Primary Commodity, FDI and Economic Development in Indonesia :*
An Econometric Model of the Indonesian Economy (1983-97)**

Suminori TOKUNAGA(Nagoya City University)

1. Introduction

It is important to have a systematic view of the national economy as a whole since the economic structure has changed and interdependency with the world has been deepening. The initial prototype quarterly macro-econometric model was developed in 1996 (Tokunaga[1996a], Tokunaga [1996b]). However, this prototype model was not enough to have a systematic understand of the national economy as a whole. Thus, we extended this prototype model to a more general model in 1996 (Tokunaga[1996-c]). The latest version of this model is designed to be used both for forecasting and for a policy simulation. This model is based on new data which base year is 1993.

Indonesia has a well-deserved reputation for good macroeconomic management so that policy adjustments have dealt effectively before the Asia Crisis (World Bank [1996]). Over the past eight years, real gross domestic product (GDPR) grew at an annual rate 7-9 percent range as shown in Table 1a. But the most recent Indonesian Government announced real growth rate was –13.2 percent in 1998.

In the 1990s inflation rate of consumer prices was keeping in the 8-10 % range (annual consumer prices growth rate) as shown in Table 1b. The economy,however, began to overheat again in 1998/99, but inflation declined in 1999.

Due to strong domestic demand such as private consumption and domestic construction, non-oil import was increasing, so the current account deficit was widening remarkably at around four percent level of GDP. On the other hand, foreign direct investment and other capital inflows were financed the wider current account deficit as shown in Table 1c. Thus, we try to extend this model by incorporating the bridge between the monetary sector and fiscal sector. The main objective of this paper is to provide an econometric model and an interpretation of the macroeconomic management in Indonesia using a quarterly macro-econometric model.

This paper is organized as follows. In section 2 we test stationarity of data andreview the macroeconomic development and management for 1990s before the crisis. In section 3 we describes the major features of this model. In section 4 we will show how well the model can simulate the real economy using the dynamic Gauss-Seidel method. Section 5 will show results of selected policy simulations for a sensitivity analysis of the model and discuss the policy implications. Some concluding remarks are made in section 6.

					(% change from previous year)			
	1990	1991	1992	1993	1994	1995	1996	1997
Nominal GDP	17.4%	18.5%	13.0%	16.8%	15.6%	18.7%	17.7%	17.2%
Real GDP (1993 constant prices)	9.0%	8.9%	7.2%	7.3%	7.5%	8.2%	8.0%	4.7%
GDP Deflator	7.7%	8.8%	5.4%	8.9%	7.5%	9.6%	9.0%	12.0%
Real GDP (1983 constant prices)	7.2%	6.9%	6.5%	6.5%	6.6%			
Real GDP by Industrial Origin								
Agriculture	3.1%	2.9%	6.3%	1.7%	0.6%	4.2%	3.2%	0.6%
Mining	7.2%	12.5%	1.6%	3.4%	5.6%	6.7%	5.8%	1.6%
Manufacturing	11.9%	10.6%	10.2%	11.4%	12.4%	10.8%	11.7%	6.2%
Non-Oil & Gas Manufactureing	12.2%	11.5%	11.2%	13.2%	13.5%	13.0%	11.7%	7.4%
Others	10.8%	10.0%	7.5%	8.4%	8.3%	8.6%	8.2%	5.6%
GDP excluding Oil/Gas & its Products	9.4%	9.0%	8.3%	8.1%	8.0%	9.2%	8.3%	5.3%
(share in current prices)								
Agriculture	*19.4%*	*18.3%*	*18.7%*	*17.9%*	*17.3%*	*17.2%*	*16.5%*	*16.1%*
Mining	*12.2%*	*12.8%*	*10.8%*	*9.6%*	*8.8%*	*8.4%*	*8.6%*	*9.5%*
Manufacturing	*20.7%*	*21.4%*	*22.0%*	*22.3%*	*23.4%*	*24.2%*	*25.5%*	*25.6%*
Other	*47.8%*	*47.6%*	*48.5%*	*50.3%*	*50.5%*	*50.2%*	*49.4%*	*48.8%*
GDP excluding Oil/Gas & its Products	*86.6%*	*86.0%*	*88.5%*	*90.0%*	*91.2%*	*92.0%*	*92.1%*	*91.4%*
GDE by Expenditure (1993 constant prices)								
Domestic Demands [1]	*11.1%*	*5.3%*	*3.8%*	*5.5%*	*9.7%*	*11.7%*	*8.0%*	*4.9%*
External Demands [1]	*-3.9%*	*1.6%*	*2.7%*	*1.0%*	*-2.2%*	*-3.5%*	*0.0%*	*-0.2%*
Private Consumption Expenditure	9.9%	7.3%	2.9%	5.8%	7.8%	12.6%	10.9%	5.3%
Fixed Capital Formation	14.6%	6.5%	4.9%	5.7%	13.8%	14.0%	14.5%	4.1%
Government Consumption	3.2%	7.0%	5.8%	0.1%	2.3%	1.3%	2.7%	0.2%
Exports	0.5%	19.9%	14.7%	6.6%	9.9%	7.7%	7.6%	6.3%
Imports	23.1%	16.8%	6.6%	4.4%	20.3%	20.9%	6.9%	6.6%
Real GNP	7.0%	7.0%	6.3%	5.8%	8.7%	7.8%	8.1%	4.4%
Per capita GNP $					*810*	*893*	*994*	*1,092*
(old base) $	*563*	*612*	*652*	*730*				

1) Contribution to GDP Growth Rate
2) Base-year changed from 1983 to 1993 -> Shaded figures are old-base
(source : BPS)

2. Stationarity of Data and Macroeconomic Policies [1]

At First, we use the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests to test for the unit root of the main variables for the period of 1983Q1-1998Q4. Both ADF and PP tests take into account the presence of a non-zero mean and a linear trend. The lag length is determined by the AIC. The ADF and PP tests for log levels are reported in Appendix C. This presents the ADF and PP test statistics for the null hypothesis that each series is a unit root process in log first difference. In the ADF tests we can reject the null hypothesis of a unit root for real investment (IR) and GDP deflator (PGDP), but cannot reject it for real private consumption (CPR), real government consumption (CGR), real exports (XR), real imports (MR), real GDP (GDPR), real money supply (M2). However, in the PP tests we can reject the null hypothesis of a unit root for CPR, CGR, IR, XR, GDPR, PGDP, but cannot reject it for MR and M2. Therefore, we conclude that almost series are stationary after first difference,

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1) See World Bank (1996), Quarterly Review Economic and Monetary Development, 1996 and R.H. McLeod (1997).

Table 1b   Consumer Prices

	CPI (Apr.88-Mar.89=100)						CPI (1996=100)		WPI (1983=100)							
	General	Food	Housing	Clothing	Others	Cumulative	General	Food	General	Domestic	Agriculture	Manufac.	Imports	Exports	Exports excl. Oil & Gas	Exports of Oil & Gas
	1)	1)	1)	1)	1)	2)	1)	1)	1)	1)	1)	1)	1)	1)	1)	1)
1991	9.2%	9.2%	7.9%	5.3%	13.9%	9.5%			5.1%	9.6%	8.1%	10.1%	5.0%	-3.5%	3.7%	-6.3%
1992	7.5%	6.2%	4.6%	7.4%	3.4%	4.9%			5.1%	7.1%	9.0%	6.3%	3.4%	3.5%	4.9%	2.9%
1993	9.7%	5.1%	16.6%	8.2%	10.3%	9.8%			3.8%	7.4%	11.7%	5.6%	1.8%	-1.2%	6.3%	-4.5%
1994	8.5%	10.4%	4.2%	4.1%	2.8%	9.2%			5.4%	10.1%	18.6%	6.4%	1.6%	0.1%	13.0%	-6.2%
1995	9.4%	13.2%	8.8%	6.4%	6.4%	8.6%			11.4%	13.4%	19.1%	10.7%	7.1%	13.1%	17.0%	11.0%
1996	7.9%	9.5%	5.2%	6.7%	9.6%	6.5%			7.9%	6.8%	12.4%	3.6%	5.4%	14.2%	2.7%	21.1%
1997	6.6%	8.8%	4.2%	4.9%	7.0%	11.1%			9.0%	6.6%	11.6%	3.7%	7.4%	17.1%	15.2%	18.3%
Apr-96	8.2%	10.1%	4.6%	6.5%	10.7%	4.0%			7.1%	7.1%	12.3%	4.3%	6.2%	8.2%	4.3%	10.7%
May-96	7.8%	8.1%	5.0%	7.0%	11.0%	4.1%			6.2%	6.4%	10.6%	3.9%	5.7%	6.5%	3.0%	8.7%
Jun-96	7.5%	8.1%	5.1%	6.9%	10.2%	4.0%			7.5%	7.0%	12.6%	3.5%	5.7%	9.5%	2.3%	14.0%
Jul-96	7.5%	8.0%	5.0%	6.8%	10.1%	4.7%			7.5%	6.3%	11.6%	3.1%	5.2%	15.8%	2.3%	23.9%
Aug-96	7.4%	7.6%	5.1%	6.8%	10.5%	5.0%			7.1%	6.3%	12.8%	2.7%	4.7%	13.9%	0.7%	22.1%
Sep-96	7.0%	6.3%	5.1%	6.5%	10.3%	5.0%			7.9%	5.9%	12.3%	2.3%	4.7%	18.4%	0.3%	29.2%
Oct-96	6.7%	5.6%	5.4%	6.1%	10.1%	5.3%			9.1%	5.6%	12.2%	1.9%	3.8%	26.0%	0.0%	43.0%
Nov-96	6.9%	5.6%	5.1%	6.0%	10.0%	5.9%			8.6%	5.5%	12.1%	1.9%	3.8%	24.3%	-1.0%	40.0%
Dec-96	6.6%	6.1%	4.8%	6.0%	10.0%	6.5%			7.7%	5.5%	11.3%	2.3%	3.4%	19.8%	-1.0%	32.2%
Jan-97	5.5%	3.4%	4.3%	4.7%	9.9%	1.1%	4.6%	2.1%	7.1%	4.7%	9.4%	1.9%	2.9%	20.2%	-1.9%	32.7%
Feb-97	4.8%	1.8%	3.7%	4.8%	10.3%	2.1%	4.0%	0.1%	5.9%	4.7%	9.3%	2.3%	3.4%	13.5%	-2.3%	22.8%
Mar-97	5.3%	3.8%	3.5%	4.9%	9.8%	2.0%	4.7%	2.3%	4.7%	5.4%	10.6%	2.7%	2.9%	3.1%	-2.3%	9.2%
Apr-97	5.0%	5.9%	3.8%	4.5%	5.7%	2.5%	4.9%	5.6%	3.5%	5.0%	9.4%	1.9%	2.5%	2.0%	-2.2%	3.6%
May-97	5.2%	6.8%	3.7%	4.0%	5.3%	2.7%	4.5%	6.6%	3.5%	4.7%	9.1%	1.9%	2.1%	3.1%	0.0%	4.3%
Jun-97	5.1%	6.5%	3.8%	3.9%	5.2%	2.6%	5.3%	6.3%	2.3%	3.9%	8.2%	1.9%	1.6%	-0.5%	0.0%	-1.2%
Jul-97	5.1%	6.6%	3.5%	3.6%	5.3%	3.2%	5.4%	6.5%	3.1%	4.6%	9.2%	1.9%	2.0%	0.0%	2.9%	-1.8%
Aug-97	5.7%	8.1%	3.8%	3.9%	5.2%	4.1%	6.4%	9.0%	5.8%	4.9%	9.9%	2.3%	3.3%	10.7%	10.9%	10.2%
Sep-97	7.1%	11.0%	4.2%	4.2%	6.5%	5.4%	7.3%	12.2%	9.6%	7.9%	13.9%	4.1%	9.0%	15.0%	21.7%	11.9%
Oct-97	8.8%	15.1%	4.8%	6.5%	6.1%	7.4%	8.4%	16.4%	16.3%	9.2%	14.9%	5.6%	15.9%	33.5%	38.1%	32.1%
Nov-97	10.0%	17.3%	5.4%	6.2%	6.9%	9.0%	8.8%	18.0%	16.6%	11.1%	17.0%	7.9%	16.7%	30.0%	38.2%	26.5%
Dec-97	11.6%	19.9%	6.2%	7.9%	8.4%	11.1%	10.3%	19.9%	27.7%	13.0%	17.9%	10.1%	26.1%	64.7%	82.2%	57.2%
Jan-98	18.0%	29.7%	9.8%	20.8%	11.9%	6.9%	16.2%	29.0%	67.4%	23.2%	27.5%	21.6%	86.5%	143.5%	189.1%	124.6%
Feb-98	31.7%	46.9%	20.8%	38.0%	21.7%	19.6%	30.0%	48.9%	81.7%	34.6%	37.3%	34.2%	108.1%	161.2%	205.6%	141.2%
Mar-98	39.1%	55.4%	24.8%	55.0%	27.4%	25.1%	36.8%	58.3%	89.8%	40.4%	42.0%	40.4%	123.9%	175.2%	216.4%	145.5%
Apr-98							42.7%	67.8%	86.8%	45.4%	48.3%	45.2%	119.0%	148.0%	177.0%	133.9%
May-98							49.7%	74.2%	106.0%	53.7%	57.5%	52.6%	135.6%	201.5%	226.6%	190.0%
Jun-98							56.7%	88.0%	131.4%	60.4%	64.2%	59.0%	153.8%	294.4%	319.5%	282.0%
Jul-98							68.7%	107.9%								
Aug-98							77.7%	123.3%								

1) % change from the same period of the previous year ; Annual - Average
2) % change from the previous month ; Annual - Cumulative

(source : BPS)

Table 1c Balance of Payments and External Debt

(US$ Mill.)

		1991	1992	1993	1994	1995	1996	1997
Current Account Balance		-4,392	-3,122	-2,298	-2,960	-6,760	-7,801	-5,824
(/GDP)	2)	-3.4%	-2.2%	-1.5%	-1.7%	-3.4%	-3.5%	-4.3%
Exports (FOB)		29,635	33,796	36,607	40,223	47,454	50,188	55,821
Non Oil & Gas Exports		18,180	23,300	26,994	30,292	36,969	38,021	44,027
Oil & Gas Exports		11,455	10,496	9,613	9,931	10,485	12,167	11,794
Imports (FOB)		24,834	26,774	28,376	32,322	40,921	44,240	46,365
Merchandise Trade Balance		4,801	7,022	8,231	7,901	6,533	5,948	9,456
Non Oil & Gas Balance		-3,284	-113	2,418	1,595	-96	-1,849	2,056
Service Trade Balance		-9,193	-10,144	-10,529	-10,861	-13,293	-13,749	-15,280
Capital Account		5,829	6,471	5,962	4,008	10,589	10,989	3,439
Official (net)		1,419	1,112	743	307	336	-522	2,689
CGI		5,227	5,574	5,786	5,353	5,627	5,055	7,853
Debt repayments		-4,219	-4,708	-5,262	-5,390	-5,449	-6,215	-5,164
Private (net)		4,410	5,359	5,219	3,701	10,253	11,511	750
Direct Investment		1,482	1,777	2,003	2,108	4,346	6,194	4,703
Foreign Reserves	3)	9,868	11,611	12,352	13,158	14,674	19,125	17,427
/Monthly Imports		4.8	5.2	5.2	4.9	4.3	5.2	5.0
Total External Debt Stocks		79,548	88,004	89,148	107,824	124,398	129,033	
(/GNP)		64.9%	66.2%	58.7%	63.3%	64.6%	59.7%	
Public Long-term		51,891	53,666	57,132	63,926	65,309	60,108	
Debt Service / Exports		34.3%	32.6%	33.6%	30.7%	30.9%	36.8%	
Foreign Exchange Rate (Rp./$)	4)	1,954	2,033	2,089	2,164	2,253	2,347	4,650

2) GNP from 1993: New series of base year 1993

3) End of the period

4) Month-End of the month : Annual--Average of the month

(source : BANK INDONESIA . WORLD BANK)

that is, the series are integrated of order 1, I(1).

Then, we use Johansen (1988) and Johansen and Juselius (1990) test the to test for the existence of any cointegrating vectors among the main variables such as CPR, IR, XR, MR and GDPR. In this model, the AIC selects 8 lags. The trace test is used to determine the number of cointegrated vectors. The trace test indicates that $H_0 : r = 0$ is rejected at a 0.05 significant level. Thus, there are at least one cointegrated vector as judged by the trace test. We cannot reject $H_0 : r \leq 1$. Hence, the data indicate one cointegrating vector for Indonesia.

Next, we review the monetary and fiscal policy before the Asia Crisis. Bank of Indonesia (hereafter we call BI) conducted an increase in the banks' required reserves ratio at the beginning of February 1996 in order to assist in achieving target growth rates for M1 and M2 in 1996/97. In 1995/96 the Government ran a surplus of roughly 0.8 percent of GDP. The surplus reflects higher-than-budgeted international oil prices, better-than-projected non-oil tax collections, less-than-budgeted development spending (World Bank [1996]). Indonesia follows a "managed float" exchange rate policy before the crisis. BI sets the

Figure 1 Rupiah against US dollar

CGI Meeting
29 Jul

Paris Club
Agreement. 24
Sep

President
Speech
15 Aug

4th IMF
Package
24 Jun

Suharto resign
21 May

3rd IMF
Package
9 Apr

Riot
14 May

President
Election
10 Mar

Suharto
Proposed CBS
13 Feb

2nd IMF Package
15 Jan

Budget Speech
6 Jan

1st IMF Package
1 Nov,
16 Banks Liquidated

Rumours of Suharto
Illness
6 Dec

Rupiah Floated
14 August

Thai Baht Devalued
2 July

18000
16000
14000
12000
10000
8000
6000
4000
2000
0

7/1/97
7/10/97
7/18/97
7/28/97
8/5/97
8/13/97
8/21/97
8/29/97
9/9/97
9/17/97
9/25/97
10/3/97
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5/12/98
5/20/98
5/28/98
6/8/98
6/16/98
6/24/98
7/2/98
7/13/98
7/21/98
7/29/98
8/6/98
8/14/98
8/24/98
9/1/98
9/10/98
9/18/98
9/28/98

central value of the rupiah based on a basket of foreign currencies, and intervenes in the markets to buy/sell rupiah in an "intervention band" around that central rate. BI has roughly followed a real exchange rate rule since the devaluation of September 1986. On the other hand, the foreign direct investments (FDI) increased significantly in 1995/96. They have increased rapidly since the Government liberalized foreign investment regulations in May 1994. As noted, an important recent development is that FDI and other capital inflows financed the wider current deficit.[2]

3. Structure of the Model

This quarterly macro model is designed to be used both for forecasting and for a policy simulation such as fiscal and monetary policies on a variety of macro-economic aggregates. A model is composed of 23 behavioral equations and 22 identities. It consists of five blocks: the final demand block, the government block, the monetary block, prices block, and the balance of payments block. The specification of the model and the estimation results are given in Appendix A, along with a list of the variables in Appendix B.[3] The model uses data from 1983:I to 1997:IV. Data in real terms are measured in 1993 prices.

The **final demand block** has seven equations and four identities: real private consumption (CPR) in equation (1), real government consumption (CGR) in equation (2), real private investment (IPR) in equation (3), real government investment (IGR) in equation (4), and real non-oil and gas exports (XNOGR) in equation (5) and real

imports (MR) in equation (7). Private consumption function and private investment function are mainly modeled as a function of the aggregate demand. That is, the increase of aggregate demand accelerates the private consumption and investment. Further, money market variable affects the behavior of business sectors. High interest rate of time deposit (RITD) is negatively related to the private investment, and this effect becomes larger recently. It may reflect increasing flexibility of money market. On the other hand, the government consumption function (CGR) and government investment function (IGR) are mainly modeled as a function of government revenues (GRT). In this model, the export is divided into two goods in terms of commodity. The export sector has one equation which determine the export of non-oil and gas (XNOGR) and one identity which determine the total exports (XR). The export of non-oil and gas is estimated with an imports of goods and services in the world, the relative export deflator and real GDP. Income elasticity and price elasticity of this equation are 0.4073 and -0.8093, respectively. The export of oil and gas (XOGR) and the deflator of exports (PX) are assumed to be exogenous variables.

On the other hand, the import sector has one equation which determine the total import (MR). The total import is estimated with real GDP and the relative import deflator. The deflator of imports (PM) is assumed to be exogenous variable.

The **government block** shows how much the Indonesian government expends for routine and development parts, and how much the government revenue, and the gap between government expenditure and government revenue. This block has five equations and five identities.

The government revenue (GRT) consists of

2) See Hal Hill(1999)

3) The equations of the present model are shown in Appendix A and B

routine revenue from oil and gas (GROG), routine revenue from non-oil and gas (GRNOG), and foreign aid/loan (AID). The routine revenue from non-oil and gas determines the amount of taxes, which are divided into income tax (TY), value added tax (TVA), import duties (TMD), and other tax (TONOG). The first two equations (TY and TVA) in equation (9) and equation (10) are estimated by nominal GDP (GDPR*PGDP) and import duties in equation (11) is explained in terms of nominal imports (MR*PM).

On the other hand, the government routine expenditure (CGRE) consists of personnel and material expenditure (CGPM) and Debt repayment (DRPG). The government development expenditure (IGDE) sector consists of gross fixed capital formation of government (IG) and non-gross fixed capital formation (IGOTH). As for government consumption (CG), we can get quarterly data from BPS's *National Income Statistics*. As there is no data of government investment from National Income Statistics, we can get government investment (Gross Fixed Capital Formation of central government) from *Neraca Pemerintahan Pusat Indonesia Triwulanan*. The change in the total tax affects the government revenue from non-oil and gas, and affects government consumption and investment. Therefore total aggregate demand through its effects affects on private consumption and private investment. In this model, government foreign aid (AID) includes in the government revenues as required enough to offset the difference between government expenditures and revenues.

The monetary block comprises four equations and two identities. The interest rate on time deposit (RITD) in equation (19) is simply equation of the discount rate on SBI (RDIS). In addition we add two variables such as money supply as supply factor and aggregate demand as demand factor. The money supply equation (M1) in equation (20) is reduced form as real interest rate of time deposit interest rate, minimum reserves requirements ratio (RR) and reserve money of monetary authorities (RM). As the degree of openness in the Indonesian economy is higher and banking deregulation is starting, the money multiplier becomes less stable. Thus, we estimate the quasi money equation in stead of money multiplier.

The final demand, price and monetary sectors are linked through the following channels: the interest rate on time deposit is included in the private investment function in final demand sector, and the money supply is included in the interest rate on time deposit and the GDP deflator. The reserve money (RM) in identity (23) is simply bridge identity of the government budget deficits (GFB) and other reserve money (RMOTH). However the reserve money is not endogenized by the effects of balance of payment deficits in this model.

The price block determines the GDP deflator (PGDP) in equation (25), the deflator for private consumption (PCP) in equation (26), the deflator for government consumption (PCG) in equation (27), and the deflator for investment (PI) in equation (28). In this model, the money supply and real GDP for goods and services are assumed to determine the price level in the whole economy instantaneous. That is, GDP deflator is determined by monetary factor and demand factor in goods and services.

The balance of payment block is how the Indonesian economy is linked to the rest of the world such as Japan and ASEAN countries. This

block has eleven identities for export of goods in Rp. and US$, import of goods in Rp. And US$, current account balance (BCAD), net private capital inflows (BKPD), capital account balance (BKD), balance of payment (BPD) and foreign reserve (FRD). In this model, however, there is no the linkage between the balance of payment and money supply process. This is a strong assumption that if BI made some intervention in the exchange rate market, BI adjust it in order to keep the same level of reserve money. There are of course something to be improved in this model, and the monetary sector is one of them especially under the globalization.

4. Model Evaluation

The historical simulation is very important to evaluate how well the model can simulate the real economy. The model has been simulated over the period from 1985:II to 1997:IV, using the dynamic Gauss-Seidel method.

Table 2 shows the three indicators of the quality of the model: the root mean square error (RMSE), the mean absolute error (MAE) and the Theil's Inequality coefficient (U, 1966). The RMS error and MA error are less than 10% of actual values, except for the ten variables for IGR, MNRMR, GFB, BCAD, BPD, FRD, RITD, RM, M2 and JR. According to the Theil's inequality coefficient, a value of the inequality index is between zero and one. Most of the main endogenous variables show a rather lower value than the mean value of U (=0.19), except for IGR, MNRMR, GFB, BCAD, BPD, FRD, M2, RM and JR. The rather bigger values than the mean value of U are almost identity equations. As the

results of the inequality coefficients suggests the results of this historical simulation are satisfactory, we will carry some policy simulations within the sample period.

5. Policy Simulations

We can measure the influences that the change of macroeconomic policies and the external shocks, such as the increase of foreign direct investment, affect on the growth rate of GDP, the inflation rate and the balance of payment and so on. So by comparing several cases, we can find out what policy mix is desirable or what macroeconomic policy we should make when faced with the external shocks. Five policy simulations are conducted by modifying the policy variables of the model. The baseline (the final test) values are those generated by the model under no policy changes. The simulations were conducted over the 1990:I - 1997:IV period. These policy simulations are as follows:

Monetary Policy
Case 1: 1 point adding on the minimum reserve requirements ratio (RR).
Fiscal policy
Case 2: 10% decrease in nominal government investment (IG)
Case 3: 10% increase in export of oil and gas (XOGR)
Exchange Rate Management policy
Case 4: 10% depreciation in nominal exchange rate (REX)
Foreign Direct Management policy
Case 5: 10% increase in Foreign Direct Investment (BKDID)

Table 2. Selected indicators for quality of the Quarterly Macro Model

Variables	RMSE	MAE	U
GDPR	1300.5	1013.2	0.0198
CPR	2749.2	2158.1	0.0743
CGR	485.7	388.4	0.0746
IPR	1475.1	1121.9	0.1100
IGR	826.9	702.9	0.2197
KPR	6676.3	6015.6	0.0175
KGR	2420.4	2040.2	0.0165
XR	837.3	655.2	0.0505
MR	1358.8	1059.7	0.0867
PGDP	8.4	7.4	0.1049
PCP	7.1	6.5	0.0869
PCG	9.9	9.2	0.1377
PI	7.3	6.4	0.0888
CGRE	625.3	503.7	0.0904
CGPM	625.3	503.8	0.1652
IGDE	706.1	597.9	0.1384
GRT	977.5	835.4	0.0871
GRNOG	712.6	549.0	0.1188
GFB	677.2	546.2	0.3440
BCAD	634.0	512.3	0.7849
BPD	634.0	512.3	0.4624
FRD	7733.8	7234.5	0.9014
RITD	2.3	1.9	0.1332
RM	2519.2	2271.7	0.2108
M2	20732.8	18012.9	0.2458
JR	3539.5	2715.9	0.5240

where   RMSE=the root mean square error
            MAE = the mean absolute error
            U= the Theil Inequality coefficient

Case 1: 1 point adding on the minimum reserve requirements ratio (RR).

At first, we carry out the policy simulation of 1 point adding on the minimum reserve requirements ratio (RR). This simulation is one of tight monetary policy. Reserve requirement regulations is aimed at slowing down the growth of M2. When reserve ratio is higher than actual value by 1 point, due to the decrease of M1 and M2, interest rate (RITD) is increasing but GDP deflator is decreasing. Next, the rise in the interest rate reduces the private investment, then real GDP decreases. Afterwards, with decrease of exports and imports caused by the gradual decrease in real GDP, the current account deficit improve gradually. On the other hand, the down of price level is relatively lower. In sum when tight monetary policy of reserve requirement regulations will slow down the economy, the growth rate of real GDP slows down, price level (GDP deflator) is also decreasing and the current balance gets better.

Case 2: 10% decrease in nominal government investment (IG)

Next, let us examine a 10% decrease in government investment (IG). The effects of a tight fiscal policy is examined by decreasing the level of nominal government investment. A

decrease of government investment is aimed at slowing down the economy and improving the government budget deficit. Due to decrease in nominal government investment, real GDP decreases by 0.40 percent in the second years. But as real GDP decreases, the current balance (BCAD) gets better due to decrease in imports than exports. On the other hand, the government budget deficit (GFB) get better due to the rapid decreases of government development expenditure (IGDE) and government routine expenditure (CGRE) than government revenue (GRT) decrease. In turn, as the government budget deficit is improving, money supply (M2) is rapidly decreasing and the GDP deflator is down. The analysis in this policy simulation suggested that a tight fiscal policy would effectively decrease GDP, and overcome heating economy and improve current account and budget deficits. As the government block is directly linked the monetary block, this model is enough to analyze between price block and monetary block. Note that it is necessary to pay attention as real GDP is rapidly decreasing when a 10% decrease in government investment (IG), that is, less-than-budgeted development spending policy will be conducted.

Case 3: 10% increase in export of oil and gas (XOGR)

Next, let us examine a 10% increase in the value of export of oil and gas (XOGR). This simulation means that the revenue projections was based on an oil price of $16.50 per barrel, but in fact the actual oil price was more than $20 per barrel. If there is a increase in export of oil and gas, the government budget deficit may improve or the government deposit may increase. Due to increase

in export of oil and gas, the government revenue of oil and gas increases. The total government revenue increases by 0.98 percent in the end of second years. Thus, the government budget deficit (GFB) improves. Due to the total government revenue increases, real government consumption and government investment increase gradually. Therefore, as an aggregate demand increases, private consumption and private investment increase. The real GDP also increases due to increase of private and government investment. In turn, as the government budget deficit is improving, money supply (M2) is rapidly decreasing, but as the aggregate demand increases, the GDP deflator is up by degrees. On the other hand, the current balance (BCAD) gets better due to much increases in exports than imports increase. The analysis in this policy simulation suggested that a increase in export of oil and gas would effectively improve in the government budget and current account deficits. However, as the government block is not directly linked between the government deposits at BI in the monetary block and the government budget in this model, if the government budget deficit is improving, the money supply (M2) is rapidly decreasing. If there is more revenue than the budget base due to high oil price, the government had better reduce its foreign public debt or foreign AID.

Case 4: 10% depreciation in nominal exchange rate (REX)

If there is a 10% depreciation in nominal exchange rate (REX), the initial impact for the GDP is weak, but GDP increases from the second year. Over the whole period, GDP deflator rises continuously at up to 3.4 percent in the two year, because of increase of aggregate demand,

especially exports increase and imports decrease brought by the depreciation. On the other hand, the increase in exports and reduction in imports lead to an improvement in current account deficit.

Case 5: 10% increase in Foreign Direct Investment (BKDID)

When the nominal foreign direct investment (BKDID) increases by 10%, the GDP increases gradually from the second year. Over the whole period, GDP deflator rises continuously at up to 0.15 percent in the two year. On the other hand, due to increase in GDP, the increase in exports and imports lead to widen in current account deficits. However, the increase of foreign direct investment financed the wider current deficit.

6. Conclusion

In this paper, we have presented the major features of the model, and policy simulation results. The main objective of this paper was to provide an econometric model of Indonesia and an interpretation of the macro economic management including theAsia crisis using a quarterly macro-econometric model.

This quarterly macro model was designed to be used both for forecasting and for a policy simulation such as fiscal and monetary policies on a variety of macro-economic aggregates. This model was composed of 23 behavioral equations and 22 identities. It consisted of five blocks:the final demand block, the government block, the monetary block, prices block, and the balance of payments block. The specification of the model and the estimation results were given in Appendix A, along with a list of the variables in Appendix B. The model used data from 1983:I to 1997:IV. Data

in real terms are measured in 1993 prices.

As shown in Table 2, the modest size of the root mean square error and inequality coefficients suggest the results of this historical simulation are satisfactory.

We summarize the main contents of policy simulations and show the directions for future works.

First, we carried out the policy simulation of 1 point adding on the minimum reserve requirements ratio (RR). When tight monetary policy of reserve requirement regulations will slow down the economy, the growth rate of real GDP slows down, price level (GDP deflator) is also decreasing and the current balance gets better.

Second, the effects of a tight fiscal policy is examined by decreasing the level of nominal government investment. Due to decreases in nominal government investment, real GDP decreases. But as real GDP decreases, the current balance (BCAD) gets better due to decreases in imports than exports. On the other hand, the government budget deficit (GFB) get better due to the rapid decreases of government development expenditure (IGDE) and government routine expenditure (CGRE). In turn, as the government budget deficit is improving, money supply (M2) is rapidly decreasing and the GDP deflator is down.

Third, when a 10% increase in the value of export of oil and gas (XOGR), the government revenue of oil and gas and total government revenues increases. Thus, the government budget deficit (GFB) improves. Due to the total government revenues increase, real government consumption and government investment increase gradually. Therefore, as an aggregate demand increases, private consumption and private investment increase. The real GDP also increases

due to increase of private and government investment. In turn, as the aggregate demand increases, the GDP deflator is up by degrees. The analysis in this policy simulation suggested that a increase in export of oil and gas would effectively improve in the government budget and current account deficits.

Fourth, If there is a 10% increase in nominal exchange rate (REX), the GDP increases from the second year. GDP deflator rises gradually, because of increase of aggregate demand, especially exports increase and imports decrease brought by the depreciation. On the other hand, the increase in exports and reduction in imports lead to an improvement in current account deficit.

Finally when the nominal foreign direct investment (BKDID) increases by 10% , the GDP increases gradually from the second year. Over the whole period, GDP deflator rises continuously at up to 0.15 percent in the two year. On the other hand, due to increase in GDP, the increase in exports and imports lead to widen in current account deficits. However, the increase of foreign direct investment financed the wider current deficit.

However, there are something to be improved in this model. It will be necessary not only to improve the specification of each equation, but also to improve the structure or the linkage mechanism. Improving the monetary sector may be one of them, because the globalization is progressing especially in the financial sector.

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Appendix A

Model Specification and Estimation Results of the Quarterly Macro Model

— Version: August-1998 [1993 price] —

by Suminori TOKUNAGA

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1. Prefix(*) denotes an exogenous variable.
2. "Real" value is in 1993 prices, and Deflator & Price Index are (1993=1.0).
3. AR(n) is an autoregressive error component of n-th order.
4. Dummy Variables etc.
    DQi   : =1(i quarter),=0(other)
    D921 : =1 (1992year-first quarter),=0(other)
    TIME : year(1970,1971,1972,....)
5. RR is adjusted R-squared value
6. DW is Durbin-Watson statistic
7. ( ) under parameter is t-value

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1. <FINAL DEMAND BLOCK>

1:    CPR ---(Private Consumption(real))

$$CPR=-9192.9+0.7406*(GDPR(-1)-TY(-1)/PGDP(-1)*100)$$
$$(-5.78)(38.1)$$

$$-337.84*DQ1+1008.3*DQ2+2938.4*DQ3$$
$$(-0.32)(0.99)(2.89)$$

RR=0.9671,DW=1.66 (OLS,1985:2-97:4)

2:    CGR ---(Government Consumption(real))

$$CGR=758.07+0.0310*(GRT(-1)/PGDP(-1)*100)+0.8845*(CGR(-1))$$
$$(1.82)(1.07)(8.74)$$

$$+1041.1*D861-100.37*DQ1-1350.0*DQ2-51.786*DQ3$$
$$(2.66)(-0.66)(-8.04)(-0.36)$$

RR=0.8825,DW=2.04 (OLS,1985:2-97:4)

3:    IPR ---(Private Investment(real))

$$IPR=2739.9+0.0725*(GDPR(-1)-JR(-1))+0.6053*(IPR(-1))$$
$$(0.93)(1.55)(5.12)$$

$$-98.872*(RITD/PGDP*100)+(BKDID*REX/1000/PI*100)$$

$$(-1.51)$$

$$-3505.4*DQ1+2789.6*DQ2+620.85*DQ3$$
$$(-5.78)(4.45)(1.00)$$

RR=0.9532,DW=2.4078(OLS, 1984:3-97:4)

4a: *IGR ---(Government Investment (Real))

$$(IGR)=7.5165+0.2194*(GRT/PGDP*100)+0.2054*(IGR(-1))$$
$$(.01)(3.06)(1.41)$$

$$+3011.06*D924+661.39*DQ1\text{-}1244.0*DQ2\text{-}132.12*DQ3$$
$$(3.23)\qquad(1.36)\qquad(\text{-}2.21)\qquad(\text{-}.32)$$

$$RR=0.726,DW=2.22\ (1985{:}2\text{-}97{:}4)$$

4b: *IGR---(Government Investment)

IGR=(IG/PI*100)

5: XNOGR ---(Export of Non-oil and gas (real))

$$\log(XNOGR)=\text{-}8.1898+2.2606*\log(MWD(\text{-}1)/PMW(\text{-}1)*100)$$
$$(\text{-}8.02)\quad(26.0)$$

$$-0.7069*\log(PX(\text{-}1)/(PXA(\text{-}1)*REX(\text{-}1))*100)$$
$$(\text{-}3.27)$$

$$-0.2412*DQ1\text{-}0.0691*DQ2\text{-}0.1080*DQ3$$
$$(\text{-}4.22)\qquad(\text{-}1.21)\qquad(\text{-}1.93)$$

$$RR=0.9339,DW=1.27\ (1984{:}2\text{-}97{:}4)$$

6: XR ---(Export of Goods & Services(real))

XR=(XOGR+XNOGR+XSR)

7: MR ---(Import of Goods & Services(real))

$$(MR)=3080.4+0.3282*(GDPR(\text{-}1))\text{-}0.0531*l(PMD(\text{-}1)*REX(\text{-}1)/PGDP(\text{-}1)*100)$$
$$(1.43)\quad(9.61)\qquad\qquad\qquad(\text{-}4.22)$$

$$+0.1687*(FRD/PMD*100)+978.96*DQ1+769.01*DQ2+1157.4*DQ3$$
$$(1.06)\qquad\qquad\qquad(1.51)\qquad(1.23)\qquad(1.84)$$

$$RR=0.9537,DW=1.80\ (1984{:}2\text{-}97{:}4)$$

8: GDPR ---(Real GDP))

GDPR=CPR+CGR+IPR+IGR+XR-MR+JR

2. <GOVERNMENT BLOCK>

9: TY ---(Income Tax(nominal))

$$TY=\text{-}1423.31+0.05469*(GDPR(\text{-}1)*PGDP(\text{-}1)/100)+1137.9*DQ1+230.54*DQ2+270.43*DQ3$$
$$(\text{-}8.41)\quad(34.4)\qquad\qquad\qquad\qquad(6.48)\qquad(1.34)\qquad(1.57)$$

$$RR=0.9605,DW=2.67\ (1985{:}2\text{-}97{:}4)$$

10: TVA ---(Value added Tax(nominal))

$$TVA=\text{-}305.46+0.0430*(GDPR(\text{-}1)*PGDP(\text{-}1)/100)+123.42*DQ1\text{-}360.303*DQ2\text{-}229.41*DQ3$$
$$(\text{-}2.55)\quad(38.4)\qquad\qquad\qquad\qquad(0.99)\qquad(\text{-}2.96)\qquad(\text{-}1.89)$$

$$RR=0.9678,DW=1.68\ (1985{:}2\text{-}97{:}4)$$

11: TMD ---(Import Duties(nominal))

$$TMD=283.99+0.0207*(MR*PM/100)\text{-}92.37*DQ1\text{-}105.39*DQ2\text{-}98.779*DQ3$$
$$(3.78)\quad(8.69)\qquad\qquad(\text{-}1.10)\qquad(\text{-}1.28)\qquad(\text{-}1.21)$$

$$RR=0.6055,DW=1.31\ (1985{:}2\text{-}97{:}4)$$

12: GRNOG ---(Government Revenues of Non-Oil and Gas(nominal))
GRNOG=TY+TVA+TMD+TONOG

13: GROG ---(Government Revenues of Oil and Gas(nominal))
GROG=514.53+0.3986*(XOGR*PX/100)+0.1572*GROG(-1)+4474.6*D911
     (1.74)   (7.71)   (1.84)   (7.56)

     +778.18*DQ1+12.022*DQ2+313.74*DQ3
     (3.33)   (0.05)   (1.40)

RR=0.8153,DW=1.75(1985:2-97:4)

14: GRT ---(Government Revenues(nominal))
GRT=GROG+GRNOG+AID

15: CGPM ---(Government Personnel and Material and other Expenditure(nominal))
CGPM=-541.85+0.8218*(CGR*PCG/100)+2118.6*D911
    (-2.45) (30.5)   (3.90)

     +543.94*DQ1+441.59*DQ2+24.126*DQ3
     (2.56)   (2.16)   (0.12)

RR=0.9505,DW=2.07(1985:2-97:4)

16: CGRE ---(Government Routine Expenditure(nominal))
CGRE=CGPM+DRPG

17: IGDE ---(Government Development Expenditure(nominal))
IGDE=(IGR*PI/100)+IGOTH

18: GFB ---(Government Fiscal Balance(nominal))
GFB=GRT-(CGRE+IGDE)

3. <MONETARY BLOCK>

19: RITD ---(Interest Rate of 3-month time deposits)
(RITD/PGDP*100)=-0.2877+0.6770*(RDIS/PGDP*100)
          (-0.059) (8.42)

    -0.0000846*(M2(-1)/PGDP(-1)*100)+0.000236*(GDPR(-1)-JR(-1))
    (-2.84)   (2.64)

    +5.4817*D911-0.4564*DQ1+1.2223*DQ2+1.0741*DQ3
    (2.50)   (-0.53)   (1.29)   (1.20)

RR=0.8927,DW=0.702 (1985:2-97:4)

20: M1 ---(M1)
(M1/PGDP*100)=11858.1-112.12*(RITD(-1)/PGDP(-1)*100)
         (3.65)   (-1.70)

    -193.58*(RR)+0.2742*(RM) +0.6139*(M1(-1)/PGDP(-1)*100)
    (-3.40)   (3.8)   (6.21)

$$-1437.85*DQ1-637.29*DQ2-736.69*DQ3$$
$$(2.57) \qquad (-1.16) \qquad (1.33)$$

RR=0.9816,DW=1.87 (1985:1-97:4)

21: MQ ---(Quasi Money)

$$(MQ)=-13065.2+1522.59*(RITD(-1)-RIMM(-1))$$
$$(-2.59) \quad (4.41)$$

$$-11074.6*(RR)+7.5862*(RM)+46316.3*(D973)$$
$$(-3.37) \qquad (29.0) \qquad (5.08)$$

$$-4561.5*DQ1-1002.1*DQ2+3492.05*DQ3$$
$$(-1.40) \qquad (-.296) \qquad (1.05)$$

RR=0.9913,DW=1.70 (1990:2-97:4)

22: M2 ---(Money Supply)

M2=M1+MQ

23: RM ---(Reserve money)

RM=RM(-1)-GFB+RMOTH

24: REX ---(Foreign Exchange Rate)

$$(REX/PGDP*100)=-1240.5+1.7939*(REX(-1)/PGDP(-1)*100))+664.61*(D973)$$
$$(-2.02) \quad (5.12) \qquad\qquad\qquad\qquad (3.66)$$

$$-71.076*(RITD(-1)/PGDP(-1)*100)/(RTBUS(-1)/CPIUS(-1)*100)$$
$$(-3.37)$$

$$-100.49*DQ1-106.1*DQ2-52.57*DQ3$$
$$(-1.11) \qquad (-1.23) \qquad (-0.57)$$

RR=0.6437,DW=0.98 (1992:2-97:4)

4. < PRICE & Deflator BLOCK>

25: PGDP ---(Deflator of GDP)

$$\log(PGDP)=3.8557+0.4849*\log(M2(-1)/GDPR(-1))+0.04537*\log(PMD(-1)*REX(-1))$$
$$(8.10) \quad (19.0) \qquad\qquad\qquad\qquad (1.14)$$

$$+0.1076*D974$$
$$(2.65)$$

$$-0.0201*DQ1+0.00015*DQ2+0.0011*DQ3$$
$$(-1.30) \qquad (0.01) \qquad (0.07)$$

RR=0.9840,DW=0.764 (1985:2-97:4)

26: PCP ---(Deflator of Private Consumption)

$$PCP=4.4105+0.6938*(PGDP)+0.2813*(PCP(-1))$$
$$(2.40) \quad (6.37) \qquad (2.30)$$

$$-0.5423*DQ1-0.9645*DQ2-1.0143*DQ3$$
$$(-0.51) \qquad (-0.93) \qquad (-0.98)$$

RR=0.9898,DW=1.48 (1984:2-97:4)

27: PCG ---(Deflator of Government Consumption)

$$PCG = -2.3272 + 0.2279*(PGDP) + 0.7820*PCG(-1)$$
$$(-0.82)\ (1.91)\qquad\qquad (6.74)$$

$$+1.8707*DQ1 + 4.5315*DQ2 - 1.8901*DQ3$$
$$(1.01)\qquad\qquad (2.50)\qquad\qquad (-1.00)$$

$$RR = 0.9741, DW = 1.90\ (1984{:}2\text{-}97{:}4)$$

28: PI ---(Deflator of Investment)

$$PI = 18.137 + 0.7177*(PGDP) + 0.1091*(PI(-1))$$
$$(5.61)\ (6.58)\qquad\qquad (0.79)$$

$$-1.8450*DQ1 - 2.2331*DQ2 - 1.4131*DQ3$$
$$(-1.33)\qquad\qquad (-1.68)\qquad\qquad (-1.06)$$

$$RR = 0.9771, DW = 2.07 (1984{:}2\text{-}97{:}4)$$

29: PX ---(Deflator of Export)

$$PX = -3.2305 + 0.7184*(PGDP) + 0.3221*PX(-1)$$
$$(-1.05)\ (5.67)\qquad\qquad (2.47)$$

$$+0.6674*DQ1 - 2.5547*DQ2 - 1.5249*DQ3$$
$$(0.30)\qquad\qquad (-1.15)\qquad\qquad (-0.70)$$

$$RR = 0.9625, DW = 1.49\ (1984{:}2\text{-}97{:}4)$$

30: PM ---(Deflator of Imports)

$$PM = -70.259 + 0.8647*(PMD) + 0.0400*REX$$
$$(-30.6)\ (31.1)\qquad\qquad (64.3)$$

$$+0.2420*DQ1 - 0.0063*DQ2 + 0.4431*DQ3$$
$$(0.28)\qquad\qquad (-0.01)\qquad\qquad (0.52)$$

$$RR = 0.9945, DW = 0.59\ (1984{:}2\text{-}97{:}4)$$

5. <BALANCE OF PAYMENTS BLOCK>

31: XGR ---(Export of Goods in Rp.)

$$XGR = (XOGR + XNOGR)$$

32: XGD ---(Export of Goods in US$)

$$XGD = ((XGR*PX/100)*1000/REX) + XGDE$$

33: MGR ---(Import of Goods in Rp.)

$$MGR = (MR\text{-}MSR)$$

34: MGD ---(Import of Goods in US$)

$$MGD = ((MGR*PM/100)*1000/REX) + MGDE$$

35: XMSD ---(Net Export of Services in US$)

$$XMSD = (XSR*PX/100\text{-}\ MSR*PM/100)*1000/REX) + XMSDE$$

36: BCAD ---(Current Balance(US$))

BCAD=XGD-MGD+XMSD

37: BKOID ---(Inflow of Official Capital(US$))

BKOID= 1876.4-0.3948*(AID/REX*1000)+2596.6*D974
$\quad\quad$ (8.53) $\quad$ (-2.13) $\quad\quad\quad\quad\quad\quad\quad$ (13.7)

$\quad$ +295.5*DQ1-379.09*DQ2-258.30*DQ3
$\quad$ (1.86) $\quad\quad$ (-2.63) $\quad\quad$ (-1.91)

$$RR=0.9698, DW=2.07 \ (1990:2-97:4)$$

38: BKODRD ---(Official Debt Repayment(US$))

BKODRD=-5935.41+0.1693*(SBKOD*(1+RTBUS/100))

$\quad$ -130.98*DQ1+394.68*DQ2+145.09*DQ3

39: BKOD ---(Net Inflow of Official Capital(US$))

BKOD=BKOID+BKODRD

40: BKDID ---(Direct Investment, Inflow of Private Capital(US$))

BKDID=-2638.2+0.06603*((GDPR(-1)*PGDP(-1)/100)/REX(-1)*1000)

$\quad\quad$ (-4.34) $\quad$ (7.93)

$\quad$ +1.0509*((RITD(-1)-(REX(-1)-REX(-2))/REX(-2)*100)/RTBUS(-1)*100)
$\quad$ (1.57)

$\quad$ +572.24*D961-776.39*D974
$\quad$ (2.25) $\quad\quad\quad$ (-1.84)

$\quad$ +333.22*DQ1-63.547*DQ2+110.40*DQ3
$\quad$ (2.19) $\quad\quad$ (-0.43) $\quad\quad$ (0.81)

$$RR=0.8746, DW=1.91 \ (1992:3-97:4)$$

41: BKPOD ---(Portfolio Investment, Inflow of Private Capital(US$))

BKPOD=-2430.54+0.06594*((GDPR(-1)*PGDP(-1)/100)/REX(-1)*1000)

$\quad\quad$ (-1.59) $\quad$ (3.20)

$\quad$ +1.4956*((RITD(-1)-(REX(-1)-REX(-2))/REX(-2)*100)/RTBUS(-1)*100)
$\quad$ (1.000)

$\quad$ +1631.37*D954-8189.52*D974
$\quad$ (2.56) $\quad\quad\quad$ (-7.63)

$\quad$ -746.25*DQ1-355.27*DQ2+31.68*DQ3
$\quad$ (-1.96) $\quad\quad$ (-0.93) $\quad\quad$ (0.08)

$$RR=0.9242, DW=2.10 \ (1992:3-97:4)$$

42: BKPD ---(Net Inflow of Private Capital(US$))

BKPD=BKDID+BKPOD

43: BKD ---(Capital Account Balance(US$))

BKD=BKOD+BKPD

44: BPD ---(Basic Balance(US$))

BPD=BCAD+BKD+NEO

45:     FRD ---(Total Foreign Reserves(US$))
        FRD=FRD(-1)+(BPD)

Appendix B List of Variables

Notation	Definition	Unit	Source
ADJR	Aggregate Demand minus Inventory and Statistical Discrepancy (real)	Billions of Rupiah	NPPI
*AID	Foreign Aid/Loan	Billions of Rupiah	NPPI
*AIDPG	Program aids	Billions of Rupiah	NPPI
*AIDPJ	Project aids	Billions of Rupiah	NPPI
BCAD	Current Account Balance	Millions of US Dollars	IE
BKD	Capital Account Balance	Millions of US Dollars	IE
*BKDID	Net Foreign Direct Investment	Millions of US Dollars	IE
*BKOD	Net Official Capital Inflows	Millions of US Dollars	IE
BKOID	Inflow of Official Capital	Millions of US Dollars	IE
BKODRD	Official Debt Repayment	Millions of US Dollars	IE
BKPD	Net Private Capital Inflows	Millions of US Dollars	IE
*BKPOD	Net Other Private Capital Inflows	Millions of US Dollars	IE
BPD	Basic Balance	Millions of US Dollars	IE
*CGDME	Domestic material expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGEME	External material expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGEPE	External personnel expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGFA	Food allowance in routine expenditures		
*CGOIP	Other internal personnel expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGSBR	Subsidies to regions in routine expenditures	Billions of Rupiah	NPPI
*CGSIJ	Personnel expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGSOLG	Non-personnel expenditures in routine expenditures	Billions of Rupiah	NPPI
CGIG	CG + IG	Billions of Rupiah	NPPI
*CGM	Material expenditures in routine expenditures	Billions of Rupiah	NPPI
*CGOTH	Other in routine expenditures	Billions of Rupiah	NPPI
*CGP	Personnel expenditures in routine expenditures	Billions of Rupiah	NPPI
CGPM	Government Personnel and Material	Billions of Rupiah	NPPI

and Other Expenditure

CGR	Government Consumption	Billions of Rupiah	IE
*CGRA	Rice allowance in routine expenditures	Billions of Rupiah	NPPI
CGRE	Government Routine Expenditure	Billions of Rupiah	NPPI
*CGWS	Wages and salaries in routine expenditures	Billions of Rupiah	NPPI
CPR	Private Consumption	Billions of Rupiah	NPPI
*DEPGR	Depreciation of Gavernment Capital Stock	Billions of Rupiah	NPPI
*DEPPR	Depreciation of Private Capital Stock	Billions of Rupiah	NPPI
*DQ1	Seasonal Dummy for the First Quarter	First Quarter=1, other=0	
*DQ2	Seasonal Dummy for the Second Quarter	Second Quarter=1, other=0	
*DQ3	Seasonal Dummy for the Third Quarter	Third Quarter=1, other=0	
*Dij	Dummy for ith year jth Quarter	ij=1, other=0	
*DRPG	Debt Repayment of Government	Billions of Rupiah	NPPI
*DRPGI	Internal Debt in routine expenditures	Billions of Rupiah	NPPI
*DRPGE	External Debt in routine expenditures	Billions of Rupiah	NPPI
FRD	Foreign Reserves	Millions of US Dollars	IFS
*FRDE	Errors and Omissions of Foreign Reserve	Millions of US Dollars	IFS
GDPR	Gross Domestic Product (real)	Billions of Rupiah	NPPI
GFB	Government Fiscal Balance	Billions of Rupiah	NPPI
*GROG	Government Revenues of Oil and Gas	Billions of Rupiah	NPPI
*GRNOG	Government Revenues of Non-Oil and Gas	Billions of Rupiah	NPPI
*GRR	Routine Receipts	Billions of Rupiah	NPPI
*GRT	Government Revenues	Billions of Rupiah	NPPI
IG	Government Investment	Billions of Rupiah	NPPI
*IGAIDPJ	Project loans/aids in development expenditures	Billions of Rupiah	NPPI
*IGDCPS	Construction of Primary Schools in development expenditures	Billions of Rupiah	NPPI
*IGDD	Departments/Institutions in development expenditures	Billions of Rupiah	NPPI
*IGDDSP	Dev. Subsidy to Province in development expenditures	Billions of Rupiah	NPPI
*IGDDSR	Dev. Subsidy to Regencies in development	Billions of Rupiah	NPPI

	expenditures		
IGDE	Government Development Expenditure	Billions of Rupiah	NPPI
*IGDEDSV	Dev. Subsidy to Villages in development expenditures	Billions of Rupiah	NPPI
*IGDFS	Fertilizer Subsidy in development expenditure	Billions of Rupiah	NPPI
*IGDGCP	Government Capital Participation in development expenditures	Billions of Rupiah	NPPI
*IGDID	Infrastructure Development in development expenditures	Billions of Rupiah	NPPI
*IGDIJ	Irian Jaya in development expenditures	Billions of Rupiah	NPPI
*IGDRDB	Reg. Dev. Based on Reg. Dev. Cont. and Tax. on land and buildings in development expenditures	Billions of Rupiah	NPPI
*IGDSF	Sanitary Facilities/Central Public Health Buildings in development expenditures	Billions of Rupiah	NPPI
*IGDSRDM	Subsidies for Reconstruct. and the Dev. of Market in development expenditures	Billions of Rupiah	NPPI
*IGDSRR	Subsidies for Regreening and Reforestration in development expenditures	Billions of Rupiah	NPPI
*IGDSUV	Poverty Alleviation Expenditures in development expenditures	Billions of Rupiah	NPPI
*IGDET	East Timor in development expenditures	Billions of Rupiah	NPPI
IGDF	Development Expenditures	Billions of Rupiah	NPPI
*IGDOTH	Others in development expenditures	Billions of Rupiah	NPPI
*IGOTH	Government Investment other (IGD-IG)	Billions of Rupiah	NPPI
IGR	Government Investment (real)	Billions of Rupiah	IG/PI
IPR	Private Investment (real)	Billions of Rupiah	IR-IGR
JR	Inventory and Statistical Discrepancy	Billions of Rupiah	NPPI
KGR	Government Capital Stock (real)	Billions of Rupiah	
KPR	Private Capital Stock (real)	Billions of Rupiah	
*NEO	Net Errors and Omissions	Millions of US Dollars	NPPI
*NFI	Net Factor Income from Abroad	Millions of US Dollars	NPPI
MGD	Imports of Goods	Millions of US Dollars	NPPI
MGDE	Errors and Omissions of Imports of Goods	Millions of US Dollars	NPPI

MGR	Imports of Goods in Rp.	Billions of Rupiah	NPPI
MNRMR	Imports of Non-Raw Materials (real)		
MQ	Quasi Money		
MR	Imports of Goods and Services (real)	Billions of Rupiah	NPPI
MRMR	Imports of Raw Materials (real)	Billions of Rupiah	NPPI
*MSR	Imports of Services (real)	Billions of Rupiah	NPPI
*MWD	Imports of Goods and Services in World	Billions of US Dollars	IFS
M1	Money Supply (M1)	Billions of Rupiah	QREMD
M2	Money Supply (M1 plus quasi money)	Billions of Rupiah	QREMD
PCG	Deflator of Government Consumption	1993=100	
	NPPI		
PCP	Deflator of Private Consumption	1993=100	NPPI
PI	Deflator of Investment	1993=100	NPPI
PGDP	Deflator of GDP	1993=100	NPPI
*PM	Deflator of Imports	1993=100	NPPI
*PMW	Import Unit Values	1990=100	IFS
*PX	Deflator of Export	1993=100	NPPI
*PXA	Export Unit Value of Asia	1990=100	IFS
*RDIS	Discount Rate on SBI	% (3, 6, 9, 12)	QREMD
*REX	Exchange Rate	Rupiah/US$	IFS
*RESDB	Budget Reserve for Development in development expenditures	Billions of Rupiah	NPPI
*RIMM	Interbank Money Market Rate	% (3, 6, 9, 12)	QREMD
RITD	Interest Rate on Time Deposits for 3 month	% (3, 6, 9, 12)	QREMD
*RM	Reserve Money of Monetary Authorities	Billions of Rupiah	QREMD
*RR	Minimum Reserves Requirements Ratio	%	NPPI
*SB	Subsidy	Billions of Rupiah	NPPI
*TEXCD	Excises Duties	Billions of Rupiah	NPPI
*TI	Indirect Tax	Billions of Rupiah	NPPI
*TLAND	Land tax/Taxes on Land and Building	Billions of Rupiah	NPPI
*TMD	Import Duties	Billions of Rupiah	NPPI
*TNR	Non tax receipts	Billions of Rupiah	NPPI
*TOOR	Other Oil receipts	Billions of Rupiah	NPPI
*TONOG	Other of Government revenues of Non-Oil and GAS	Billions of Rupiah	NPPI

*TOTH	Other tax	Billions of Rupiah	NPPI
*TY	Income Tax	Billions of Rupiah	NPPI
*TVA	Value added Tax on the sale of Luxuries Goods	Billions of Rupiah	NPPI
*TX	Export tax	Billions of Rupiah	NPPI
XGD	Exports of Goods	Millions of US Dollars	NPPI
*XGDE	Errors and Omissions of Exports of Goods	Millions of US Dollars	NPPI
XGR	Exports of Goods in Rp.	Billions of Rupiah	NPPI
*XMSD	Net Exports of Services	Millions of US Dollars	NPPI
XNOGR	Exports of Non-Oil and GAS	Billions of Rupiah	NPPI
*XOGR	Exports of Oil and GAS	Billions of Rupiah	NPPI
*XSR	Exports of Services (real)	Billions of Rupiah	NPPI
XR	Exports of Goods and Services (real)	Billions of Rupiah	NPPI

* denote exogenous variables

Appendix C Unit Root Test and Johansen's Test for Cointegration

Summary of Unit root tests
Test Statistics

	LCPR	LIR	LXR	LMR	LGDPR
Wld.Sym.	-3.24793	-1.04043	-1.92915	-1.07605	-2.75556
Dickey-F	-2.45355	-3.80757	-1.44474	-2.02019	-0.99975
Phillips	-36.12847	-25.50846	-17.50459	-15.54243	-31.46779

P-values

	LCPR	LIR	LXR	LMR	LGDPR
Wld.Sym.	0.042387	0.97012	0.69510	0.96688	0.16166
Dickey-F	0.35156	0.016181	0.84730	0.59039	0.94415
Phillips	0.0022744	0.022764	0.11534	0.16769	0.0063489

Number of lags

	LCPR	LIR	LXR	LMR	LGDPR
Wld.Sym.	8.00000	6.00000	3.00000	3.00000	7.00000
Dickey-F	8.00000	3.00000	3.00000	3.00000	6.00000
Phillips	8.00000	3.00000	3.00000	3.00000	6.00000

Johansen (trace) cointegration tests
==

Variables: LCPR LIR LXR LMR LGDPR

Num lags	1	2	3	4	5
Eigval1	0.66302	0.48257	0.42321	0.65046	0.76368
Eigval2	0.60702	0.40227	0.39130	0.39937	0.38276
Eigval3	0.30292	0.30340	0.20112	0.22442	0.30674
Eigval4	0.096267	0.092586	0.13421	0.16933	0.16543
Eigval5	0.0071173	0.00010895	0.00077919	0.0023921	0.000033054
HO:r=0	112.09287	65.29210	49.56519	60.08909	61.80641
P-valAsy	0.000063807	0.30453	0.85711	0.51002	0.43888
HO:r<=1	63.14511	38.93693	30.30563	28.55513	25.74256
P-valAsy	0.0060027	0.52362	0.85189	0.88945	0.93242
HO:r<=2	21.11501	18.35238	12.93066	13.26205	13.68029
P-valAsy	0.59666	0.74870	0.92171	0.91543	0.90685
HO:r<=3	4.87638	3.89061	5.07141	5.63758	4.52167
P-valAsy	0.84765	0.88780	0.83843	0.80912	0.86331
HO:r<=4	0.32142	0.0043584	0.027282	0.071849	0.00082636
P-valAsy	0.53834	0.63008	0.62368	0.61110	0.63107
Num obs	55.00000	55.00000	55.00000	55.00000	55.00000
LogLike	481.66831	495.89180	515.40665	553.98849	584.77333
AIC	-406.66831	-395.89180	-390.40665	-403.98849	-409.77333

Num lags	6	7	8	Opt:8
Eigval1	0.66334	0.93581	0.99586	0.99586
Eigval2	0.61748	0.60831	0.96237	0.96237
Eigval3	0.45407	0.52056	0.71174	0.71174
Eigval4	0.20856	0.48667	0.36912	0.36912
Eigval5	0.012920	0.011761	0.010950	0.010950
HO:r=0	58.03685	76.45533	104.82168	104.82168
P-valAsy	0.59427	0.061615	0.00025857	0.00025857
HO:r<=1	36.26307	35.26620	49.95400	49.95400
P-valAsy	0.64731	0.68963	0.11496	0.11496
HO:r<=2	17.04338	21.20701	17.15523	17.15523
P-valAsy	0.80588	0.59103	0.80141	0.80141
HO:r<=3	4.93820	10.18009	4.71643	4.71643
P-valAsy	0.84478	0.45545	0.85489	0.85489
HO:r<=4	0.26008	0.17746	0.11011	0.11011
P-valAsy	0.55650	0.58071	0.60018	0.60018
Num obs	55.00000	55.00000	55.00000	55.00000
LogLike	632.50778	758.33391	999.13517	999.13517
AIC	-432.50778	-533.33391	-749.13517	-749.13517