}$	Corporate dividend tax rate
SG	Government saving
$\overline{SI}$	Employer and employee contributions to social insurance
$\overline{SIE}$	New supply of industrial equipment funds
SP	Personal saving
$SRL0$	Regulated interest rates
$SRL1$	Non-regulated interest rates
$\overline{SSP}$	Accumulated personal income

$\overline{SUB}$	Subsidies
T	Total taxes
TC	Corporate income taxes
$\overline{TFG}$	Transfers from abroad to government
$\overline{TFP}$	Transfers from abroad to persons
$\overline{TGF}$	Transfers from government to abroad
TI	Indirect taxes
$\overline{TIME}$	Time trend
$TP*$	Personal income taxes
$\overline{TPF}$	Transfers from persons to abroad
$\overline{TR}$	Government transfer payments to persons
$\overline{TW/}$	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
$\overline{YG*}$	Government enterprise surplus
YP	Personal income
$YR*$	Property income less interest on consuner's debt

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

NOTATIONS

$\bar{R}^2$;   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

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

1.2.   Private consumption expenditure

$$C/=4438.7720+0.49479583(YD/PC)+0.14690470(\overline{FI}_{-1}/PC)$$
$$\quad\ (8.61)\qquad\ \ (6.88)\qquad\qquad\quad (3.09)$$

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

1.3.   Private fixed capital formation

$$IF/=-7579.8029+0.92152667\sum_{i=0}^{7}\{(8-i)/36\}V/_{-1-i}$$
$$\quad\ (-3.23)\qquad (7.96)$$

$$-15718.534\sum_{i=0}^{7}\{(8-i)/36\}UCC_{-1-i}+27467.315\sum_{i=0}^{7}\{(8-i)/36\}(RW/H)_{-1-i}$$
$$(-1.85)\qquad\qquad\qquad\qquad\qquad\quad (2.26)$$

$$-0.63480866KF^{*}_{-1}+0.29259075(\overline{SIE/PI})_{-1}$$
$$(-4.38)\qquad\qquad (2.52)$$

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

1.4.   Identity for government fixed investment

$$IG/=IG+PIG$$

1.5.   Private residential fixed capital formation

$$IH/=-3252.0139+\sum_{i=0}^{3}W_{1i}(YD/PC)_{-i}+\sum_{i=0}^{3}W_{2i}\overline{(PR/PST)}_{-i}$$
$$\quad\ (-3.04)$$

$$+\sum_{i=0}^{3}W_{3i}\{(\overline{HFB+HFL})/PH\}_{-1-i}$$

i	W_{1i}	Second-order t-value	i	W_{2i}	Second-order t-value	i	W_{3i}	Second-order t-value
−1	0		−1	0		−1	0	
0	0.020535176	6.84	0	502.54306	4.38	0	0.25446713	5.65
1	0.030802765	6.84	1	753.81459	4.38	1	0.38170069	5.65
2	0.030802765	6.84	2	753.81459	4.38	2	0.38170069	5.65
3	0.020535176	6.84	3	502.54306	4.38	3	0.25446713	5.65
4	0		4	0		4	0	

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

$\bar{R}^2=0.9724$ $d=0.945$ $P=(6604, 7504)$

1.6. Inventory investment in private non-agricultural sector

$$DKJN=-864.21570+0.11772415\sum_{i=0}^{3}\{(4-i)/10\}V/_{-i}-0.28866679KJPN_{-1}$$
$$(-2.00)\qquad(5.79)\qquad\qquad\qquad\qquad\qquad(-5.11)$$
$$+37.655451[\{(PJPN/PJPN_{-1})^4-1\}\cdot100-SRL0]_{-1}$$

$\bar{R}^2=0.6317$ $S=595.13$ $d=1.073$ $P=(6101, 7504)$
(4.66)

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

$$V=C+\overline{CG}+IF+\overline{IG}+IH+JPN+\overline{JPA}+\overline{JG}+E-M$$

1.10. Identity for private consumption experditure

$$C=C/\times PC$$

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

$$E=3.3491355+0.99761593\{\overline{EXV}\cdot(EIMF+\overline{SRVC})/1000\}$$
$$(0.12)\qquad(354.35)$$

$\bar{R}^2=0.9995$ $S=131.44$ $d=1.717$ $P=(6101, 7504)$

1.15. Export of goods (I.M.F.)

$EIMF = -11.402667 + 0.98259236 EC^*D$
$(-0.39)(906.57)$

$\bar{R}^2 = 0.9999$ $S = 146.82$ $d = 1.064$ $P = (6101, 7504)$

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

$EC^*D = ECD / \times PECD$

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

$\log(ECD/) = 0.23099080 - 1.8048475 \log(PECD/\overline{PEW})$
$(2.12)(-10.03)$

$\overset{\frown}{+} 1.7104682 \log(\overline{TW}/) - 0.74690153 \log[ROH^*/\{\sum_{i=0}^{3}(4-i)/10\}ROH^*_{1-i}]$
$ (85.24)(-4.81)$

$\bar{R}^2 = 0.9926$ $S = 0.052264$ $d = 1.288$ $P = (6101, 7504)$

1.18. Imports and income payments to abroad

$M = -6.1047264 + 0.99890461\{\overline{EXV} \cdot (MIMF + \overline{SRVD})/1000\}$
$(-0.22)(356.67)$

$\bar{R}^2 = 0.9995$ $S = 132.37$ $d = 1.650$ $P = (6101, 7504)$

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

$MIMF = -806.84858 + 0.86681125 MC^*D$
$(-10.66)(320.81)$

$\bar{R}^2 = 0.9994$ $S = 384.21$ $d = 0.442$ $P = (6101, 7504)$

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

$MC^*D = MCD/ \times \overline{PMCD}$

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

$MCD/ = M1D/ + M2D/ + M3D/ + M4D/$

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

$\log(M1D/) = 4.0001591 + 0.23250779 \log(C/) - 0.64025258 \log(\overline{KJPA}_{-1})$
$(2.14)(2.03)(-2.96)$

$+ 0.71815985 \log(M1D/_{-1}) + 0.18961259 \log(\overline{EX})$
$(8.96)(1.46)$

$\bar{R}^2 = 0.9881$ $S = 0.053871$ $d = 2.426$

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

$\log(M2D/) = -0.19455644 + 0.15570034 \log(V/)$
$(-0.80)(1.91)$

$+ 0.82403174 \log(M2D/_{-1})$
(9.94)

1.24. Import of mineral fuel (C.C.B.)

$$\log (M3D/) = -9.8576586 + 1.6189716 \log (V/) - 0.088665727 \log (\overline{PM3D})$$
$$(-42.23) \qquad (75.00) \qquad\qquad (-6.00)$$

$$\bar{R}^2 = 0.9926 \qquad S = 0.052460 \qquad d = 0.783 \qquad P = (6101, 7504)$$

1.25. Import of other goods (C.C.B.)

$$\log (M4D/) = -0.72881101 + 0.22281455 \log (C/ + \overline{CG/} + \overline{DKJA} + \overline{JG/})$$
$$(-1.20) \qquad (2.25)$$

$$+ 0.80676879 \log (M4D/_{-1}) + 0.36930788 \log (\overline{EX})$$
$$(12.38) \qquad\qquad (2.10)$$

$$\bar{R}^2 = 0.9807 \qquad S = 0.078299 \qquad d = 1.315 \qquad P = (6101, 7504)$$

II. INCOME DISTRIBUTION

2.1. Identity for national income

$$Y = V - D - TI + \overline{SUB} - \overline{EPS}$$

2.2. Identity for wage income

$$W = RW \times LW$$

2.3. Dividend and other transfer payments from corporation to persons

$$DI^* = 58.756188 + 0.0076762032\{(Y - W - \overline{YG}^*) + (Y - W - \overline{YG}^*)_{-1}\}/2$$
$$(2.87) \qquad\qquad (2.34)$$

$$+ 0.74899116 DI^*_{-2}$$
$$(6.85)$$

$$\bar{R}^2 = 0.9724 \qquad S = 62.901 \qquad d = 0.730 \qquad P = (6101, 7504)$$

2.4. Personal income

$$YP = 3242.2649 + 1.1749985(W + YR^* + DI^* + \overline{TR} + \overline{TFP})$$
$$(13.25) \qquad (242.69)$$

$$\bar{R}^2 = 0.9990 \qquad S = 1118.9 \qquad d = 0.245 \qquad P = (6101, 7504)$$

2.5. Identity for disposable income

$$YD = YP - TP^* - \overline{SI} - \overline{TPF}$$

2.6. Corporate income before inventory valuation adjustment

$$YC^* = -206.65633 + 0.63236613 \sum_{i=0}^{3} \{(4-i)/10\}(IF - DF)_{-i} - 2073.1579 SRL1_{-1}$$
$$(-0.05) \qquad (8.76) \qquad\qquad\qquad\qquad\qquad (-4.94)$$

$$+ 40114.977 PWI - 17868.575 \overline{PMCY}$$
$$(13.75) \qquad\quad (-10.79)$$

$$\bar{R}^2 = 0.9849 \qquad S = 565.48 \qquad d = 0.911 \qquad P = (6101, 7504)$$

2.7. Property income less interest on consuner's debt

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

$$\bar{R}^2 = 0.9973 \qquad S = 233.08 \qquad d = 0.221 \qquad P = (6101, 7504)$$

2.8. Identity for personal saving

$$SP = YD - C$$

2.9. Identity for accumulated personal saving

$$SSP = SSP_{-1} + \tfrac{1}{4} \times SP$$

III. EMPLOYMENT AND WAGES

3.1. Man-hours

$$HL = 80146.798 + \sum_{i=0}^{3} W_i \left[\frac{V/}{(RW/H)/P} \right]_{-i}$$
$$(31.39)$$

		First-order
i	W_i	t-value
−1	0	
0	0.084557339	13.55
1	0.063418004	13.55
2	0.042278670	13.55
3	0.021139335	13.55
4	0	

$$\sum W_i = 0.211393$$

$$R = 0.9082 \qquad S = 945.81 \qquad d = 1.195 \qquad P = (6504, 7504)$$

3.2. Hours of work

$$H = 2247.5911 + 3.0407953ROH^* + \sum_{i=0}^{7} W_i ETA_{-i}$$
$$(58.12) \qquad (8.49)$$

		Second-order
i	W_i	t-value
−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	

$$\sum W_i = -0.202573$$

$$R=0.9777 \qquad S=17.153 \qquad d=0.666 \qquad P=(6501, 7504)$$

3.3. Identity for employed persons

$$L=HL+H$$

3.4. Employees

$$LW=-4.4005332+0.17095621L+0.87731273LW_{-1}$$
$$\quad (-2.37) \qquad (2.66) \qquad\quad (20.42)$$

$$\bar{R}^2=0.9971 \qquad S=0.20402 \qquad d=1.901 \qquad P=(6101, 7504)$$

3.5. Job offers to applicants, ratio

$$JOA=-1.2020962+12.952352 \sum_{i=0}^{3} \{(4-i)/10\}(IF//V)_{-i}$$
$$\quad (-6.40) \qquad (11.83)$$

$$\bar{R}^2=0.7021 \qquad S=0.18987 \qquad d=0.193 \qquad P=(6101, 7504)$$

3.6. Wage income per employee

$$(RW-RW_{-4})/RW_{-4}=-0.019911876+0.052523311JOA$$
$$\qquad\qquad\qquad (-1.14) \qquad\qquad (6.18)$$

$$+0.97469680 \cdot \tfrac{1}{4} \cdot \sum_{i=0}^{3} \{(PCI-PCI_{-4})/PCI_{-4}\}_{-i}$$
$$\quad (9.70)$$

$$+0.44853748 \cdot \tfrac{1}{4} \cdot \sum_{i=0}^{3} \{(V/-V/_{-4})/V/_{-4}\}_{-i}$$
$$\quad (3.57)$$

$$\bar{R}^2=0.7862 \qquad S=0.020772$$

IV. PRICES

4.1. Wholesale price index

$$PWI=0.57325388+0.00016714832RW-0.00042745360ETA$$
$$\quad (9.89) \qquad\qquad (2.76) \qquad\qquad (-2.45)$$

$$+0.35070101(\overline{PMCD/EX})+0.0000076459757FV_{-1}$$
$$\quad (8.09) \qquad\qquad\qquad (2.26)$$

$$\bar{R}^2=0.9849 \qquad S=0.027996 \qquad d=0.355 \qquad R=(6101, 7504)$$

4.2. Consumer price index

$$\frac{PCI-PCI_{-4}}{PCI_{-4}}-\frac{RTI-RTI_{-4}}{RTI_{-4}}$$

$$=-0.042060245+0.21087883\frac{RW-RW_{-4}}{RW_{-4}}-0.31552810\frac{ETA-ETA_{-4}}{ETA_{-4}}$$
$$\quad (4.52) \qquad\quad (3.72) \qquad\qquad\qquad (-5.11)$$

$$+0.28044197\frac{\overline{PCP}-\overline{PCP}_{-4}}{\overline{PCP}_{-4}}+0.30339191\frac{PWI-PWI_{-4}}{PWI_{-4}}$$
$$\quad (6.14) \qquad\qquad\qquad (9.83)$$

$$\bar{R}^2=0.9455 \qquad S=0.012525 \qquad d=1.370 \qquad P=(6201, 7504)$$

4.3. Implicit deflator for private consumption expenditure

$$PC = 0.061953976 + 0.93229669 PCI$$
$$\quad\;(18.61)\qquad\;(291.95)$$

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

4.4. Implicit deflator for private fixed capital formation

$$PI = 0.16987046 + 0.81791998 PWI$$
$$\quad\;(19.77)\qquad\;(106.72)$$

$$+ 0.000020348378 \cdot \tfrac{1}{4} \cdot \sum_{i=0}^{3} (IF/ - IF/_{-1})_{-i-1}$$
$$\quad(4.34)$$

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

4.5. Implicit deflator for private residential fixed capital formation

$$PH = 0.14574719 + 0.00042200441 RW + 0.43702363 PWI$$
$$\quad\;(2.07)\qquad\qquad(11.55)\qquad\qquad(4.60)$$

$$+ 0.00015043620 \cdot \tfrac{1}{4} \cdot \sum_{i=0}^{3} (IH/ - IH/_{-1})_{-i-1}$$
$$\quad(2.49)$$

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

4.6. Implicit deflator for government investment

$$PIG = 0.21735203 + 0.55673544 PWI + 0.00022400361 RW$$
$$\quad\;(7.76)\qquad\qquad(13.81)\qquad\qquad(13.74)$$

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

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

$$PJPN = 0.023746321 + 0.98957467 PWI$$
$$\quad\;(3.22)\qquad\qquad(142.94)$$

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

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

$$PECD = -0.95712352 + 1.1742304 PWI + 0.77992948 \overline{EX}$$
$$\quad\;(-17.56)\qquad(34.02)\qquad\qquad(10.92)$$

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

4.9. Implicit deflator for exports and income from abroad

$$\log(PE) = 0.0038245900 + 0.49138754 \log(PECY) + 0.48448599 \log(PE_{-1})$$
$$\qquad\quad\;(1.44)\qquad\qquad(5.69)\qquad\qquad\qquad\;(4.98)$$

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

4.10. Implicit deflator for imports and income payments to abroad

$$PM = 0.13996830 + 0.79781253 \overline{PMCY} + 0.081524471 (MCD/)/18747.8$$
$$\quad\;(12.06)\qquad\qquad(63.35)\qquad\qquad\qquad(6.26)$$

$$\bar{R}^2=0.9923 \quad S=0.029062 \quad d=0.291 \quad P=(6101,\,7504)$$

4.11. Identity for implicit deflator for gross national product

$$P=V\div V/$$

4.12. Identity for price index for exports of goods

$$PECY=PECD\div \overline{EX}$$

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

$$\overline{PM3D}=\overline{PM3Y}\times \overline{EX}$$

4.14. Identity for price index for imports of goods

$$\overline{PMCY}=\overline{PMCD}\div \overline{EX}$$

V. GOVERNMENT

5.1. Identity for government saving

$$SG=T+\overline{SI}+\overline{YG^*}+\overline{TFG}-\overline{TGF}-\overline{CG}-\overline{TR}$$

5.2. Identity for total taxes

$$T=TP^*+TI+TC-\overline{SUB}$$

5.3. Personal income taxes

$$TP^*=-441.97945+0.045858351 \sum_{i=0}^{3} (YP-\overline{TR}-\overline{TFP})_{-i}$$
$$(-4.79) \qquad (56.24)$$

$$\bar{R}^2=0.9817 \quad S=399.98 \quad d=0.462 \quad P=(6101,\,7504)$$

5.4. Indirect taxes

$$TI=-276.43356+0.026697759(V+V_{-1})$$
$$(-2.22) \qquad (22.26)$$

$$+0.013497926(V/+V/_{-1})$$
$$(6.20)$$

$$\bar{R}^2=0.9941 \quad S=211.92 \quad d=0.699 \quad P=(6101,\,7504)$$

5.5. Corporate income taxes

$$TC=-686.37794+0.91192196\cdot\tfrac{1}{4}\cdot \sum_{i=0}^{3} \{\overline{R1}\cdot(YC^*-\overline{Q}\cdot DI^*)\}_{-i-1}$$
$$(-5.28) \qquad (10.36)$$

$$+8.2971002\cdot\tfrac{1}{4}\cdot \sum_{i=0}^{3} (\overline{R2}\cdot DI^*)_{-i-1}$$
$$(5.96)$$

$$\bar{R}^2=0.9742 \quad S=358.52 \quad d=1.417 \quad P=(6201,\,7504)$$

5.6. Identity for balance of government sector

$$BG=SG+\overline{DG}-\overline{IG}-\overline{JG}$$

VI. FOREIGN TRADE

6.1. Identity for balance of payments (dollars)

$$BF\$=10\times BF+\overline{EXV}$$

6.2. Identity for balance of payments (yen)

$$BF=E-M+\overline{TFP}-\overline{TPF}+\overline{TFG}-\overline{TGF}$$

6.3. Identity for balance of trade (IMF, dollars)

$$BTR=EIMF-MIMF$$

6.4. Identity for balance on current account (IMF, dollars)

$$BCR=BTR+\overline{BSRV}+\overline{BTRF}$$

6.5. Identity for ratio of exchange rate

$$\overline{EX}=360 \text{ yen}+(\text{exchange rate per U.S. dollar})$$

6.6. Identity for reserves of current account

$$R=R_{-1}+\tfrac{1}{4}BF$$

VII. INTEREST RATES

7.1. Regulated interest rates

$$SRL0=1.3677325+0.38341711\overline{DELT}+2.9832293(PWI-PWI_{-1})$$
$$(9.80) \qquad (13.45) \qquad (5.02)$$

$$+0.48405319SRL0_{-1}$$
$$(13.10)$$

$$\bar{R}^2=0.9844 \qquad S=0.10602 \qquad d=0.981 \qquad P=(6101, 7504)$$

7.2. Non-regulated interest rates

$$SRL1=0.99482185+0.12898218SRL0+0.77088856SRL1_{-1}$$
$$(5.50) \qquad (11.43) \qquad (29.16)$$

$$\bar{R}^2=0.9771 \qquad S=0.0055203 \qquad d=1.021 \qquad P=(6101, 7504)$$

VIII. CAPACITY OUTPUT

8.1. Capacity output

$$\log VP3=-10.827964+1.4104756 \log (\overline{HT}\times\overline{LFU2})$$
$$(5.74)$$

$$+0.29673625 \log (100\times KF^*_{-1})+0.013368494(\overline{TIME})$$
$$(5.59) \qquad\qquad (8.87)$$

$$P=(6501, 7504)$$

8.2. Full emplopment employed persons

$$\overline{LFU2}=0.9869\times\overline{NL}$$

8.3. Standard hours of work

$$\overline{HT}=1930.5015+20084.276(1/\overline{TIME})$$
$$(12.06)$$

$$\bar{R}^2=0.7707 \qquad S=38.167 \qquad d=0.1920 \qquad P=(6501, 7504)$$

IX. CAPITAL CONSUMPTION ALLOWANCES

9.1. Identity for total capital consumption allowance

$$D=DF+DH+\overline{DG}$$

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

$$DF/=-316.3196+0.19104463\cdot\frac{\tfrac{1}{4}\left\{\sum_{i=0}^{3}(PI/PI_{-1}\cdot KF_{-1})_{-i}+\sum_{i=0}^{3}(PI\cdot KF)_{-i}\right\}}{(PI+PI_{-1})}$$
$$(-14.56) \qquad (45.13)$$

$$\bar{R}^2=0.9718 \qquad S=506.12 \qquad d=0.152 \qquad P=(6101, 7504)$$

9.5. Capital consumption allowance for private residential fixed capital stock

$$DH/=-90.452527+0.044519528\cdot\frac{\tfrac{1}{4}\left\{\sum_{i=0}^{3}(PH/PH_{-1}\cdot KH_{-1})_{-i}+\sum_{i=0}^{3}(PH\cdot KH)_{-i}\right\}}{(PH+PH_{-1})}$$
$$(-4.20) \qquad (49.86)$$

$$\bar{R}^2=0.9768 \qquad S=62.546 \qquad d=0.454 \qquad P=(6101, 7504)$$

X. OTHER DEFINITIONS

Capital stock accumplation

10.1. Private fixed capital stock (installed base)

$$KF^*=(KF_{-1}+0.25\times IF/)\times(1-0.0422)^{1/4}$$

10.2. Private fixed capital stock (started base)

$$KF=KF_{-1}+\tfrac{1}{4}(IF/-DF/)$$

10.3. Private residential fixed capital stock

$$KH=KH_{-1}+\tfrac{1}{4}(IH/-DH/)$$

10.4. Inventories in private non-agricultural sector

$$KJPN=KJPN_{-1}+\tfrac{1}{4}DKJN$$

Unit labor cost and user cost of capital

10.5. Unit labor cost

$$ULC1=RW\times LW \div V/$$

10.6. User cost of capital

$$UCC=\{PI(0.01\times SRL1+0.0422)-(PI-PI_{-1})\}/(1-RTC)$$

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

$$ETA=V/\div L$$

10.10. Gross national product less inventory investments

$$FV=V/-DKJN-\overline{DKJA}-\overline{JG}/$$

10.11. Capacity utilization ratio

$$ROH^{*}=(V/)/VP3\times 100$$