Shock-absorption Capacity of Fiscal-Monetary Policies

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- Analysis by Short-term Brazilian Decision Model-

1. Introduction

The exchange rate regime change and accompanying devaluation at January 1999 was really inevitable and desirable? Whether it improved or damaged the Brazilian economy? How fiscal-monetary policies nicely accommodated to this sudden shock? How the instruments of these policies were changed based on the changing trends of various economic targets, and contributed to protect the national welfare? This paper aims to answer these questions.

The governmental policies are expected to serve to develop the national economy. More specifically the macroeconomic policies such as fiscal and monetary policies are expected to fulfill the basic targets of growth, price stability, and balance-of-payment equilibrium. If the basic object of economic policy (O) is specified as a linear combination of three targets, it is expected that these policies try maximizing the object in the normal period, and trying to avoid a big deterioration in a critical period. Therefore, observing the manipulation of these policies and the resulting effects on basic object can assess the overall effectiveness of these policies. The experience of Brazilian economy after the devaluation at January 1999 offers an interesting case study, because the regime change of exchange rate and a big devaluation was a big unexpected shock to Brazilian economy, and many governmental instruments were changed abruptly.

This paper takes up the Brazilian case (June 1997-June 2000), and empirically assesses the overall effectiveness of fiscal-monetary policies quantitatively. First I construct a decision model based on the monthly data. Secondly I implement various simulation experiments, and clarify how each instrument was changed after the devaluation shock. Finally I calculate the changes of national welfare, and discuss the overall effectiveness of fiscal-monetary policies. This paper is a follow-up of previous study (Fukuchi, 2000b). [1] The structure of the paper is as follows. In section 2, I briefly describe the trends of Brazilian economy, and changing tendencies of various economic targets and instruments in the period. In section 3, I construct a decision model based on monthly data, and show the result of final test. Section 4 compiles the results of simulation studies, and the comparison of resulting changes of objects. Final section concludes the paper.

2. Trends of Brazilian Economy

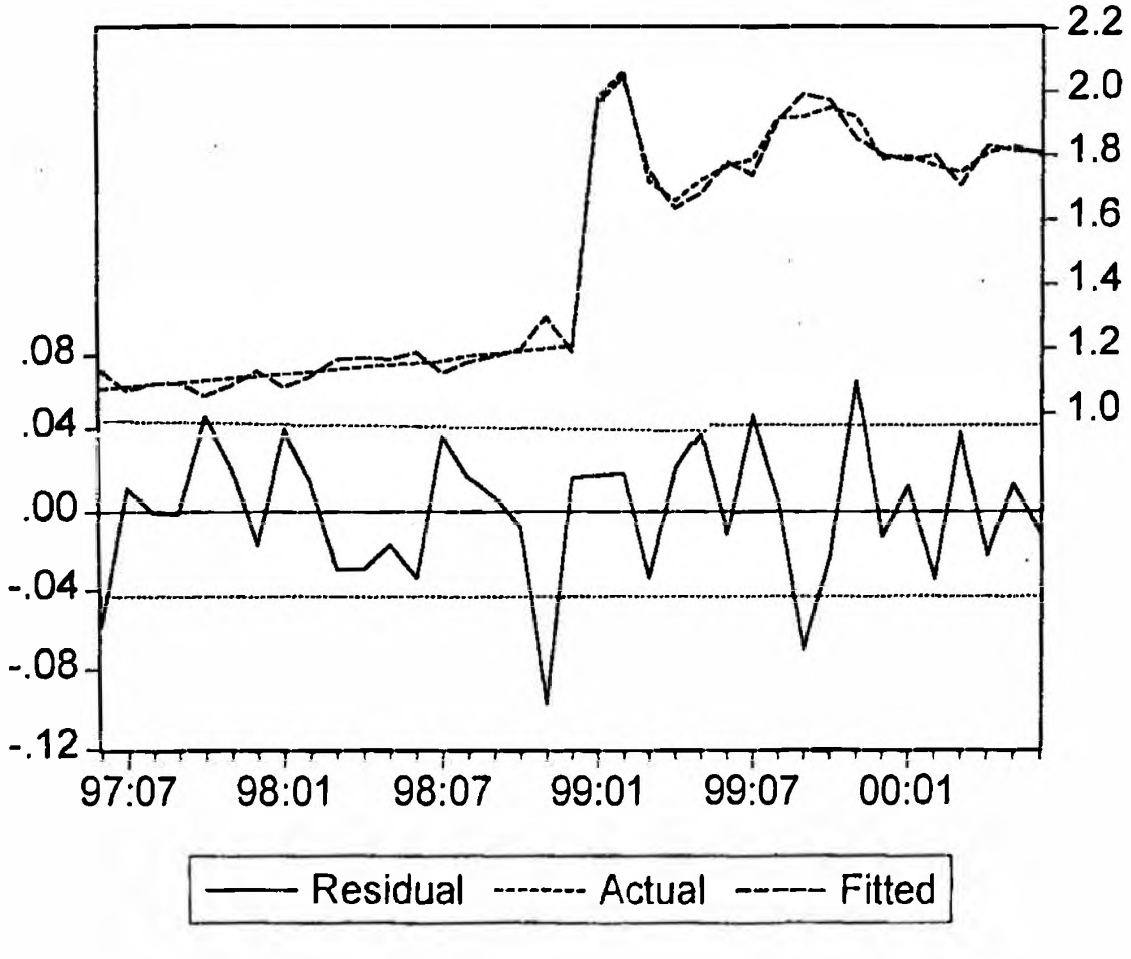
I selected the observation period of the Brazilian economy each 18 months before and after the devaluation, I.e., June 1997-June 2000. As shown in Figure.1, the exchange rate (Real per U.S Dollar) showed a creeping inflationary trend and reached to 1.2 at December 1998. At January 1999, the Brazilian Central Bank decided to abandon the fixed exchange rate regime, and made the rate float freely. Then the rate immediately jumped up to 2.0, and remained around 1.8 until June

FIGURE.1. Trend of Exchange Rate

Dependent Variable: RATE
Method: Least Squares
Date: 07/23/01 Time: 12:58
Sample: 1997:06 2000:06
Included observations: 37

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.99454	1.064415	11.26866	0.0000
FPF$(-1)/FPF$(-2)	-0.005322	0.000999	-5.327872	0.0000
FPF$(-5)	-6.63E-05	6.77E-06	-9.789509	0.0000
FPF$(-6)	-3.18E-05	7.07E-06	-4.489784	0.0002
IPCA(-3)/IPCA(-12)	-9.899350	0.998906	-9.910194	0.0000
RES$(-2)/IM(-2)	-0.026213	0.006118	-4.284342	0.0003
CA$(-1)/CA$(-2)	0.210418	0.035123	5.990872	0.0000
SELIC(-2)/SELIC(-7)	-0.083685	0.035956	-2.327417	0.0291
GDE(-4)/GDE(-8)	-1.024973	0.236464	-4.334574	0.0002
LIBORUSA(-1)/LIBORU	5.162780	0.554347	9.313265	0.0000
AWR(-1)/AWR(-13)	-3.628711	0.413768	-8.769924	0.0000
POIL$(-1)/POIL$(-3)	-0.871373	0.097386	-8.947612	0.0000
POIL$(-1)/POIL$(-7)	0.553928	0.055340	10.00949	0.0000
NFSNO(-1)/NFSNO(-7)	-0.397898	0.051488	-7.727962	0.0000

R-squared	0.990569	Mean dependent var	1.476281
Adjusted R-squared	0.985238	S.D. dependent var	0.359353
S.E. of regression	0.043661	Akaike info criterion	-3.143412
Sum squared resid	0.043844	Schwarz criterion	-2.533876
Log likelihood	72.15312	F-statistic	185.8267
Durbin-Watson stat	2.157080	Prob(F-statistic)	0.000000



2000, showing decaying fluctuation. This surprised shock influenced to Brazilian economy through various channels.

Figures 2 and 3 show the trends of GDE. In succeeding figures, three lines denoted as X-ACT, X-SIN, X-FIN indicate the actual trend, the trend of single-equation estimation, and the trend by final test. The procedure of estimation and final test will be explained at section 3. As shown in Figures 2 and 3, real GDP (=GDE) in Real was basically constant accompanied with seasonal fluctuation until 1999, and then showed a quick recovery. But the level of real monthly per-capita GDP (Y$/N) at June 2000 was still lower than the pre-devaluation level at December 1999, after showing an abrupt drop by 150 dollars and a fluctuating recovery.

As shown in Figure 4, the balance-of-payment (BP$, in $U.S.) was basically negative in 1997-98 except the former half of 1998, and recorded especially big deficit immediately before the devaluation based on strong flight of short-term capital. After the devaluation, it showed a steady improvement, but still recorded negative figures in 1999. As shown in Figure 5, this reflected in the deteriorating trend of foreign currency reserve (RES$, in $U.S). Except the beginning of 1998, it showed a steady declining trend. In 37 months, it decreased to a half from $ 60 B to $30B.

As shown in Figure 6, the consumer's price index (IPCA) showed different trends before and after the devaluation. The increase in 18 months before the devaluation was only 5 percent. In 18 months after devaluation, it increased about the double, i.e., 11 percent.

These observations indicate that the stagnation of per-capita GDP, balance-of-payment deficit, and potential inflationary trend were big concerns for macro-economic management in these months. So I take up these three as major concerns or targets of fiscal-monetary policies.

Let us observe the trends of major fiscal-monetary instruments. Figure 7 shows a very volatile trend of interest rate (SELIC). It showed two humps in the end of 1997, and of 1998. After the devaluation, it jumped to 45 percent, and quickly went down to 20 percent, and kept that level until June 2000. These changes occurred after a few months of big changes of balance-of-payment, and suggest that a purpose of manipulation is the protection of balance-of-payment deficit. But it kept constant in 2000 while balance-of-payment showed volatile changes, so the manipulation of SELIC was multi-purposed. But the contrast of big humps and constancy may suggest a structural change after 2000. These points will be discussed in section 3.

Figures 8 and 9 show the trends of M1 and M2. M2 showed a steadily increasing trend, while M1 showed stagnation through 1999 when IPCA growth was relatively big before a jump at the beginning of 2000. These different trends show the different ways of manipulation of M1 and M2.

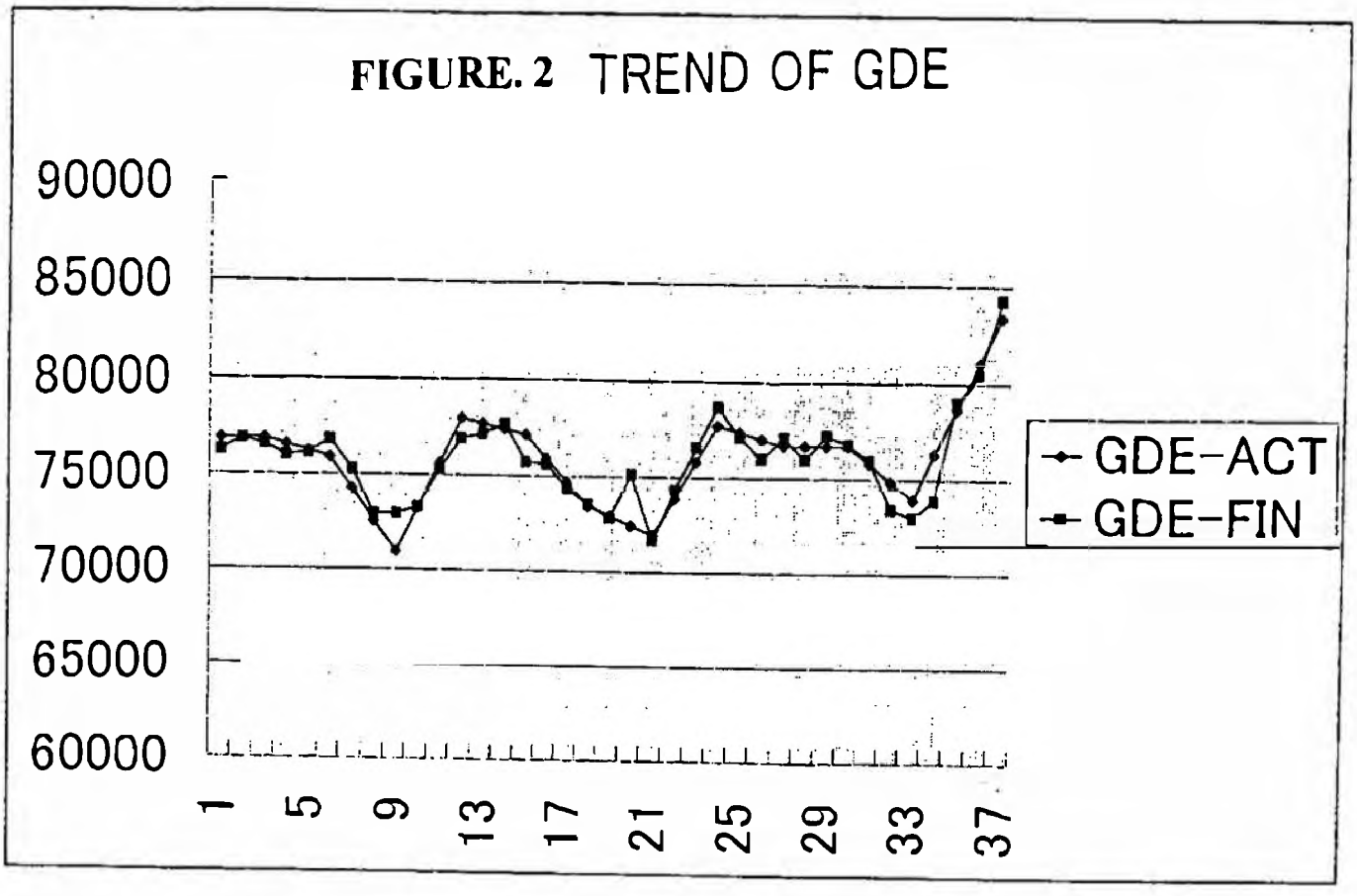


FIGURE. 2 TREND OF GDE
90000
85000
80000
75000
70000
65000
60000
1
5
9
13
17
21
25
29
33
37
GDE-ACT
GDE-FIN

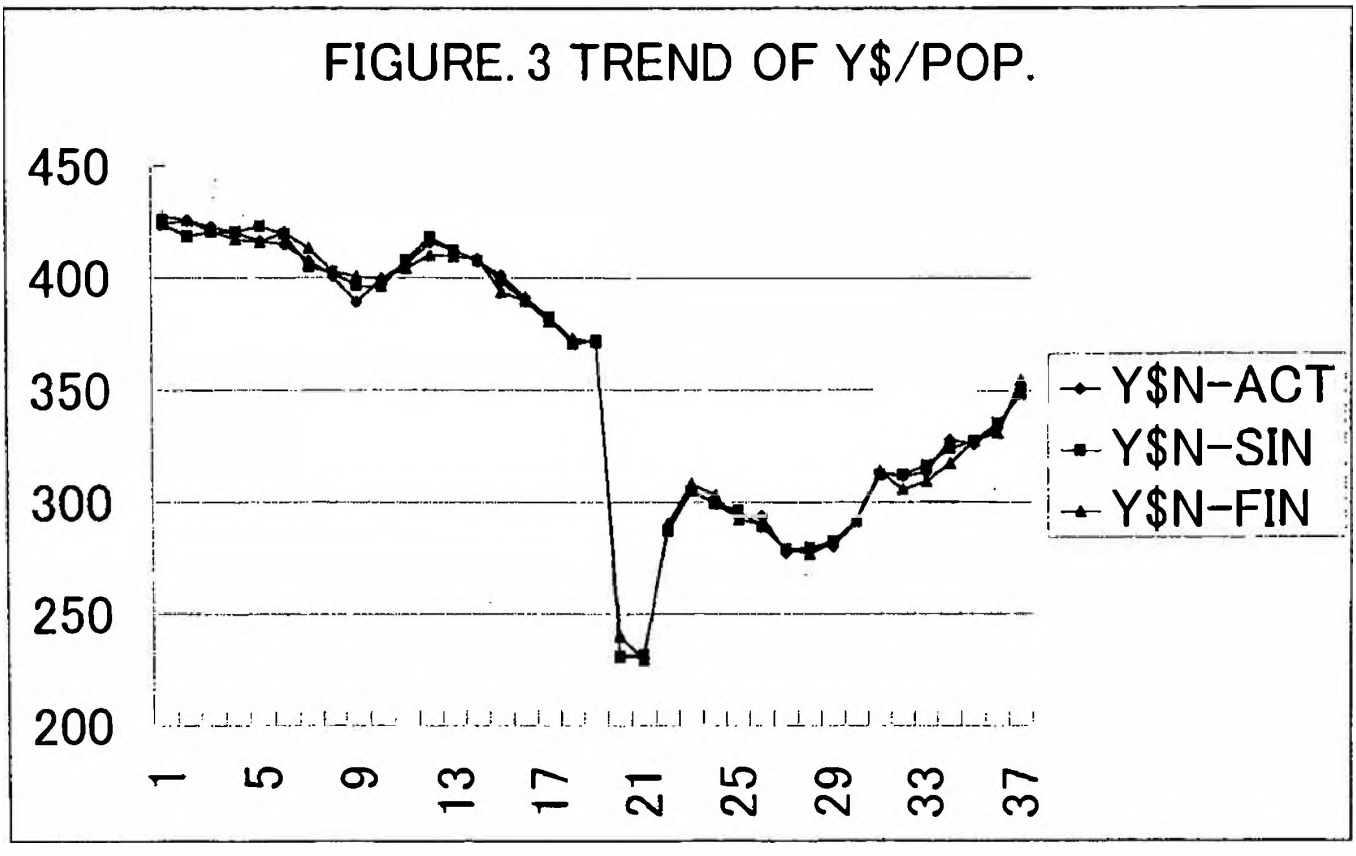


FIGURE. 3 TREND OF Y$/POP.
450
400
350
300
250
200
1
5
9
13
17
21
25
29
33
37
Y$N-ACT
Y$N-SIN
Y$N-FIN

FIGURE. 4 TREND OF BP$

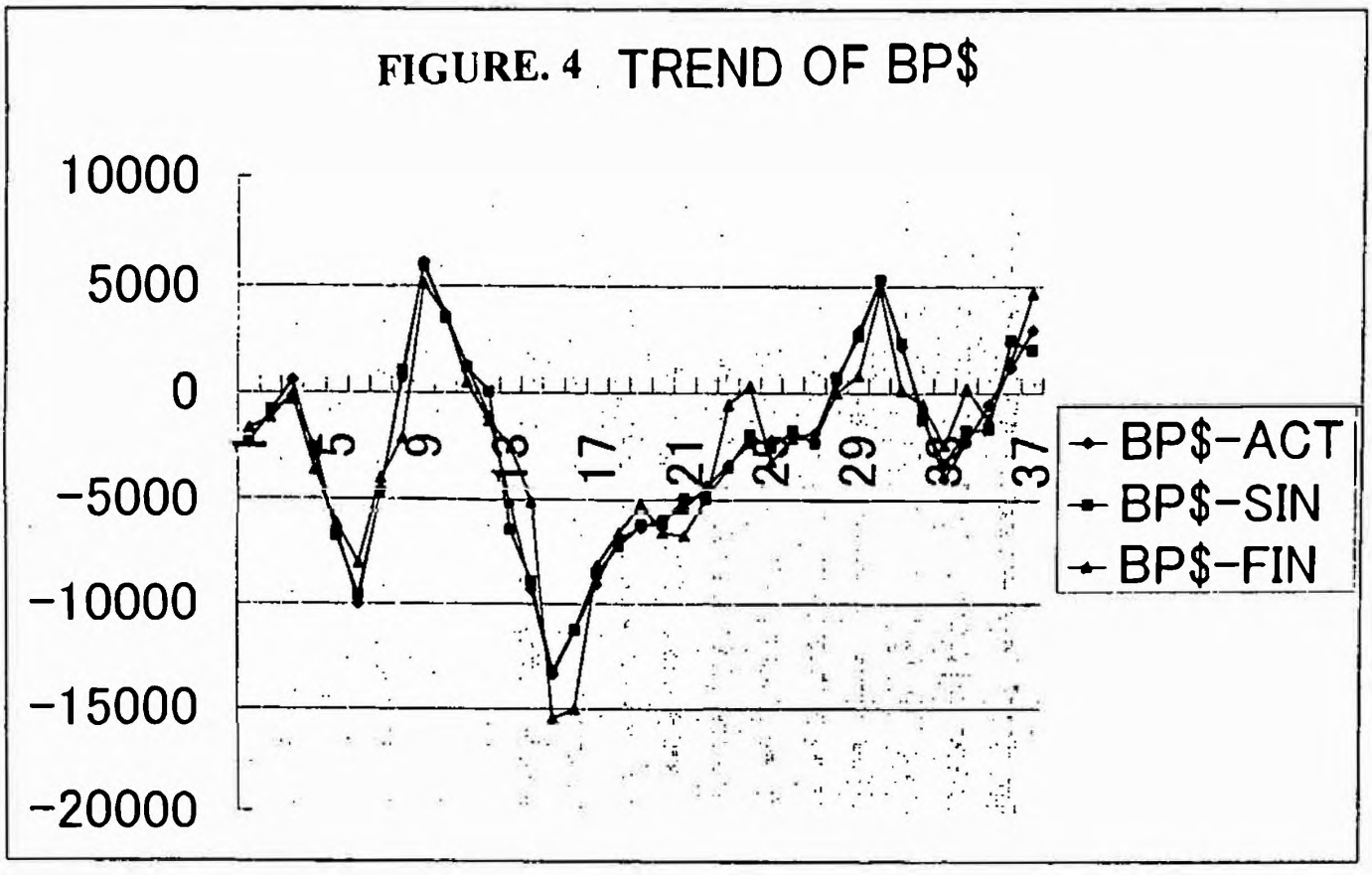
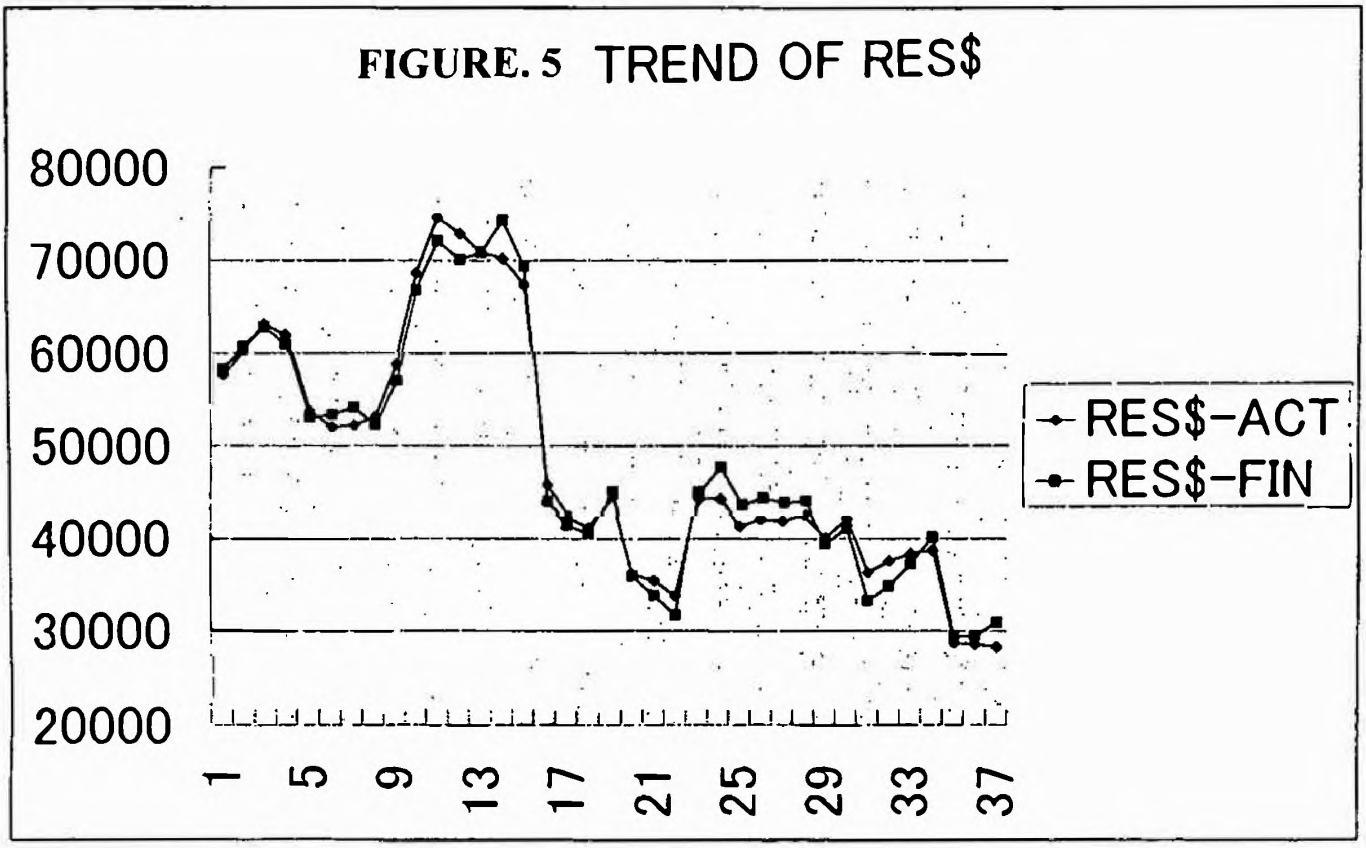


FIGURE. 5 TREND OF RES$



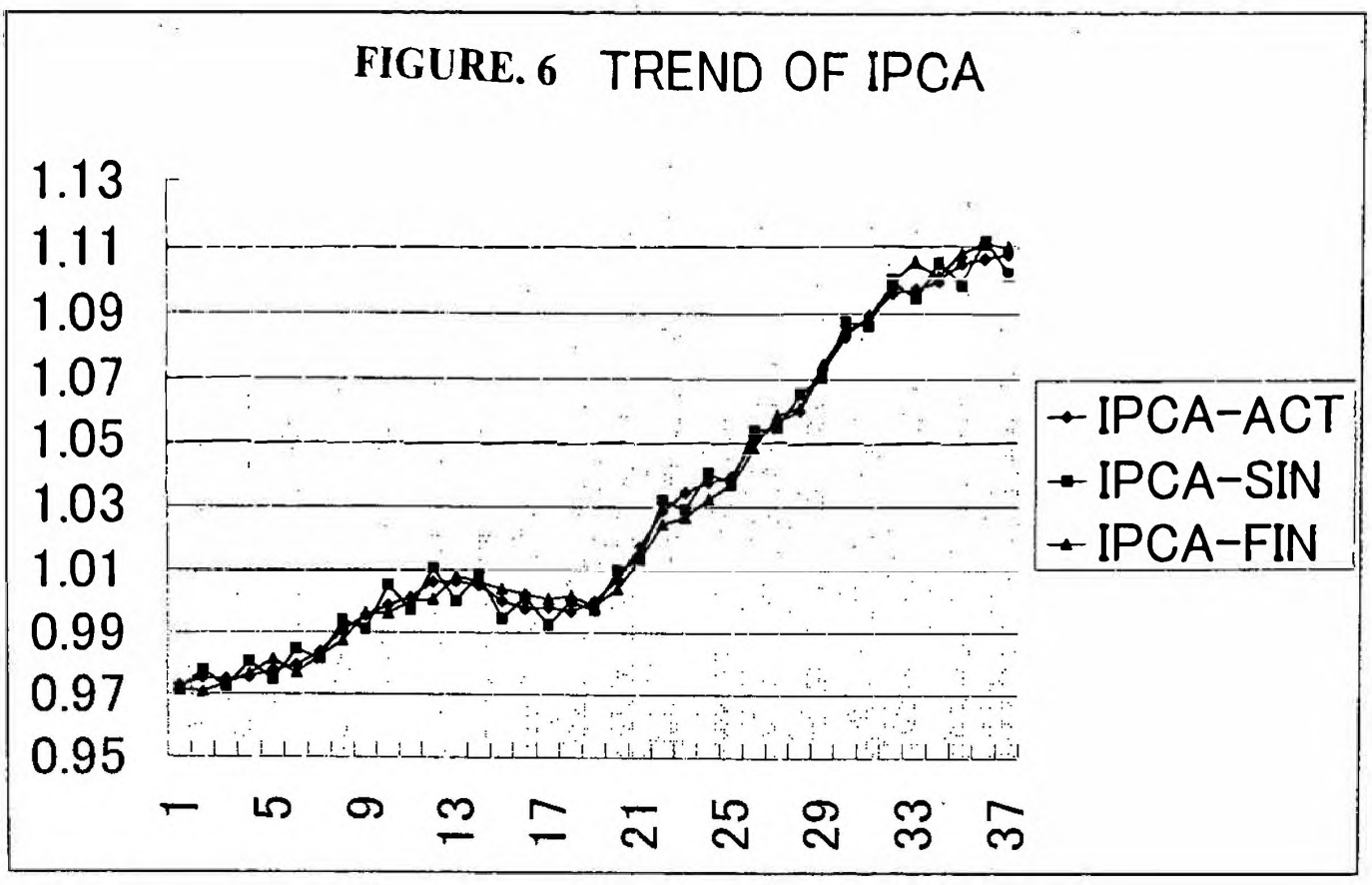


FIGURE. 6 TREND OF IPCA
1.13
1.11
1.09
1.07
1.05
1.03
1.01
0.99
0.97
0.95
1
5
9
13
17
21
25
29
33
37
IPCA-ACT
IPCA-SIN
IPCA-FIN

FIGURE. 7 TREND OF SELIC

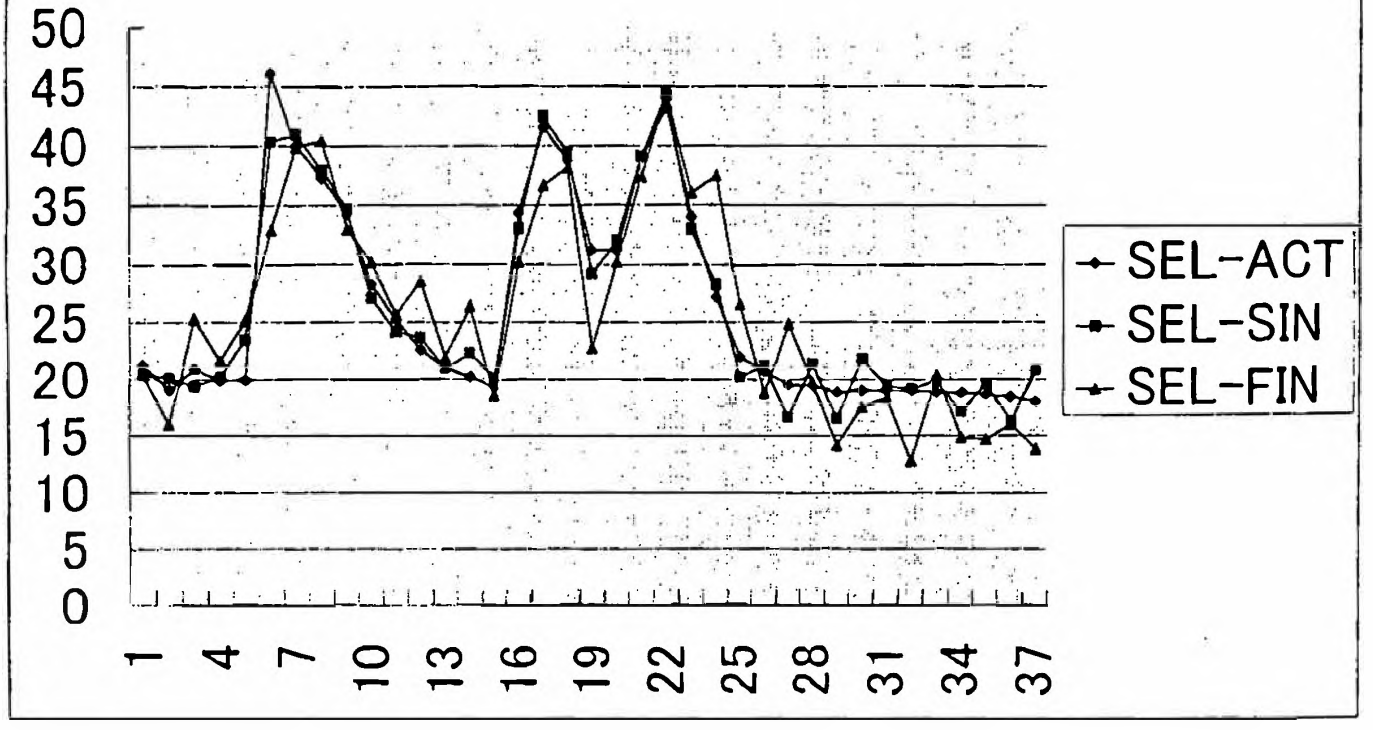


FIGURE. 8 TREND OF M1

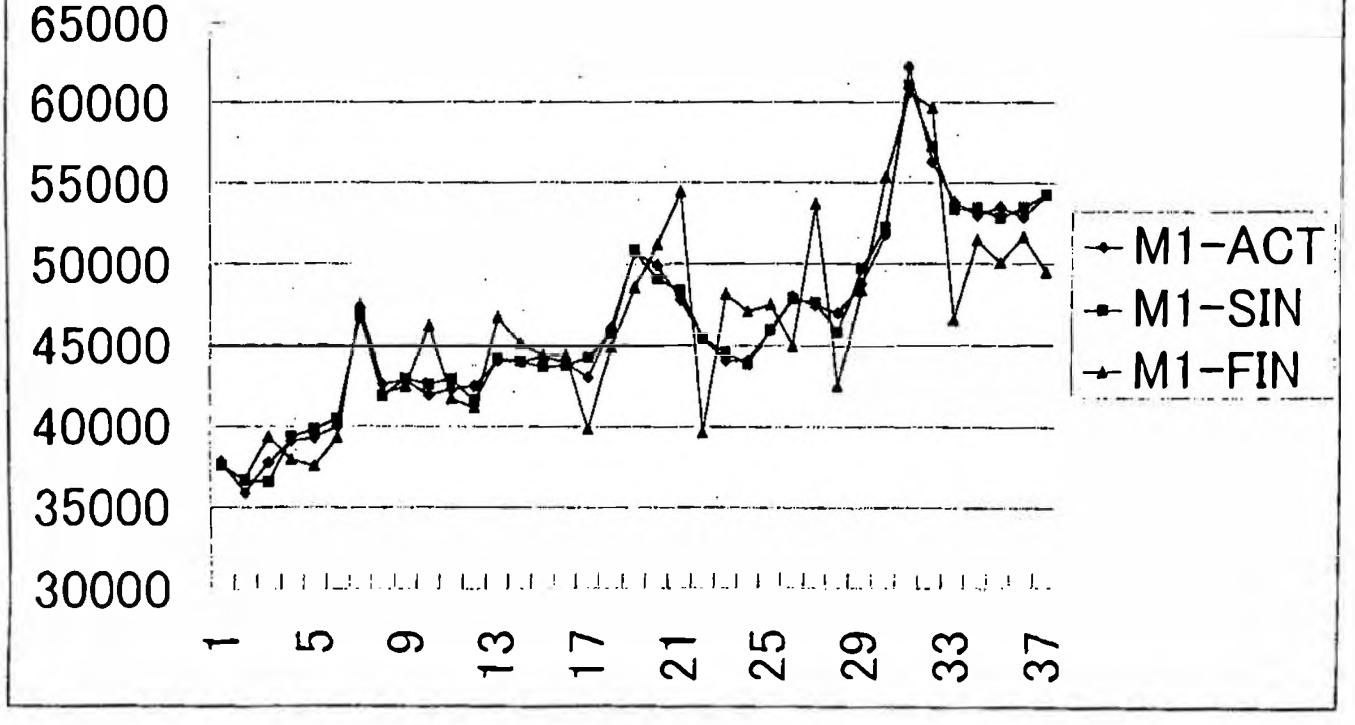


FIGURE. 9 TREND OF M2

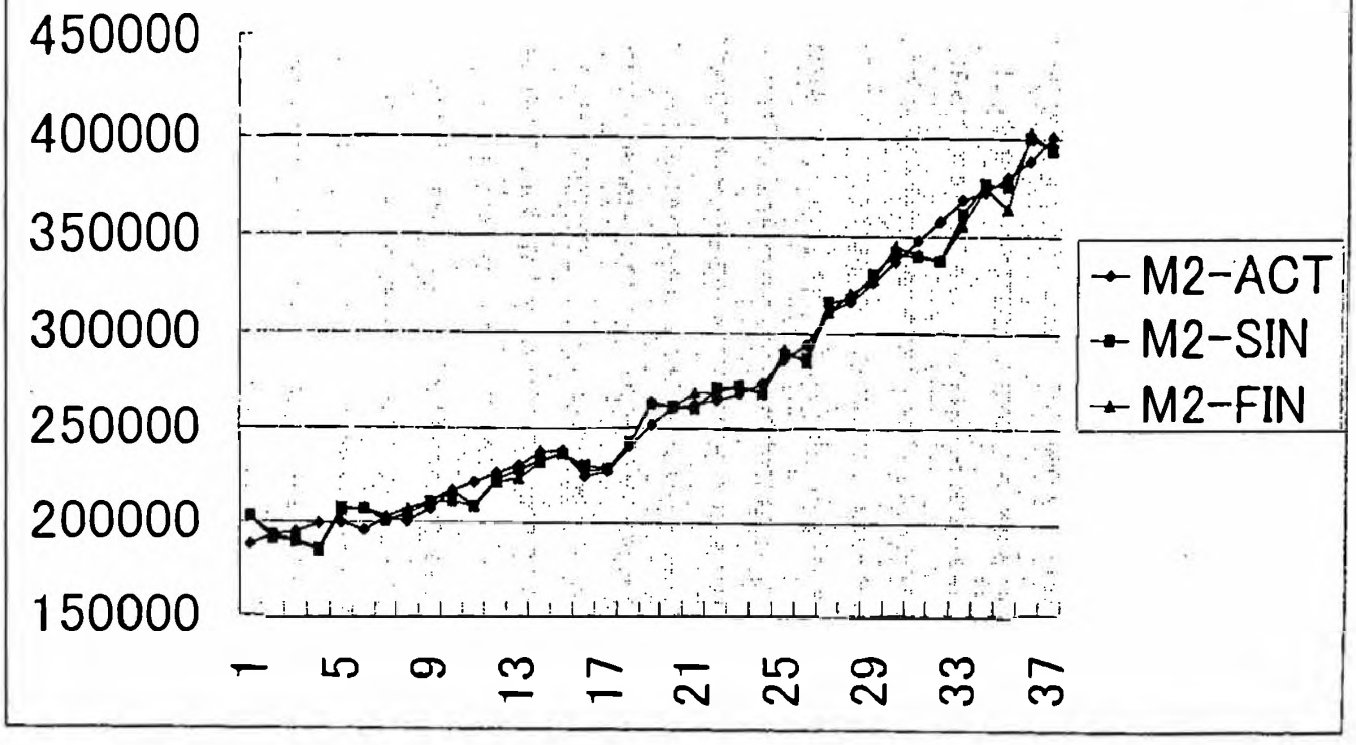


FIGURE. 10 TREND OF NFSNO

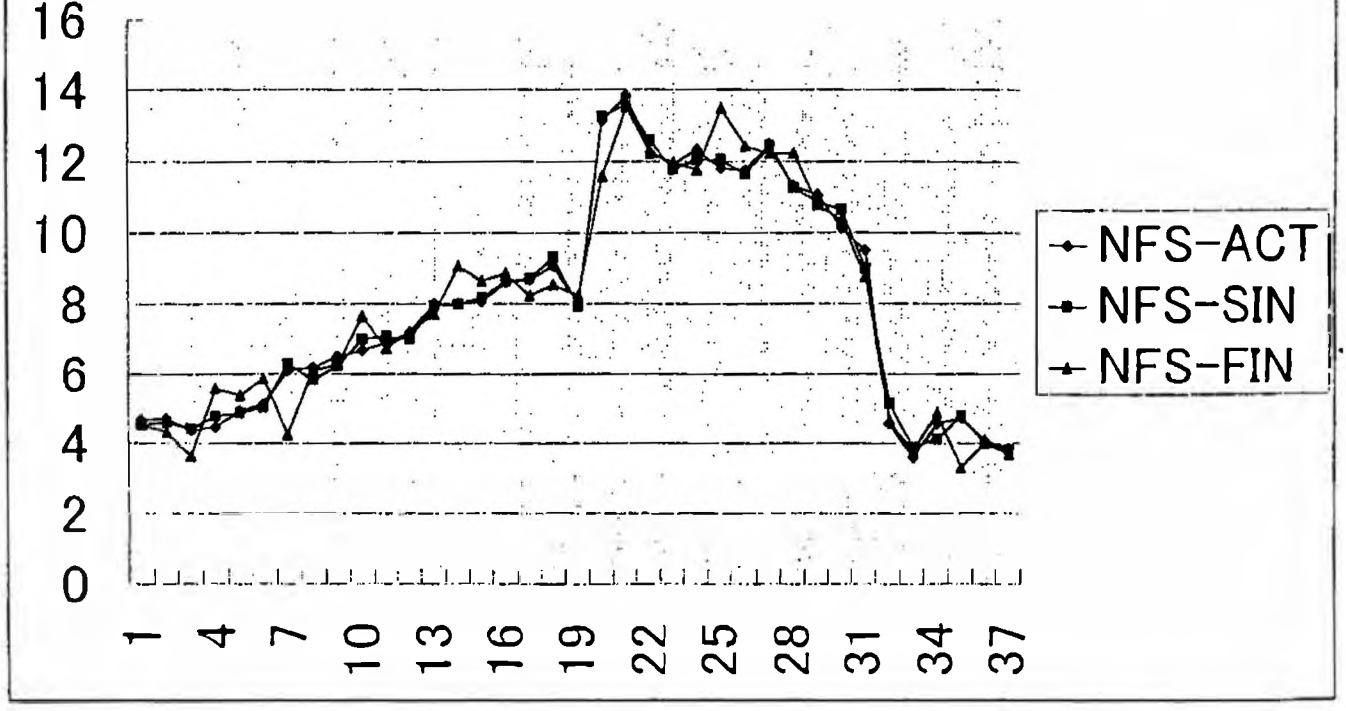


Figure 10 shows the trend of the nominal necessity of financial sector (NFSNO) as a percent of GDE. Until the end of 1998, it steadily increased from 4 to 8 percent. After the devaluation it jumped up to 14 percent. After that it gradually decreased to 10 percent in 1999, and decreased to 4percent in 2000. This trend partially reflects the changes of SELIC, but also manifests other political targets.

As shown above, the changes of targets and instruments are quite volatile, and suggest the existence of multi-purposed ways of manipulation, and intensive interrelated relationships. First I will conceptually discuss the methodology of empirical study below.

I select four current endogenous variables (GDP, IPCA, BP$, RES$) and some exogenous variables (SELIC, M1, M2, NFSNO, RATE, POIL$, POP, FDI$, KFDI , GDPUS, CPIUS, FPF$; underlined in (2-1)).[2] I constructed a simultaneous equation model, in which eight variables are treated as endogenous variables. Four variables (GDP, IPCA, BP$, RES$) are targets, and four variables (SELIC, M1, M2, NFSNO) are instruments. The model consists of eight equations (Fj).

Fj (GDP, IPCA, BP$, RES$; SELIC, M1, M2, NFSNO; <u>RATE, POIL$, POP, FDI$, KFDI, GDPUS, CPIUS, FPG$;</u> u) = 0 (j=1,...,8) (2-1)

First four equations explain the changes of target variables based on instruments and other exogenous variables. Next four equations explain the changes of instrument variables by targets and other exogenous variables. These four equations are understood as reaction functions of public sector, which describe the behaviors of government and central bank to determine the levels of instruments responding to the observed values of targets and economic environment expressed by other exogenous variables.

The object of macroeconomic policy (W), which I simply call as national welfare to discriminate from target variable, is specified as an aggregate of three basic targets (growth, price stability, balance-of-payment equilibrium) and is expressed as a linear combination of three endogenous variables.

W=F (GDP, (-)IPCA, BP$) (2-2)

The negative sign attached to IPCA implies that the decrease of consumer's price is desirable. When the dynamic solution of (2-1) is inserted into (2-2), the estimated value of welfare (W*) is expressed as the function of exogenous variables.

W*=F(SELIC, M1, M2, NFSNO; RATE, POIL$, POP, FDI$, KFDI, GDPUS, CPIUS, FPG$) (2-3)

Now I want define eight different scenarios (F, G, R, B, C, D, E, A) based on two regimes of exchange rate, and different ways of manipulating instruments. Cases

(F) and (G) manifest actual trend of exchange rate in which the regime changed from crawling peg to floating regime after January 1999. To compare the effects of different macroeconomic policies, I specified other cases (R) to (A), in which the exchange rate is fixed after January 1999.

Case (F) is the actual process or the final test case utilizing the full model, in which all instruments are determined endogenously. The value of W* of (2-3) calculated is denoted as WF*. Case (G) assumes actual floating exchange rate, but all instruments are fixed after January 1999. Other six cases (R, B, C, D, E, A) assume that the exchange rate is fixed after January 1999. In case (R) all instruments change based on reaction functions. In cases (B), (C), (D), (E), only one or two instrument change endogenously, and others are fixed after January 1999. In last case (A) all instruments are fixed. In the following equations, the underline implies the exogenous determination. The values of welfare are suffixed accordingly.

WF* = F (SELIC, M1, M2, NFSNO; RATE; OTHERS) (2-4)
WG* = F (SELIC, M1, M2, NFSNO; RATE; OTHERS) (2-5)
WR* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-6)
WB* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-7)
WC* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-8)
WD* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-9)
WE* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-10)
WA* = F(SELIC, M1, M2, NFSNO; RATE ; OTHERS) (2-11)

The exchange rate (RATE) is exogenously fixed; it takes actual values in (F) and (G), and in (R) to (A) it takes actual values until month 59, and then is fixed at the level of month 60. All other exogenous variables take the actual values.

Let us compare two contrasting regimes after January 1999: floating regime and accompanying devaluation, and fixed rate regime. Then the question is: (1) whether the regime change and the resulting devaluation improved the national welfare compared with the contrasted case of continuation of fixed exchange rate, and to what extent? (2) Under two different regimes, how each instrument variable would be manipulated indifferent ways? (3) How the manipulation of each instrument did improve the national welfare? Which instrument effectively contributed? In other words, three questions are related to: (1) measurement of social cost or gain of regime change and devaluation, (2) possibility of estimation of reaction function, (3) comparison of relative effectiveness to increase national welfare between instruments. Constructing decision model and comparing the national welfare of eight different cases can answer these questions. The empirical results will be discussed in section 4

3. Construction of Monthly Decision Model

I prepared the monthly time-series data after January 1997, and adopted 37

months (June 1997-June 2006) as the estimation period, and constructed a decision model. I prepared another monthly model of fuller scale including a big number of endogenous and exogenous variables.[3] Decision model can be considered as a reduced version of such a full model, and can be constructed by eliminating irrelevant endogenous variables and date, thus by containing only some endogenous variables as target variables, and some exogenous variables as instruments. The decision model of this paper was not directly reduced from a mother macro model, but it was independently estimated based on the same data bank.

In all following estimated equations, the explaining variables in principle do not contain any current endogenous variables, so OLS estimation is expected to not incur heavy simultaneity errors. I set the estimation criteria as follows: (1) all explained variables at left-hand side are deflated by suitable variable to eliminate the steady trend. In this way, I tried to avoid possible bias caused by spurious correlation, which can happen, by the existence of common trends between explained and explaining variables. (2) I required that the determination coefficient is higher than 0.95 to secure a good fitting at single equation estimation, and all T-values bigger than 1.0 to secure the explaining power of each explaining variable. (3) I tried to confine the MAPE in last five months as less than 10 percent to secure a sufficiently good fitting. (4) I decided to not employ any dummy variables, because they contribute to improve the fitting, but it is difficult to attach reasonable explanations. Instead of using dummy variables, I added the special term, which is a linear combination of foreign portfolio investment, Fi (FPF$), to i-th equation. I interpret that Fi(FPF$) manifests the expectation to the movement of Brazilian economy, so that the influences of changing expectation of various economic entities can be expressed by functions of (FPF$).

List of Variables:

Endogenous Variables (10):

(Symbol)	(Name)	(Unit)
Target Variables:		
GDE	:GDE	(1 Billion Real)
GDPN	: Per-Capita GDP	(1000 Real)
Y$/N	: Per-capita Monthly GDP in Dollar	(Dollar)
IPCA	: Consumers Price Index	(index)
BP$	: Balance of Payment	(1 Million Dollar)
RES$	: Foreign Currency Reserve	(1 Million Dollar)
Instrument Variables:		
SELIC	: Interest Rate	(Per Cent)
M1	: Narrow Money Supply	(1 Billion Real)
M2	: Wide Money Supply	(1 Billion Real)
NFSNO	: Ratio of Financial Necessity of Public Sector	(Per Cent of GDP)

Exogenous Variables (9)

BPE$	: Error Term of Balance-of-Payment	(1 Million Dollar)

FPF$	: Portfolio Foreign Investment	(1 Million Dollar)
GDPUS	: GDP of U.S.A	(1 Trillion Dollar)
KFDI	: Real Stock of Foreign Direct Investment	(1 Billion Real)
FDI$	: Foreign Direct Investment	(1Million Dollar)
FPF$	: Foreign Portfolio Investment	(1 Million Dollar)
POIL$	: Oil Price	(Dollar per Barrel)
POP	:Population	(1Million)
RATE	: Exchange Rate	(Real per Dollar)

Decision Model of Brazilian Economy (June 1997-June 2000: 37 samples)

(Target Function)
(T-1) Per-Capita Monthly GDP in Dollars (Y$/N)

$$(Y\$/N)=2482.98-0.2868*((SELIC)(-1)-(IPCA)(-1)+(IPCA(-2))$$
(6.75) (-1.69)
$$-0.2251*((SELIC)(-7)-(IPCA)(-7)+(IPCA)(-8))$$
(-1.42)
$$+4.303*(M2)(-1)/(IPCA)(-1)-2.239*(NFSNO)(-7)$$
(5.87) (-1.63)
$$-235.2*(RATE)/(RATE(-1)-225.1*(RATE)(-1)/(RATE)(-5)$$
(-19.81) (-22.83)
$$-168.8*(RATE)(-5)/(IPCA)(-5)-34.30*(POIL\$)(-3)/(POIL\$)(-5)$$
(-16.40) (-3.53)
$$+25.98*(KFDI)(-1)/(KFDI)(-12)-1499*(GDPUS)(-1)/(GDPUS)(-4)$$
(5.57) (-4.24)
$$+F1(PFP\$)+u \qquad (3\text{-}1)$$

$R^2=0.9976$, $RA^2=0.9955$, SE=3.9667, SD=59.6684, DW=1.93, F=478.02

(T-2) Per-Capita Monthly GDP (in Real) (GDPN)

$$(GDPN)=(Y\$/N)*(RATE) \qquad (3\text{-}2)$$

(T-3) GDE(GDE=GDP)(GDE)

$$(GDE)=(GDPN)*(POP) \qquad (3\text{-}3)$$

(T-4) Balance-of-Payment (BP$)

$$(BP\$)=-466228.9+214.0*(SELIC)(-2)+88.72*(SELIC)(-3)+416.9*(SELIC)(-9)$$
(-6.03) (6.89) (2.51) (9.18)
$$+196.24*(SELIC)(-10)+117.8*(SELIC)(-14)-626.7*(NFSNO)(8)$$
(5.03) (3.34) (-1.46)
$$+945.9*(NFSNO)(-9)+1119*(NFSNO)(-14)+6837*(RATE)(-4)$$
(4.95) (5.17) (4.15)
$$+18050*(RATE)(-8)+8926*(RATE)(-8)/(RATE)(-12)$$
(5.77) (4.77)
$$-23370*(POIL\$)(-1)/(POIL\$)(-7)+836.4*(POIL\$)(-3)$$
(-6.59) (3.82)
$$+256.8*(POIL\$)(-7)+231.5*(POIL\$)(-9)+6942*(KFDI)(-2)/(KFDI)(-13)$$

(1.98) (1.73) (6.82)
+361500*(GDPUS)(-4)/(GDPUS)(-13)+F4(FPF$)+u (3-4)
(4.93)

R^2=0.9913, RA^2=0.9792, SE=657.42, SD=4566.34, DW=2.82, F=81.99

(T-5) Foreign Currency Reserve(RES$)
(RES$)=(RES$)(-1)+(BP$)+(BPE$) (3-5)

(T-6) Consumers Price (IPCA)
(IPCA)/(IPCA)(-2)*1000=1165.22-0.1080*(SELIC)(-7)-0.1327*(SELIC)(-12)
(4.45) (-1.74) (-1.85)
+16.02*(M1)(-1)/(M1)(-4)-72.88*(M2)(-1)/(M2)(-8)
(2.22) (-5.20)
+0.4201*((NFSNO)(-4)-(NFSNO)(-5))+15.91*(RATE)(-1)
(1.31) (6.40)
+5.484*(RATE)(-2)/(RATE)(-8)+4.665*(POIL$)(-1)/(POIL$)(-12)
(1.83) (2.16)
-268.5*(CPIUS)(-1)/(CPIUS)(-3)+149.7*(POP)(-1)/(POP)(-10)
(-1.15) (1.67)
+F6(FPF$)+u (3-6)

R^2=0.9517, RA^2=0.9131, SE=2.045, SD=4.573, DW=2.35, F=24.65

(Instrument Function)
(I-1) Interest Rate (SELIC)
(SELIC)=299.06+103.8*(GDE)(-4)/(GDE)(-12)-1.589E-04*(RES$)(-2)
(3.84) (5.13) (-1.82)
-296.0*(IPCA)(-1)/(IPCA)(-7)-55.77*(M2)(-1)/(M2)(-2)
(-4.67) (-1.86)
-2.103*(NFSNO)(-7)-23.69*(RATE)/(RATE)(-1)+7.348*(RATE)/(RATE)(-12)
(-3.11) (-3.65) (2.97)
-9.492*(RATE)(-2)/(RATE)(-15)+9.266*(RATE)(-4)/(RATE)(-7)
(-1.86) (1.53)
+17.12*(POIL$)(-1)/(POIL$)(-3)+6.691*(POIL$)(-5)/(POIL$)(-9)
(2.55) (1.33)
+36.92*(FDI$)(-3)/(KFDI)(-4)+F7(FPF$)+u (3-7)
(2.04)

R^2=0.9572, RA^2=0.9144, SE=2.5535, SD=8.7321, DW=2.99, F=22.38

(I-2) Narrow Money Supply (M1)
(M1)/(GDE)(-1)/(IPCA)(-1)=2.8501+1.199E-03*(GDE)(-4)/(POP)(-4)
(4.56) (3.15)
+4.367E-03*(GDE)(-7)/(POP)(-7)+6.722E-06*(BP$)(-6)
(11.92) (6.11)
-8.266*(IPCA)(-1)/(IPCA)(-5)+2.657*(IPCA)(-1)/(IPCA)(-7)

(-6.93) (2.99)
+1.219E-03*(SELIC)(-1)+1.248E-03*(SELIC)(-10)+0.01793*(NFSNO)(-2)
(1.90) (2.03) (7.01)
-0.01002*(NFSNP)(-8)-0.02348*(RATE)/(RATE)(-4)
(-2.88) (-1.02)
+0.1299*(RATE)(-1)/(RATE)(-12)+0.2236*(POIL$)(-7)/(POIL$)(-13)
(6.31) (7.44)
+0.08284*(POIL$)(-2)/(POIL$)(-7)+F8(FPF$)+u (3-8)
(2.43)

R^2=0.9789, RA^2=0.9525, SE=0.01238, SD=0.05683, DW=2.82, F=37.13

(1-3) Wide Money Supply (M2)
(M2)/(GDE)(-1)/(IPCA)(-1)=60.98+0.01020*(SELIC)(-7)
(4.40) (2.67)
-19.23*(IPCA)(-1)/(IPCA)(-2)+0.02565*(GDE)(-7)/(POP)(-7)
(-1.92) (7.75)
+4.889E-05*(BP$)(-7)-1.465*(RATE)/(RATE)(-1)
(4.62) (-4.41)
+0.3081*(RATE)/(RATE)(-2)+0.4190*(RATE)/(RARE(-7)
(1.05) (2.01)
+0.2508*(NFSNO)(-7)-50.67*(POP)(-1)/(POP)(-13)
(12.70) (-4.22)
-0.2416*(POIL$)(-1)/(POIL$)(-7)+F9(FPF$)+u (3-9)
(-1.17)

R^2=0.9787, RA^2=0.9652, SE=0.1218, SD=0.6539, DW=1.61, F=72.48

(E-25) Ratio of Necessity of Financial Sector to GDE (NSFNO)
(NFSNO)=-156.68+5.701*(GDE)(-1)/(GDE)(-8)+0.08941*(SELIC)(-1)
(-6.48) (2.18) (6.02)
+152.4*(IPCA)(-1)/(IPCA)(-2)+1.350E-05*(RES$)(-1)
(6.29) (1.00)
-0.5109*(POIL$)(-2)+3.732*(RATE)+4.484*(RATE)(-1)
(-20.69) (4.44) (5.22)
+29.93*(IGPDI)(-1)/(IGPDI)(-7)-3.771*(RATE)(-4)/(RATE)(-7)
(3.01) (-3.07)
+F10(FPF$)+u (3-10)

R^2=0.9937, RA^2=0.9881, SE=0.3418, SD=3.1377, DW=2.80, F=177.25

The specification of functions of short-term capital net inflow (FPF$) is as follows:

F1(FPF$)=-1.178E-03*(FPF$)(-1)-0.4226*(FPF$)(-1)/(FPF$(-11)
(-1.98) (-3.18)
+0.1766*(FPF$)(-3)/(FPF$)(-14)+0.4183*(FPF$)(-4)/(FPF$)(-15)
(1.27) (3.83)

-3.014E-03*(FPF$)(-7)-1.064*(FPF$)(-12)
(-3.80) (-2.67)

F4(FPF$)=1.853*(FPF$)+27.90*(FPF$)(-2)/(FPF$)(-4)
(14.26) (1.94)
+364.0*(FPF$)(-4)/(FPF$)(-9)-144.5*(FPF$)(-8)/(FPF$)(-13)
(6.33) (-3.76)

F5(FPF$)=1.089E-03*(FPF$)(-1)+7.560*(FPF$)(-2)
(3.70) (2.08)
-0.2487*(FPF$)(-3)/(FPF$)(-8)+0.1014*(FPF$)(-4)/(FPF$)(-8)
(-3.33) (2.69)
-0.3902*(FPF$)(-4)/(FPF$)(-11)-0.5028*(FPF$)(-5)/(FPF$)(-12)
(-5.30) (-6.81)

F7(FPF$)=1.836E-05*(FPF$)(-2)-1.628*(FPF$)(-5)
(4.62) (-5.91)
+0.0009118*(FPF$)(-1)/(FPF$)(-8)+0.001298*(FPF$)(-1)/(FPF$)(-12)
(1.20) (1.99)
-0.001641*(FPF$)(-2)/(FPF$)(-15)-0.001031*(FPF$)/(FPF$)(-4)
(-1.81) (-3.89)

F8(FPF$)=-0.009794*(FPF$)(-1)/(FPF$)(-2)-0.0001111*(FPF$)(-7)
(1.24) (-4.36)
-5.141E-05*(FPF$)(-10)+5.229*(FPF$)(-12)
(-2.37) (2.31)

F9(FPF$)=-0.009794*(FPF$)(-1)/(FPF$)(-2)-0.001111*(FPF$)(-7)
(-3.08) (-4.36)
-5.141E-05*(FPF$)(-10)+5.229*(FPF$)(-12)
(1.59) (2.31)

F10(FPF$)=-0.04552*(FPF$)/(FPF$)(-2)+0.003924*(FPF$)/(FPF$)(-6)
(-4.90) (1.24)
-0.01088*(FPF$)(-1)/(FPF$)(-5)+0.02603*(FPF$)(-2)/(FPF$(-13)
(-1.58) (1.59)
+0.05043*(FPF$)(-3)/(FPF$)(-6)+0.02290*(FPF$)(-4)/(FPF$)(-7)
(4.08) (1.37)
+0.03957*(FPF$)(-5)/(FPF$)(-14)+0.0002080*(FPF$)(-6)
(2.61) (2.70)
+0.0003630*(FPF$)(-7)-0.0003770*(FPF$)(-10)
(5.32) (-6.70)

In (3-1), per-capita GDE in dollar (Y$/N) is negatively influenced by the real interest rate, which is nominal interest rate (SELIC) minus the increment of consumer's price (IPCA), financial necessity ratio (NFSNO), exchange rate (RATE), and positively influenced by money supply (M2) and increase of foreign capital (KFDI). GDE is determined by definition. The actual trend is fairly well traced, including a drop at January 1999, a steady recovery in dollar term, and a quick recovery in Real.

In (3-4), the balance-of-payment (BP$) is positively influenced by the interest rate (SELIC), financial necessity (NFSNO), exchange rate (RATE), growth of foreign

capital and GDP of U.S.A. The financial necessity ratio (NFSNO) and the oil price (POIL$) of different months have changing signs, and create cyclical influences. As shown in Figure 4, the estimated values fairly well traced the actual cyclical movement, including a quick drop at the end of 1998, and the following steady recovery. The estimated foreign currency reserve (RES$) also nicely traced the actual sharp decline after 1998 as shown in Figure 5.

In (3-5), consumer's price (IPCA) is negatively influenced by SELIC, while positively influenced by financial necessity ratio (NFSNO) and exchange rate (RATE), oil price, and population growth. The growth of CPI in U.S.A exerts a weak negative influence. It may mitigate the positive influence of exchange rate. The money supply (M2) has positive and negative signs, representing the contrasting effects of short-term demand increasing effect and long-term supply enhancing effect.

In (3-7), SELIC increases when the growth of GDE, FDI and oil price is high, and decreases when the financial necessity ratio (NFSNO), the foreign currency reserve (RES$) and money supply (M2) grow. The response to inflationary trend is complex: SELIC decreases when growth of IPCA is high, while it responds to exchange rate with changing signs over time. The actual trend of SELIC is complex, including two humps and constancy in last 12 months. It was fairly well traced by the reaction function. But in the last 12 months, the error term showed a fluctuating movement. The big contrast between big humps and constancy made the consistent explanation quite difficult. Table 1 shows the decomposition of SELIC change into the influences of nine explaining variables multiplied with their coefficients. Big changes are explained mainly explained by following variables.

A big increase by 11.6 % in October 1998 (month 57): IPCA (3.3%), GDE (3.0%), FPF$ (2.8%), FDO (1.5%).

- A big drop by 15.4 % in December 1998: FPF$ (8/0%), M2 (3.0%), FDI (2.0%), POIL$(1.1%).

Increases in January-March 1999 by 21.5% : FPF$, exchange rate, M2, IPCA, GDE, POIL$ (by order of sum of absolute % changes).

Drops in April and June 1999 by 19.1%: GDE (8.5%), exchange rate (5.7%), IPCA (5.1%), oil price (4.0%), M2 (3.2%), RES$(2.4%).

Therefore, many variables played the major roles interchangeably in different months. But according to Table 1, the net inflow of short-term capital (FPF$) played important roles in creating big humps. Change of exchange rate created drastic changes at the time of devaluation. IPCA, GDE, M2, NFSNO, POIL$ also exerted strong effects at certain months.

The equation (3-8) explains the trend of M1. The ratio of M1 to GDP is positively influenced by per-capita GDP, balance-of-payment, SELIC, financial necessity ratio (NFSNO), exchange rate, and oil price growth. Exchange rate influences with changing signs. In Figure 8, the relative stagnation after devaluation, and a quick increase in 2000 is adequately explained.

TABLE. 1. DECOMPOSITION OF SELIC CHANGE

VAR MON	(1) RES$	(2) M2	(3) IPCA	(4) GDE	(5) NFS	(6) RATE	(7) FDI	(8) POIL	(9) FPF	(10) SELIC
43	-0.5	-4.7	0.1	1.2	1.0	-0.0	-0.8	-1.4	0.6	-4.5
44	0.2	8.4	3.9	1.2	0.9	-0.1	0.2	-1.1	-4.3	9.3
45	-0.4	-2.6	0.7	3.6	0.3	0.1	-1.9	0.9	-4.3	-3.6
46	-0.3	0.8	0.6	-0.0	-0.6	-0.1	0.5	0.1	2.6	3.5
47	0.3	-8.0	1.2	1.7	0.9	0.0	-0.2	1.5	10.4	7.8
48	1.3	6.3	2.6	1.1	0.2	-0.0	-0.1	0.3	-4.8	6.9
49	-0.0	1.5	-0.4	0.8	1.5	-0.0	1.3	-2.9	-1.3	0.6
50	-0.1	-2.4	-1.8	1.9	0.5	0.0	-1.9	-2.4	-1.2	-7.4
51	0.3	0.1	-1.8	-2.0	1.4	-0.0	0.4	1.5	-2.6	-2.8
52	-0.8	-0.6	0.9	-5.1	-4.0	0.0	-1.0	0.9	5.0	-4.5
53	-1.6	3.9	0.4	-5.8	0.4	-0.0	0.3	1.5	3.7	2.9
54	-0.8	-5.8	-1.6	0.8	-1.0	0.0	-0.9	0.6	2.3	-6.6
55	0.3	3.0	-0.6	-0.3	3.4	-0.0	1.3	-2.0	-0.7	4.4
56	-0.1	-1.6	2.0	3.0	-3.9	-0.1	-0.4	0.4	-7.1	-7.8
57	-0.6	0.9	3.3	3.0	-0.4	0.1	1.5	0.9	2.8	11.6
58	0.8	3.7	0.5	0.2	-2.9	-0.0	-0.5	0.8	4.0	6.5
59	4.0	-2.8	1.6	-0.3	1.9	-0.0	1.6	0.6	-5.1	1.5
60	0.4	-3.0	-0.1	-0.5	-1.0	0.1	-2.2	-1.1	-8.0	-15.4
61	0.1	-1.6	3.1	3.2	-1.0	-10.0	1.0	-2.9	15.6	7.5
62	-0.7	5.7	-2.1	-1.8	-2.9	14.7	-1.5	3.1	-7.3	7.1
63	1.5	-2.4	-3.5	-1.7	0.9	-4.0	0.4	1.9	13.8	6.9
64	0.3	1.6	-3.8	-3.6	-0.5	-4.1	-1.0	0.9	1.9	-8.2
65	0.3	-0.7	-1.1	0.9	1.3	7.5	2.2	3.7	-12.7	1.4
66	-2.1	1.6	-1.3	-4.9	-0.7	1.6	-1.7	-3.1	-0.3	-10.9
67	-0.4	-5.4	-2.3	2.9	0.7	-2.7	-0.3	-3.8	3.7	-7.7
68	0.6	5.7	-1.6	5.6	-7.0	-6.5	-0.1	3.4	6.1	6.0
69	-0.1	-6.1	-0.1	3.0	-4.1	1.4	0.4	4.1	-3.7	-5.1
70	0.1	3.4	2.6	-0.4	2.7	0.7	0.8	-0.8	-14.7	-5.6
71	-0.0	0.3	-3.3	-0.4	0.6	1.0	-0.7	-1.4	7.2	3.3
72	0.7	-1.6	-1.2	2.6	0.4	0.6	-0.1	-0.9	0.4	0.9
73	-0.3	3.6	0.2	-4.8	-3.6	-5.8	-0.3	0.1	5.4	-5.6
74	1.3	-0.2	0.3	6.8	2.2	1.3	0.0	-0.2	-4.0	7.6
75	-0.3	-3.3	1.4	-4.6	0.4	0.2	0.2	0.4	-0.1	-5.6
76	-0.4	-0.2	1.9	-4.2	-0.0	4.5	-0.0	-0.6	-1.1	-0.2
77	-0.5	4.6	2.0	-6.1	3.1	0.7	-0.4	-3.9	1.9	1.4
78	1.7	-7.6	2.1	1.4	0.9	-1.6	0.0	0.9	0.0	-2.2

(Note) Definition of variables: (K) shows the delta of W(K)

W(1)=-.0001589*RES$(-2)

W(2)=-55.77*M2(J-1)/M2(J-2)

W(3)=-296.0*IPCA(J-1)/IPCA(J-7)

W(4)=103.8*GDE(J-4)/GDE(J-12)

W(5)=-2.103*NFSNO(-7)

W(6)=-23.69*RATE/RATE(-1)+7.348*RATEF/RATEF(-12)
-9.492*RATE(-2)/RATE(-15)+9.265*RATE(-4)/RATE(-7)

W(7)=36.92*F(J-3,29)/F(J-4,56)

W(8)=17.12*POIL$(-1)/POIL$(-3)+6.691*POLI$(-5)/POIL$(-9)

W(9)=SELIC-SUM OF W(1)-W(8)

W(10)=SELIC

The equation (3-9) explains the ratio of M2 to GDE. It is positively influenced by SELIC, per-capita GDE, balance-of-payment, financial necessity ratio (NFSNO), and negatively influenced by growth of IPCA, population and oil price. The exchange rate influences with changing signs. As shown in Figure 9, the estimated values fairly well traced the actual trend.

The equation (3-10) explains the trend of financial necessity ratio (NFSNO). It is influenced positively by GDE growth, IPCA growth, SELIC, foreign currency reserve, exchange rate, wholesale price growth, and negatively by oil price. As shown in Figure 10, the trend of NFSNO is complex, including steady increase, a big hump, and a quick drop. The estimated values traced well this complex trend.

I calculated the final test for 37 months (42-78). The mean absolute percentage error (MAPE) of endogenous variable is shown in Table 2.

Table.2. Result of Final Test (42-78 months)

Variables	MAPE (Last 10 months)(%)	MAPE (Last 5 months)(%)	MAPE (Last 3 months)(%)	Determination Coefficient
Target				
Y$/POP	1.05	1.32	0.73	0.9976
GDE	1.05	1.32	0.73	(Definition)
GDE/POP	1.05	1.32	0.73	(Definition)
BP$	------	——-	——	0.9913
RES$	4.44	4.28	5.01	(Definition)
IPCA	0.24	0.33	0.29	0.9517
Instruments				
SELIC	15.77	17.46	19.29	0.9572
M1	5.96	6.78	5.86	0.9789
M2	2.51	2.77	3.24	0.9787
NSFNO	7.03	9.53	12.03	0.9937

(Source) Calculated by author. MAPE of Balance-of-payment (BP$) is not shown because it can take zero value, so MAPE is meaningless.

The result of final test was generally good, and all the estimation criteria were satisfied, except the case of SELIC. As it showed volatile cyclical changes in 2000, MAPE was relatively big. The average absolute error was 3% and the average level of SELIC was 18%, so MAPE reached to 17% in final five months. But the standard deviation of error term was 2.5%. So the average absolute error of 3% was in admissible range, and not extraordinarily big. So I judged the result of final test as acceptable.

4. Simulation Experiment

After the final test, I implemented the various simulation studies to compare the national welfare as scheduled.

First I set the evaluation coefficients of national welfare (W) as follows. The

(3-b-2) The sound money supply growth is necessary to eliminate financial repression, and adequate supply of necessary fund for development. This welfare-enhancing function of money supply growth is important considering a low domestic saving propensity, and the trend of prizatization. This function must be considered beyond the inflation-controling function.

Naturally such a long-term considertion cannot be adequately handled within the framework of a high-frequency modeling by monthly data. Therefore a combined use of annual, quaterly, monthly models is needed to overall structural analysis, and comprehensive policy discussions.

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(Note-1) Nishijima, Shoji, Currency Crisis in Asia and Latin America: A Comparison, paper presented to IPEA/JICA Workshop: Modeling the Brazilian Economy, Rio de Janeiro, August 14-15,2001.

(Note-2) Portugal Marcelo S, Regina C. Madalozzo and Ronald O.Hillbrecht,Inflation, Unemployment, and Monetary Policy in Brazil,XXI Encontro Brasileiro de Econommetria, 08-10 de dezembro de 1999, Belem, Para,pp.522-542. They estimated the transsfer function of unemployment to inflation based on IBGE data (1982-1998), and showed that after 1007, the actual unemployment rate exceeded NAIRU.In 1998 2-3 quarter, NAIRU stayed lower than 6%, while the actual level exceeded 7% (Graph 2, p.530).

Price did not increase sharply as expected. So the devaluation effect to improve competitiveness sufficiently persisted, and resulted in increasing export and decreasing import.

(B) Low labor market pressure. Employment increased by 14%, in parallel with GDP, but unemployment rate and the real wage remained as roughly constant. So there was no strong pressure in labor market to push up the wage, perahps because of existence of massive abundant labor force. This suggests that the NAIRU may be still quite high.than actual level of unemployment. This contrasts with the estimate by Portugal-Madalozzo-Hillbrecht (1999).(2)

(C) The propensity-to-import remained low as 8%(=6500/83000), because the Brazilian economy is still gradually opening up. So, the positive income effect to increase import was easily cancelled out by the price effect of devaluation.

In the future, as the economy becomes more open, and reaching to the turning point in the labor market, (C) the import-propensity will increase, (A) the degree of passthrough will become higher, and (B) the labor market pressure will be higher. So, in the future, the effect of devaluation to improve the current balance will be smaller.

(3) Long-term versus Short-term Development

There exists trade-offs between short-term and long-term policy targets. I concentrated to three short-term targets (growth, price stability, current nalance). But, there are two issues for further consideration: Turnpike nature of planning, and consideration of other policy targets.

(3-a) Turnpike nature. Usually the optimum growth path differs according to the different plan period. When the planning period gets longer, the investment like betterment of soft and hard economic infrastructure must be strengthened at first instead of directly improving consumption level. For that purpose, the sound supply of money supply and positive fiscal stance must be emphasized.

(3-b) Inclusion of additional policy targets like decrease of governmental debts, or betterment of infrastructure for direct welfare (schools, hospitals, road, etc) will greatly change the optimum solution.

(3-b-1) The fiscal policy to increase NFSNO (PSBR) contributes to increase the current GDP, but increase the governmental debt, which will decrease the confidence to the government, and exert negative effects to the capital inflow, and also to the private expenditure (based on Ricardian Equivalent Theorem).

(APPENDIX) Some observations

(1) Assignment of Instruments:

As discussed by Nishijima's paper (2001, p.17)(1), there were three possibilities to solve the difficulties under the fixed exchange rate regime: Mexico, Thailand, Indonesia, Korea, Brazil adopted the floating regime; China, Malaysia, Chile adopted capital control; Argentina and Hong Kong adopted the curecny board to maintain dollar-peg. In Brazil, after the regime change from pegged system with a band to clean float, the exchange rate was expected to achieve the current balance equilibrium, but the balance-of-payment equilibrium had to be handled additionally by another instrument because of the volatile change capital account balance.The capital market is not completely open so that the domestic interest rate diverged from the international rate by various reasons. Then when there are three targets (Growth, Price-stability, Foreign Currency Reserve), and three instruments(SELIC, M1&M2,NFSNO), what was the effective assignment of instruments to targets? Based on the simulation study, the ordering of.effective-ness of each instrument to specific target was as follows:

Target:	Ordering of effectiveness of Instrument:
Growh (GDP)	M2&M1, NFSNO, SELIC
Price (IPCA)	M2&M1, NFSNO, SELIC
Foreign Currncy Reserve:	SELIC, M2&M1, NFSNO

Based on the relative effectiveness criterion, the best assignment was:NFSNO(fiscal policy) to growth (increase of GDP&employment)), M2&M1 to price stability (decrease of IPCA), SELIC to balance-of payment target (increase of foreign currency reserve). This policy mix was adopted after the devaluation, and successfully improved the national welfare to a large extent. This assignment will be useful in the future, if without the big changes of basic economic structure.

(2) Effectiveness of Devaluation to Current Balance.

In 18 months after the devaluation (January 1999), Brazil improved the current balance (-4000 to 0) based on three factors: low exchange rate passthrough, low labor market pressure, and low propensity-to-import. Theoretically,

$$CA\$=F((+)(\text{rate/price}),(-)(\text{real wage}),(-)(\text{GDP}) \qquad (1\text{-}1)$$

Where GDP and CA$ are simultaneously determined. Ex post, GDP increased by 14%, but import was roughly constant at 6500.

(A) Low exchange rate passthrough; Devaluation (from 1.2 to 1.9; by 70%) resulted in price increase (IGPDI by 15%), so

$$d(\text{price})/d(\text{rate})=0.3 \qquad (1\text{-}2)$$

(3) Fukuchi, Takao (September 2000a), Inflationary Burst and Free-Fall in Krismon Period – A Vicious Circle Between Real and Monetary Aspects of Indonesian Economy, The Developing Economies, Vol. 38, No. 3, pp. 257-307.
(4) Fukuchi, Takao (September 2000b), An Investigation of Virtuous Circle Between Real and Monetary Aspects of the Brazilian Economy, Discussion Paper No.27, IPEA, p.1-14.
(5) Fukuchi, Takao (August 2001), Econometric Analysis of Brazilian Economy by Monthly Econometric Model (mimeographed).

There are some important points open to further improvement. The model treats two important variables as exogenous: the exchange rate (RATE) and short-term capital net inflow (FPF$). After these two variables are successfully explained endogenously, the resulting enlarged decision model could better serve to describe the changes of instruments variables and to assess their effectiveness in a more detail. A preceding study is Indonesian monthly model (Fukuchi, 2000a).[4] Also I admit that the object of fiscal policy is not confined to three macroeconomic targets. Therefore the additional components like the preparation of better infrastructure must be additionally considered to the full assessment of fiscal instrument. As the changes of targets and instruments were very volatile in observation period, the possibility of structural changes must be further checked.[5]

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Technical notes:

(1). Some amendments are: renewal of observation period, elimination of IPI index, endogenization of NUCI.

(2). Actually I estimated Per-capita Monthly GDP (Y$/N) and defined GDP(=GDE) afterwards.

(3). The single-equation estimation of exchange rate function is rather easy when short−term capital net inflow was also included. Figure 1 shows an example. The trend of exchange rate (RATE) was explained by short−term capital inflow (FPF$), IPCA change, ratio of foreign currency reserve over import (RES$/IM), current balance (CA$) change, SELIC change, GDE change, change of U.S. LIBOR interest rate, change of real wage, oil price change, and change of NFSNO. The trend of exchange rate was fairly well traced, including the slow devaluation trend in 1998, a quick devaluation at January 1999, and volatile cyclical movement in 1999-2000. But the result of final test usually did not converge after including exchange rate and short-term capital net inflow functions. Also see Fukuchi−Tokunaga (1999).

(4) See Fukuchi (2001).

(5) The chronological process of structural changes of Brazilian economy after the hyperinflation period is an interesting theme for modeling work. Fiorencio-Moreira (FM, 1999) discussed the exchange rate passthrough in different regimes based on their VAR model including INPC, SELIC and exchange rate, and defined the degree of indexation by maximum Eigen root. They showed that the degree decreased drastically after the Real Plan and was stable until the beginning of 1999.

References.

(1) Fiorencio, Antonio and Ajax R.B. Moreira (July, 1999), Latent Indexation and Exchange Rate Passthrough, Texto Para Discussao No. 650, p.1-20.

(2) Fukuchi, Takao and Suminori Tokunaga (1999), Simulation Analysis of Exchange Rate Dynamics: The Case of Indonesia, The Developing Economies, Vol.37, No.1, pp. 35-58.

uncertain: if growth target is emphasized, the ordering is B,D,C,A. If price stability is important, the ordering is B,C,A,D. If balance-of-payment is emphasized, B or A,C and D. To maintain RES$, C, B or A and D. Therefore, The ordering changes according to evaluation coefficients among (B,C,D,A).

(3) The decrease of foreign currency reserve is so great in five cases of fixed exchange rate regime (R,B,C,D,A). So, the regime change and accompanying devaluation was inevitable and desirable if the balance-of-payment target is given any positive evaluation coefficient. But the current assessment is still partial to definitely judge whether the floating regime was best and inevitable. Because I treated the exchange rate and short-term capital inflow as exogenous. If the changes of instruments drastically affect to these variables, then the crawling peg regime might be useful to avoid the balance-of-payment crisis.

5. Summary and Conclusion

When an economy faced with a big external shock, how fiscal-monetary policies could mitigate the deteriorating effects of shock, and improve the national welfare? This paper tried to get some lessons about this issue through the construction of a monthly decision model of the Brazilian economy (June 1997-June 2000), and related simulation studies. Some observations are in order.

(1) The regime change and accompanying devaluation at January 1999 was inevitable to avoid the balance-of-payment crisis. If the exchange rate were fixed, then the balance-of-payment deficit would reach to unbearable level.

(2) After the devaluation, the fiscal-monetary instruments (SELIC, M1, M2, NFSNO) changed based on reaction functions, and increased the sum of national welfare by 8.7% when compared with the case in which they were kept constant. Here the national welfare is specified as a linear combination of three macroeconomic targets (GDE growth, price stability, balance-of-payment equilibrium).

(4) When the exchange rate was fixed after January 1999, the sum of national welfare would decrease by 16.1% even if all the instruments changed effectively following the reaction functions.

(5) The manipulation of monetary instruments (SELIC, M1, M2) is more effective to increase the national welfare than the fiscal instrument (NFSNO). Such ordering depends on the relative evaluation of targets. So the relative effectiveness of fiscal instrument is higher when growth target and price stability target is emphasized, but the fiscal instrument is quite weak to improve the balance-of-payment target.

(6) The current decision model with four targets variables (GDE, IPCA, BP$, RES$), four instruments (SELIC,M1,M2,NFSNO) and nine exogenous variables could successfully describe the mutual over-time interrelationships between targets and instruments. There are many interesting studies of such targets-instruments interaction based on VAR framework. But usually the number of variables is smaller and the fitting to actual trend is not rigorously confirmed. The monthly decision model offers an alternative framework to supplement these two points.

TABLE. 13. COMPARISON OF RES$ (AFTER DEVALUATION)

MON	CASE(F)	CASE(R)	CASE(B)	CASE(C)	CASE(D)	CASE(E)	CASE(A)
59	40521	41368	40521	41368	39927	41065	40455	41368
60	45044	44695	45044	44695	44111	44454	43285	44695
61	35914	36453	35914	36453	34816	36820	34139	36453
62	33869	35626	33869	35626	34141	36372	34679	35626
63	31710	33547	33876	33547	35601	33482	36170	33547
64	45002	42703	45573	42703	48874	41981	46583	42703
65	47643	39451	46850	34929	46613	34633	45954	34929
66	43648	34746	40449	25227	40275	26186	39404	25227
67	44375	35990	38541	23474	39390	22960	38038	23474
68	43903	38036	36587	22882	36259	23244	36509	22882
69	44062	45056	16637	7076	17506	4424	11617	7076
70	39467	44528	-6740	-18590	-5251	-16576	-14352	-18590
71	41148	44528	-23036	-35063	-18380	-33339	-34163	-35063
72	33272	34279	-46307	-60941	-39163	-60298	-51811	-60941
73	34889	35064	-46610	-72467	-46109	-73356	-58097	-72467
74	37279	38545	-59478	-82163	-58108	-83374	-69241	-82163
75	40120	40914	-65970	-94777	-78227	-93303	-77089	-94777
76	29413	31838	-98368	-121390	-111616	-121747	-104057	-121390
77	29505	33898	-116205	-136718	-128816	-139733	-118600	-136718
78	30913	39080	-126003	-149110	-141918	-155450	-137887	-149110

(NOTE) CASE(F), FINAL TEST:CASE(G), INSTRUMENTS FIXED
DEVALUATION:CASE(R, B, C, D, E, A)
CASE(R), SELIC, M1, M2, NFSNO ARE ENDOGENOUS
CASE(B), M1. M2 (ENDOGENOUS), SELIC, NFSNO (EXOGENOUS)
CASE(C), SELIC (ENDOGENOUS), M1, M2, NFSNO (EXOGENOUS)
CASE(D), NFSNO (ENDOGENOUS), SELIC, M1, M2 (EXOGENOUS)
CASE(E), M1, M2, SELIC (ENDOGENOUS), NFSNO (EXOGENOUS)
CASE(A), ALL INSTRUMENTS ARE EXOGENOUS

TABLE. 12. COMPARISON OF BP$ (AFTER DEVALUATION)

MON	CASE(F)	CASE(R)	CASE(B)	CASE(C)	CASE(D)	CASE(E)	CASE(A)
59	-6636	-6376	-6636	-6376	-5265	-6248	-7294	-6376
60	-5244	-6440	-5244	-6440	-5583	-6378	-6938	-6440
61	-6610	-5721	-6610	-5721	-6774	-5114	-6626	-5721
62	-6766	-5548	-6766	-5548	-5396	-5168	-4180	-5548
63	-4930	-4850	-2764	-4850	-1311	-5661	-1280	-4850
64	-535	-4671	-2131	-4671	-555	-5329	-3414	-4671
65	304	-5589	-1060	-10111	-4598	-9685	-2966	-10111
66	-3194	-3904	-5600	-8902	-5537	-7647	-5749	-8902
67	-2106	-1590	-4742	-4587	-3719	-6059	-4200	-4587
68	-2103	417	-3584	-2222	-4760	-1346	-3159	-2222
69	12	6872	-20098	-15953	-18901	-18968	-25040	-15953
70	819	4885	-17963	-20253	-17343	-15587	-20556	-20253
71	4848	3167	-13129	-13306	-9961	-13595	-16644	-13306
72	142	-2230	-15253	-17859	-12764	-18940	-9629	-17859
73	-517	-1350	-2437	-13660	-9081	-15192	-8420	-13660
74	-2437	-1345	-17695	-14523	-16826	-14846	-15971	-14523
75	178	-295	-9155	-15278	-22783	-12592	-10511	-15278
76	-1213	418	-22904	-17118	-23895	-18950	-17474	-17118
77	1451	3419	-16478	-13969	-15841	-16627	-13183	-13969
78	4666	8440	-6540	-9134	-9844	-12459	-16029	-9134

(NOTE) CASE(F), FINAL TEST: CASE(G), INSTRUMENTS FIXED
DEVALUATION: CASE(R, B, C, D, E, A)
CASE(R), SELIC, M1, M2, NFSNO ARE ENDOGENOUS
CASE(B), M1. M2 (ENDOGENOUS), SELIC, NFSNO (EXOGENOUS)
CASE(C), SELIC (ENDOGENOUS), M1, M2, NFSNO (EXOGENOUS)
CASE(D), NFSNO (ENDOGENOUS), SELIC, M1, M2 (EXOGENOUS)
CASE(E), M1, M2, SELIC (ENDOGENOUS), NFSNO (EXOGENOUS)
CASE(A), ALL INSTRUMENTS ARE EXOGENOUS

TABLE. 11. COMPARISON OF IPCA (AFTER DEVALUATION)

MON	CASE(F)	CASE(R)	CASE(B)	CASE(C)	CASE(D)	CASE(E)	CASE(A)
59	1.0016	1.0000	1.0016	0.9991	1.0009	0.9953	1.0005	1.0000
60	0.9984	0.9971	0.9984	0.9995	0.9975	1.0021	0.9983	0.9971
61	1.0039	1.0099	1.0039	1.0037	1.0103	1.0048	1.0045	1.0099
62	1.0136	1.0169	0.9908	0.9927	1.0044	1.0098	0.9932	1.0047
63	1.0247	1.0366	1.0173	1.0174	1.0192	1.0141	1.0170	1.0192
64	1.0268	1.0384	1.0010	1.0011	1.0137	1.0186	1.0035	1.0136
65	1.0324	1.0505	1.0163	1.0156	1.0227	1.0193	1.0200	1.0231
66	1.0369	1.0554	1.0107	1.0125	1.0194	1.0228	1.0182	1.0198
67	1.0483	1.0757	1.0317	1.0298	1.0354	1.0319	1.0343	1.0361
68	1.0586	1.0847	1.0316	1.0337	1.0344	1.0393	1.0354	1.0361
69	1.0611	1.1017	1.0479	1.0451	1.0490	1.0465	1.0498	1.0500
70	1.0746	1.1179	1.0328	1.0371	1.0529	1.0596	1.0373	1.0565
71	1.0846	1.1430	1.0623	1.0604	1.0742	1.0729	1.0641	1.0763
72	1.0886	1.1528	1.0412	1.0447	1.0733	1.0794	1.0488	1.0765
73	1.0994	1.1720	1.0585	1.0620	1.0912	1.0890	1.0628	1.0931
74	1.1052	1.1796	1.0513	1.0571	1.0884	1.0941	1.0622	1.0913
75	1.1010	1.1990	1.0521	1.0656	1.1043	1.1038	1.0615	1.1084
76	1.1077	1.2026	1.0411	1.0563	1.0993	1.1061	1.0522	1.1037
77	1.1103	1.2248	1.0438	1.0609	1.1197	1.1157	1.0510	1.1222
78	1.1095	1.2204	1.0306	1.0422	1.1080	1.1116	1.0332	1.1095

(NOTE) CASE(F), FINAL TEST: CASE(G), INSTRUMENTS FIXED
DEVALUATION: CASE(R, B, C, D, E, A)
CASE(R), SELIC, M1, M2, NFSNO ARE ENDOGENOUS
CASE(B), M1. M2 (ENDOGENOUS), SELIC, NFSNO (EXOGENOUS)
CASE(C), SELIC (ENDOGENOUS), M1, M2, NFSNO (EXOGENOUS)
CASE(D), NFSNO (ENDOGENOUS), SELIC, M1, M2 (EXOGENOUS)
CASE(E), M1, M2, SELIC (ENDOGENOUS), NFSNO (EXOGENOUS)
CASE(A), ALL INSTRUMENTS ARE EXOGENOUS

TABLE. 10. COMPARISON OF GDP (AFTER DEVALUATION)

MON	CASE(F)	CASE(R)	CASE(B)	CASE(C)	CASE(D)	CASE(E)	CASE(A)
59	73562	72963	73562	73035	72975	72385	73210	72963
60	72890	73111	72890	73313	72987	73594	73073	73111
61	75114	71970	74512	73735	72595	72469	74206	72595
62	71716	71239	72730	74051	69709	70640	73403	70358
63	74351	72673	72382	72107	72995	73041	72351	73259
64	76549	75131	68414	70313	70120	70917	68651	70871
65	78677	75724	70832	70864	69971	70576	70527	70485
66	77110	75332	68964	69538	71225	70856	68944	71092
67	75999	70773	67351	67169	68714	68170	67495	67934
68	77116	74601	64870	65175	66159	64904	63227	66152
69	75977	72754	66395	65865	64365	65270	64541	64470
70	77253	72422	66016	64600	63209	64812	62441	63830
71	76794	70395	62356	64014	62413	63147	63085	62194
72	75971	68985	64943	62749	61738	61506	61331	61323
73	73443	67229	61092	62108	61372	60803	61454	60370
74	73023	66686	63084	61297	60358	60005	60497	59826
75	73916	66981	61800	62376	60173	60463	61301	59984
76	79012	69702	66916	64449	61345	61844	64679	60978
77	80469	71182	63520	63836	61442	61857	63237	60799
78	84277	71709	68695	65160	61386	62355	65276	61025

(NOTE) CASE(F), FINAL TEST:CASE(G), INSTRUMENTS FIXED
DEVALUATION:CASE(R, B, C, D, E, A)
CASE(R), SELIC, M1, M2, NFSNO ARE ENDOGENOUS
CASE(B), M1. M2(ENDOGENOUS), SELIC, NFSNO(EXOGENOUS)
CASE(C), SELIC(ENDOGENOUS), M1, M2, NFSNO(EXOGENOUS)
CASE(D), NFSNO(ENDOGENOUS), SELIC, M1, M2(EXOGENOUS)
CASE(E), M1, M2, SELIC(ENDOGENOUS), NFSNO(EXOGENOUS)
CASE(A), ALL INSTRUMENTS ARE EXOGENOUS

It is reasonably expected that the welfare sum would be higher when the constraints became loose, so the range of accommodation (number of instruments manipulated) became wider. As expected, the over-month sum of national welfare of cases (B, C, D, E) exists between the sum of cases (R) and case (A).

The welfare sum changes by the degree or range of accommodation as follows:
Complete : SUMR (all changed: 7012)
Partial : >SUME(6958)>SUMB(6899)>SUMC(6713)> SUMD(6699)
No : >SUMA(all fixed: 6678) (4-2)

The social gain or shadow price of manipulating instruments is 334(=7012-6678), Which is smaller than the gain of 727 (=WF*-WG*) under floating regime. The shadow price of each instrument is calculated as follows:

- Shadow price of manipulation of M1 and M2: 221= 6899-6678
- Shadow price of manipulation of SELIC : 35= 6713-6678
- Shadow price of manipulation of NFSNO : 21= 6699-6678
- Shadow price of manipulation of M1,M2, SELIC: 280= 6958-6678
- Shadow price of manipulation of all instruments: 334=7012-6678

Therefore, the total gain can be divided into two: the gain of monetary policies (GM, by M1, M2, SELIC) and by fiscal policy (GF, by NFSNO):

(Total gain)(334)=(GM)(=280)+(GF)(54) (4-3)

The calculation above shows that the gain by each instrument has multiplication effect.

Gain (by M1,M2) + Gain (by SELIC) < Gain (M1,M2,SELIC) (4-4)
221 + 35 280

The evaluation coefficients of growth, stability, balance-of-payment were rather arbitrarily set as 1: 1/2: 1/40. So it is important to look at the levels of three targets separately. Table 10-13 summarizes result of comparison. The order of targets is summarized as follows. I eliminate Case (E) which is the combination of cases (C) and (D). The ordering of seven cases is as follows. The inequality sign (X>Y) implies that X is preferred than Y.

Welfare Sum: Case(F)>Case(G)>Case(R)>Case(B)>Case(C)>Case(D)>Case(A)
GDE(78) : Case(F)>Case(G)>Case(R)>Case(B)>Case(D)>Case(C)>Case(A)
: 84277 > 71709 > 68659 > 65160 > 62355 > 61386 > 61025
IPCA (78) : Case(R)<Case(B)>Case(C)>Case(F)=Case(A)>Case(D)>Case(G)
1.0306 1.0422 1.1080 1.1095 1.1095 1.1116 1.2204
BP$ (78) : Case(G)>Case(F)>Case(R)>Case(B)=Case(A)>Case(C)>Case(D)
8440 > 4666 > -6540 > -9134 -9134 -9844 -12459
RES$ (78) : Case(G)>Case(F)>Case(R)>Case(C)>Case(B)=Case(A)>Case(D)
39080 30913 -126003 -141918 -149109 -149109 -155450

(1) Therefore, among the five cases (R,B,C,D,A), the case (R) has highest order independently with the evaluation coefficients. So, the national welfare can be maximized when all instruments can change based on reaction functions.
(2) But the ordering among the partial or no accommodation cases (B,C,D,A) is

TABLE. 9. TARGET COMPARISON (INST CONST AFTER 60:CASE(A))

B(1)=1, B(2)=466/1. 027//2, B(3)=466/4119/40

MON,	SELIC,	M2	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(A-F),	SUMA,	SUMF
60	8. 47	-12669	-0. 22	1	0	-3	-2	6	4396	4390
61	1. 01	-9530	-3. 56	-16	-1	3	-14	-8	4598	4607
62	-6. 10	-17516	-5. 50	-8	2	3	-3	-11	4787	4799
63	-13. 02	-17989	-4. 22	-7	1	0	-5	-17	4992	5008
64	-4. 78	-21887	-3. 95	-35	3	-12	-43	-60	5181	5241
65	-6. 20	-17753	-3. 74	-50	2	-29	-77	-137	5349	5486
66	4. 68	-39745	-5. 47	-37	4	-16	-49	-186	5525	5711
67	12. 43	-33901	-4. 41	-49	3	-7	-53	-239	5691	5930
68	6. 39	-59546	-4. 21	-67	5	-0	-62	-302	5852	6154
69	11. 47	-68669	-4. 22	-70	3	-45	-113	-414	5961	6375
70	17. 06	-76118	-2. 75	-81	4	-60	-137	-551	6051	6602
71	13. 75	-93133	-2. 32	-88	2	-51	-138	-689	6145	6835
72	12. 83	-89037	-0. 75	-89	3	-51	-137	-826	6222	7049
73	18. 39	-86454	3. 37	-80	1	-37	-115	-942	6303	7244
74	10. 82	-103654	4. 24	-80	3	-34	-111	-1053	6377	7430
75	16. 38	-122686	3. 15	-85	-2	-44	-130	-1183	6447	7630
76	16. 54	-111849	4. 71	-109	1	-45	-153	-1336	6517	7853
77	15. 19	-151151	4. 00	-119	-3	-44	-165	-1501	6589	8090
78	17. 37	-141958	4. 33	-140	-0	-39	-179	-1680	6678	8358

TABLE.5. TARGET COMPARISON (RATE CONST AFTER 60:CASE(B))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2 ,	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(B-F),	SUMB,	SUMF
60	8.47	-2554	-0.22	3	-0	-3	-1	1	4391	4390
61	1.01	35517	-3.56	-9	0	3	-6	-5	4601	4607
62	-6.10	-39517	-5.50	14	5	3	23	17	4816	4799
63	-13.02	-25282	-4.22	-14	2	0	-12	5	5014	5008
64	-4.78	-21291	-3.95	-38	6	-12	-44	-39	5202	5241
65	-6.20	-36994	-3.74	-48	4	-29	-73	-112	5374	5486
66	4.68	-45993	-5.47	-46	6	-16	-57	-169	5542	5711
67	12.43	-47977	-4.41	-54	4	-7	-57	-225	5705	5930
68	6.39	-34617	-4.21	-73	6	-0	-68	-293	5861	6154
69	11.47	-55240	-4.22	-62	4	-45	-103	-396	5979	6375
70	17.06	-50745	-2.75	-77	8	-60	-128	-524	6079	6602
71	13.75	-72415	-2.32	-77	6	-51	-123	-647	6188	6835
72	12.83	-69194	-0.75	-80	10	-51	-121	-768	6280	7049
73	18.39	-68825	3.37	-69	8	-37	-98	-866	6378	7244
74	10.82	-66183	4.24	-71	11	-34	-95	-960	6470	7430
75	16.38	-72008	3.15	-70	8	-44	-106	-1066	6563	7630
76	16.54	-62120	4.71	-88	12	-45	-122	-1188	6665	7853
77	15.19	-87635	4.00	-100	11	-44	-133	-1321	6770	8090
78	17.37	-95040	4.33	-115	15	-39	-139	-1459	6899	8358

TABLE.6. TARGET COMPARISON(RATE CONST AFTER 60:CASE(C))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(C-F),	SUMC,	SUMF
60	6.54	-12669	-0.22	1	0	-1	-0	2	4392	4390
61	9.85	-9530	-3.56	-16	-1	-0	-17	-16	4591	4607
62	-2.27	-17516	-5.50	-12	2	4	-6	-22	4777	4799
63	2.65	-17989	-4.22	-8	1	10	3	-19	4989	5008
64	4.59	-21887	-3.95	-39	3	-0	-36	-55	5186	5241
65	-8.57	-17753	-3.74	-53	2	-14	-65	-120	5366	5486
66	-9.18	-39745	-5.47	-36	4	-7	-38	-158	5553	5711
67	5.64	-33901	-4.41	-44	3	-5	-46	-204	5726	5930
68	6.12	-59546	-4.21	-67	5	-8	-69	-273	5881	6154
69	12.05	-68669	-4.22	-71	3	-54	-121	-395	5981	6375
70	6.04	-76118	-2.75	-85	5	-51	-132	-526	6076	6602
71	6.97	-93133	-2.32	-87	2	-42	-127	-653	6182	6835
72	1.97	-89037	-0.75	-86	3	-37	-119	-773	6276	7049
73	12.12	-86454	3.37	-73	2	-24	-96	-868	6376	7244
74	5.57	-103654	4.24	-77	4	-41	-114	-982	6448	7430
75	7.93	-122686	3.15	-83	-1	-65	-149	-1131	6498	7630
76	10.68	-111849	4.71	-107	2	-64	-169	-1301	6552	7853
77	12.28	-151151	4.00	-115	-2	-49	-166	-1467	6624	8090
78	18.15	-141958	4.33	-138	0	-41	-178	-1645	6713	8358

TABLE. 7. TARGET COMPARISON (RATE CONST AFTER 60:CASE(D))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2 ,	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(D-F),	SUMD,	SUMF
60	8.47	-12669	-0.49	4	-1	-3	0	5	4395	4390
61	1.01	-9530	-0.63	-16	-0	4	-12	-7	4600	4607
62	-6.10	-17516	-7.28	-7	1	5	-1	-8	4790	4799
63	-13.02	-17989	-6.98	-8	2	-2	-8	-16	4992	5008
64	-4.78	-21887	-6.39	-34	2	-14	-46	-62	5179	5241
65	-6.20	-17753	-4.46	-49	3	-28	-75	-137	5350	5486
66	4.68	-39745	-6.52	-38	3	-13	-47	-184	5527	5711
67	12.43	-33901	-5.04	-48	4	-11	-55	-239	5691	5930
68	6.39	-59546	-5.40	-74	4	2	-68	-307	5847	6154
69	11.47	-68669	-6.71	-65	3	-54	-116	-423	5952	6375
70	17.06	-76118	-5.56	-75	3	-46	-119	-541	6061	6602
71	13.75	-93133	-6.10	-83	3	-52	-132	-674	6161	6835
72	12.83	-89037	-5.28	-88	2	-54	-140	-813	6235	7049
73	18.39	-86454	-5.12	-77	2	-42	-116	-929	6315	7244
74	10.82	-103654	-5.25	-79	3	-35	-112	-1041	6389	7430
75	16.38	-122686	-5.75	-82	-1	-36	-119	-1160	6470	7630
76	16.54	-111849	-3.23	-104	0	-50	-154	-1313	6539	7853
77	15.19	-151151	-6.71	-112	-1	-51	-165	-1478	6612	8090
78	17.37	-141958	-5.45	-132	-0	-49	-181	-1659	6699	8358

TABLE. 8. TARGET COMPARISON (RATE CONST AFTER 60:CASE(E))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2 ,	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(E-F),	SUME,	SUMF
60	0.27	-1541	-0.22	1	0	-5	-4	-5	4385	4390
61	9.74	34187	1.57	-6	-0	-0	-6	-11	4596	4607
62	-8.88	-37859	0.32	10	5	7	22	12	4810	4799
63	20.50	-27302	0.01	-12	2	10	-0	11	5020	5008
64	3.41	-20520	-0.04	-48	5	-8	-51	-40	5201	5241
65	-1.86	-41958	0.57	-50	3	-9	-56	-96	5391	5486
66	2.83	-46096	-1.68	-50	4	-7	-53	-148	5563	5711
67	1.74	-48673	-0.68	-52	3	-6	-55	-203	5727	5930
68	-5.33	-32062	0.26	-85	5	-3	-82	-285	5869	6154
69	-12.89	-62758	-0.94	-70	3	-71	-138	-423	5952	6375
70	-2.76	-55096	0.30	-90	8	-61	-142	-565	6037	6602
71	-4.16	-81476	-0.21	-83	5	-61	-139	-705	6130	6835
72	-5.91	-72208	0.75	-89	9	-28	-107	-812	6237	7049
73	10.57	-73881	-0.08	-73	8	-22	-87	-899	6345	7244
74	2.61	-69007	-0.18	-76	10	-38	-105	-1004	6427	7430
75	5.33	-74526	-0.30	-77	9	-30	-98	-1102	6528	7630
76	16.56	-68462	1.41	-87	13	-46	-120	-1222	6631	7853
77	14.78	-87744	0.08	-104	13	-41	-132	-1354	6736	8090
78	28.01	-100587	0.16	-114	17	-59	-155	-1509	6849	8358

averages of GDP/POP, IPCA, BP$ (absolute value) were 466.714, 1.02768, 4119.865 in the observation period respectively. I decided to relatively evaluate three terms by 1.0, 1/2, 1/40 respectively. So I define the function (2-2) as:

W=(GDE)/(POP)+(466.714/1.02768/2)*(IPCA)+(466.714/4119.865/40)*(BP$) (4-1)

Tables 3-9 report the results of cases (R), (G), (B), (C), (D), (E), (A). They record the divergences of instruments (SELIC, M2, NSFNO) and of targets (Y/POP=GDE/POP), IPC (=IPCA) multiplied with their corresponding evaluation coefficients, and the sum of evaluation, i.e., the national welfare (TOTAL). SUM denotes the over-month sum of national welfare (SUM). SUMF (8358) denotes the over-month sum of W by the final test, while SUMS denotes the over-month sum in each simulation case.

Table 3 summarizes the result of case (G) in which all the instruments were fixed after devaluation, SUM (G-F) denotes the accumulated differences between the case (G) and final test. SELIC or NFSNO was kept higher while M2 was lower than the final test case. Then per-capita GDP became lower, and IPCA (with negative evaluation coefficient) and balance-of-payment became higher than the final test. Therefore, compared with final test, growth and price stability targets deteriorated but balance-of-payment was improved. As the result, the national welfare was kept lower, and the sum of differences accumulated. At the last month, the accumulated sum of national welfare (7631) became 91.30% of corresponding sum of final test (8358). The difference (727=8358-7631, or 8.7%) manifests the social gain by which the accumulated national welfare increased by the manipulation of instruments (SELIC, M1, M2, NFSNO) based on reaction function instead of being kept constant.

Table 4 reports the result of case(R) when the exchange rate of fixed after January 1999, and all the instruments changed based on corresponding reaction functions. SELIC was kept higher, while money supply (M2) and NFSNO were kept lower in comparison with the final test case with devaluation. In this case, price stability target was improved, but the growth target (Y/GDP) and balance-of-payment target deteriorated. So the national welfare greatly decreased. The difference from final test enlarged. At the end, the over-month sum (7012) became 83.89% lower compared with final test. The difference (1346 or 16.11%) manifests the social gain brought by the regime change and accompanying devaluation to the Brazilian economy when all the instruments were always accommodating to the changing economic conditions based on reaction functions. At last, the regime change at January 1999 was a big success.

Tables 5-9 report the results of five experiments (B, C, D, E, A) assuming that exchange rate was fixed after January 1999. In three cases (B,C,D), one of money supply (M1 and M2), SELIC and NFSNO was changed based on reaction function and others were kept constant. In case (E), all instruments of monetary policies (M1, M2, SELIC) were manipulated while NFSNO was kept constant. In case (A) all instruments were kept fixed.

TABLE. 3. TARGET COMPARISON (RATE CONST AFTER 60:CASE(G))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2 ,	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(G-F),	SUMG,	SUMF
60	8.47	-12669	-0.22	1	0	-3	-2	6	4396	4390
61	1.01	-9530	-3.56	-19	-1	3	-18	-12	4594	4607
62	-6.10	-17516	-5.50	-3	-1	3	-0	-13	4786	4799
63	-13.02	-17989	-4.22	-10	-3	0	-13	-25	4983	5008
64	-4.78	-21887	-3.95	-9	-3	-12	-23	-48	5193	5241
65	-6.20	-17753	-3.74	-18	-4	-17	-39	-87	5399	5486
66	4.68	-39745	-5.47	-11	-4	-2	-17	-104	5607	5711
67	12.43	-33901	-4.41	-32	-6	1	-37	-141	5789	5930
68	6.39	-59546	-4.21	-15	-6	7	-14	-155	5999	6154
69	11.47	-68669	-4.22	-20	-9	19	-9	-164	6211	6375
70	17.06	-76118	-2.75	-29	-10	12	-28	-192	6410	6602
71	13.75	-93133	-2.32	-39	-13	-5	-57	-249	6586	6835
72	12.83	-89037	-0.75	-42	-15	-7	-64	-312	6736	7049
73	18.39	-86454	3.37	-38	-16	-2	-57	-369	6875	7244
74	10.82	-103654	4.24	-39	-17	3	-52	-421	7009	7430
75	16.38	-122686	3.15	-42	-22	-1	-66	-487	7143	7630
76	16.54	-111849	4.71	-56	-22	5	-73	-560	7293	7853
77	15.19	-151151	4.00	-56	-26	6	-76	-637	7454	8090
78	17.37	-141958	4.33	-76	-25	11	-90	-727	7631	8358

TABLE. 4. TARGET COMPARISON (RATE CONST AFTER 60:CASE(R))

B(1)=1, B(2)=466/1.027//2, B(3)=466/4119/40

MON,	SELIC,	M2	NFSNO,	Y/POP,	IPC,	BP$,	TOTAL,	SUM(R-F),	SUMR,	SUMF
60	0.00	0	0.00	0	0	0	0	0	4390	4390
61	10.12	33471	-2.89	-4	0	0	-4	-4	4603	4607
62	-11.65	-37043	-5.81	6	5	0	11	8	4806	4799
63	19.58	-30110	-10.18	-12	2	6	-4	3	5012	5008
64	4.00	-20344	0.04	-50	6	-5	-48	-45	5196	5241
65	0.03	-43316	-6.96	-48	4	-4	-48	-93	5394	5486
66	5.39	-45928	-3.51	-50	6	-7	-50	-143	5568	5711
67	1.99	-50362	-6.38	-53	4	-7	-56	-200	5730	5930
68	4.93	-33366	-4.31	-75	6	-4	-73	-272	5882	6154
69	0.21	-57030	-7.91	-58	3	-57	-112	-385	5991	6375
70	18.65	-47768	-5.11	-68	9	-53	-112	-497	6106	6602
71	-5.49	-67615	-9.79	-87	5	-51	-133	-630	6205	6835
72	9.33	-75746	-4.30	-67	11	-44	-100	-730	6319	7049
73	18.35	-60340	-8.93	-75	9	-5	-71	-801	6443	7244
74	16.53	-71858	-3.57	-60	12	-43	-91	-892	6538	7430
75	17.56	-64893	-6.35	-74	11	-26	-89	-981	6649	7630
76	35.11	-68699	-3.86	-73	15	-61	-120	-1101	6752	7853
77	27.10	-80284	-6.32	-102	15	-51	-138	-1238	6852	8090
78	51.21	-101312	-4.95	-94	18	-32	-107	-1346	7012	8358