Chapter 3

Analysis of Current Economic Crisis by IOPM

3.1 Current Exchange Rate Shock and IOPM Modeling

The Asian currency shock initiated in Thailand July 1997 forced the Indonesian Rupiah devaluate to 8,900Rp/$ on 16 January in Singapore market, and reached to 16,500Rp/$, 23rd January. After that the rate came back to 7,000Rp/$, but still is fluctuating around 8,000-9,000Rp/$. Many Indonesian private companies have serious difficulties in meeting with short-term debt service, and the negotiation for rescheduling started. "There have been only three instances of actual repudiation of the debt in the post-war period: China in 1949, Cuba in 1961, and North Korea in 1974(Balkan, 1992, p.1000) ". A rescheduling is in a sense a violation of the original contract between the lender and the borrower and can be treated as a proxy for default. One of the important conditions for successful rescheduling is the stabilization of future exchange rate based on suitable schemes, including the proposal of currency board.

The current currency shock will exert a strong impact in short-term as well as in long-term on Indonesian economy. Already the level of GDP of Indonesia decreased from 228 billion US$ in 1996 to 49.6 billion US$ in 1997(Financial Times, January 23, 1998). The rate of inflation rate in 1998 is expected as 20 %, though IMF expects to slow down to one digit figure afterward.

(1) Framework of Current IOPM

Current IOPM based on the framework of I-O Table, and naturally it is not a panacea. It mainly covers the inter-industry transaction of goods and services induced from final demand, which includes exports and imports of commodities. On the other hand, IOPM does not cover the service receipts and payments and capital transactions, which include the interest and amortization payments of foreign debts. Therefore, when we discuss the influences of Currency Crisis(CC), such issues are not appropriate terms-of-agenda of IOPM exercise, as "How it happened ? ", "What were the main causes of CC ?", "How repayment of bad loans can be negotiated ?", "How exchange rate could stabilize ?", "How debt rescheduling can be planned ?". On the other hand, IOPM can be an useful and strong tool to respond to some questions, like "When the future trend of exchange rate is projected, what is the optimum development path for Indonesia ?", "How the different trends of future exchange rate would influence to the economy ? ". We might be able to calculate the optimum trend of exchange from a set of targets. The analysis of (CC) itself needs employment of another model, then IOPM can calculate out the impacts and overtime influences of specific trend, once the solution of (CC) is suggested. Therefore a combined use of IOPM and another suitable model which analyses each important policy issue greatly improve the analytical capacity of whole panning capacity.

(2) Some Suggested Revisions for IOPM Exercise

The discussion above suggests that the medium-term and long-term planning(Repelita VII and PJP II) must adequately consider the features of development path in the recovery period as well as in steady growth period. Accordingly, it is important to assess the wide social needs and to establish the accompanying policy packages in these periods from a wide and a long-term perspective. IOPM could nicely serve as one of important tools to give the future picture and suggest relevant policy packages.

The recognition of current exchange shock urges some amendments to the current version of IOPM in following points: JICA Study Team tried some simulations considering following 1) - 4), except 5),

1) The Initial Condition Adjustment Effect: The first period of IOPM corresponds to 1994-98 years. As the current shock would decrease the GDP, the initial condition (growth rates in first period) must be adjusted accordingly.

2) The Relative Price Effect: Export and import prices will change according to the Pass-through effects after devaluation. This implies that a tactful projection of these prices is necessary for future simulations.

3) The Trend Adjustment Effect: The future path of export price and exchange rate makes necessary to change the upper and lower boundaries of export growth accordingly.

4) The Scaling-down Effect: When GDP in Rupiah terms is converted into dollar terms, the future depreciated exchange rate will force to keep GDP in dollar terms to a half or one third compared with the trend value.

5) The Liquidity Constraint Effect: The consideration of liquidity constraint will be necessary even after the second period. It implies that the foreign currency holding at the end of each period could be evaluated with a positive evaluation coefficient in the target function.

3.2 Exercises by National IOPM

3.2.1 Revision of National IOPM

In an attempt to analyze the recent currency shock by our IOPM, we should consider following points:

(A) Since we are already in the final year of the first period, 1994-1998(Repelita VI), of the IOPM program, we must take the past four-year's GDP growth rates into the solution. (Initial Condition Adjustment Effect)

(B) The change in the exchange rate is to be reflected into the model in real terms. This means that the affected changes in import/export prices caused by the changes in exchange rate should be somehow measured and be reflected into the model. (Pass-through coefficients)

(1) The Initial Condition Adjustment Effect

To take GDP growth rate of the 1st period in the solution of IOPM as close as the current footprint of the economy, we first estimate externally this growth rate of the 1st period, and then impose this estimate as a macro constraint for the first period. And also for the sector wise, we impose some appropriate bandwidth constraints on the sectoral GDP growth rates only for the 1st period. In setting the bandwidth of the sectoral GDP growth rates, we refer to the corresponding sectoral growth rates of the Case 4, which is the base case of this simulation. The procedure is as follows.

1) Estimation of the Macro GDP Growth Rate for the 1st Period(1994-1998)

We estimate macro GDP growth rate for the 1st Period(1994-1998) utilizing the data as following table.

Table 3-1 GDP Growth Rate at 1st Period

Year	GDP Growth (%)	Source
1994	7.5	BPS
1995	8.2	BPS
1996	7.8	BPS
1997	5.7	IDE
1998	0.0	IMF

The expression is as follows:

$$\dot{Y}_1 = 1 - \sqrt[5]{(1+\dot{Y}_{1994})(1+\dot{Y}_{1995})(1+\dot{Y}_{1996})(1+\dot{Y}_{1997})(1+\dot{Y}_{1998})} = 0.058 = 5.8(\%) \qquad (3\text{-}1)$$

Where

$\dot{Y}_1$: GDP Growth rate at 1st Period

$\dot{Y}_{1994}$: GDP Growth rate at 1994

$\vdots$

$\dot{Y}_{1998}$: GDP Growth rate at 1998

2) Imposition of additional Constraints on the Macro and Sectoral GDP Growth Rates for the 1st Period

(i) Macro GDP growth rate constraint for the 1st period:

$$\frac{v_1 X_1}{v_0 X_0} - 1 = 0.058 = 5.8(\%) \qquad (3\text{-}2)$$

(ii) Sectoral GDP growth rates constraints for the 1st period:

The value added as a whole of the 1st period will be decreased from that of the base case 4, as much as

$$\frac{v_1 X_1^{(Case4)} - v_1 X_1}{v_1 X_1^{(Case4)}} = 1 - \frac{1.058 \cdot v_0 X_0}{1.076 \cdot v_0 X_0} = 1 - \frac{1.058}{1.076} = -1.67(\%) \qquad (3\text{-}3)$$

$$\frac{v_1^i X_1^{i,(Case4)} - v_1^i X_1^i}{v_1^i X_1^{i,(Case4)}} = 1 - \frac{(1+\dot{Y}_1^i)\cdot v_0^i X_0^i}{(1+\dot{Y}_1^{i,(Case4)})\cdot v_0^i X_0^i} = 1 - \frac{1.058}{1.076} \qquad (3\text{-}4)$$

The GDP growth rate of the i-th sector for the 1st period $\dot{Y}_1^i$ become

$$Y_1^i = Y_1^{i,(Case4)} \cdot \frac{1.058}{1.076} \qquad (3\text{-}5)$$

For the bandwidth of the sectoral GDP growth rates, we added $\pm 4\%$ for the above-calculated estimate.

$$\dot{Y}_1^i - 0.04 \le \frac{v_1^i X_1^i}{v_0^i X_0^i} - 1 \le \dot{Y}_1^i + 0.04 \qquad (3\text{-}6)$$

Since the sectoral value added ratios relative to the outputs are parameters, we may impose bandwidth constraints on the outputs as follows.

$$\frac{v_0^i X_0^i\left(1+\dot{Y}_1^i-0.04\right)}{v_1^i} \le X_1^i \le \frac{v_0^i X_0^i\left(1+\dot{Y}_1^i+0.04\right)}{v_1^i} \qquad (3\text{-}7)$$

Table 3-2 GDP Growth Rate at 1st Period by Sector

Sector	$\dot{Y}_1^i$	Bounds on Growth Rate		Case 4
		Lower (-4%)	Upper (+4%)	
1.Farm food	1.5	0.5	2.5	3.2
2.Estate crops	2.0	1.0	3.0	3.7
3.Livestock	4.5	3.5	5.5	6.2
4.Forestry	5.3	4.3	6.3	7.1
5.Fishery	11.0	10.0	12.0	12.9
6.Oil & Gas	-2.7	-3.7	-1.7	-1.0
7.Non Oil, Gas	8.1	7.1	9.1	10.0
8.Food	4.2	3.2	5.2	6.0
9.Textile	9.9	8.9	10.9	11.7
10.Wood	3.7	2.7	4.7	5.5
11.Paper	13.5	12.5	14.5	15.5
12.Chemical	11.1	10.1	12.1	13.0
13.Non Metallic	1.1	0.1	2.1	2.8
14.Iron & steel	13.9	12.9	14.9	15.9
15.Non Ferrous metal	19.8	18.8	20.8	21.8
16.Fabricated Metal	10.3	9.3	11.3	12.1
17.Machinery	20.2	19.2	21.2	22.2
18.Transport Equip	17.0	16.0	18.0	19.0
19.Oth manufacturing	28.4	27.4	29.4	30.6
20.Elec.Gas,Water	15.0	14.0	16.0	16.9
21.Construction	5.0	4.0	6.0	6.8
22.Trade	4.8	3.8	5.8	6.6
23.Restaurant,Hotel	7.8	6.8	8.8	9.6
24.Transportation	7.6	6.6	8.6	9.4
25.Finance	7.3	6.3	8.3	9.2
27.Oth. Service	3.9	2.9	4.9	5.7
Total	5.8			7.6

Source: JICA Study Team

(2) Pass-through Effects and Exchange Rate Simulation

1) Concept of Pass-through

Before considering next amendment, we should discuss an important concept of Pass-through in empirical study.

At base year, a TV set which is priced at 500US$ in USA is imported. The exchange rate is 2,000Rp/$. Its importer takes a margin of 100%, and tries to sell at 2 million Rupiah in the market. Now, the exchange rate changes to 4,000Rp/$. The importer thinks that he can not sell at 4 million Rupiah price at the domestic market, so he reduces his margin to 50%, and sell it at 3 million Rp(= 500US$*4000Rp/$*1.5). The exchange rate increases by 100%, but imported price increases by only 50%. In this case, the degree of Pass-through is 50%. Formally, the Import Price(IMP) is determined by Foreign Price(Pf$) and the Exchange Rate(RATE) by:

$$IMP = (Pf\$)(RATE)^{\beta} \qquad (0 < \beta < 1) \qquad (3\text{-}8)$$

The degree of Pass-through (ß) degree depends on many factors: market-share of this specific commodity, degree of differentiation, monopoly power of dealer and others.

In a similar way, an exporter exports a machine of 40 million Rupiah at 20, 000US$ to a foreign market at the exchange rate of 2, 000Rp/$. And then the rate changes to 4,000Rp/$. He could sell it at 10, 000US$, but he wants to increase his margin keeping his dollar price. Supposing that he decides to sell it at 15,000US$ to a foreign market, the degree of Pass-through become 50%. Henceforth Domestic Price(Pd) and the Exchange Rate(RATE) decide the dollar Export Price(EXP).

$$EXP = (Pd)/(RATE)^{\gamma} \qquad (0 < \gamma < 1) \qquad (3\text{-}9)$$

The existence incomplete Pass-through effect ($0<\beta, r<1$) is an important factor to explain why the variability of actual export and import price are less than that of exchange rate. And also explain why the relationship between the real exchange rate and the terms-of-trade or the balance-of-trade is not as high as expected. Yang(1997) showed that for US manufacturing import, the degree of Pass-through is 0.2-0.6 for various sub-sectors. According to our calculation, the Pass-through coefficients of Indonesia differ from sector by sector, but on the average, such coefficients are about 0.8 for exports and 0.2 for imports.

2) Nominal Foreign Currency Constraint

Before analyzing the effects of changes in exchange rate on the import and export prices, we need to define foreign currency constraint in an explicit nominal expression. The nominal foreign currency constraint in terms of Rupiah and US dollars are expressed as follows:

< Nominal Balance of Payments >

$$BP_{nominal}^{(Rp)} = \left(\frac{EXP_t^{(Rp)}}{EXP_{93}^{(Rp)}}\right) E_t^{(93\,Price)} - \left(\frac{IMP_t^{(Rp)}}{IMP_{93}^{(Rp)}}\right) M_t^{(93\,Price)} \tag{3-10}$$

IMP: Import Price

$$BP_{nominal}^{(\$)} = RATE_t^{(\$/Rp)} \left(\left(\frac{EXP_t^{(Rp)}}{EXP_{93}^{(Rp)}}\right) E_t^{(93\,Price)} - \left(\frac{IMP_t^{(Rp)}}{IMP_{93}^{(Rp)}}\right) M_t^{(93\,Price)} \right) \tag{3-11}$$

EXP: Export Price

Note: The current foreign currency constraints defined in IOPM are also a nominal expression in terms of US$. This may be seen as follows.

< Current Foreign Currency Constraints >

$$RATE_0^{(\$/Rp)} (P_e)_t E_t^{(93\,Price)} - RATE_0^{(\$/Rp)} (P_m)_t M_t^{(93\,Price)} \geq 0 \tag{3-12}$$

writing $(P_e)_t$ *and* $(P_m)_t$ explicitly,

$$\Rightarrow RATE_0^{(\$/Rp)} \left(\left(\frac{EXP_t^{(\$)}}{EXP_0^{(\$)}}\right) E_t^{(93\,Price)} - \left(\frac{IMP_t^{(\$)}}{IMP_0^{(\$)}}\right) M_t^{(93\,Price)} \right) \geq 0 \tag{3-13}$$

$$\Rightarrow RATE_0^{(\$/Rp)} \left(\frac{RATE_t^{(\$/Rp)}}{RATE_0^{(\$/Rp)}}\right) \left(\left(\frac{EXP_t^{(Rp)}}{EXP_0^{(Rp)}}\right) E_t^{(93\,Price)} - \left(\frac{IMP_t^{(Rp)}}{IMP_0^{(Rp)}}\right) M_t^{(93\,Price)} \right) \geq 0 \tag{3-14}$$

$$\Rightarrow RATE_0^{(\$/Rp)} \frac{BP_{nominal}^{(\$)}}{RATE_0^{(\$/Rp)}} \geq 0 \tag{3-15}$$

$$\Rightarrow BP_{nominal}^{(\$)} \geq 0 \tag{3-16}$$

We denote the foreign currency constraint in explicit nominal formulation as follows:

$$RATE_t^{(\$/Rp)}\left(\left(\frac{EXP_t^{(Rp)}}{EXP_{93}^{(Rp)}}\right)E_t^{(93\,Price)} - \left(\frac{IMP_t^{(Rp)}}{IMP_{93}^{(Rp)}}\right)M_t^{(93\,Price)}\right) \geq R_t \tag{3-17}$$

$$R_t = R_{t-1} + RATE_{t-1}^{(\$/Rp)}\left(\left(\frac{EXP_{t-1}^{(Rp)}}{EXP_{93}^{(Rp)}}\right)E_{t-1}^{(93\,Price)} - \left(\frac{IMP_{t-1}^{(Rp)}}{IMP_{93}^{(Rp)}}\right)M_{t-1}^{(93\,Price)}\right) \tag{3-18}$$

3) Changes in Exchange Rate and Import/Export Prices in Rupiah Term

(i) Pass-through effects

The Pass-through effects is defined and measured by the following expression:

a) Imports:

$$\left(P_m\right)_t^{(Rp)} = \frac{IMP_t^{(Rp)}}{IMP_0^{(Rp)}} = \frac{IMP_t^{(\$)}}{IMP_0^{(\$)}} \cdot \left(\frac{RATE_t^{(Rp/\$)}}{RATE_0^{(Rp/\$)}}\right)^{\beta^{(IM)}} \tag{3-19}$$

β : Pass-through Coefficients

b) Exports:

$$\left(P_e\right)_t^{(Rp)} = \frac{EXP_t^{(Rp)}}{EXP_0^{(Rp)}} = \frac{EXP_t^{(\$)}}{EXP_0^{(\$)}} \cdot \left(\frac{RATE_t^{(\$/Rp)}}{RATE_0^{(\$/Rp)}}\right)^{\beta^{(EX)}} = \frac{EXP_t^{(\$)}}{EXP_0^{(\$)}} \Bigg/ \left(\frac{RATE_t^{(Rp/\$)}}{RATE_0^{(Rp/\$)}}\right)^{\beta^{(EX)}} \tag{3-20}$$

(ii) Method for estimation of Pass-through Coefficients(β)

[Example: Case of Import Prices]

We calculate β for 1985-1990 and for 1990-1993 and 1985-1993 by the Import price index in Rupiah term, and then take the mean of the three figures.

$$\beta^{(IM)} = \left(\beta_{85->90}^{(IM)} + \beta_{90->93}^{(IM)} + \beta_{85->93}^{(IM)}\right)/3 \tag{3-21}$$

$$\beta_{85->90}^{(IM)} = \left(\ln\left(\frac{IMP_{90}^{(Rp)}}{IMP_{85}^{(Rp)}}\right) - \ln\left(\frac{IMP_{90}^{(\$)}}{IMP_{85}^{(\$)}}\right)\right) \Bigg/ \ln\left(\frac{RATE_{90}^{(Rp/\$)}}{RATE_{85}^{(Rp/\$)}}\right) \tag{3-22}$$

$$\beta_{90->93}^{(IM)} = \left(\ln\left(\frac{IMP_{93}^{(Rp)}}{IMP_{90}^{(Rp)}}\right) - \ln\left(\frac{IMP_{93}^{(\$)}}{IMP_{90}^{(\$)}}\right)\right) \Bigg/ \ln\left(\frac{RATE_{93}^{(Rp/\$)}}{RATE_{90}^{(Rp/\$)}}\right) \tag{3-23}$$

$$\beta_{85->93}^{(IM)} = \left(\ln\left(\frac{IMP_{93}^{(Rp)}}{IMP_{85}^{(Rp)}}\right) - \ln\left(\frac{IMP_{93}^{(\$)}}{IMP_{85}^{(\$)}}\right)\right) \Bigg/ \ln\left(\frac{RATE_{93}^{(Rp/\$)}}{RATE_{85}^{(Rp/\$)}}\right) \tag{3-24}$$

Table 3-3 Pass-through Coefficients

(1) Import: $\beta^{(IM)}$

Sector	$\beta^{(IM)}$={ln(Pm$^{(Rp)}$)-n(Pm$^{(\$)}$)}/ln(rate) 1985-1990	1990-1993	1985-1993	Average	$\beta^{(IM)}$ for Simulation
1	0.0288	0.2038	0.0633	0.0986	0.0986
2	3.0663	0.0374	2.4686	1.8574	0.0374
3	0.0217	0.0359	0.0245	0.0274	0.0274
4	0.1108	0.0213	0.0932	0.0751	0.0751
5	0.2371	0.1058	0.2112	0.1847	0.1847
6	0.0167	0.0003	0.0134	0.0101	0.0101
7	-0.0040	0.0717	0.0110	0.0262	0.0262
8	-0.5638	0.1479	-0.4233	-0.2797	0.1479
9	-1.6277	0.6724	-1.1738	-0.7097	0.6724
10	0.2284	0.2807	0.2387	0.2493	0.2493
11	-0.1579	1.3079	0.1313	0.4271	0.4271
12	0.0460	0.2798	0.0921	0.1393	0.1393
13	-0.2775	0.6651	-0.0915	0.0987	0.0987
14	-0.8252	0.6877	-0.5266	-0.2214	0.6877
15	0.1024	0.2074	0.1232	0.1443	0.1443
16	-0.4784	2.4975	0.1089	0.7094	0.7094
17	0.5975	-1.6796	0.1482	-0.3113	0.1482
18	0.6374	-2.2127	0.0750	-0.5001	0.0750
19	-0.2094	1.4737	0.1227	0.4623	0.4623
Total	-0.0020	0.5109	0.0992	0.2027	0.2027

(2) Export: $\beta^{(EX)}$

sector	$\beta^{(EX)}$={ln(Pe$^{(Rp)}$)-ln(Pe$^{(\$)}$)}/ln(rate) 1985-1990	1990-1993	1985-1993	Average	$\beta^{(EX)}$ for Simulation
1	-0.5663	0.0000	-0.4545	-0.3403	0.8101
2	-1.4265	0.0000	-1.1450	-0.8572	0.8101
3	0.0000	-0.0040	-0.0008	-0.0016	0.8101
4	0.0000	0.0000	0.0000	0.0000	0.8101
5	1.4659	0.0000	1.1767	0.8809	0.8809
6	0.8686	0.0000	0.6972	0.5219	0.8101
7	-1.1194	0.0000	-0.8985	-0.6726	0.8101
8	1.7868	0.0000	1.4342	1.0737	0.8101
9	0.2450	1.2918	0.4515	0.6628	0.6628
10	1.0513	1.6431	1.1681	1.2875	0.8101
11	0.0000	0.0000	0.0000	0.0000	0.8101
12	-0.4236	-0.2546	-0.3903	-0.3562	0.8101
13	-0.7485	0.0000	-0.6008	-0.4497	0.8101
14	0.0000	0.0000	0.0000	0.0000	0.8101
15	0.9183	-5.1531	-0.2797	-1.5048	0.8101
16	0.0000	0.0000	0.0000	0.0000	0.8101
17	0.0000	0.0000	0.0000	0.0000	0.8101
18	4.3971	4.6310	4.4433	4.4905	0.8101
19	-1.8693	0.0000	-1.5004	-1.1232	0.8101
Total	1.2277	0.1815	1.0212	0.5101	0.8101

Source: JICA Study Team

(iii) Extrapolation of Import/Export Prices in Rupiah Base Using β

Since the foreign currency constraint is defined in nominal terms, we can rewrite it in explicit form as follows:

$$BP^{(\$)}_{nominal} = RATE^{(\$/Rp)}_{t}\left(\left(\frac{EXP^{(Rp)}_{t}}{EXP^{(Rp)}_{93}}\right)E_{93Price} - \left(\frac{IMP^{(Rp)}_{t}}{IMP^{(Rp)}_{93}}\right)M_{93Price}\right) \geq 0 \qquad (3\text{-}25)$$

The required data for this constraint other than parameters β's are

a) Exchange rate at period t

b) Import price index for period t in Rupiah base (1993=100)

c) Export price index for period t in Rupiah base (1993=100)

However, future exchange rates are exogenously given as scenarios in this simulation, we only need future import/export price indices in Rupiah term. The changes in the import/export price indices in Rupiah term from period t to period t+1 is estimated from the following equation using β, the exchange

rates given for the periods t and t+1 and the import/export price indices in US$ re-estimated from the linear regression extrapolation after excluding outeriors.

$$\frac{IMP_{t+1}^{(Rp)}}{IMP_t^{(Rp)}} = \left(\frac{IMP_{t+1}^{(\$)}}{IMP_t^{(\$)}}\right) \cdot \left(\frac{RATE_{t+1}^{(Rp/\$)}}{RATE_t^{(Rp/\$)}}\right)^{\beta^{(IM)}} \tag{3-26}$$

$$\frac{EXP_{t+1}^{(Rp)}}{EXP_t^{(Rp)}} = \left(\frac{EXP_{t+1}^{(\$)}}{EXP_t^{(\$)}}\right) \Bigg/ \left(\frac{RATE_{t+1}^{(Rp/\$)}}{RATE_t^{(Rp/\$)}}\right)^{\beta^{(EX)}} \tag{3-27}$$

The above equation, however, gives only the rate of changes in import/export price indices, while what we need are the level of indices with 1993=1. We figure them in a following manipulation.

[Example: Case of Import Price Index]

$$\frac{IMP_{1Period}^{(Rp)}}{IMP_{93}^{(Rp)}} = \left(\frac{IMP_{1Period}^{(\$)}}{IMP_{93}^{(\$)}}\right) \cdot \left(\frac{RATE_{1Period}^{(Rp/\$)}}{RATE_{93}^{(Rp/\$)}}\right)^{\beta^{(IM)}}$$

$$\frac{IMP_{2Period}^{(Rp)}}{IMP_{1Period}^{(Rp)}} = \left(\frac{EXP_{2Period}^{(\$)}}{EXP_{1Period}^{(\$)}}\right) \cdot \left(\frac{RATE_{2Period}^{(Rp/\$)}}{RATE_{1Period}^{(Rp/\$)}}\right)^{\beta^{(IM)}}$$

$$\vdots$$

$$\vdots$$

$$\frac{IMP_{5Period}^{(Rp)}}{IMP_{4Period}^{(Rp)}} = \left(\frac{EXP_{5Period}^{(\$)}}{EXP_{4Period}^{(\$)}}\right) \cdot \left(\frac{RATE_{5Period}^{(Rp/\$)}}{RATE_{4Period}^{(Rp/\$)}}\right)^{\beta^{(IM)}}$$

We have,

$$\left(P_m\right)_{1Period} = \frac{IMP_{1Period}^{(Rp)}}{IMP_{93}^{(Rp)}} \tag{3-28}$$

$$\left(P_m\right)_{2Period} = \frac{IMP_{2Period}^{(Rp)}}{IMP_{93}^{(Rp)}} = \frac{IMP_{1Period}^{(Rp)}}{IMP_{93}^{(Rp)}} \cdot \frac{IMP_{2Period}^{(Rp)}}{IMP_{1Period}^{(Rp)}} = \left(P_m\right)_{1Period} \cdot \frac{IMP_{2Period}^{(Rp)}}{IMP_{1Period}^{(Rp)}} \tag{3-29}$$

$$\vdots$$

$$\left(P_m\right)_{5Period} = \frac{IMP_{5Period}^{(Rp)}}{IMP_{93}^{(Rp)}} = \frac{IMP_{1Period}^{(Rp)}}{IMP_{93}^{(Rp)}} \cdot \frac{IMP_{2Period}^{(Rp)}}{IMP_{1Period}^{(Rp)}} \cdots \frac{IMP_{5Period}^{(Rp)}}{IMP_{4Period}^{(Rp)}} = \left(P_m\right)_{4Period} \cdot \frac{IMP_{5Period}^{(Rp)}}{IMP_{4Period}^{(Rp)}}$$

(3-30)

Table 3-4 Price Indices (Rupiah Base) in CaseB1-17

(1) Import Price Indices (Rupiah Base)

Sector	1st period	2nd period	3rd period	4th period	5th period
1	1.25982	1.62329	1.95660	2.28991	2.62321
2	1.24074	1.61642	1.98092	2.34542	2.70992
3	1.18906	1.48471	1.77254	2.06036	2.34819
4	1.30149	1.75405	2.18295	2.61185	3.04075
5	1.35859	1.82851	2.23689	2.64527	3.05364
6	1.09436	1.25163	1.40889	1.56616	1.72343
7	1.21816	1.56364	1.90142	2.23920	2.57699
8	1.28094	1.64263	1.95805	2.27347	2.58889
9	1.86940	2.85862	3.52064	4.18265	4.84466
10	1.45881	2.05768	2.56666	3.07563	3.58461
11	1.63839	2.41992	3.02470	3.62947	4.23425
12	1.41731	2.02558	2.58568	3.14578	3.70588
13	1.51106	2.30927	3.07129	3.83331	4.59532
14	1.85891	2.80678	3.42123	4.03568	4.65013
15	1.34487	1.82202	2.25180	2.68157	3.11135
16	1.86152	2.78749	3.36815	3.94881	4.52947
17	1.33647	1.79587	2.20690	2.61793	3.02897
18	1.23323	1.56881	1.88199	2.19518	2.50836
19	1.61570	2.31774	2.83027	3.34279	3.85532
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000
23	1.30318	1.65874	1.94937	2.24000	2.53063
24	1.30318	1.65874	1.94937	2.24000	2.53063
25	1.30318	1.65874	1.94937	2.24000	2.53063
27	1.30318	1.65874	1.94937	2.24000	2.53063

(2) Export Price Indices (Rupiah Base)

Sector	1st period	2nd period	3rd period	4th period	5th period
1	0.66640	0.64197	0.73524	0.82850	0.92177
2	0.70770	0.73264	0.88257	1.03251	1.18244
3	0.75141	0.82863	1.03856	1.24848	1.45841
4	0.73759	0.79828	0.98925	1.18021	1.37117
5	0.72274	0.78821	0.99134	1.19446	1.39759
6	0.65416	0.61509	0.69155	0.76801	0.84447
7	0.73960	0.80269	0.99641	1.19012	1.38384
8	0.69537	0.70558	0.83861	0.97163	1.10465
9	0.82343	0.93897	1.17555	1.41213	1.64870
10	0.73954	0.80255	0.99618	1.18981	1.38343
11	0.75775	0.84255	1.06119	1.27982	1.49845
12	0.66191	0.63211	0.71922	0.80632	0.89342
13	0.72966	0.78086	0.96093	1.14101	1.32108
14	0.73224	0.78654	0.97016	1.15378	1.33740
15	0.73361	0.78955	0.97505	1.16055	1.34605
16	0.69475	0.70422	0.83640	0.96857	1.10074
17	0.67155	0.65327	0.75359	0.85392	0.95424
18	0.74269	0.80947	1.00742	1.20538	1.40333
19	0.74151	0.80688	1.00322	1.19956	1.39589
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.74423	0.81286	1.01293	1.21300	1.41308
23	0.74423	0.81286	1.01293	1.21300	1.41308
24	0.74423	0.81286	1.01293	1.21300	1.41308
25	0.74423	0.81286	1.01293	1.21300	1.41308
27	0.74423	0.81286	1.01293	1.21300	1.41308

Table 3-5 Price Indices (Rupiah Base) in both CaseB1-44 and CaseB1-46

(1) Import Price Indices (Rupiah Base)

Sector	1st period	2nd period	3rd period	4th period	5th period
1	1.25982	1.62329	1.96622	2.31249	2.66212
2	1.24074	1.61642	1.98461	2.35417	2.72510
3	1.18906	1.48471	1.77495	2.06598	2.35779
4	1.30149	1.75405	2.19112	2.63144	3.07502
5	1.35859	1.82851	2.25753	2.69433	3.13899
6	1.09436	1.25163	1.40889	1.56616	1.72343
7	1.21816	1.56364	1.90390	2.24536	2.58710
8	1.28094	1.64263	1.97251	2.30718	2.64668
9	1.86940	2.85862	3.64040	4.47207	5.35610
10	1.45881	2.05768	2.59869	3.15287	3.72049
11	1.63839	2.41992	3.08966	3.78704	4.51295
12	1.41731	2.02558	2.60366	3.18969	3.78374
13	1.51106	2.30927	3.08640	3.87113	4.66351
14	1.85891	2.80678	3.54032	4.32152	5.15282
15	1.34487	1.82202	2.26803	2.72036	3.17910
16	1.86152	2.78749	3.48914	4.23760	5.03533
17	1.33647	1.79587	2.22323	2.65682	3.09670
18	1.23323	1.56881	1.88903	2.21162	2.53659
19	1.61570	2.31774	2.89612	3.50017	4.13076
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000
23	1.30318	1.65874	1.96913	2.28564	2.60836
24	1.30318	1.65874	1.96913	2.28564	2.60836
25	1.30318	1.65874	1.96913	2.28564	2.60836
27	1.30318	1.65874	1.96913	2.28564	2.60836

(2) Export Price Indices (Rupiah Base)

Sector	1st period	2nd period	3rd period	4th period	5th period
1	0.66640	0.64197	0.70619	0.76434	0.81679
2	0.70770	0.73264	0.84771	0.95255	1.04778
3	0.75141	0.82863	0.99753	1.15180	1.29232
4	0.73759	0.79828	0.95017	1.08881	1.21501
5	0.72274	0.78821	0.94883	1.09423	1.22541
6	0.65416	0.61509	0.66423	0.70853	0.74830
7	0.73960	0.80269	0.95705	1.09795	1.22623
8	0.69537	0.70558	0.80548	0.89638	0.97885
9	0.82343	0.93897	1.13742	1.32200	1.49342
10	0.73954	0.80255	0.95683	1.09766	1.22588
11	0.75775	0.84255	1.01927	1.18070	1.32779
12	0.66191	0.63211	0.69080	0.74387	0.79167
13	0.72966	0.78086	0.92297	1.05264	1.17062
14	0.73224	0.78654	0.93183	1.06442	1.18508
15	0.73361	0.78955	0.93653	1.07067	1.19275
16	0.69475	0.70422	0.80336	0.89356	0.97538
17	0.67155	0.65327	0.72382	0.78778	0.84556
18	0.74269	0.80947	0.96763	1.11203	1.24351
19	0.74151	0.80688	0.96359	1.10666	1.23692
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.74423	0.81286	0.97292	1.11906	1.25214
23	0.74423	0.81286	0.97292	1.11906	1.25214
24	0.74423	0.81286	0.97292	1.11906	1.25214
25	0.74423	0.81286	0.97292	1.11906	1.25214
27	0.74423	0.81286	0.97292	1.11906	1.25214

Note: To measure Pass-through effects, we need Import/Export Price Indices in terms of US$ and Rupiah and also need Exchange Rate. The sources of data we utilized are as follows:

a) Import Price Index (US$): This Data obtained from LPEM.

b) Export price index (US$): This Data obtained from LPEM.

c) Import Price Index (Rupiah): Constructed from the import column (409) of nominal (current price) I-O Tables of 1985, 90, 93 and from corresponding 1993 constant price I-O Tables of 1985, 90, 93.

d) Export Price Index (Rupiah): Constructed from the export columns (305+306) of nominal (current price) I-O Tables of 1985, 90, 93 and from corresponding 1993 constant price I-O Tables of 1985, 90, 93.

e) Exchange rates: IMF

4) The Exchange Rate and the Import/Export Prices in Rupiah Term for the 1st Period

We assume exchange rate for 1998 at 10,000Rp/$, and then the average exchange rate of the 1st period is 3,934Rp/$:

Table 3-6 Exchange Rate (Rp/$)

Year	Rp/$
1994	2161
1995	2249
1996	2342
1997	2917
1998	10000
Average	3934

Source: IMF

Then the 1st period exchange rate for the foreign currency constraints is 3,934Rp/$, and the import/export price indices in Rupiah term can will be calculated as follows:

$$\frac{IMP^{(Rp)}_{1Period}}{IMP^{(Rp)}_{93}} = \left(\frac{IMP^{(\$)}_{1Period}}{IMP^{(\$)}_{93}}\right)\cdot\left(\frac{RATE^{(Rp/\$)}_{1Period}}{RATE^{(Rp/\$)}_{93}}\right)^{\beta^{(IM)}} \qquad (3\text{-}31)$$

$$\frac{EXP^{(Rp)}_{1Period}}{EXP^{(Rp)}_{93}} = \left(\frac{EXP^{(\$)}_{1Period}}{EXP^{(\$)}_{93}}\right)\Bigg/\left(\frac{RATE^{(Rp/\$)}_{1Period}}{RATE^{(Rp/\$)}_{93}}\right)^{\beta^{(EX)}} \qquad (3\text{-}32)$$

Note: $IMP^{(\$)}_{1Period}$, $EXP^{(\$)}_{1Period}$ are the mid-period year 1996 estimates from the linear extrapolation.

3.2.2 Optimum Solutions of National IOPM

(1) Assumption of Each Case

JICA Study Team tried to exercise some currency shock simulations by incorporating three points: 1) Initial Condition Adjustment Effect, 2) Relative Price Adjustment Effect, and 3) Trend Adjustment Effect. Under these assumptions, Case B1-17, Case B1-44 and Case B1-46 are assumed as currency shock simulation. These Cases are constructed from the standard base case of the Case4, with the macro GDP growth rate = 5.8 per cent of the 1st period combined with some scenarios of future exchange rates, and various cases of β and of sectoral export(import) upper-lower bounds.

1) Initial Condition Adjustment Effect

Since the period of Repelita VI is almost over, we tentatively assumed the real growth rate in 1998 as zero per cent, and so, the average growth rate in Repelita VI period(1994-98) turns out to be as 5.8 per cent. Naturally the sectoral growth rates may differ, and so we set an upper and lower ceiling for growth rate of each sector, which turns out the average growth rate about 5.8 per cent *. Before this adjustment, the original growth rate in Repelita VI is 7.5 and 7.6 per cent in Case 1 and in Case 4, respectively. The lower adjustment of the growth rate in Repelita VI implies a smaller investment for future development, which leads to a lower growth rate for Repelita VII period, and eventually a lower adjustment of average growth rate in PJP II period.

*The sectoral growth rate was constrained by 5.8 per cent plus or minus 4 per cent.

2) Relative Price Adjustment Effect

The future trends of export and import prices can be calculated by the formula (3-8) and (3-9). We first observed the past trends of (Pf), (Pd) and exchange rate, and then estimated the Pass-through coefficients for exports and imports. For projection work, we adopted (i) the average Pass-through coefficient for export except a few cases, because the estimates varied too greatly among sectors, but (ii) adopted different estimates by sectors for imports, because the estimates by sectors were in many cases reasonable.

We assumed two cases for future trends of exchange rate: In one case, we assumed a stable rate after the second period, and in the other case, a very small depreciation after second period, 1 per cent per year. The forecasted levels of exchange rates are as follows:

(i) Case B1-17: Exchange rates are assumed to depreciate from 3,934Rp/$(first period) to 5,000Rp/$(second period), but is pegged since then at 5,000Rp/$.

(ii) Case B1-44 and Case B1-46: Exchange rates assumed to depreciate from 3,934Rp/$(first period) to 5,000Rp/$(second period), and then, gradually depreciates until 5,805Rp/$(fifth period).

Table3-7 Two Cases for Future Trend of Exchange Rate (Unit: Rp/US$)

Case	1993	(R-VI)	(R-VII)	(R-VIII)	(R-IX)	(R-X)
CaseB1-17	2087	3934	5000	5000	5000	5000
CaseB1-44, CaseB1-46	2087	3934	5000	5255	5523	5805

3) Trend Adjustment Effect

The depreciation of exchange rate would result in the increase of competitive power of export, and increase in the export growth potential. Therefore, in simulations, the upper and lower ceilings of export and import growth are set wider than those of standard Case 4. Case B1-17 is set them only in the first period, while Case B1-44 and Case B1-46 are set them in the first period and after second period. The deference between Case B1-44 and Case B1-46 is width of the upper and lower ceilings.

(2) Results of Currency Shock Simulations

Summaries of simulation results are shown as following tables and figures. Case 4 in tables is the standard base case without currency shock.

Table 3-8 Annual Growth Rate of GDP in Each Case (Unit: %)

Case	0-1	1-2 (R-VII)	2-3 (R-VIII)	3-4 (R-IX)	4-5 (R-X)	0-5 Average
Case 4	7.6	8.4	8.9	8.8	9.2	8.6
B1-17	5.8	4.8	5.9	7.8	9.0	6.6
B1-44	5.8	4.7	6.1	7.7	8.9	6.6
B1-46	5.8	4.6	6.8	8.6	10.1	7.2

Source: JICA Study Team

Figure 3-1 Comparison of Currency Shock Cases with Standard Case 4

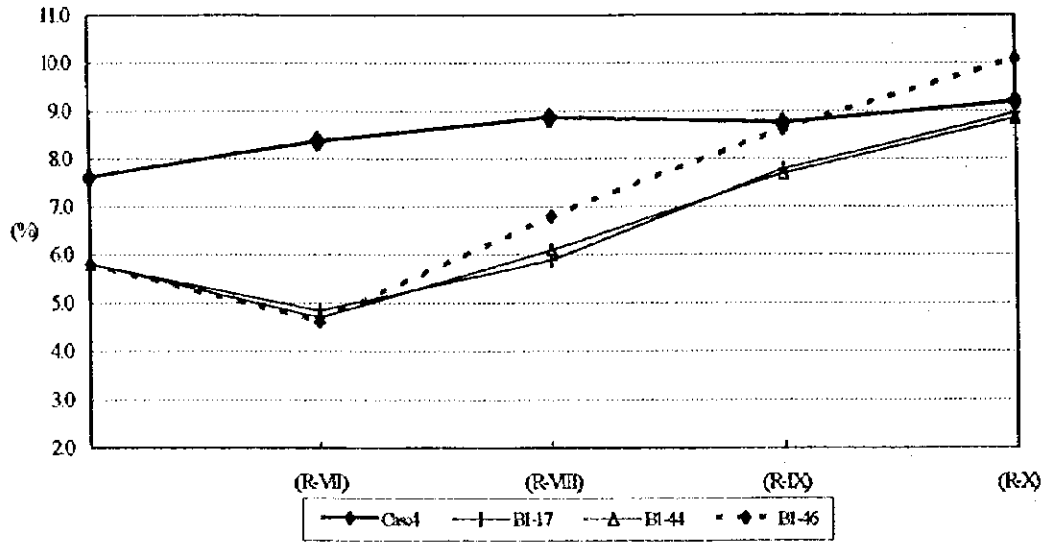


Table 3-9 Annual Growth Rate of GDP Component in Each Case (Unit: %)

	Case	0-1 (R-VI)	1-2 (R-VII)	2-3 (R-VIII)	3-4 (R-IX)	4-5 (R-X)	0-5 Average
Consumption	Case 4	7.5	7.8	8.1	7.5	7.6	7.7
	B1-17	2.0	3.6	4.0	6.4	8.1	4.8
	B1-44	2.0	3.4	4.0	5.2	8.0	4.5
	B1-46	2.0	3.3	3.9	5.1	8.2	4.5
Investment	Case 4	5.5	9.6	10.3	10.9	11.4	9.5
	B1-17	-2.5	0.3	12.4	11.7	10.9	6.4
	B1-44	-2.4	0.2	11.8	12.1	9.9	6.1
	B1-46	-2.3	0.1	14.1	13.7	11.7	7.2
Export	Case 4	7.0	7.2	8.5	8.8	9.3	8.1
	B1-17	14.7	8.6	4.6	6.4	8.2	8.4
	B1-44	14.7	8.5	5.3	7.3	8.5	8.8
	B1-46	14.7	8.6	5.9	8.4	10.2	9.5
Import	Case 4	4.4	6.9	8.2	8.6	9.2	7.4
	B1-17	-1.8	3.2	4.5	6.6	8.2	4.1
	B1-44	-1.8	3.1	4.1	6.3	7.5	3.8
	B1-46	-1.8	3.1	4.8	7.5	9.2	4.5

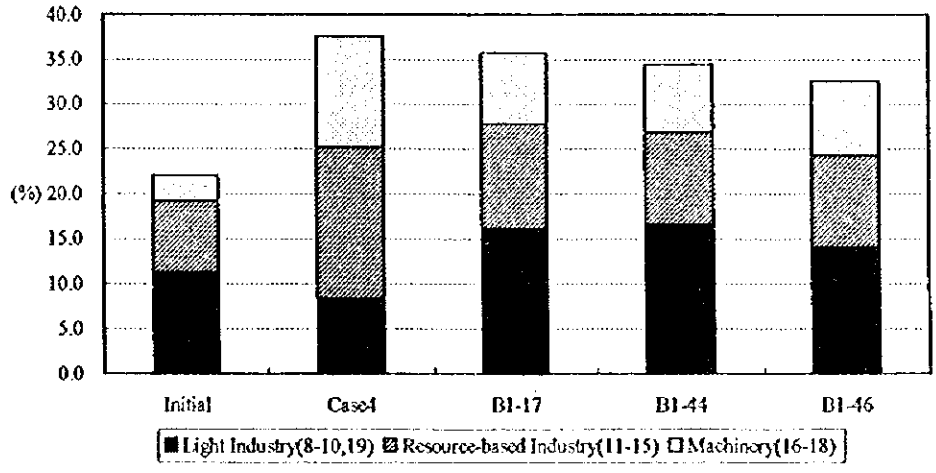
Source: JICA Study Team

Table 3-10 Sectoral Share of GDP at Final Period in Each Case (Unit: %)

Sector (IO Code)	Initial	Case 4	B1-17	B1-44	B1-46
Agriculture(1-5)	19.1	6.7	8.9	9.1	8.9
Mining(6-7)	10.9	3.8	4.4	3.0	3.1
Manufacturing(8-19)	22.0	37.6	35.7	34.4	32.5
Light Industry(8-10,19)	11.2	8.2	16.0	16.5	14.0
Resource-based Industry(11-15)	8.0	17.0	11.7	10.4	10.3
Machinery(16-18)	2.8	12.4	7.9	7.6	8.3
Electricity, Gas & Water(20)	0.9	1.8	1.3	1.3	1.3
Construction(21)	7.1	9.0	6.9	6.5	7.4
Services(22-27)	40.1	41.1	42.9	45.6	46.8
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: JICA Study Team

Figure 3-2 Manufacturing Share of GDP and its Components at Planning Period



(3) Observations

The differences between the past standard Case 4 and the recent simulations, Case B1-44 and Case B1-46 show the influences of recent currency shock in the followings:

1) Deterioration of Import Capacity

The currency shock resulted in a sharp depreciation of Rupiah against the US dollars, so that the import capacity aggravated greatly. In the standard Case 4, the growth rate of import was 4.4 and 6.9 per cent in Repelita VI and Repelita VII periods, respectively, but in the recent simulation for example, in Case B1-46, the import growth is (-)1.8 and 3.1 in two periods, and on the average near to zero. The huge depreciation of Rupiah occurred in first period also depressed the general import capacity throughout the PJP II period.

2) Decrease of Investment Activity

As the import dependence ratio of Indonesia is quite high, the decline of import capacity results in the decrease of investment through the shortage of machinery import and intermediate goods. The growth rate of investment was 5.5 and 9.6 per cent for Repelita VI and ReperitaVII periods, respectively, but it now decreased to (-)2.3 and 0.1 per cent in Case B1-46. Resulting in the investment activities virtually ceased in two periods. Although the growth rate recovers in later Repelitas, the average investment growth rate in PJP II period decreases from 9.5 per cent in Case 4 to 6.1 per cent or to 7.2 per cent in currency shock simulations.

3) Rapid Export Growth

The quick depreciation of Rupiah greatly improves the international competitiveness of export, so that the growth rate of export increases greatly in Repelita VI and Repelita VII periods. The growth rate would slow down in the later Repelita periods, because the supply capacity deteriorates due to the slowdown of investment activities in early Repelitas.

4) Deterioration of Consumption Level

The average growth rate of consumption in PJP II period decreased from 7.7 per cent in Case 4 to 4.8 per cent in Case B1-17 or to 4.5 per cent in Case B-1-44, Case B-1-46 respectively. This implies that the consumption becomes 4.461 times in Case 4, and 2.930 times in Case B1-17, and 2.707 times in Case B1-46. Generally speaking, the consumption level would decrease to about a half at the end of PJP II by current currency shock (or radical depreciation of Rupiah).

5) Lower Growth Rate

In the IOPM framework, the growth rate of GDP is determined from the demand side and also from the supply side. At the beginning, export will show a quicker growth, but import will stagnate by the high cost and investment and finally consumption would follow. From the supply side, the lowered capital stock will be constraint the industrial activities. As the result, the GDP growth rate would decrease in the early Repelita periods: 7.6 and 8.4 per cent in Repelita VI and Repelita VII in Case 4 to

5.8 and 4.6 per cent in Case B1-46. The average growth rate in PJP II period would also slow down from 8.6 per cent in Case 4 to 6.6 per cent in Case B1-17 and in Case B1-44, and to 7.2 per cent in Case B1-46. Based on these average growth rates, GDP becomes 5.399 times in Case 4, and 3.744 times in Case B-1-44 and 4.265 times in Case B-1-46. Case 4 projected that per capita GDP would attain 8,192,657 Rupiah by the end of PJP II period. If we use these figures as same condition as Case 4, per capita GDP would reach 5,222,225Rupiah in Case B1-44 and 5,948,136Rupiah in Case B1-46. In Case 4, per capita GDP figure is 5,541,926Rupiah by the end of Repelita IX period. It implies that the development of Indonesian economy would be retarded about six years.

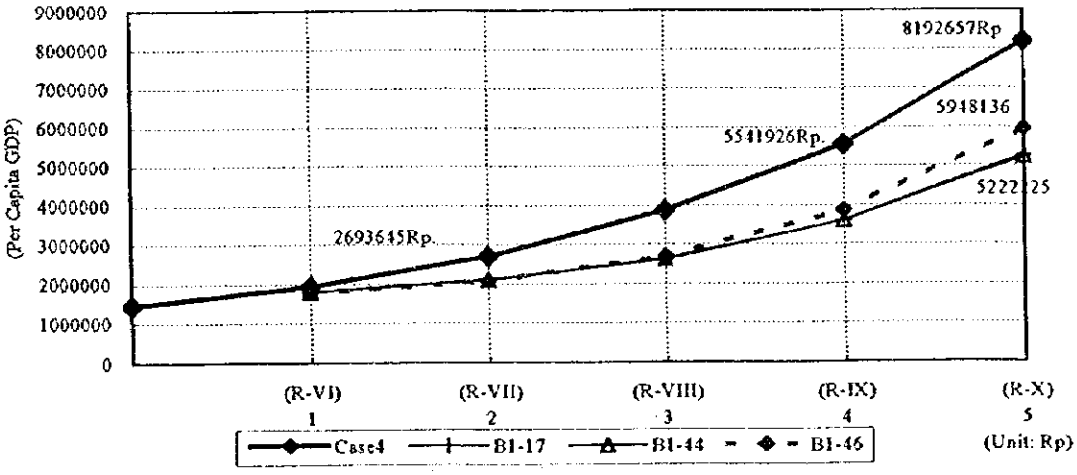
6) Enormous Development Efforts Needed

The level of per capita GDP of Indonesia was 295,317Rupiah in 1980. Now, depending on the average exchange rate in 1998, the per capita GDP in dollars would be greatly lowered to the level in Repelita III period. If we stick to the calculation in Case 4, and project that, it would reach to a similar level of a targeted figure by the end of Repelita IX (around 5,540,000Rupiah). The economy of Indonesia in PJP II period must be the following two:

(i) The quick recovery from the lowest level to the past highest level of 2,693,645Rupiah: This implies that the development equivalent to the achievement in Repelita III, Repelita IV, Repelita V, Repelita VI must be implemented quickly.

(ii) The further development scheduled in Repelita VII, Repelita VIII and Repelita IX must be efficiently realized.

Figure 3-3 Influences of Currency Crisis Shock



In a word, in the coming twenty years, Indonesia must achieve the economic development, which is equivalent to the ones scheduled in seven Repelitas from III to IX. In other words, the tasks of seven Repelitas must be implemented in only four Repelita periods. The accumulated hard and soft infrastructures, especially the improved human capital, are an important national asset when to tackle such a hard task.

3.3 Exercises by Two-Region IOPM

(1) Assumption of Currency Shock Simulations

JICA Study Team tried to exercise some currency shock simulations utilizing Two-Region IOPM in the same way as National IOPM by incorporating three points: 1) Initial Condition Adjustment Effect, 2) Relative Price Adjustment Effect, and 3) Trend Adjustment Effect.

After these simulations utilizing National IOPM were made, we received new information of GDP growth rate, exchange rate, and other current macro economic data. With these new information, the macro GDP growth rate of the 1st period utilizing in Two-Region IOPM is revised to 4.8 per cent.

A future trend of exchange rate is also revised. Exchange rate is now assumed to depreciate from 3,934Rp/$(first period) to 7,000Rp/$(second period), but is pegged since then at 7,000Rp/$. Based on this change, the Import price and Export price are re-estimated by using Path-through coefficient for currency shock simulations.

Under these assumptions, Case 1-1 of currency shock simulation is constructed from the standard base case of the Case 0-1. Conditions for Case 0-1 and Case 1-1 are shown respectively in the following tables.

Table 3-11 Revised GDP Growth Rate at 1st Period

	Two-Region IOPM			National IOPM	
Year	GDP Growth (%)	Source		GDP Growth (%)	Source
1994	7.5	BPS		7.5	BPS
1995	8.2	BPS		8.2	BPS
1996	8.0	BPS	(revised)	7.8	BPS
1997	4.7	BPS	(revised)	5.7	IDE
1998	-4.0	IMF	(revised)	0.0	IMF
Average	4.8			5.8	

Table 3-12 Future Trend of Exchange Rate (Unit: Rp/US$)

Case	1993	(R-VI)	(R-VII)	(R-VIII)	(R-IX)	(R-X)
Case 0-1	2087	2087	2087	2087	2087	2087
Case 1-1	2087	3934	7000	7000	7000	7000

Table 3-13 Price Indices(Rupiah Base) in Case 1-1

(1) Import Price Indices

Sector	1st period	2nd period	3rd period	4th period	5th period
1	1.25982	1.67806	2.02262	2.36718	2.71173
2	1.24074	1.63690	2.00602	2.37513	2.74425
3	1.18906	1.49844	1.78893	2.07941	2.36990
4	1.30149	1.79893	2.23881	2.67868	3.11856
5	1.35859	1.94574	2.38030	2.81486	3.24942
6	1.09436	1.25163	1.40889	1.56616	1.72343
7	1.21816	1.57750	1.91827	2.25905	2.59983
8	1.28094	1.72646	2.05798	2.38949	2.72101
9	1.86940	3.58438	4.41447	5.24456	6.07464
10	1.45881	2.23771	2.79122	3.34473	3.89824
11	1.63839	2.79391	3.49215	4.19039	4.88863
12	1.41731	2.12277	2.70975	3.29673	3.88371
13	1.51106	2.38723	3.17498	3.96272	4.75047
14	1.85891	3.53757	4.31201	5.08644	5.86087
15	1.34487	1.91269	2.36385	2.81501	3.26617
16	1.86152	3.53891	4.27610	5.01329	5.75047
17	1.33647	1.88768	2.31973	2.75177	3.18382
18	1.23323	1.60889	1.93008	2.25127	2.57246
19	1.61570	2.70785	3.30665	3.90544	4.50424
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.00000	0.00000	0.00000	0.00000	0.00000
23	1.30318	1.77580	2.08695	2.39809	2.70924
24	1.30318	1.77580	2.08695	2.39809	2.70924
25	1.30318	1.77580	2.08695	2.39809	2.70924
27	1.30318	1.77580	2.08695	2.39809	2.70924

(2) Export Price Indices

Sector	1st period	2nd period	3rd period	4th period	5th period
1	0.66640	0.48880	0.55982	0.63083	0.70185
2	0.70770	0.55784	0.67200	0.78617	0.90033
3	0.75141	0.63093	0.79077	0.95061	1.11045
4	0.73759	0.60782	0.75322	0.89863	1.04403
5	0.72274	0.58603	0.73705	0.88808	1.03910
6	0.65416	0.46833	0.52655	0.58477	0.64299
7	0.73960	0.61118	0.75868	0.90617	1.05367
8	0.69537	0.53724	0.63853	0.73981	0.84110
9	0.82343	0.75128	0.94057	1.12986	1.31915
10	0.73954	0.61107	0.75850	0.90593	1.05336
11	0.75775	0.64153	0.80800	0.97447	1.14094
12	0.66191	0.48130	0.54762	0.61394	0.68026
13	0.72966	0.59456	0.73167	0.86878	1.00589
14	0.73224	0.59888	0.73869	0.87850	1.01831
15	0.73361	0.60117	0.74241	0.88366	1.02490
16	0.69475	0.53620	0.63684	0.73748	0.83812
17	0.67155	0.49740	0.57379	0.65018	0.72657
18	0.74269	0.61634	0.76706	0.91779	1.06851
19	0.74151	0.61437	0.76387	0.91336	1.06285
20	0.00000	0.00000	0.00000	0.00000	0.00000
21	0.00000	0.00000	0.00000	0.00000	0.00000
22	0.74423	0.61892	0.77126	0.92360	1.07593
23	0.74423	0.61892	0.77126	0.92360	1.07593
24	0.74423	0.61892	0.77126	0.92360	1.07593
25	0.74423	0.61892	0.77126	0.92360	1.07593
27	0.74423	0.61892	0.77126	0.92360	1.07593

Source: JICA Study Team

Table 3-14 Comparison of Constraints for Currency Shock Simulation with Standard Case 0-1

Case	GDP Growth for the 1st Period	Export of Sector 22(Trade)
Case 0-1	None	None
Case 1-1	4.80%	**

Note: ** Export Growth rate of Sector 22(Trade) is pegged with import and export growth rate of combined sectors other than Sector 22(Trade) as shown in the following expression.

$$\frac{E_{22,t}^{Java}}{E_{22,0}^{Java}} = \frac{\sum_{i=1,i\neq 22}^{26}\left(E_{i,t}^{Java} + m_{i,t}^{Java,IM} a_{ij,t}^{JJ} X_{i,t}^{Java} + M_{i,t}^{Java,FD}\right)}{\sum_{i=1,i\neq 22}^{22}\left(E_{i,0}^{Java} + m_{i,0}^{Java,IM} a_{ij,0}^{JJ} X_{i,t}^{Java} + M_{i,0}^{Java,FD}\right)}$$

$$\frac{E_{22,t}^{Outside}}{E_{22,0}^{Outside}} = \frac{\sum_{i=1,i\neq 22}^{26}\left(E_{i,t}^{Outside} + m_{i,t}^{Outside,IM} a_{ij,t}^{OO} X_{i,t}^{Outside} + M_{i,t}^{Outside,FD}\right)}{\sum_{i=1,i\neq 22}^{22}\left(E_{i,0}^{Outside} + m_{i,0}^{Outside,IM} a_{ij,0}^{OO} X_{i,t}^{Outside} + M_{i,0}^{Outside,FD}\right)}$$

(2) Results of Currency Shock Simulations

Summaries of simulation results are shown as following tables and figures. Case 0-1 in tables is standard base case without currency shock.

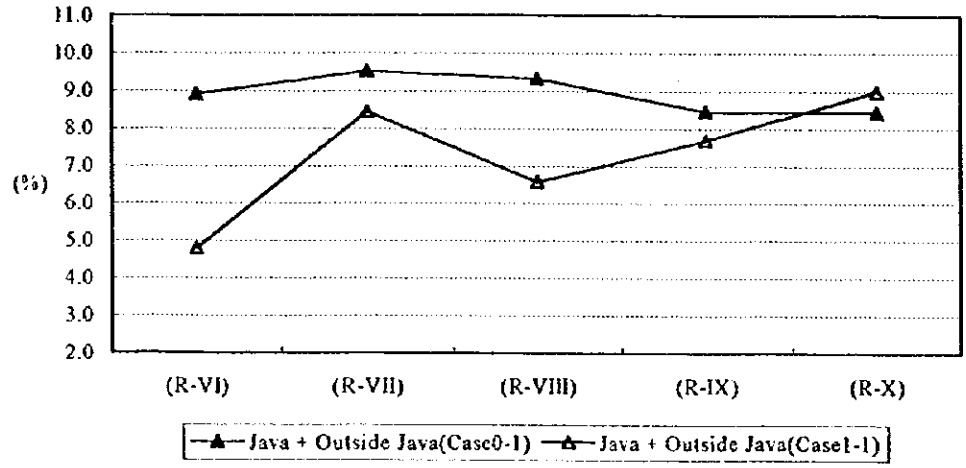
Table 3-15 Annual Growth Rate of GDP in Each Case (unit: %)

Case	Region	0-1 (R-VI)	1-2 (R-VII)	2-3 (R-VIII)	3-4 (R-IX)	4-5 (R-X)	0-5 Average
Case 0-1	Java	9.3	9.8	9.4	8.4	9.0	9.2
	Outside Java	8.3	9.0	9.2	8.6	7.5	8.5
	Java + Outside Java	8.9	9.5	9.3	8.5	8.4	8.9
Case 1-1	Java	2.2	6.1	3.9	4.3	6.7	4.6
	Outside Java	8.2	10.8	8.7	9.8	10.2	9.5
	Java + Outside Java	4.8	8.4	6.6	7.7	9.0	7.3

Source: JICA Study Team

Figure 3-4 Comparison of Currency Shock Case 1-1 with Standard Case 0-1

(1) Total (Java+Outside Java)



(2) By Region

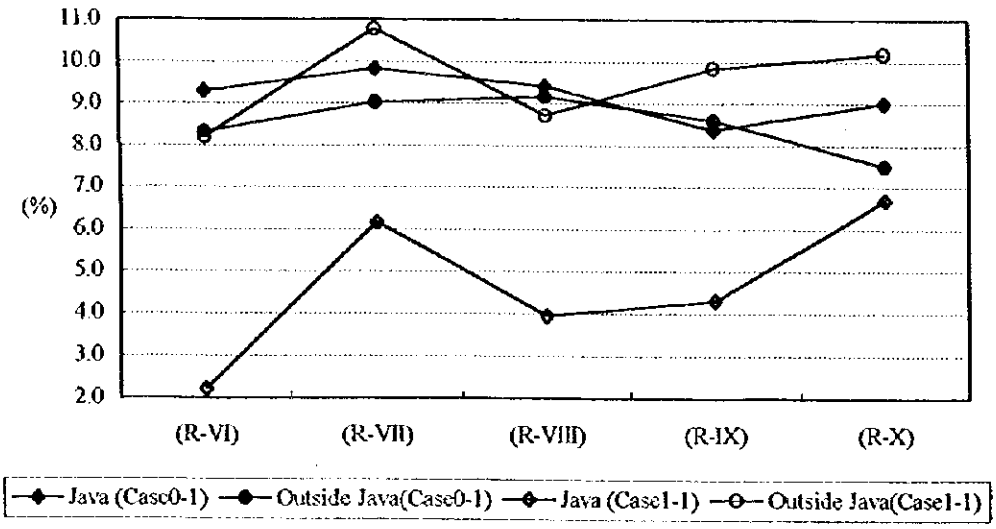


Table 3-16 Annual Growth Rate of GDP Composition in Each Case (unit: %)

	Case	Region	0-1 (R-VI)	1-2 (R-VII)	2-3 (R-VIII)	3-4 (R-IX)	4-5 (R-X)	0-5 Average
Consumption	Case 0-1	Java	7.0	9.3	8.2	7.9	7.9	8.1
		Outside Java	9.1	8.4	8.2	6.5	7.4	7.9
		Java + Outside Java	7.7	8.9	8.2	7.4	7.7	8.0
	Case 1-1	Java	2.0	2.0	2.6	2.8	6.7	3.2
		Outside Java	2.0	2.0	3.1	4.7	9.0	4.2
		Java + Outside Java	2.0	2.0	2.8	3.5	7.6	3.6
Investment	Case 0-1	Java	7.5	10.2	11.6	10.1	9.7	9.8
		Outside Java	9.5	9.6	9.0	9.4	9.8	9.5
		Java + Outside Java	8.2	10.0	10.7	9.9	9.7	9.7
	Case 1-1	Java	-33.3	38.0	-1.8	14.4	8.6	2.3
		Outside Java	9.3	5.4	9.6	9.9	10.8	9.0
		Java + Outside Java	-9.0	12.6	5.8	11.2	10.1	5.8
Export	Case 0-1	Java	7.3	8.2	8.3	4.6	10.1	7.7
		Outside Java	7.9	9.1	10.6	10.9	6.6	9.0
		Java + Outside Java	7.6	8.6	9.6	8.4	7.9	8.4
	Case 1-1	Java	10.5	5.2	5.9	-2.1	-3.4	3.1
		Outside Java	17.6	17.3	10.6	11.1	10.3	13.4
		Java + Outside Java	14.5	13.2	9.4	8.6	8.8	10.9
Import	Case 0-1	Java	5.5	7.8	8.7	8.0	8.5	7.7
		Outside Java	4.7	7.7	8.8	8.4	7.4	7.4
		Java + Outside Java	5.3	7.8	8.8	8.1	8.3	7.6
	Case 1-1	Java	-6.7	4.0	2.7	4.9	5.8	2.1
		Outside Java	2.2	8.3	9.0	8.9	8.1	7.3
		Java + Outside Java	-4.7	5.3	4.8	6.5	6.8	3.6

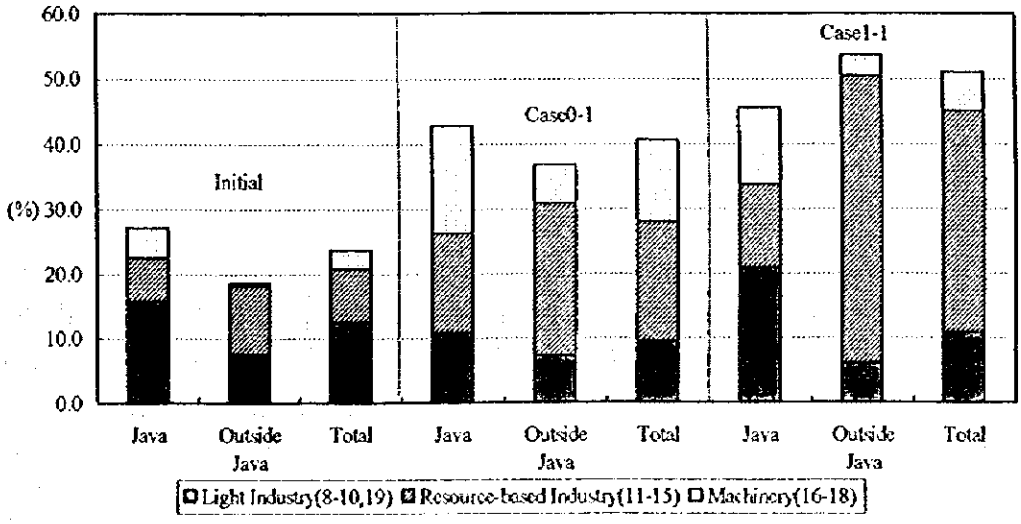
Source: JICA Study Team

Table 3-17 Sectoral Share of GDP at Final Period in Each Case (Unit: %)

Sector (IO Code)	Initial			Case 0-1			Case 1-1		
	Java	Outside Java	Total	Java	Outside Java	Total	Java	Outside Java	Total
Agriculture(1-5)	16.7	23.9	19.6	4.6	10.8	6.9	7.9	10.8	9.9
Mining(6-7)	2.4	21.9	10.3	1.0	14.6	6.0	0.9	4.1	3.1
Manufacturing(8-19)	27.1	18.6	23.7	42.8	36.8	40.6	45.5	53.6	51.0
Light Industry(8-10,19)	15.8	7.6	12.5	10.9	7.3	9.5	20.9	6.0	10.8
Resource-based Industry(11-15)	6.7	10.5	8.2	15.4	23.6	18.4	12.9	44.4	34.3
Machinery(16-18)	4.6	0.5	2.9	16.4	5.9	12.6	11.7	3.2	5.9
Electricity, Gas & Water(20)	1.5	0.5	1.1	2.0	0.8	1.6	1.7	0.6	0.9
Construction(21)	6.9	8.0	7.4	10.0	7.7	9.1	5.2	5.5	5.4
Services(22-27)	45.5	27.0	38.0	39.7	29.2	35.8	38.9	25.4	29.7
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: JICA Study Team

Figure 3-5 Manufacturing Share of GDP and Its Components at Planning Period



(3) Observation

The differences between the standard Case 0-1 and the recent simulations, Case 1-1 show the influences of recent currency shock in the followings:

1) Growth Rate of GDP

Case 1-1 shows the lower annual growth rate of GDP than that of Case 0-1, except that of "Outside Java". The average growth rate in PJP II period is 7.3 per cent in Case 1-1 as against 8.9 per cent in Case 0-1. By region, "Java" shows the growth rate of 4.6 per cent in Case 1-1 as against 9.2 per cent in Case 0-1, while "Outside Java" shows that of 9.5 per cent in Case 1-1 as against 8.5 per cent in Case 0-1. This shows the structure of Case 1-1 in which the growth of "Outside Java" offsets the decline of "Java" and leads the growth of the economy as a whole.

The growth rate of the economy as a whole during PJP II period shows the stable movement of about 9 per cent in Case 0-1. Meanwhile in Case 1-1, it shows a strong rebound to 8.4 per cent in Repelita VII from the low level of 4.8 per cent in Repelita VI, then declines to 6.6 per cent during Repelita VIII, followed by the trend of recovery to 7.7 per cent in Repelita IX and 9.0 per cent in the last period, which is higher than 8.4 per cent in the same period in Case 0-1.

2) Growth Rate of GDP component

Each demand component shows the similar trend as the result of National IOPM.

(i) Deterioration of Import Capacity

The currency shock resulted in a sharp depreciation of Rupiah against the US dollars, so that the import capacity aggravated greatly. In Case 1-1, its rate shows the minus growth of (-)4.7 per cent in Repelita VI, but recovers rapidly to 5.3 per cent in Repelita VII, after which, however, it shows only a little fluctuation. The average growth rate is 3.6 per cent in Case 1-1, much lower than that of Case 0-1, which is 7.6 per cent. The huge depreciation of Rupiah occurred in the first period also depressed the general import capacity throughout the PJP II period.

(ii) Rapid Export Growth

In contrast to Import, Export shows the favorable 10.9 per cent in Case 1-1 as against 8.4 per cent in Case 0-1. However, viewed as a whole, the growth rate is slowing down toward the latter half of PJP II period. The decline is particularly sharp in "Java". The growth rate would slow down in the later Repelita periods, because the supply capacity deteriorates due to the slowdown of investment activities in early Repelitas.

(iii) Fluctuation of Investment Activity

Sharp contrast between the movements of "Java" and "Outside Java" marks the feature of investment activity. While the latter shows the stable growth rate of about 10 per cent throughout PJP II period, the former shows the strong recovery to 38.0 per cent in Repelita VII from the substantial minus growth of (-)33.3 per cent in Repelita VI, followed by the sharp fluctuation throughout the plan period, showing (-)1.8 per cent, 14.4 per cent and 8.6 per cent in Repelita VIII, Repelita IX and Repelita X, respectively.

(iv) Deterioration of Consumption Level

The initial decline is steep, with 2 per cent both in Repelita VI and Repelita VII in Case 1-1 as against 7.7 per cent and 8.9 per cent in the same periods in Case 0-1. However, it shows a substantial recovery of 2.8 per cent, 3.5 per cent and 7.6 per cent from Repelita VIII, Repelita IX and Repelita X, respectively.

3) Sectoral Share of GDP

Two-Region IOPM, as well as National IOPM, gives a picture of the economic growth led by manufacturing industry. Share of manufacturing increases most in "Java" in Case 0-1 as standard case, in contrast to Case 1-1 as currency shock simulation, in which its share increases most in "Outside Java". By component of manufacturing sector, the feature of Case 0-1 is a steep growth of machinery in "Java", while in Case 1-1, Resource-based Industry in "Outside Java" shows a substantial growth.

References

Balkan, Erol M. (September 1992), "Political Instability, Country Risk and Probability of Default", *Applied Economics*, Vol.24, No.9, pp.999-1008.

Yang, Jiawen (February 1997), "Exchange Rate Pass-through in U.S. Manufacturing Industries", *The Review of Economics and Statistics*, Vol.79, No.1, pp.95-104.

Chapter 4

Selected Development Issues

4.1 Balance of Payments and External Debt

In this section, we consider balance of payments and debt problems in the context of planning model. Firstly, we discuss background of the problems and discuss several theoretical underpinnings. Secondly, we discuss a simulation model. Thirdly, we discuss probabilistic approaches. Fourthly, we discuss renewed concern about early warning system of currency crisis. A brief comment concludes this section.

4.1.1 Balance of Payments and External Debt during the Repelita VI period

The time series profile of the current account during the projected period is hump shaped. The current account worsens at first, but improves in the later period. The non-oil export growth is the main engine of the Repelita VI, and it is assumed to grow at 16.8% p.a. in dollar terms. The Oil and gas exports do not grow as much as non-oil export. The non-oil imports grow at 15% p.a. during the Repelita VI. Its elasticity to nominal GDP is 1.2. The following figures show the growth contribution of non-oil and oil and gas balance to the current account.

Table 4-1 Current Account of the Repelita VI

(unit: million dollar)

	93/94	94/95	95/96	96/97	97/98	98/99
Current Account	-2888	-3110	-3145	-3425	-3135	-2796
Non Oil/Gas	-5637	-5661	-5617	5388	-4872	-3885
Oil/Gas	2749	2551	2472	1693	1737	1089
Growth Contribution	93/94	94/95	95/96	96/97	97/98	98/99
Current Account		1%	-1%	-7%	-15%	-31%
Non Oil/Gas		7%	3%	16%	7%	21%
Oil/Gas		8%	1%	9%	-8%	-11%

The pattern of the non-oil export improves the current account in the later period, while oil and gas exports go to the opposite direction. In the final year, the current account improves by 11%, and this improvement can be decomposed into 31% improvements by non-oil and 21% deterioration by oil and gas.

Actual figures turns out as follows:

Table 4-2 Actual Current Account Figures

(unit: million dollar)

	93/94	94/95	95/96	96/97	97/98
Current Account	-2,940	-3,488	-6,987	-8,069	-3,603
Non Oil/Gas	-5,474	-7,275	-10,460	-12,606	-6,639
Oil/Gas	2,534	3,787	3,473	4,537	3,036
Growth Contribution	93/94	94/95	95/96	96/97	97/98
Current Account		19%	100%	15%	-55%
Non Oil/Gas		61%	91%	31%	-74%
Oil/Gas		-43%	9%	-15%	19%

To finance the current account, the capital movements must match the current account deficits. The Repelita VI assumes that net borrowings by the public sector declines, though the gross borrowings are still important. Private capital inflows are expected to be an increasingly important source of external financing. The following table shows the growth contribution of capital inflow to finance current account deficits.

Table 4-3 Capital Flows of the Repelita VI

Growth Contribution of Capital Flow	94/95	95/96	96/97	97/98	98/99
Government Debt	-6%	25%	-4%	8%	3%
Government Debt Repayments	6%	-6%	22%	0%	-12%
Other Capital Flows	-108%	28%	17%	12%	-1%
Direct Investment (Net)	9%	6%	7%	1%	6%
Other Capital (Net)	-117%	22%	10%	11%	-8%
Monetary Movement	-3%	-45%	-26%	-28%	0%
Errors and Omissions	119%	0%	0%	0%	0%
Capital Movements	8%	1%	9%	-8%	-11%

Government debt reduces contribution, but repayments are required. Private capital inflows are growing to be an important source of external financing. The monetary movements shows that the build-up of reserves continues, and their size matches debt repayments sometimes.

From the viewpoints of uses and sources of external finance, the average external financing through the Repelita VI requires $17.1 billion, of which the current account is $3.7 billion, principal repayments $11.4 billion, and increase in net foreign assets $2.0 billion. On the sources of $17.1 billion, direct foreign investment covers $2.9 billion, public borrowings $6.8 billion, and other private capital $7.4 billion.

Actual figures turns out as follows:

Table 4-4 Actual Capital Flows Figures

Growth Contribution of Capital Flow	94/95	95/96	96/97	97/98
Government Debt	-19%	2%	-6%	71%
Government Debt Repayments	-14%	-11%	-3%	16%
Other Capital Flows	0%	201%	26%	-323%
Direct Investment (Net)	20%	80%	17%	-56%
Other Capital (Net)	-20%	121%	9%	-268%
Monetary Movement	48%	-34%	16%	-8%
Errors and Omissions	4%	-58%	-18%	189%
Capital Movements	19%	100%	15%	-55%

The current situation already deviates from the Plan. The increased current account deficits are financed by other capital flows, that is, direct foreign investment, private loans, and short-term capital finance. Hence, the unfavorable developments created volatile capital movements.

These observations invite well-balanced analysis of the subject, and we initiate fundamental discussion. The relationship between external debt and economic growth has been a continuing challenge

and burden in the international finance. The debt problems can be classified in mainly three aspects, theoretical, empirical, and operational. In this section theoretical and empirical aspects are discussed because of their significance on the long-term planning.

The answer to the question whether external financing promotes economic development or growth looked so obvious before the world debt problem of the 1980's exploded. Therefore, the problem was not studied seriously until the actual defaults took place. The debt crisis that surrounded the developing countries imposed an austerity on the economy. Governments tried hard to review their priorities and rationalize their activities.

There are several competing theories around the developing country debt. Firstly, the Harrod=Domer model is discussed. Historically, the dynamic analysis started the application of the Harrod=Domer model. According to this type of model, once we set the target growth rate of an economy, the required amount of capital inflow follows. It is convenient and simple to use. It answers the solvency question as well providing the condition for solvency between the growth rate and interest rate. That is, to be solvent, the growth rate must exceed the interest rate. A postulate of constant saving ratio is an unattractive feature of this type of analysis, but it can be modified without changing the main conclusion.

According to this model, one can classify an economy into two types: an import-constrained economy or a saving-constrained economy. It is sometimes called two-gap model. Naturally, this type of model provides supportive arguments about external financing of economic development. External financing can help the economy constrained by its own saving or the economy faces the foreign exchange constraints.

More general model is the Solow model, classified as a neoclassical growth model. This type of model has a feature that in the steady state the net debtor runs trade surplus to service her debt. The debt of an economy evolves with the differential equation, that can be used as a convenient tool for classification of the balance of payments of an economy into several stages.

Suppose initially, the economy operates with insufficient capital stock, that means there is a room to equate the domestic marginal product to the world interest rate, and which initially has no debt, where in steady state the wealth per capita exceeds the capital stock. The economy approaches to the steady state in five stages; immature debtor-borrower, mature debtor-borrower, debtor-repayer, immature creditor-lender, and mature creditor-lender. The scenario is attractive, but its evidence is not easily found.

This type of model is characterized by two parameters, saving ratio and population growth. External financing may have transitory effects, but has no permanent effects, and the necessity can be shown by modifying the model.

Recently, the neoclassical model is challenged by new endogenous model. The Solow model

essentially states that, under the assumption of neoclassically well-behaved production function, constant saving ratio and population growth, the steady state of the economy can be characterized solely by these parameters. The predictions are simple, high saving ratio implies an affluent economy, high population growth implies a poor country provided other things being equal. This challenge negates the Solow model on the ground that it fails to explain cross-country variation in income maintaining the decreasing returns hypothesis. In particular, the endogenous growth models employ increasing returns technology to explain the differences in income. These models typically establish the negative relationship between world interest rate and debtor country growth rate. The supporters of the Solow model claim that it can accommodate the empirical disparities in income if the model adds the factor of human capital.

The difficulties are obvious. If one keeps, faith with the Solow model, it is required to incorporate the human capital. Or if one takes the new view seriously, the closure of the model requires abolishing of the assumption oof the competitive economy due to the non-concavity. It is the assumption so crucial to conduct economic analysis, and also difficult.

From the viewpoint of the role of external finance in raising investment, these models have similar qualitative characteristics. If the marginal returns on investment exceed the real interest rate, no debt difficulties arise.

Turning to the empirical observation, there is a Feldstein=Horioka hypothesis: most of the investment is self-financed. That is, international capital movements do not have important role in financing capital formation. There were numerous attempts to refute this hypothesis but it still survives.

We can ask a different question on whether the external financing speeds up growth. The historical evidence shows that there are only small numbers of countries whose growth can be attributed to external financing. These countries have insufficient initial capital stock, but have human capital, such as Canada, United State, Australia, New Zealand, and Argentina. India will be an exception.

It is interesting to point out that Canada and Argentina had similar initial conditions and opportunities. Both are rich in natural resources and human capital. The only important difference would be of the trade policy: Canada took free trade, but Argentina did not. The consequence was drastic. Canada is one of the affluent countries, but Argentina is still classified as developing country.

4.1.2 Computer Simulation Model for Debt Projection

The DBPM is basically a collection of accounting systems. More sophisticated models might incorporate optimization of the objective function, for instance, by employing linear programming, which is search routines for the optimum solution. However, such procedures are less useful when a model is used to provide input information to the parent model. Another possibility is the estimation from the macro econometric model. Econometric estimation depends on, the past history, thus it is not much

reliabe at providing a long run projection.

It would seem that a compromising approach is required: computer simulation. The availability of inexpensive personal computer enables us to overcome uncertainties.

If the criteria can not be translated into precise mathematical values rather than search for the optimum solution, we can simulate. Values can be introduced for variables for which there are no data, and the sensitivity of the system to the different values are assessed. Although computer simulation lacks the elegance of mathematical programming models, and does not provide general or best solutions, it does provide good solutions.

By supplying series of alternatives and assessing their direct and indirect effects, computer simulation models for debt and the balance of payments can become an important tool.

One can identify two types of model, an unconstrained trade model and a finance-constrained model. Most models for forecasting balance of payments assume, explicitly or implicitly, the following steps.

1. It begins by assuming that import and export values in a given year are determined by a number of exogenous factors such as developed countries, growth and inflation, own country's growth rate, real exchange rate and the value of the dollar.
2. It derives the trade balance from using these values.
3. It calculates the service account including the net interest payments. The net interest payments are derived from the indebtedness of the country.
4. It estimates the current account.

This type of model is called the unconstrained trade model because it assumes that the current account deficit will be automatically financed. The other type of model is the finance constrained model which assumes the following steps.

1. It assumes what financing will be available in any given year.
2. It assumes interest rates and resulting net interest payments.
3. It calculates the feasible trade balance.
4. By assuming the exports, it derives the feasible imports and GDP.

The principal purpose of these models is to forecast the constraints of foreign exchange and/or risks of servicing debt. Inability to service the debt is due to either insolvency or illiquidity. Insolvency occurs due to unsound economic activities and/or policies. The capacity of a country's borrowing depends on the present value of the discounted stream of net foreign exchange earnings. The expected future income must exceed the value of debt. The requirement is that the real growth rate of the country must exceed the real interest rate. Illiquidity is a short-run difficulty of servicing debt. It may occur

despite the healthy long-run economic outlook of the borrower country.

The Description of the DBPM (Debt and the Balance of Payments Model) is as follows:

Nominal exports of goods and services in year t are projected as

$$XG(t) = XG(0)(1+gx)^t \quad (4\text{-}1)$$

$$XS(t) = XS(0)(1+gxs)^t \quad (4\text{-}2)$$

Nominal imports of goods and services other than factor payments are projected as,

$$MG(t) = MG(0)(1+gm)^t \quad (4\text{-}3)$$

$$MS(t) = MS(0)(1+gms)^t \quad (4\text{-}4)$$

The long-term interest payments are calculated as follows,

$$IPAY(t) = rppg\ DPPG(t-1) + rpng\ DPNG + rst\ DST \quad (4\text{-}5)$$

where DPPG=Public and Publicly Guaranteed Debt, DPNG=Private Nonguaranteed Debt, DST=Short term Debt. rppg, rpng, and rst are corresponding interest rates.

The profit by foreign investment is calculated as follows,

$$PROF(t) = rou\ KDFI(t-1) \quad (4\text{-}6)$$

where rou=profit rate, KDFI=stock of foreign investment.

The current account is calculated from the above components.

$$CA(t)=XG(t)+XS(t)-MG(t)-MS(t)-IPAY(t)-PROF(t) \quad (4\text{-}7)$$

Given the current account, the capital account is constructed as follows,

$$KA = R(t)-R(t-1)-CA(t) \quad (4\text{-}8)$$

where R= foreign exchange reserves.

The level of reserves is assumed to equal a fraction of imports,

$$R(t) = rou\ (MG\ (t)+MS(t)) \qquad (4\text{-}9)$$

The direct foreign investments are assumed to grow at a constant rate

$$DFI(t) = DFI(0)(1+gdfi)^t \qquad (4\text{-}10)$$

The stock of DFI is calculated as,

$$KDFI(t) = KDFI(t-1)+DFI(t) \qquad (4\text{-}11)$$

The disbursements of new loan in each debt category are assumed to grow at a constant rate. Disbursements of public and public guaranteed are as follows,

$$LPPG = LPPG(0)(1+gppd)^t \qquad (4\text{-}12)$$

Also, disbursements of private non-guaranteed is,

$$LPNG = LPNG(0)(1+gpng)^t \qquad (4\text{-}13)$$

Amortization on accrual basis for each debt is estimated as,

$$APPG(t) = cppgDPPG(t-1) \qquad (4\text{-}14)$$

$$APNG(t) = cpngDPNG(t-1) \qquad (4\text{-}15)$$

Given a current account deficit, the required increase in reserves, and the assumed amount of direct foreign investment, the total amount of new net lending required to finance the balance of payments are the differences between the current account, changes in reserves, and foreign direct investment. Private miscellaneous and short term capital are implicit in the calculation.

$$LST(t)=KA(t)-\{LPPG(t)-APPG(t)\}-\{LPNG(t)APNG(t)\}DFI(t) \qquad (4\text{-}16)$$

The total debt is the sum of the previous year's debt plus net borrowing,

$$DPPG(t) = DPPG(t-1)+LPPG(t)-APPG(t) \qquad (4\text{-}17)$$

$$DPNG(t) = DPNG(t-1)+LPNG(t)-APNG(t) \qquad (4\text{-}18)$$

$$DST(t) = DST(t-1)+LST(t) \qquad (4\text{-}19)$$

$$D(t) = DPPG(t)+DPNG(t)+DST(t) \qquad (4\text{-}20)$$

In a more detailed model, one must be careful about the dynamics of a long-term debt. If a debt is negotiated and settled, it becomes commitments. This committed amount will be disbursed later. One must make assumptions on this commitments and disbursements lags for each components of the public and publicly guaranteed debt. Starting disbursements does not mean starting the principal repayments because usually there is a grace period that postpones the principal repayments for several years. The debt dynamics becomes complex. The debt service payments such as the interest and the principal repayments must be adjusted for these situations. Therefore, a debt has complex profile, and takes a long period from commitments to the end of payment.

By making the calculation, the necessary amount of required borrowing will be obtained from the balance of payments assumption. At the same time the amount of disbursements of the long-term debt will be obtained from the public and publicly guaranteed. If one takes the view of the unconstrained trade model, the required borrowing must be financed through capital imports. Capital imports takes two forms, debt creating and non-debt creating capital imports. Non-debt creating capital import stands for the foreign direct investments. Of course, one needs to consider reserve build-up. As default, the DBPM assumes that the adjustment occurs on short-term capital flows. If net borrowing has to be financed by short-term capital inflows, the total debt continues to be accumulated. It, thus, worsens the debt export ratio and the debt service ratio.

An interesting decomposition of the debt export ratio is the following. By definition, the increase in debt can be written as,

$$D(t)-D(t-1) = R(t)-R(t-1)+MGS(t)+rD(t)-(DFI(t)+XGS(t)) \qquad (4\text{-}21)$$

where R is the average interest rate, D is the total debt, XGS is the sum of XG and XS, and MGS is the sum of MG and MS.

The changes in debt export the ratio can be written as,

$$[D(t)-D(t-1)]/D(t)-[XGS(t)-XGS(t-1)]/XGS(t)$$

$$= [R(t)-R(t-1)+MGS(t)-DFI]/D(t) + \{rXGS(t)-[XGS(t)-XGS(t-1)]/XGS(t)\} \qquad (4\text{-}22)$$

The first term of the right hand side can be interpreted as external factors and the second term can be interpreted as internal factors.

We can set the limit of the total borrowing by some assumption about the debt export ratio or the debt service ratio. If such limit is binding, imports must be adjusted. This case resembles liquidity

problem.

4.1.3 The Sustainability of Debt: Probabilistic Approaches

This time we will take another approach to the debt problem, which can be classified as probabilistic models. A number of econometric studies has attempted to identify the determinants of the debt default problem. Researchers used various methods: discriminant analysis, principal component analysis, logit analysis, and probit analysis. Variables found to be positively associated with rescheduling are of debt service obligations at rescheduling, ratio of imports to foreign reserves, stock of debt as a ratio of GNP, and stock of debt as a ratio of exports. In a cross-section model, higher income inequality was found to be a significant variable. This approach may be called default function approach.

A similar question may be asked using time series model; a new approach of whether the historical data provide an evidence for expecting the present-value borrowing constraint of the government. They asked a question of whether governments are subject to the borrowing constraint that the expected value of expenditures does not exceed the expected present value of receipts. In case of a household, it will do so if there is an opportunity of running permanent deficit. It rolls over debt without having to pay back. We know it is not possible for the reason of feasibility. However, in the case of government it is not a straightforward question. If a government runs a deficit and it makes an implicit promise to creditors that it will run offsetting surpluses in the futures, we call it is under present-value borrowing constraint. The policy of running a permanent deficit is infeasible. The empirical tests of this proposition turned out to be unit root tests.

The default function approach is as follows. This kind of analysis demonstrated that the probability of rescheduling is a function of the following variables, such as the countries* current account deficit, the debt service to export ratio, the ratio of net debt to exports, and the ratio of foreign reserves to imports. All the variables except the last one expected to increase the probability of default. On the other hand, there is a view that these variables are the symptoms of the problem rather than the causes.

Firstly, the foreign trade regime is important. There is a consensus that outward-oriented trade policies have been successful in raising the share of exports in national output, promoting growth, and providing the debt servicing capability. Secondly, the importance of political situation has to be considered. In many countries the reliance of a government on foreign borrowing was determined by the political needs. In their view the political pressures for excessive foreign borrowing tend to be acute in economies with inequalities of income. Thirdly, conflicts between agricultural and urban interests influence the political decision of economic policy. Governments are the secure if finds a significant support in the agricultural sector, and favors conservative and stable policies. Hence, the estimation

requires to include trade regime, income inequality, and agricultural scale in the economy.

The dependent variable (RESCH) is a value of one if rescheduled and otherwise zero. Rescheduled countries mean that they rescheduled their foreign debts owed commercial lenders between 1982 and 1987. The independent variables include the trade regime (REGIME), the highest to the lowest ratio of the percentage share of income quintiles (RATIO), the share of agricultural production to GNP (AGY), and the squared per capita GNP (YCSQ). The data set includes 35 cross-section of the developing countries including Indonesia. The probit result is as follows.

Table 4-5 Estimation Result 1

Probit Analysis Dependent Variable =Resch

Variable Name	Estimated Coefficient	Standard Error	T-Ratio
Ratio	0.19273	0.078330	2.4605
Regime	-0.08825	0.39826	-0.22159
Agy	-0.25766	0.090388	-2.8506
Ycsq	-0.0000002	0.0000001	-2.2938
Constant	3.4380	1.8573	1.8511

Prediction Success Table

		ACTUAL	
		0	1
PREDICTED	0	18	2
	1	2	13

As the prediction success table shows, four cases out of 35 cases are not predicted correctly. In case of default, the dependent variable takes the value of unity, thus the thirteen out of the fifteen cases are predicted correctly. The t-value of REGIME was insignificant, so it was dropped and re-estimated the equation.

Table 4-6 Estimation Result 2

Probit Analysis Dependent Variable =Resch

Variable Name	Estimated Coefficient	Standard Error	T-Ratio
Ratio	.19754	0.07602	2.5989
Agy	-.26293	0.08894	-2.9561
Ycsq	-0.0000002	0.0000001	-2.4552
Constant	3.3167	1.7860	1.8570

Prediction Success Table

		ACTUAL	
		0	1
PREDICTED	0	18	2
	1	2	13

As the prediction success table shows, the three out of the thirty five cases are not predicted correctly. To check the model, the estimation result of the same equation using LOGIT analysis are presented.

Table 4-7 Estimation Result 3

Logit Analysis Dependent Variable =Resch

Variable Names	Estimated Coefficient	Standard Error	T-Ratio
Ratio	.33570	.13614	2.4658
Agy	-.44932	.16404	-2.7391
Ycsq	-0.0000004	0.0000002	-2.2779
Constant	5.7071	3.2227	1.7709

Prediction Success Table

		ACTUAL	
		0	1
PREDICTED	0	18	2
	1	2	13

Now we use most recent data of explanatory variables and compare the probability of default. To do so, we evaluate the above probit equation using more recent values in each explanatory variable one by one. As the estimation results shows, the logit estimation result is similar to the probit estimation, so we use the probit result below. The estimated probability of 0.0024(0.24%) is obtained from the estimated equation. Improvements in the RATIO decrease the probability from 0.24% to 0.04%. If every independent variable is replaced with most recent data, then the probability deteriorates from 0.24% to 34.3%, though it does not exceed 50%.

Table 4-8 Simulation Results

	Predicted Values
Estimated	0.0024 (Final Test)
Ratio	0.0004 (Inequality)
AGY	0.6030 (Share of Agricultural Production)
YCSQ	0.0017 (Square Per Capita Income)
ALL	0.3430 (Current Situation)

As the results show the probability of default improves in most cases. The improvements in inequality improve the debt situation significantly. The GNP has similar effect. But, the agricultural share of output (AGY) has adverse effect, though the dependent variables stay no-default if overall effects are taken into account. This can be verified from the facts that the Indonesian agricultural share decreased drastically and the large parameter value is attributed to this variable. It seems AGY captures complex domestic political effects. Of course, this variable can be seen as a mirror to the industrialization, therefore, invites controversy.

However, if we omit the agricultural share of the output from the estimation, the fit of estimation deteriorates substantially.

Table 4-9 Estimation Result 3

Variable Names	Estimated Coefficient	Standard Error	T-Ratio
Ratio	0.10178	0.03959	2.5712
Agy	-0.15186	0.26928	-0.56394
Ycsq	-0.0000007	0.0000003	-0.24187
Constant	-1.2188	0.86814	-1.4039

Prediction Success Table

		ACTUAL	
		0	1
PREDICTED	0	17	7
	1	3	8

If we include the agricultural share of the output, its effect is extraordinarily large relative to other variables. Inequality measure has a large influence on the probability of default in these cross-section exercises. These variables are expected to reflect the conducts of the government and the stability of supports for the current government.

The unit root tests approach is as follows. Whether a government can run a budget deficit remains an unsettled and theoretical question. If the government borrows at an interest rate that equals or exceeds the economy's growth rate, unpaid deficit implies that the debt must grow to infinite. It was shown that the government accumulating ever-growing debt through perpetual deficit financing has a mathematical parallel in the proposition that prices can rise continually in a self-fulfilling speculative bubble. Thus, an empirical test that have been developed for the bubble detection can be applied in this case.

This means that testing for solvency of a government can be pursued by the unit root tests in the time series analysis by examining if the debt path is stationary.

In the time series analysis terminology, the testable solvency requirement is that the unconditional expectation of the discounted public debt should be zero or nonpositive. We ask following questions. Firstly, is there a stable data generating process that describes the behavior of the discounted public debt? Secondly, is this data generating process stationary? Thirdly, is its unconditional mean equal to zero?

Establishing nonstationarity would, therefore, imply that the policies pursued during the sample period, if they were adhered into the indefinite future, mean insolvency of the government. Note that a finding of nonstationary data generating process does not mean that there will be government insolvency, but that, in the absence of policy or other changes that render the data generating process stationary, a bankruptcy of the government may result. The unit root tests can be applied to tackle this problem.

The following identity is the starting point of the analysis.

$$b(t) = (1 + r(t-1))\, b(t-1) - s(t) \qquad (4\text{-}23)$$

where b is the debt, r is the interest rate, and s is the surplus(non interest).

Let q be the discount factor from period t back to period zero.

$$q(t) = 1/[\,(1 + r(t-1))\,(1 + r(t-2))\,(1 + r(t-3))\,\ldots\ldots]; \; q(0) = 1 \qquad (4\text{-}24)$$

Rewrite equation (4-23) by discounting each of the variable.

$$q(t)\, b(t) = q(t-1)\, b(t-1) - q(t)\, s(t) \qquad (4\text{-}25)$$

Let capital letter means discounted values of the corresponding variables.

$$B(t) = B(t-1) - S(t) \qquad (4\text{-}26)$$

Recursive forward substitution to equation (4-26) yields the following.

$$B(t) = B(t+N) - S(t+1) - S(t+2) - \ldots - S(t+N) \qquad (4\text{-}27)$$

Equation (4-27) can be interpreted as a proposition that if B(t+N) converges to zero in the limit, then the current value of the debt equals the sum of expected future surplus.

$$B(t) = S(t+1) + S(t+2) + \ldots + S(t+^{*}) \qquad (4\text{-}28)$$

This turns out to be the same as detecting nonstationarity of the time series, that is, the unit roots of the data generating process of B(t).

For the purpose of empirical estimation, the average interest rate for the public and the publicly guaranteed loan, and the deposit rate are chosen. To obtain the real variables, consumer price index is used. Due to the lack of appropriate discount factors, several debt series are calculated; nominal debt discounted by average rates, nominal debt discounted by deposit rates, and real debt discounted by real deposit rates. Furthermore, debt itself and debt net of the foreign exchange reserve are used. For the purpose of comparison the undiscounted debt and the debt-GNP ratio are also used.

The results show consistently that the data generating processes of any debt series are nonstationary. For instance, in the simplest model, the Dickey=Fuller test statistics and the significance level are -4.1 and -11.2, respectively. The pattern of behavior that produces the debt process is not sustainable. Note this does not mean that the Indonesian government is insolvent. It only shows that, in the absence of policy or other changes that render the data generating process stationary, the government

is insolvent. There are ample policy options to make the process stationary, such as broadening tax base and cutting back the expenditure of the government.

Important implication of this exercise is the recognition of asset and liability side of the government in the form of discounted sum. This recognition points to the importance of the ALM(Asset Liability Management) concepts for future analysis.

The two probabilistic models show that debt situation of the Indonesian government is not without problem. Default function approach showed that most variables are improving and reducing the probability of default. However, if we take the political factor depicted by the share of agricultural output, the probability of default increases significantly. The unit root tests showed the insolvent data processes requiring correction of the future fiscal policy.

Of course, these results need careful consideration. In particular, default function results depend on the specification. At the same time, the selection of independent variables are crucial to the results. Also, the unit root tests are known to have weak power. However, even these points are taken into account, the results are reasonably robust.

4.1.4 Currency Crises and the Indicators

The recent attacks on the Southeast Asian currencies reminded us of the vulnerability of emerging countries. The fact is simple; huge shift of funds occurred starting from Thailand to neighbouring countries.

At the same time, the need for early warning system of the currency crises is reminded. Earlier, Mexican crisis attracted many researchers, and we already have tentative conclusions.

The crisis was started as an attack on the Thai Baht. Several factors are said to have caused it, the current account deficit, the short-term capital inflows, the non-performing financial institution, and the running down of international reserves. However, as a first question, we need to know why it has to be Thai Baht. Were there any signs of crisis in the Thai economy?

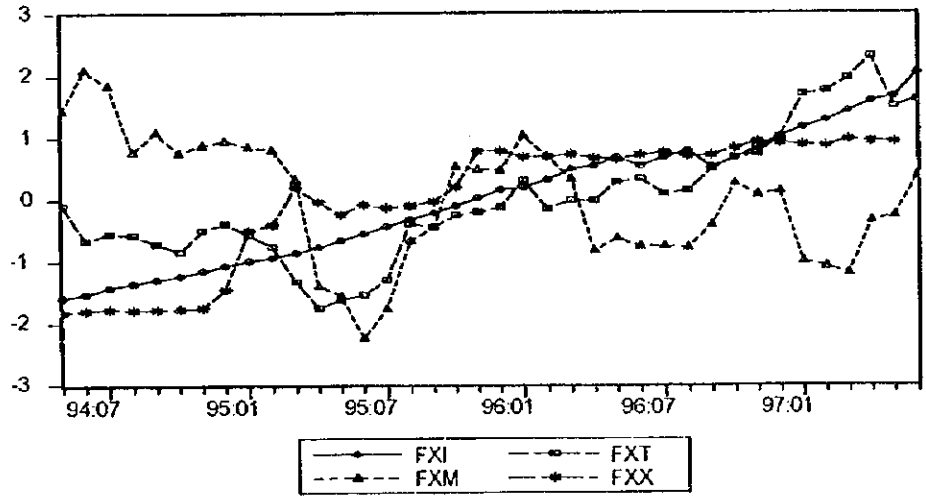
Secondly, following the Thai Baht, most Southeast Asian currencies depreciated, i.e., the contagion occurred. These contagion effects need an explanation about whether they have been induced by the difference in capital movements, governmental reaction, or pure speculation.

In this part, we will mainly conduct exploratory data analysis to the first question, and try to reach the tentative conclusion. To do so, we focus mainly on the monthly data. Since it is useful to be an early warning system. Naturally, the data base lack, completeness and so is the analysis.

We can learn from the lessons of the Mexican crisis. The Mexican Peso crisis of December 1994

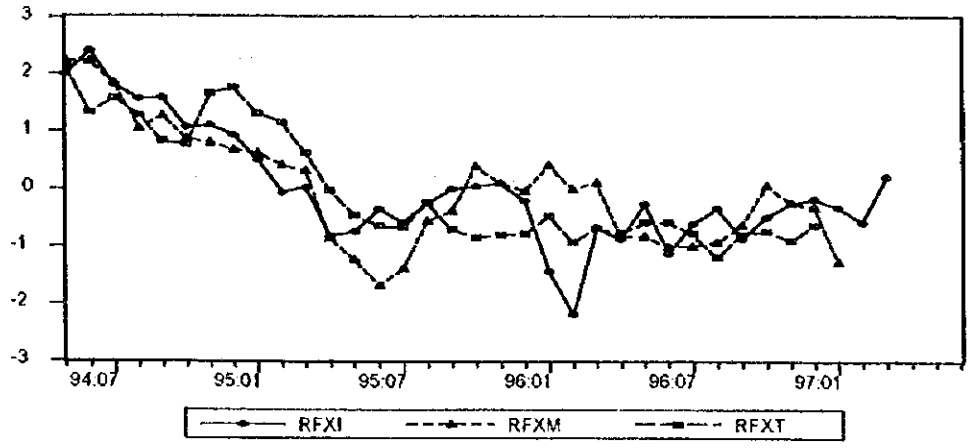
brought a new concern to the international finance circle. A consensus among observers is that the Mexico's huge current account deficit used up capital inflows and the Peso crisis was inevitable. However, the Southeast Asian emerging countries were not exceptions to the similar problems, but they did not experience the currency crisis at that time. In addition, there were mixed contagion effects of the post crisis effects among the Latin American countries. For instance, Argentina and Brazil got attacked, but Chile and Colombia did not. In 1997, the situation reversed. The Southeastern Asian countries experienced the currency attacks from Thailand and spread among most neighboring countries, but the magnitudes were different. The following graph shows the behavior of the exchange rates (standardized figures). The Mexican Peso (FXX) was sharply depreciated in December 1994, however, Indonesian Rupiah(FXI), Malaysian Ringgit(FXM) and Thai Baht(FXT) were not affected by that event.

Figure 4-1 Change in Exchange Rates .



Three variables were found during the course of the Mexican crisis and its contagion, namely a high real exchange rate, a recent lending boom, and low international reserves. We shall review these variables in the following graphs. Firstly, we define the real exchange rate index as a bilateral real exchange rate, using home and the U.S. consumer price indices. The high value signifies real depreciation, and the low value signifies real appreciation that might represent weak fundamentals due to the overvaluation.

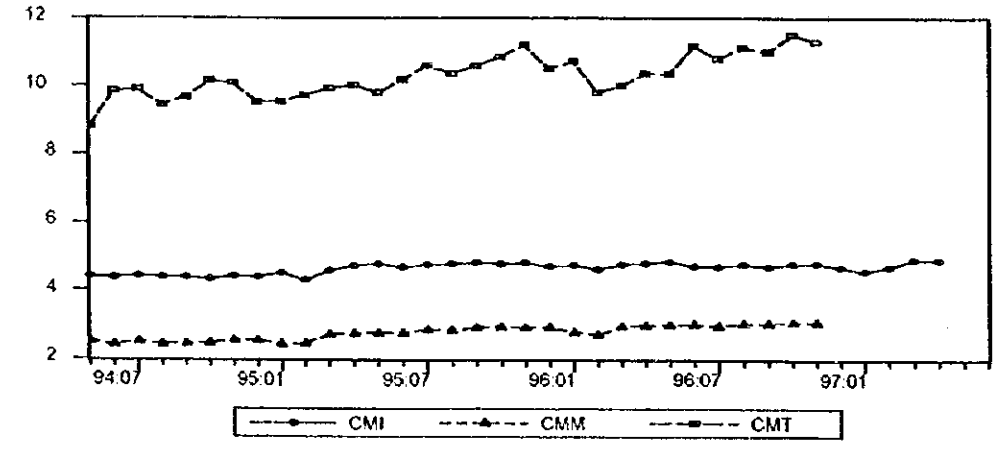
Figure 4-2 Bilateral Real Exchange Rates



As the graph shows, the appreciation of rates are apparent, but they are bottomed around 1996, and have been fluctuating within a band.

Secondly, we look at the lending boom using (Private credit) / (M1) ratio in the following graph.

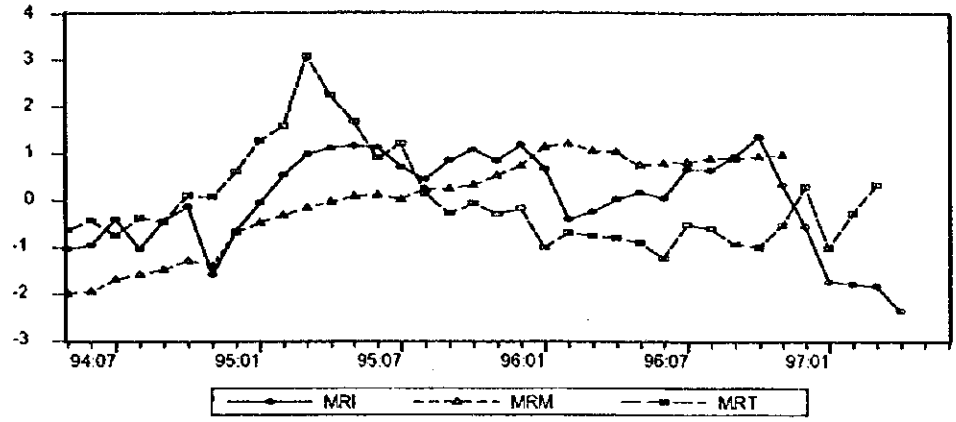
Figure 4-3 Lending Boom



Clearly, the credit expansion in Thailand exceeds others. In terms of the ratio, Indonesia and Malaysia are stable and low compared to Thailand.

Finally, we look at the international reserve adequacy using (M2 /International Reserve) ratio.

Figure 4-4 International Reserve Adequacy



The foreign reserve adequacy ratio of Indonesia and Thailand are fluctuating, but the recent directions are different. Indonesia is improving while Thailand shows some deteriorating trend. In the case of Malaysia, it is continuously deteriorating recently.

What kind of a tentative conclusion can be reached from there. A simplification brings the following table.

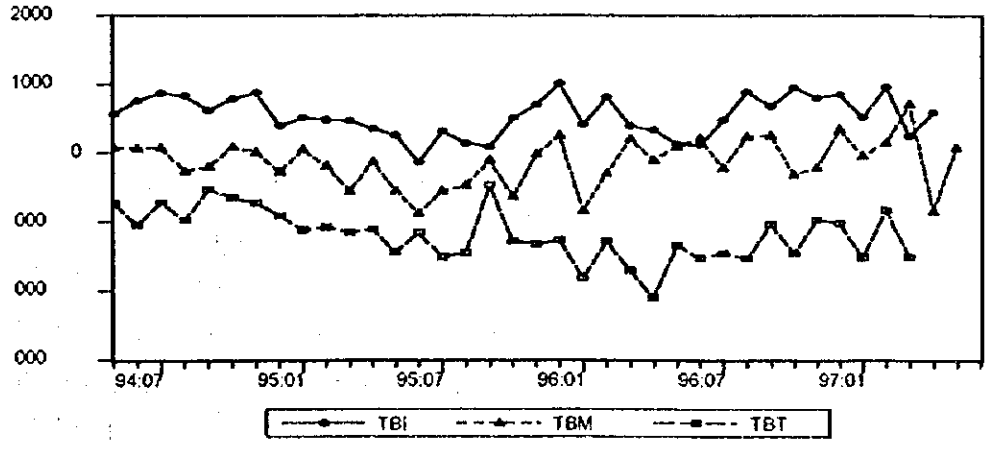
Table 4-10 Results of Observation

	Indonesia	Malaysia	Thailand
Real Exchange Rate	O	X	X
Credit Expansion	O	O	X
Reserve Adequacy	O	X	X

From this table, we can rank the countries vulnerable to the currency attack as Thailand, Malaysia and Indonesia. This gives weak evidence why Thailand got attacked first.

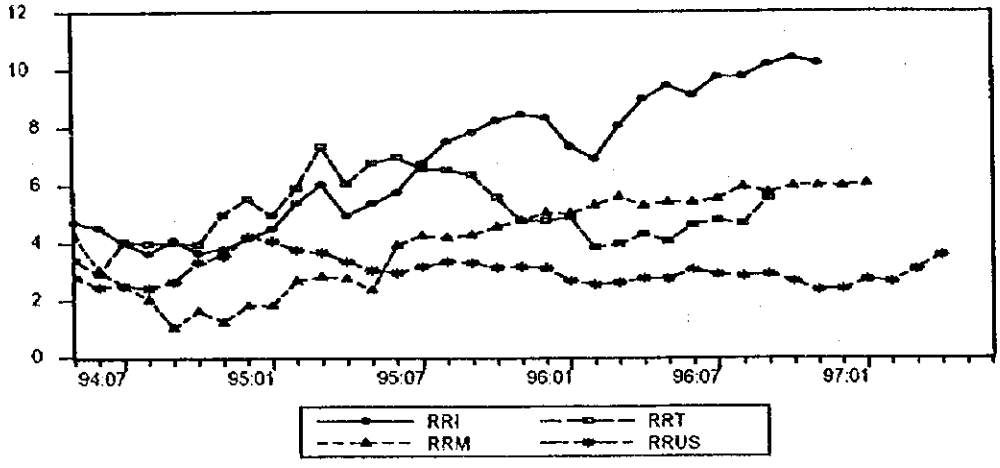
The following graph of trade balances might indicate another partial explanation. Thailand continues to have deficit in the trade balance throughout the 1990's.

Figure 4-5 Trade Balances



We can also compare the real interest differences between the domestic and the US rates. The real interest rates are defined as the 6 months time deposit rates or similar rates minus the log differences of CPIs. All countries have higher real interest rate differentials in a recent period.

Figure 4-6 Real Interest Rates



We can continue similar casual exploratory data analysis, but we should review the literature at this point.

It is worthwhile to review the Krugman model of the currency attack. It deposits, that: under the fixed exchange rate, domestic credit expansion beyond the demand for money leads to the depletion of international reserves, and that the currency attack becomes inevitable. Before the attack, declining international reserves and growing domestic credit relative to demand for money can be observed. Several extensions to this approach identified indicators for the currency crisis such as real appreciation of the currency, deterioration of trade balance, and high domestic interest rate. The story behind these variables is that expansionary macro policy results in both an increase in demand for traded goods which deteriorates the trade balance and an increase in demand for nontraded goods which leads to the real appreciation through the changes in the relative prices. In turn, to defend the parity, the domestic interest rate will be raised.

Recent theories suggest different paths. The banking sector problem is one of them. If high interest rate is inevitable due to the public debt, for instance, it may weaken the banking sector. In that case, the government may devaluate rather than bailing out the banking system. An explanation depends on the expectation formation to policy reaction. A sudden worsening of expectation may change the policy of a country and it may result in currency crisis. Contagion theory looks at the interrelationship between countries, if one country devaluates the trading partner devaluates its currency in order to maintain the competitiveness. Also, if the investors do not distinguish the difference in economic fundamentals in each country, the contagion effects become evident, the crisis in the neighbor country results in the crisis in the country. Tequila effect points out the spread of panics due to the self-fulfilling

speculative attack.

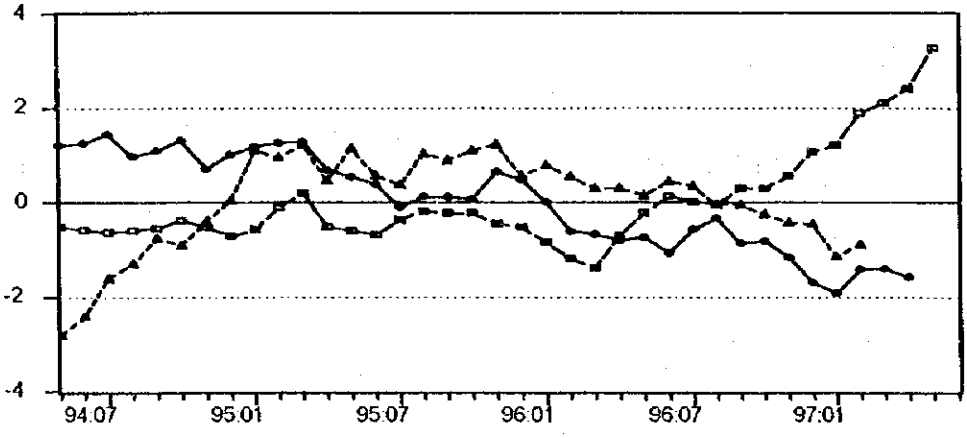
Recent developments classified these crisis models as the first-generation and the second-generation, respectively, and suggested that these models can not treat current the Asian crises. Firstly, none of the fundamentals that drive the first-generation crisis models were present. That is, the governments did not have large fiscal imbalances, did not engage in irresponsible credit creation, and did not have irresponsible monetary expansion. Above all, the inflation rates were in control. Secondly, the countries did not have unbearable unemployment, therefore, did not have incentive to abandon the fixed exchange rate. These point out that the first-generation and the second-generation crisis models do not fit the facts. Krugman then proceeded to present a small descriptive model that consists of both moral hazard of financial intermediaries and asset inflation of land and capital, saying that the problem began with financial intermediaries that have implicit government guarantee, but not regulated, so there were moral hazard problem. Excess loan created asset inflation, and the bursting of the bubble was inevitable. Falling asset prices made the intermediaries insolvent, making them stop lending, thus decelerating the asset prices. These process may explain the severity of crisis and the vulnerability of the economies, and may help to explain the contagion between economies with few economic links.

Renewed interests in the indicator approach to the currency crises are present. There are mainly four categories in this analysis: qualitative discussion; discussion of the causes and developments leading to the crises, examination of stylized facts, estimation of probability of devaluation, and evaluation using the nonparametric approach. They advocated the last approach and tested various indicators. In fact, they identified eleven indicators: real exchange rate, exports, stock prices, M2/international reserves, output, excess M1 balances, international reserves, M2 multiplier, domestic credit/GDP, real interest rate, and terms of trade.

Defining crisis itself is not an easy task. Firstly, It is customary to define a currency crisis as a large devaluation, but larger than the previous nominal devaluation. Secondly, one can define crisis indicator based on the evolution of the real exchange rate by associating the large jumps in the real exchange rate as a crisis. Finally, one can combine relating variables.

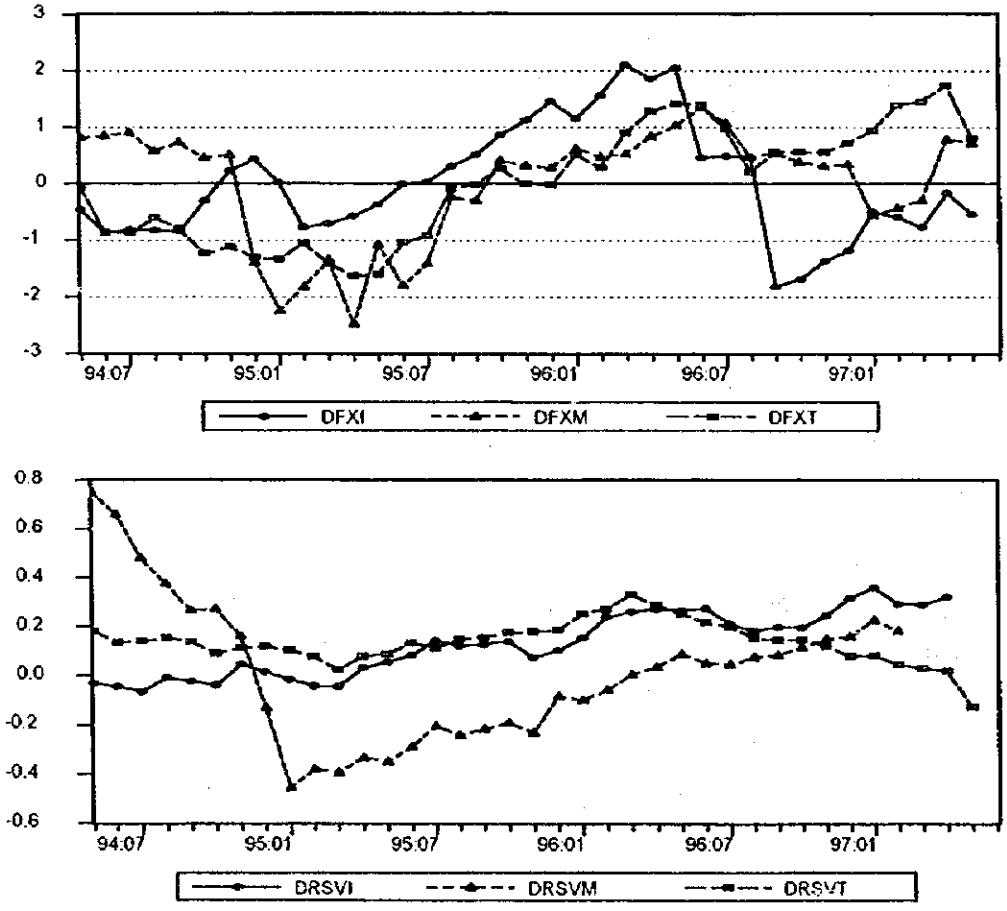
It customarily defined the crisis using an artificial variable of the weighted average of nominal depreciation rate and reserve depletion rate (the sign is reversed). Increases in this index show the nominal depreciation, and/or the depletion of reserves is happening. Essentially, this index measures the exchange market pressure. Appearenly, the pressure toward the Thai Baht can be seen from this index.

Figure 4-7 Crisis index



The changes in nominal exchange rates and the changes in international reserves are as follows:

Figure 4-8 Changes in Components of Crisis Index



The candidates of the indicators are as follows:

- Capital account: international reserves, capital inflows, short-term capital flows, foreign direct investment, and differentials between domestic and foreign interest rates.
- Debt profile: public foreign debt, total foreign debt, short-term debt, share of debt classified by type of creditor and by interest structure, debt service, and foreign aid.
- Current account: real exchange rate, current account balance, trade balance, exports, imports, terms of trade, price of exports, savings and investment.
- International variables: foreign real GDP growth, interest rates and price level.
- Financial liberalization: credit growth, change in money multi-plier, real interest rates, and spread between bank lending and deposit interest rates.
- Other financial variables: central bank credit to the banking system, gap between money demand and supply, money growth, bond yields, domestic inflation, position of exchange rate within the official band, and M2/international reserves.
- Real sector: real GDP growth, output gap, employment, un-employment, wages, and changes in stock prices.
- Fiscal variables: fiscal deficit, government consumption, and credit to the public sector.
- Institutional/structural factors: openness, trade concentration, financial liberalization, banking crises, past foreign exchange market crises.
- Political variables: dummies for elections, incumbent electoral victory or loss, change of government, and degree of political instability.

Then, we obtain signals from each indicator within 24 months from each crisis defined ex-post using the above indices to count the following matrix. Most of the indicators in levels are transformed to some difference series and measured from the mean. Those signals are spikes exceeding the individually calculated threshold level. (For details, please see the original paper.)

Table 4-11 Classification of Signal and Crisis

	Crisis	No Crisis
Signal was issued	A	B
No Signal was issued	C	D

Then, we calculate the probabilities using A, B, C, and D. Among these probabilities, P(Crisis/Signal) or A/(A+B) are as follows: real exchange rate(67%), exports(49%), stock prices(49%), M2/international reserves(46%), output(49%), excess M1 balances(43%), international reserves(41%), M2 multiplier(40%), domestic credit/GDP(39%), real interest rate(34%), and terms of trade(36%). The average lead time ranges from 17 months to 12 months. For instance, real exchange rate signals the first sign on average 17 months before the crisis. That means that all the indicators send the first signal anywhere between a year and a year and half before the crisis. The signal approach can be useful as the basis for an early warning system of the currency crises. In particular, signals occur sufficiently early to allow preemptive policy actions.

We can plot the top four major indicators, namely, the changes in real exchange rate(DRFX), the changes in exports(DEX), the changes in stock prices(DSP), and M2/international reserve ratio(MRI), which are shown on the following graphs. Note all the variables are normalized.

Figure 4-9 Major Indicators of Indonesia

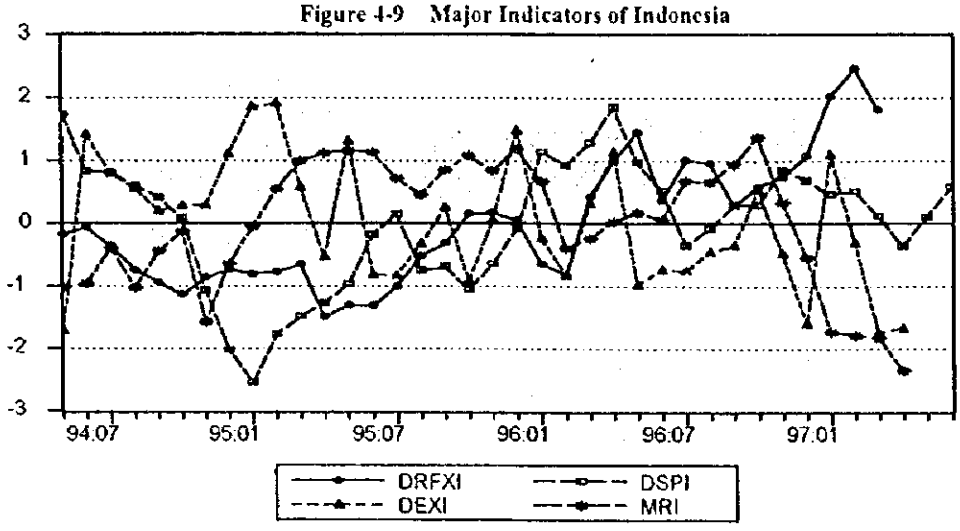


Figure 4-10 Major Indicators of Malaysia

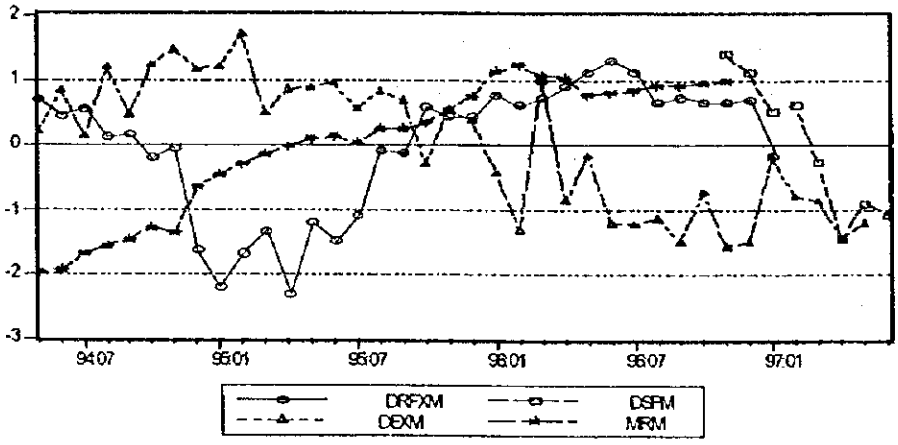
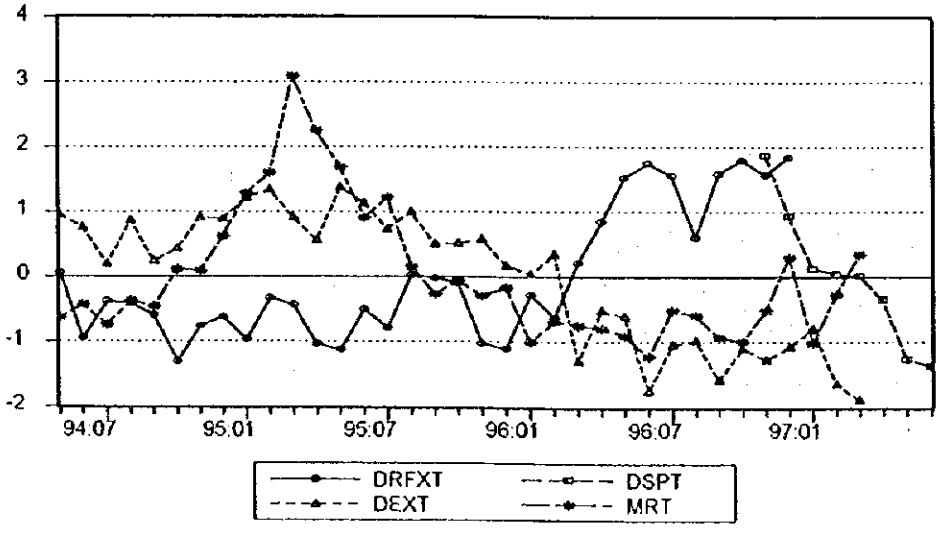


Figure 4-11 Major Indicators of Thailand



It is clear that real exchange rate plays a crucial role. So it is worthwhile to review the real exchange rate. There are mainly three alternatives to calculate the real exchange rate.

Before discussing the real exchange rate, we can summarize the factors that affect the nominal exchange rate. That is, from the viewpoint of supply of the foreign currency, the improvement of the efficiency of the export industry, the development of the new export products or increases in capacity of export goods and, from the viewpoint of demand for the foreign currency, the reduction of import restrictions, the increases in income which are partly spent on tradable goods, the changes in the level of debt service payments, and the changes in world prices of import goods.

Firstly, one can ger by deflating the nominal exchange rate with some price level, for instance, the consumer price index or the GDP deflator. At an inflationary period, this is useful especially when local prices are increasing rapidly, neglecting world inflation does not create significant problem. In case that relative inflation is important, the real exchange rate is obtained from changes in the purchasing power of the dollar by multiplying a general dollar price index. This can be calculated using the wholesale price indexes of G5 countries with weights that have been employed in the IMF calculation of the Special Drawing Rights. In this case, the real exchange rate measures the price in its own currency of an international currency basket, which are built up of the wholesale price, of the G5 economies. Then, this price is deflated by the country's own CPI. It is the real price of the real dollar.

Secondly, the real exchange rate is calculated by adjusting changes in the prices of tradable goods relative to those of non-tradables. Under flexible exchange rates, the adjustments ideally occur by movements of the nominal exchange rate. Under fixed exchange rates, with tradables* price that is given in the world market, adjustment occurs through the internal price levels. In either case, adjustment occurs as changes in the ratio of tradables prices to non-tradable prices.

Thirdly, the real exchange rate examines the forces working on the respective prices of tradables and non-tradables. The nominal exchange rate is the variable that brings changes in the internal prices of tradables for given levels of their world prices. In this case, we can view the level of wages that determines the internal prices of non-tradables. Therefore, real appreciation implies gain in the real wages, while real depreciation implies loss of the real wages. The euphoria following the real appreciation, and the pain following the real depreciation.

In practice, the real exchange rate can be calculated from the nominal exchange rate times the world price level divided by the general price level of the country. Because the price levels refer to average prices, so are the nominal exchange rates. Regarding the internal general price level that deflates the nominal exchange rate, the best candidate is either the consumer price index or the GDP deflator because it includes both tradables and non-tradables. Regarding the foreign price level, there is a consensus that the foreign wholesale price index will be chosen discretionarily.

In the meantime, can always find results negative to the above approaches. For instance, while one establishes that the real exchange rate is a summary variable and an important leading indicator of the currency crises. When expectations of depreciation from the survey data are regressed against alternative misalignment measures, the coefficients are positive and significant. However, in a panel logit regression of a crisis indicator on expected depreciation, the coefficient is close to zero and insignificant. Therefore, exchange rate crises are largely unpredictable events.

4.1.5 Concluding Note

Developing countries gained access to external financing through globalization and integration to the world economy. At the same time they experienced greater exposures to international disturbances. While sound economic policy is important, it is necessary to prepare for the sudden currency crises. To reduce vulnerability to such shocks it is recommended to reform the debt policy. In particular, the idea of the Asset Liability Management (ALM) of private firms is useful. The currency composition of a country's external debt can serve as a hedging instrument against the changes in exchange rates and commodity prices. In particular, in the case of Indonesia the optimal debt portfolio consists of a larger proportion of US dollars and a smaller proportion of Japanese yen. With an optimal debt portfolio, Indonesia could still manage its external shocks effectively even she has only limited access to the organized hedging market, and has only limited resources to bear the fees of futures and derivatives. There are a number of derivative instruments and strategies, such as currency futures, forward contracts, foreign currency swaps, and foreign currency options.

For instance, changes in the dollar value of the external debt between 1993 and 1995 were due to the cross-currency movements, primarily of the appreciation of yen. In the case of Indonesia, her export revenues were mainly in dollar, while a little less than half of her external debt was in yen.

At the same time, the vulnerability of developing countries to external shocks depends on the interest rates and the maturity of foreign currency denominated debt. Financial deregulation and resulting increases in short-term capital movements may make a country vulnerable to liquidity crises. One way of looking at the Mexico's crisis is that the problem was not the level of burden of debt, rather the composition of debt structure of currencies and maturity. The choice of currencies and the maturity of external debt tend to depend on the lower risk premium and coupon rates for the purpose of initial budget savings rather than considering their long-run consequences.

The simulation model discussed here uses the parameters that are calibrated discretionarily. However, this type of model is expected to be useful in the long-term programming exercises because back-solving capabilities are invaluable to provide necessary constraint conditions such as the foreign exchange ceilings. Also the choice variables in the IOPM such as exports and imports can be substituted into the model. Furthermore, it can be modified to calculate the present value of the current account and

debt that is, the first step to consider ALM techniques. It can be used to calculate the weighted average term to maturity, sometimes called duration. Therefore, solvency can be discussed by equalizing not only the present value but also the duration of assets and liabilities, the necessary condition for immunization. Even if it is not operational to use ALM techniques for a country, the duration provides a convenient way of computing the change in value that will occur when various conditions change. At the same time, one must use alternatives such as probabilistic and indicator approaches.

4.2 Industrial Development

4.2.1 Development Plan and Past Performance of the Industrial Sector

(1) Introduction

1) Review of the past 25 years

During the first long-term plan period, Indonesia's industrial sector experienced a very rapid growth at an average rate of 12% per year in real term. In the final year of the Repelita I, the share of industry in the national product, including oil and gas industries, was only 9.6%. The rapid industrial growth resulted that the share of industry went up to 20.8% in 1992. Since 1991, this share of industry to the national product has exceeded that of agriculture.

During the first half of this period, the import substitute industries were developed intensively, while export-oriented industries expanded in the latter half of the period. This was brought by a series of deregulation policies since the 1980s. In the Repelita IV and V there was also a change in the order of priorities, although the same policy objectives were set in both five-year plans. The promotion of exports was given priority over "the deepening of the industrial structure".

Export of non-fuel industrial products rose 18.2% annually between 1969 and 1983, and 22.2% per year between 1984 and 1992. Substantial growth in export of industrial products was generated by labor-intensive industries and resource oriented industries such as textile, wood-processing and leather industries. And in 1990s, electric instruments and electronics were added as export products.

Regarding the employment, in 1971 industries provided jobs to the 6.8% of the nation's work force. It grew to 9.3% in 1985 and to 11.4% in 1990. Comparing the share of employment and that of the GDP, however, it is noted that the employment absorption rate of industrial sector is relatively low.

In the final Fifth Five-year Plan, the average growth rate of the industrial sector was expected to be 8.5%, and the contribution to the GDP was targeted to be 17.0% in the final year of the Fifth Plan. Compared to these targets, the industrial sector grew at the rate of 12.6% and the contribution to the GDP achieved 20.7%. The speed of industrial expansion has been accelerated .

2)International Comparison

Table 4-12 shows the percentage share of manufacturing sector to the GDP and its growth rate in some developing countries. Comparing to the Latin American countries, Brazil and Mexico, which were already well industrialized in the mid 70s, the industrialization of South East Asian countries started more recently and has been accelerated especially during these ten years with the pace of more than 10% annual growth. Although the Indonesian figure is relatively low among these Asian countries, it exceeds that of Mexico and is almost on a level of Brazil. Considering the fact that the share of manufacturing

industry to the GDP was less than 10% in 1975, the industrialization of Indonesia has been advanced with various kinds of investment during these two decades.

Table 4-12 Manufacturing Share and Growth Rates

	Manufacturing Rates of GDP (%)				Manufacturing Growth Rates (%)			
country/year	1975	1985	1994	1995	1975-84	1985-95	1994	1995
Brazil	30.3	33.7	25.2	24.8	2.6	-0.9	5.5	1.6
China	31.6	35.4	37.0	37.6	13.1	12.3	17.2	13.0
Indonesia	9.8	16.0	23.5	24.3	14.4	10.9	12.5	11.1
Malaysia	16.9	18.5	31.7	33.1	9.0	13.5	14.7	14.7
Mexico	21.9	23.5	19.7	19.8	4.4	2.8	3.6	-6.4
Thailand	18.7	21.9	28.5	29.2	7.6	13.7	12.0	12.3

Source: Trends in Developing Economies 1996: WB.

3) Increase of Establishments and Employment

In Indonesia, the 1996 Economic Census has started its publication since March of 1998, and some data on numbers of establishments and employees are already available. From this second economic census, we can see the transformation of each economic sectors (see Table 4-13). The manufacturing industry increased its number of establishments from 1.53 million in 1986 to 2.76 million in 1996, with the annual average growth rate of 6.1% over these 10 years. Regarding the employment, the percentage of labor absorption of manufacturing industry was 10.7% in 1986 and it amounted to 15.1% in 1996. In terms of both establishments and employment, the industrial sector expanded at more than double of the average growth rates of all the economic activities, the latter rates were 2.9% for establishments and 3.0% for employment.

Table 4-13 Number of Establishments, Employees, and Their Annual Rate of Growth During 1986-1996

(Thousands)

Industry	Establishments			Employees		
	1986	1996	Growth(%)	1986	1996	Growth(%)
1. Agriculture*)	20,117.5 (68.4)	22,535.6 (57.8)	1.1	32,347.8 (65.5)	32,183.2 (48.5)	-0.1
2. Mining & Quarrying	127.8 (0.4)	192.6 (0.5)	4.2	328.7 (0.7)	446.9 (0.7)	3.1
3. Manufacturing Industry	1,533.6 (5.2)	2,759.3 (7.1)	6.1	5,286.5 (10.7)	10,039.5 (15.1)	6.6
4. Electricity, Gas and Water Supply	20.5 (0.1)	13.6 (0.04)	-4.0	97.8 (0.2)	140.3 (0.2)	3.7
5. Construction	86 (0.3)	211.2 (0.5)	9.4	367.8 (0.7)	1,039.7 (1.6)	11.0
6. Wholesale and retail Trade, Restaurants and Accomondation Services	5,105.6 (17.4)	9,462.3 (24.3)	6.4	6,917.4 (14.0)	15,205.7 (22.9)	8.2
7. Transport, Storage, and Communication	882.3 (3.0)	1,733.4 (4.5)	7.0	1,384.1 (2.8)	2,498.6 (3.8)	6.1
8. Financial Institution	22.8 (0.1)	73.3 (0.2)	12.4	248.8 (0.1)	661.2 (1.0)	10.3
9. Real Estate, Rental Services, and Other Services	1,498.5 (5.10)	1,981.1 (5.1)	2.8	2,403.2 (4.9)	4,098.0 (6.2)	5.5
Total	29,394.8(100.0)	38,962.5(100.0)	2.9	49,382 (100.0)	66,313.1(100.0)	3.0

Source: 1996 Economic Census, BPS
Note:*) The figures of Agriculture sector are estimated from Agriculture Census 1993

(2) PJP II and Repelita VI

The industrial sector is expected to be an engine for economic development in the second 25 years. It is expected to increase business opportunities and jobs and to strengthen the national economy by creating forward and backward linkages between sectors.

1) PJP II

In the Second Long-term Plan, the objective of the industrial development is to establish a strong and modern industrial sector that is capable of promoting a self-reliant and dependable economy. For that purpose it is necessary to improve the competitive capacities, to disperse industries through out the country, to strengthen the small and medium industries, and to establish dependable physical and institutional facilities.

The quantitative targets of the industrial sector were set as follows.

- Share to GDP	32.5%
- Absorption of labor force	27.5%
- Average annual growth rate of manufacturing value added	9.2%
- Annual growth rate of employment in manufacturing	4.4%
- Average annual growth rate of non-oil manufacturing	9.8%
- Annual growth rate of employment in non-oil manufacturing	4.4%
- Average annual growth rate of labor productivity	4.8%

2) Repelita VI

During the period of the Sixth Five-year Plan, the average growth rate of the industrial sector, which includes oil and gas industries, was estimated 9.4%, and it was expected to raise its contribution to the GDP from 20.8% at the end of the Fifth Five-year Plan to 24.1% at the end of the Sixth Plan. Non-oil manufacturing industries, on the other hand, was expected to grow at an average rate of 10.3% annually, and that it would raise the contribution to GDP from 17.6% to 21.3% during the Sixth Plan period.

Table 4-14 Target Added Value Growth of Manufacturing Industry 1994/95 - 1998/99

(percent per annum)

Items	End of Repelita V	Repelita VI					
		1994/95	1995/96	1996/97	1997/98	1998/99	Average
1. Manufacturing Industry	8.8	9.4	8.9	8.9	10.0	9.7	9.4
2. Non oil and Gas Manufacturing Industry	10.0	10.0	10.1	10.3	10.5	10.7	10.3
a. Agro-industry	8.3	8.1	8.2	8.4	8.3	8.4	8.2
b. Basic metal and capital goods industry	12.3	12.3	12.4	12.6	12.8	13.0	12.6
c. Chemical industry	8.8	9.2	9.4	9.6	10.0	10.3	9.7
d. Other important industries (include textile and garment)	13.5	12.4	12.6	13.1	13.2	13.7	13.0

Table 4-14 shows the targeted growth rates in added values of manufacturing industries during the Repelita VI. Agro-industry was projected to grow at an average annual rate of 8.2%, basic metal and capital goods industry at 12.6%, chemical industry at 9.7%, and other important industries, which include textile and garment industries, at 13.0%. Export of industrial products was estimated to grow continuously at 17.8% per year during the Sixth Plan period.

Along with this projected expansion of the industrial production, 3,020,000 new jobs were expected to be created during the Plan period, which meant the industrial sector was expected to absorb 25.3% of the new entries into the labor market. The labor productivity in this sector was also expected to grow at an average rate of 4.0% annually.

To accomplish the above targets, the following strategies were focused: 1) developing broad-spectrum industries oriented towards the international market, natural resource-intensive industries with a rising technological level, labor-intensive industries which become more skill-intensive over time, and technology-intensive industries; 2) developing industries by accelerating technological mastery in order to solidify the base for producing superior industrial products; 3) developing industries which rely on the market mechanism, with the private sector in the lead; and 4) developing industries which emphasize growth and income distribution by giving priority to those industries capable of fast growth and improving the participation of the broader community.

In accordance with these strategies, development priorities were set in: 1) agroindustries; 2) mineral processing industries; 3) machinery, capital goods and electronics industries, which produce components and engage in sub-assembly; and 4) export-oriented industries which become increasingly skill-intensive and diversified over time, including textiles and textile products.

In addition to the priority subsectors, the growth of competitive small and medium industries were also aimed to be stimulated in the Sixth Plan. Linkages between large, medium and small industries were emphasized to be developed through mutually profitable business partnership, as well as the development of regulatory support institutions and business partnership institutions.

(3) Performance in the Period of 1993-1996

Manufacturing industry achieved an annual growth rate of 11.6% in the period 1993-1996, and accounted for 25.5% of GDP in 1996. Excluding oil and gas processing, the growth rate of manufacturing sector reached at 12.8% during the same period, and its share to the GDP amounted to 22.8% in 1996. Compared to the target annual growth rate of Repelita VI shown in Table 4-14 , actual performance of industrial sector surpassed those targets up to 1996.

The development of industrial sector in recent years resulted in an expansion of export of manufactured products. In 1996 the export value of non oil-gas manufacturing industry amounted to US$32.1 billion, which was an increase of 37.8% of the final year of Repelita V, 1993. The contribution of non oil-gas industries amounted to 64.5% of the total export of Indonesia, and to that of non oil-gas shared 76.5% of the total export. The development of industrial sector could be characterized not only by an increase of export volume, but also by the diversification of export products and the improvement of the quality.

Up to 1996, the food, beverage and tobacco industry still contributed a significant 67.5% to the growth of non oil-gas manufacturing industry, while the fertilizer, chemical and rubber industry contributed 10.4%, the textile, leather and footwear industry 7.6%, and the transport vehicle, machinery and apparatus industry 3.8%. These four groups of industries together contributed 89.3% to the growth of non oil-gas manufacturing industry.

The employment opportunity in industrial sector increased much and the sector absorbed 9.9 million people, or 12.6% of the total number of manpower in 1995.

1) Agro-industries

During the first three years of Repelita VI, agro-industies achieved a significant progress and their role became more and more important, not only because the subsector met the basic needs of the people and their potential to develop national resources, but because they developed into export industries.

In the group of food and beverages, the production of coconut oil and palm oil showed prominent increases in 1996 with 38.6% and 34.9% over the previous year respectively. The powdered milk and margarine production also increased by 13.5% and 1.5% more than the previous year. The production of other commodities in agro-industies grew at 5.0% on the average.

The wood processing industries generally performed satisfactorily in 1996. However, the production of plywood, sawn wood and particle boards have declined because of the decreased supply of raw materials. On the other hand, the production of decorative plywood, doors and frames of doors/windows showed significant increases of 57.4% and 28.0% respectively compared to the production in 1995. Other products which increased the production are furniture, prefabricated housings, and rattan products. The increase of value added of wood processing industry was caused by the effort of

diversification of products which previously consisted only of plywood.

The paper and pulp industries showed an increase of production in 1996, paper with 17.2% and pulp with 12.1 % increase over the previous year. Compared to the production in 1993, the paper and pulp industries expanded their production by 61.2% and 73.8% respectively.

The leather and footwear industries are playing an important role in export of manufactured products. In 1996 the production continued to grow at 9.0% on the average.

The rubber based industries also showed big increase in the production of motorcycle tires (42.0%), tires for four wheel motorized vehicles (18.8%), and bicycle tires (14.8%) in 1996 compared to the previous year.

2) Metal, Machinery and Electronics Industries

This group of industries corresponds to the category of basic metals and capital goods in Repelita VI, which bears the most emphasized and strategic role to enhance the technological competence and to strengthen the industrial structure of the country. The products of these industries are needed by these industries themselves or by other sectors of economy, such as agriculture, mining, communication and other services sectors.

During the period of 1993-1996 the subsectors of this group which had shown significant development were the industries producing 1) industrial machinery and factory tools, 2) heavy-duty equipment/construction tools, 3) agricultural machinery and tools, 4) machine components, 5) communication devices, 6) electronic data processing instruments, 7) electronic instrumentation and control devices, 8) computer software and hardware, 9) transportation devices, and 10) basic material and intermediary products for downstream industries.

The production of these industries showed a steady growth in general, although the production of some of these industries was still fluctuating. Such a condition was influenced by the demands of domestic market and exports as well as the development of domestic capital investments. The machinery producing industries in general still depended on domestic markets, because their products were yet not able to compete with imported machineries. However, significant increases in production were seen in the industry of agriculture machines and tools, and industries of heavy duty equipment and construction tools. The production of factory machines and tools, steel constructions and boilers for instance, also increased in 1996.

Since 1993 the production of motorcars had been continuously expanding. And the production of components of motorcars had also been growing in line with the development of auto industry.

The industry of electric machineries showed a substantial increase as well as the electronic industries. The development of the electronic industries was caused by the relocation of overseas

advanced electronic industries to Indonesia. These industries had a significant role in export and in increasing domestic consumption.

3) Chemical Industries

The chemical industries are capital intensive and require the use of advanced technology. They also use energy and local natural resources as their imputs, and this sector produces the basic commodities for other industries. Therefore, these industries are positioned to link upstream and downstream industries and strengthen the industrial linkages in the economy. The market of the products of chemical industries was primarily domestic, and only surplus products were exported. The production in general showed a steady increase, supported by an expansion of production capacities.

As an agricultural input, the production of fertilizers increased substantially in 1996. Among others, it is caused by the expansion of oil palm plantations. Especially the production of urea increased by 13.7%, and those of TSP and ammonia with around 5% increase. The production of inorganic chemical industry, which includes caustic soda, oxygen and nitrogen, showed an increase around 5% over the previous year. In the group of organic chemical industries, the production of polystyrene showed a significant increase of 41.9% in 1996 over the previous year, and that of ethylacetate with 16.5% increase. Other products in this group showed an increase of 5% on the average.

The group of non-metal mining products achieved a notable increase, such as ceramic insulators (126.3%), cement tiles (28.0%), white cement (24.3%), asbestos cement (16.7%), sanitary ware (15.7%), and crockery (13.0%).

4) Other Important Products

Textile products still have an important role in Indonesian industry. The textile industry is the largest contributor of non oil-gas exports, and a large absorber of labor force. In 1996 the production of sheet textile and ready-made wear increased by 14.3% and 13.8% respectively. And also noted were the increase of production of plastic bags (17.0%) and of plastic sacks (17.0%).

5) Export Oriented Industries

Industries which significantly contributed to the total export of non-oil gas manufacturing industry in 1996 were industries of textile products (19.9%), processed wood (17.9%), electronics (10.4%), and leather and footwear (7.6%). The industry of textile and textile products, and the electronic industry, which were previously established as import substitution industries, developed rapidly into important export oriented industries. Export of electronic products amounted to US$ 3.3 billion in 1996, with the increase of 31.8% over the previous year.

4.2.2 The Industrial Structure

A comprehensive picture of Indonesia's industrial structure in 1986 is presented in Table 4-15, in which the data are based on the 1986 economic census.

The data in column 2 of Table 4-15 show the oil and gas processing industries (ISIC 353/4) were, the most important manufacturing industries in 1986, accounting for 28% of the total manufacturing value added (MVA) (26% if the small enterprises are included). The only non-oil and gas industry with value added more than 10% of the total MVA was the tobacco industry. The relative importance of the various non-fuel industry is shown in the column 1, and they are the tobacco (17%), textile (12%) and the wood products (10%) industries, followed by the basic metals (8.5%), food products (8%), and transport equipment (6%) industries.

Concerning the employment, largest employers were the textile(18%), food products (13%), and tobacco products (12%) industries, from the data in column 4. While the industrial sector contributed 21% to the GDP in 1991, it absorpted only 10.4% of the total labor force of Indonesia.

Moreover, the structure of manufacturing employment was that about two-thirds of industrial workers were employed in small and cottage industries (4.8 million in 1991), with the remaining one-third in large and medium enterprises (2.7 million in 1990).

Table 4-15 The Structure of Manufacturing, 1986

(percentage of total)

ISIC	Industry	Out put			Employment	
		L+M[b]	L+M	L+M+S[b]	L+M	L+M+S
		excluding oil and gas	including oil and gas		including oil and gas	
		(1)	(2)	(3)	(4)	(5)
311	Food Products	8.2	6.0	6.9	12.9	13.3
312	Food Products	3.3	2.4	2.9	5.3	7.9
313	Beverages	1.3	1.0	1.0	0.7	0.7
314	Tobacco	16.8	12.1	11.7	11.7	12.0
321	Textiles	11.6	8.4	8.1	18.0	14.3
322	Garment	1.7	1.2	1.7	3.7	5.1
323	Leather products	0.3	0.2	0.3	0.2	0.4
324	Footwear	0.5	0.3	0.5	0.5	1.0
331	Wood Products	10.0	7.2	7.2	9.9	9.1
332	Furniture	0.3	0.2	0.6	0.8	2.5
341	Paper products	1.3	1.0	1.0	1.5	1.1
342	Printing & publishing	2.0	1.4	1.6	2.2	2.3
351	Basic chemical	5.3	3.8	3.6	2.1	1.6
352	Other chemicals	5.0	3.6	3.6	3.9	3.0
353/	Oil and Gas processing	0.0	27.6	25.9	1.3	0.9
4	Rubber products	3.1	2.2	2.1	5.3	3.8
355	Plastics	1.4	1.0	1.0	2.9	2.3
356	Pottery and china	0.4	0.3	0.3	0.7	0.5
361	Glass products	1.3	0.9	0.9	0.6	0.4
362	Cement	3.0	2.2	2.3	1.7	2.7
363	Structural clay products	0.2	0.2	0.4	1.3	3.5
364	Other non-metallic minerals	0.3	0.2	0.2	0.4	0.4
369	Basic metals	8.5	6.1	5.8	1.0	0.7
370	Metal products	3.9	2.8	2.9	3.5	3.5
381	Non-electric machinery	0.8	0.6	0.6	0.9	0.8
382	Electrical equipment	3.0	2.2	2.1	2.2	1.7
383	Transport equipment	6.1	4.4	4.2	3.8	2.9
384	Professional equipment	neg.	neg.	neg.	0.1	0.1
385	Miscellaneous	0.4	0.3	0.5	0.8	1.4
390						
	Total	100.0	100.0	100.0	100.0	100.0
Value added in Rp billion; employment in thousands:						
Excluding oil and gas		10,197.3		11,097.7		
Including oil and gas			14,081.2	14,981.0	1,869.0	2,709.5

neg.= negligible, that is, the share is less than 0.1 percent

a. Output refers to value added; data on the value added of the oil and gas processing industries were obtained from the Indonesia's national accounts of 1986.

b. According to the Central Bureau of Statistics (BPS): L = large enterprises (that is, establishments employing more than one hundred works); M = Medium enterprises (that is, establishments employing between twenty to ninety-nine workers); S = small enterprises (tat is, establishments employing five to nineteen workers). (Cottage enterprises include establishment employing less than five workers, including unpaid family workers.)

Source: Hill (1990) "Indonesia's Industrial Transformation: Part I"

Table 4-16 The Relative Importance of Small Enterprises in Indonesian Manufacturing, 1986

Enterprise size	Establishments		Employment		Value added at market prices	
	Number	Percent	Number	Percent	Million rupiah	Percent
Large and medium enterprises	12,765	0.8	1,691,435	32.7	9,348,483	82.2
Small enterprises	94,534	6.2	770,144	14.9	775,304	6.8
Cottage enterprises	1,416,935	93.0	2,714,264	52.4	1,254,419	11.0
Total	1,523,935	100.0	5,175,843	100.0	11,378,206	100.0

Source: Biro Pusat Statistik (1991).

In Table 4-16, the establishment, employment and value added production by the size of enterprises are shown. From this table, it is indicated that the average value added per worker in large and medium enterprises exceeded that of small enterprises by a factor of 5.5, and that of the cottage enterprises by a factor of 12. Table 4-16 also shows that while large and medium enterprises accounted for only 0.8% of all the manufacturing establishments in the country, they produced more than 82% of the total value added utilizing 33% of the manufacturing labor force. On the other hand, cottage industries accounted for 93% of the number of total establishments and absorbed more than one half of the manufacturing labor force, however, they produced only 11% of the value added.

According to the 1996 economic census, some new data on the number of establishments by subsectors of two digits are given in the next table 4-17. The food, beverages and tobacco industry had the largest number of establishments, followed by the wood products and furniture industry. The shares of the two subsectors were 35.1% and 33.8% respectively, and the sum of them amounted to 68.9% of the total establishments. The third importance in number of establishment was seen in the textile, apparel and leather industry, followed by the non-metalic mineral products, i.e. cement & non ferrous quarrying products. Among other subsectors, the fabricated metal & machinery industry and the chemical industry, the latter of which includes fertilizer and rubber products, shared less than 3%, although each of the subsectors contributed to the value added of manufacturing industry more than 11%.

Table 4-17 Number of Establishments in Manufacturing Industry by Subsector

	Total	%
31. food, beverages and tobacco	967,177	35.1
32. textiles, wearing apparel and leather	403,469	14.6
33. wood and wood products, including furniture	931,804	33.8
34. paper and printing	23,746	0.9
35. chemical, petroleum, coal, rubber and plastic products	28,320	1.0
36. non-metallic mineral products, except petroleum and coal	258,750	9.4
37. basic metal industries	2,319	0.1
38. fabricated metal products, machinery and equipment	73,906	2.7
39. Other manufacturing industries	69,849	2.5
Total	2,759,340	100.0

Source: 1996 Economic Census, BPS

The distribution of value added of the manufacturing industry is shown in the next table 4-18. Comparing to the distribution of the numbers of establishments, the food industry contributed almost

half of the total value added of non-oil manufacturing industry, and its share was increasing in recent years. The second and the third largest subsectors were the fertilizer, chemical & rubber product industy, and the transport equipment & apparatus industry, already mentioned above, however, their percentage contributions to MVA were slightly decreasing. The wood, bamboo & rattan industry, the fourth largest, was showing a rapid decreasing tendency of its share of value added. The paper & printing industry was also losing its share in recent years.

Table 4-18 Percentage Distribution of Non Oil Manufacturing Value Added at Current Market Prices, 1993-1997

(percent)

Sector	1993	1994	1995	1996*	1997**
Food, drink & tobacco	42.1	45.4	47.1	47.0	49.9
Textile, clothing & leather	10.7	9.6	9.2	9.3	8.9
Wood, bamboo & rattan	8.19	7.5	6.8	6.3	5.6
Paper & printing products	4.1	4.1	4.0	3.7	3.6
Fertilizer, chemical & rub. Product	13.3	13.3	13.5	13.1	12.8
Cement & non ferrous quer. Product	3.1	3.1	3.3	3.4	3.3
Basic mental & iron	3.6	3.1	3.22	4.4	3.7
Transport equip. & apparatus	14.2	13.3	12.4	12.7	11.7
Others	0.1	0.6	0.1	0.5	0.5
Total	100.0	100.0	100.0	100.0	100.0

Source: National Income of Indonesia 1994-1997, BPS

Note:*) Preliminary figures

**) Very preliminary figures

In terms of scale of manufacturing industry, numbers of establishments by employment size and turnover size are distributed as shown in Table 4-19. More than 90% of manufacturing establishments employed less than 5 workers, which can be categorized into the "micro industry", and 8.3% employed 5-19 workers, which corresponds to the "small industry". Manufacturing establishments which employ more than 20 workers are called "medium and large industries", and they accounted for only 1% of the total number of establishments in 1996.

Table 4-19 Number of Establishments in Manufacturing Industry by Employment Size and Turnover Size

Employment Size	< 5	5-19	20-99	>= 100			Total
Number of Establishments	2,501,569	228,978	22,284	6,509			2,759,340
(%)	90.7	8.3	0.8	0.2			100.0
Turnover Size (Million Rupiah)	<25	25-49	50-99	100-499	500-999	>= 1000	Total
Number of establishments	2,523,625	115,108	46,680	48,750	14,305	10,872	2,759,340
(%)	91.5	4.2	1.7	1.8	0.5	0.4	100.0

Source: 1996 Economic Census, BPS

By the scale of turnover, the distribution of establishments are also given in the same table. 91.5% of the total establishments was classified into the turnover size of less than Rp.25 million, which corresponds to the percentage share of the micro industries. In the groups of Rp.25-499 million of turnover size, 7.8% of establishments was included, and it can be said that the share corresponds to the small industries defined by employment size of less than 20 workers. The others were classified into more than Rp.500 million of turnover, which indicates the large industries. The per capita turnover of the micro enterprize was around Rp.1 million, and this was almost a half of the per capita income of the

country. On the other hand, the per worker sales of the medium and large industries can be calculated at least aound Rp.25 million, slightly higher than the per capita income level of the year.

4.2.3 Comparison of IOPM Results and Repelita VI

Manufacturing industry, which has been an engine of economic growth of Indonesia for recent years, achieved a sufficiently high annual growth rate of 11.6% in the period of 1993-1996. Here, the comparison of the IOPM results and the Repelita targets will be discussed with the reference of the recent trend.

(1) Priority Industries of IOPM and Repelita VI

As the IOPM is an optimal programming model with an objective function to be maximized under some structural constraints, it is important to note what conditions are implicitly and explicitly included in the model structure. (see "Mid-Term Perspective of Indonesian Manufacturing Sector," discussion paper No. 9702 by Dr. Fukuchi, T. JICA September Seminar, 1997, in Jakarta.) Among several criteria for resource allocation and subsectoral development, it is pointed out that the IOPM considers 'growth' as its target, and that the three criteria of 'capital-saving,' 'net-foreign-currency-earning' and 'skilled-labor-saving' are set in the model by the structural constraints of capital, foreign currency holding and skilled labor, respectively. Therefore, among the industrial subsectors, those industries with low capital and low skilled labor coefficients, and with high net foreign-currency-earning ratios are given high priority to grow in the IOPM.

On the other hand, the government saw the industrial sector as the prime mover of national economic growth and expected the expansion of employment opportunities and exports as well as improvements of income distribution and poverty reduction. In order to achieve the Repelita VI targets, the direction of the industrial sector was stated as:

1) to become an affective prime mover of economic development,
2) to create an increasingly strong industrial structure, supported by an ever improving technological capability and the utilization of human resources,
3) to improve its competitiveness by the production of prime products able to penetrate international markets and the reduction of dependency on imports,
4) to develop small and medium scale industries, including village industries, so that increased productive participation by the people in industrial activities is assured,
5) to expand the regional industrial development which can be implemented including to Eastern Indonesia, with the intention to develop regional economic growth centers and to develop resource potentials in order to achieve an even distribution of development.

Furthermore, the development strategy was oriented towards international markets and to promote the following.

1) industries with intensive use of natural resources and implementing advanced technologies,
2) industries with intensive use of skilled labor,
3) industries with intensive use of technologies,
4) the development of industries by accelerating the mastery of technologies in the framework of stabilizing the basis of industrialization to produce prime products,
5) the development of industries which are supported by market mechanisms with the business world as prime actors,
6) the development of industries where industrial growth and even distribution of industries may be achieved at the same time, by extending priorities to various industries which are able to grow rapidly and increasing extensive and productive participation by the people.

Based on this strategy, the industries which were given priorities in Repelita VI were; i) agroindustry, ii) mineral processing industries, iii) the machinery, capital goods and electronics industries, and iv) export-oriented industries, such as textile and garment industry. The above 2) and 3) of the strategy are focusing and challenging the existing difficulties for the industrial development, while the criteria of IOPM assume them as consraints.

(2) Comparison of IOPM Results and the Repelita VI

When we compare the IOPM solutions with the Repelita VI targets or the actual performance of manufacturing sector, it is necessary to note the difference of categories of industries in Repelita and IOPM analysis. In the IOPM analysis twelve industrial subsectors are grouped into three categories, and in Repelita VI the targets of growth rates are given to four groups of industries. The following table shows their corresponding subsectors of IOPM industries.

Table 4-20 Grouping of Industrial Subsectors in Repelita and IOPM Analysis

IOPM Subsectors	Repelita VI	IOPM Analysis
8. Food Processing	Agro-industry	Light industry
9. Textile	Other important ind.	〃
10. Wood processing	Agro-industry	〃
11. Paper & pulp	〃	Resource-based ind.
12. Chemical	Chemical excl. oil & gas	〃
13. Non Metal	〃	〃
14. Iron & steel	Basic metal & capital goods	〃
15. Non ferrous metal	〃	〃
16. Fabricated metal	〃	Machinery
17. Machinery	〃	〃
18. Transport Equipment	〃	〃
19. Other manufacturing		Light industry

The Case 1 results of IOPM solution are given by the next tables (Table 4-21 and 4-22). Comparing the growth rates of manufacturing sectors in the IOPM solution with those of Repelita VI targets, the most prominent feature of the IOPM solution is the emphasis on machinery industry at the first stage of PJP II period. The average annual growth rate of this group during the Repelita VI period is

18.4%, while the target growth rate of basic metals and capital goods industry in Repelita VI was 12.6%. Taking the difference of these two industrial categories into account, the growth rate of machinery industries in IOPM solution is much higher than that of Repelita VI which includes rapidly growing basic metal industries in the category. Up to 1995, the actual growth rate of value added in the machinery industry was one digit percentage, however, the production of motorcars in 1996 increased 36.7% and it was expected that the value added of the machinery industries were also shifted upward accordingly.

Table 4-21 Annual Growth Rate of GDP by 8 Sectors: Case 1

(unit:%)

Sector (IO Code)	0-1 (R-VI)	1-2 (R-VII)	2-3 (R-VIII)	3-4 (R-IX)	4-5 (R-X)	0-5 Average
Agriculture (1-5)	6.0	4.9	4.1	2.8	2.5	4.1
Mining (6-7)	1.5	2.2	3.5	4.3	5.5	3.4
Manufacturing (8-19)	11.3	10.0	10.3	10.0	10.0	10.3
Light Industry (8-10,19)	7.8	5.3	6.3	6.4	5.8	6.3
Resource-based Industry (11-15)	12.9	12.3	11.3	10.6	10.7	11.5
Machinery (16-18)	18.4	15.2	13.8	12.7	12.2	14.4
Electricity, Gas & Water (20)	16.5	10.1	10.6	10.5	10.4	11.6
Construction (21)	5.9	8.3	9.4	9.4	9.3	8.4
Services (22-27)	7.6	8.5	8.7	8.7	8.6	8.4
Total	**7.5**	**7.8**	**8.3**	**8.3**	**8.5**	**8.1**

The second feature of the IOPM solution is the relatively slow and declining progress of the light industry in the long run. Even during the Repelita VI period, the light industry of the IOPM solution is expected to grow only 7.8% on the average. On the other hand, in the scenario of the Repelita VI, the target growth rate of agro-industry, 8.2%, was set below the average rate of manufacturing sector but with slightly increasing rate of growth during the Repelita VI period. This can be explained by the increasing demand of foodstuff along with the increase of people's income, although the decline of wood products subsector is expected in the future. The actual performance of this group of industries had achieved two digit growth rates up to 1995 except wood products industry. Another important subsector of light industry is the textile industry which is leading the country's non oil-gas exports. This industrial categories in the Repelita VI, mainly because of the importance of export and of its absorption capacity of labor force.

Table 4-22 Share of GDP by 8 Sectors: Case 1

(unit:%)

Sector (IO Code)	0	1 (R-VI)	2 (R-VII)	3 (R-VIII)	4 (R-IX)	5 (R-X)
Agriculture (1-5)	19.1	17.8	15.5	12.7	9.8	7.4
Mining (6-7)	10.9	8.2	6.3	5.0	4.1	3.6
Manufacturing (8-19)	22.0	26.1	28.9	31.6	34.2	36.6
Light Industry (8-10,19)	11.2	11.4	10.1	9.2	8.4	7.4
Resource-based Industry (11-15)	8.0	10.1	12.4	14.2	15.8	17.4
Machinery (16-18)	2.8	4.6	6.4	8.2	10.0	11.8
Electricity, Gas & Water (20)	0.9	1.3	1.4	1.6	1.7	1.9
Construction (21)	7.1	6.5	6.7	7.0	7.4	7.6
Services (22-27)	40.1	40.1	41.3	42.2	42.8	42.9
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The percentage share of manufacturing industry in GDP was targeted to 32.5% at the end of PJP II period by Repelita, while the IOPM solution indicates 36.6% of industrial share at the same stage of the planning period. The IOPM solution of Case 1 depicts more ambitious scenario of heavily industrialized economy than that of PJP II. In reality the performance of the first two years of the Repelita VI period showed rapid industrialization process, achieving the industrial share in GDP of 23.9% in 1995, while the figure of targeted share by the end of Repelita VI was 24.1%. The contribution of non oil-gas manufacturing sector to GDP was 21.3% in 1995, which means the targeted figure of 21.3% was already reached in the second year of the same period.

The another solution, Case 4, is assumed a higher rate of decrease of skilled labor coefficients in industrial and services sectors except food processing industry in the IOPM. The result shows more industrialized structure of the economy, with the share of manufacturing sector to GDP of 37.6% at the final stage of the planning period, and with 10.9% of the average growth rate of the industrial sector.

4.2.4 Regional Context

(1) Regional Development: Difference and Concentration

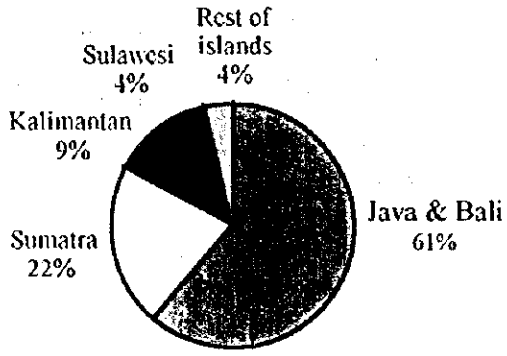
As shown in Table 4-23 and Fig.4-12, the regional distribution of GDP is concentrated most in Java, which amounts to around 60% of the total GDP, followed by Sumatra and Kalimantan. In these economically important regions, there are also large differences in income levels among the provinces. In oil and gas producing provinces, i.e. Ache, Riau, South Sumatra and East Kalimantan, their percentage shares of GRDP (Gross Regional Domestic Product) were declining in these ten years. On the other hand, the shares of Jakarta and West Java were increasing quite rapidly and this leads to the Java's dominance in the national economy.

Table 4-23 Share of Regional GDP

Province	1983	1994
1. Dista Aceh	4.80	3.22
2. Sumatra Utara	4.87	5.81
3. Sumatra Barat	1.73	1.93
4. Riau	10.53	4.67
5. Jambi	0.69	0.78
6. Sumatra Selatan	4.82	3.53
7. Bengkulu	0.37	0.47
8. Lampung	1.48	1.75
Sumatra	**29.29**	**22.16**
9. DKI Jakarta	11.71	16.03
10. Java Barat	14.29	16.34
11. Java Tengah	10.24	10.53
12. Dista Yogyakarta	1.07	1.31
13. Java Timur	15.21	15.06
Java	**52.52**	**59.27**
14. Bali	1.27	1.71
Java & Bali	**53.79**	**60.98**
15. Kalimantan Barat	1.19	1.62
16. Kalimantan Tengah	0.67	0.99
17. Kalimantan Selatan	1.26	1.25
18. Kalimantan Timur	6.05	5.09
Kalimantan	**9.17**	**8.95**
19. Sulawesi Utara	0.94	0.86
20. Sulawesi Tengah	0.51	0.52
21. Sulawesi Selatan	2.46	2.34
22. Sulawesi Tenggara	0.41	0.40
Sulawesi	**4.32**	**4.12**
23. Nusa Tenggara Barat	0.73	0.78
24. Nusa Tenggara Timur	0.70	0.65
25. Timor Timur	0.13	0.16
26. Maluku	0.67	0.72
27. Irian Jaya	1.20	1.48
the rest of Islands	**3.43**	**3.79**
Total	**100.00**	**100.00**

Source: National Income Statistics by Province, BPS

Figure 4-12 Share of GDP by Main Islands, 1994



Source: National Income Statistics by Province, BPS

The per capita income of each province is shown in Table 4-24. As for the per capita income without oil and gas, Jakarta has a very particular position. Next is East Kalimantan, where it enjoys the highest share of manufacturing sector in Indonesia (see Table 4-25) mainly because of the resource-based industries such as oil and gas refining and plywood processing, and this accounts for higher per capita income. The third highest per capita income was seen in Irian Jaya, where mineral resources contribute most to their high GRDP.

Table 4-24 Per Capita GRDP by Province

(unit: Rp. 1,000)

Province	with oil and gas		without oil and gas	
	1983	1994	1983	1994
1. Dista Aceh	1,221	3,222	422	1,563
2. Sumatra Utara	393	1,989	371	1,952
3. Sumatra Barat	347	1,704	347	1,704
4. Riau	3,097	4,666	400	1,895
5. Jambi	336	1,280	301	1,247
6. Sumatra Selatan	685	1,889	509	1,647
7. Bengkulu	303	1,299	303	1,299
8. Lampung	213	1,006	213	1,006
Sumatra		**2,084**		**1,613**
9. DKI Jakarta	1,204	6,728	1,204	6,728
10. Java Barat	347	1,596	289	1,523
11. Java Tengah	278	1,337	267	1,268
12. Dista Yogyakarta	273	1,673	273	1,673
13. Java Timur	360	1,676	360	1,674
Java		**1,958**		**1,915**
14. Bali	353	2,224	353	2,224
Java & Bali		**1,965**		**1,923**
15. Kalimantan Barat	321	1,713	321	1,713
16. Kalimantan Tengah	453	2,351	453	2,351
17. Kalimantan Selatan	410	1,662	386	1,652
18. Kalimantan Timur	3,163	8,672	768	4,398
Kalimantan		**3,307**		**2,377**
19. Sulawesi Utara	301	1,230	301	1,230
20. Sulawesi Tengah	262	1,029	262	1,029
21. Sulawesi Selatan	285	1,177	285	1,177
22. Sulawesi Tenggara	285	993	285	993
Sulawesi		**1,146**		**1,146**
23. Nusa Tenggara Barat	180	810	180	810
24. Nusa Tenggara Timur	173	692	173	692
25. Timor Timur	137	739	137	739
26. Maluku	316	1,327	313	1,321
27. Irian Jaya	669	2,965	384	2,774
the rest of Islands		**1,200**		**1,168**
Indonesia	**407**	**1,989**	**362**	**1,815**

Source: National Income Statistics by Province, BPS

Table 4-25 Structural Change of Regional Economy

Province	Agriculture		Mining		Manufacturing		Other	
	1983	1994	1983	1994	1983	1994	1983	1994
1. Dista Aceh	17.41	20.76	35.59	33.33	33.08	25.30	13.92	20.61
2. Sumatra Utara	32.68	25.35	5.41	2.54	13.42	25.51	48.49	46.60
3. Sumatra Barat	29.99	22.73	0.83	5.85	10.04	14.34	59.14	57.08
4. Riau	3.71	7.53	85.44	55.50	2.82	16.35	8.03	20.62
5. Jambi	38.07	28.65	11.04	4.07	7.67	16.83	43.22	50.45
6. Sumatra Selatan	19.61	19.81	24.11	14.21	19.93	19.37	36.35	46.61
7. Bengkulu	47.29	36.18	0.60	3.52	1.69	2.96	50.42	57.34
8. Lampung	44.79	37.57	0.30	1.72	8.97	13.96	45.94	46.75
Sumatra	**18.41**	**21.13**	**41.68**	**20.33**	**13.19**	**19.90**	**26.72**	**38.64**
9. DKI Jakarta	1.45	0.25	0.00	0.00	22.35	21.50	76.20	78.25
10. Java Barat	21.84	16.97	17.01	5.79	14.63	28.81	46.52	48.43
11. Java Tengah	33.31	22.35	0.43	1.15	15.00	31.75	51.26	44.75
12. Dista Yogyakarta	31.23	17.53	0.52	1.85	8.70	14.48	59.55	66.14
13. Java Timur	32.53	19.44	0.53	2.32	16.30	25.86	50.64	52.38
Java	**22.82**	**13.97**	**4.88**	**2.44**	**16.78**	**26.53**	**55.52**	**57.06**
14. Bali	43.24	21.28	0.65	0.83	4.32	7.59	51.79	70.30
Java & Bali	**27.27**	**14.18**	**3.19**	**2.40**	**13.55**	**25.99**	**55.99**	**57.44**
15. Kalimantan Barat	34.24	24.65	0.26	1.18	13.69	20.66	51.81	53.51
16. Kalimantan Tengah	33.94	39.92	0.52	0.56	9.86	13.55	55.68	45.97
17. Kalimantan Selatan	29.82	27.18	6.33	7.61	11.63	19.26	52.22	45.95
18. Kalimantan Timur	7.31	9.59	65.15	32.94	12.87	31.88	14.67	25.59
Kalimantan	**15.85**	**18.12**	**43.90**	**20.07**	**12.59**	**26.06**	**27.66**	**35.74**
19. Sulawesi Utara	36.16	27.41	0.42	3.60	5.44	8.50	57.98	60.49
20. Sulawesi Tengah	42.34	39.65	2.24	4.16	5.80	5.92	49.62	50.27
21. Sulawesi Selatan	43.31	38.48	2.70	3.52	4.80	12.01	49.19	45.99
22. Sulawesi Tenggara	47.17	33.79	9.91	2.91	0.80	6.84	42.12	56.46
Sulawesi	**42.03**	**35.86**	**2.84**	**3.56**	**4.68**	**10.00**	**50.45**	**50.58**
23. Nusa Tenggara Barat	52.37	37.91	1.73	2.98	2.30	4.84	43.60	54.27
24. Nusa Tenggara Timur	56.72	41.24	0.41	1.56	1.91	2.76	40.96	54.44
25. Timor Timur	44.49	30.94	0.53	0.98	1.25	2.98	53.73	65.10
26. Maluku	42.44	28.03	3.88	4.47	4.98	19.34	48.70	48.16
27. Irian Jaya	20.81	19.48	50.67	51.89	1.60	2.48	26.92	26.15
the rest of island	**39.73**	**29.10**	**19.00**	**22.04**	**2.47**	**6.24**	**38.80**	**42.61**
Indonesia		**17.4**		**8.84**		**23.23**		**100.00**

Source: National Income Statistics by Province, BPS

(2) Distribution of Economic Activities between Two Regions

Based on the results of the 1996 Economic Census, the publication of which have just started, the distribution of establishments and employment between the Java & Bali region and the others by economic activities are shown as in Table 4-26.

Table 4-26 Number of Establishments and Employees of Two Regions by Industry, 1986 and 1996

(Thousands)

Industry	Establishments				Employees			
	1986		1996		1986		1996	
	Java & Bali	Others	Java & Bali	Others	Java & Bali	Others	Java & Bali	Others
1. Agriculture*)	11996.7	8120.8	12280.4	10255.2	18240.9	14106.9	16106.0	16077.2
2. Mining & Quarrying	89.0	38.8	124.7	67.9	194.3	134.4	237.4	209.5
3. Manufacturing Industry	1111.1	422.5	1857.1	902.2	4141.7	1144.8	7467.5	2572
4. Electricity, Gas and Water Supply	9.1	11.4	4.8	8.8	57.5	40.3	84.6	55.7
5. Construction	32.6	53.4	88.4	122.8	180.3	187.5	478.4	561.3
6. Wholesale and retail Trade, Restaurants and Accommodation Services	3814.0	1291.6	6310.4	3151.9	5073.3	1844.1	9956.0	5249.7
7. Transport, Storage, and Communication	666.5	215.8	1245.2	488.2	1021.8	362.3	1755.1	743.5
8. Financial Institution	18.1	4.7	50.9	22.4	193.4	55.4	469.0	192.2
9. Real Estate, Rental Services, and Other Services	1164.3	334.2	1392.7	588.4	1793.8	609.4	2906.8	1191.2
Total	18901.4	10493.4	23354.5	15608.0	30897.2	18484.8	39460.8	26852.3

Source: 1996 Economic Census, BPS

Note:*) The figures of Agriculture sector are estimated from Agriculture Census 1993

The first point to note is that in Java & Bali the employment of agriculture decreased more than two million, which accounted for 11.7%, over these ten years. The contribution of agriculture in employment was 40.8% in this region in 1996. Instead, the trade, restaurant & hotel sector, and the manufacturing industry together absorbed 8.2 million new employment during the same period. In the rest of the region, the employment share in agriculture also decreased from 76.3% in 1986 to 59.9% in 1996. During the same period, the total number of employment in Java & Bali increased 27.7%, while that in the other region increased 45.3%. This is reflected in the total number of establishments. The increase in Java & Bali was 23.6%, and that in the other region was 48.7%, on the other hand.

In the industrial sector, numbers of establishments by subsector were distributed as in Table 4-27. The ratio of the total numbers between the region of Java & Bali, and others was around 2:1 in 1996. If we take this ratio as a benchmark, the three subsectors, the textile and leather industry, the chemical industry including oil and gas, and the fabricated metal product and machinery industry, were distributed relatively more in outside Java & Bali. It can be explained that the textile industry is spread all over the country because the traditional local weaving and handicraft products are included in this subsector. The location of chemical industry, on the other hand, is determined mostly by the location of raw material natural resources. Although the subsectors of wood and furniture, paper and printing, and non-metalic mineral products except petroleum and coal, i.e. cement and ceramics, are also categorized as resource based industries, they are rather concentrated in the Java & Bali region. These industries include the downstream manufacturing which is mostly done on smaller scale as well as the processing of

raw materials which is usually done on larger scale.

Table 4-27 Number of Establishments in Manufacturing Industry by Province and Subsector

	Java and Bali	Others	Total
31. food, beverages and tobacco	639,405	327,772	967,177
32. textiles, wearing apparel and leather	239,503	163,966	403,469
33. wood and wood products, including furniture	656,498	275,306	931,804
34. paper and printing	19,399	4,347	23,746
35. chemical, petroleum, coal, rubber and plastic products	15,559	12,761	28,320
36. non-metallic mineral products, except petroleum and coal	191,415	67,335	258,750
37. basic metal industries	1,594	725	2,319
38. fabricated metal products, machinery and equipment	43,418	30,488	73,906
39. Other manufacturing industries	50,281	19,568	69,849
Total	1,857,072	902,268	2,759,340

Source: 1996 Economic Census, BPS

In terms of the size of employment, manufacturing establishments outside of Java & Bali are concentrated in the smallest category, which is defined to employ less than 5 workers and classified as micro industry, compared to those in the Java & Bali region. The shares of small and medium scale industries are higher in Java & Bali, as well as that of large scale industries.

Table 4-28 Number of Establishments in Manufacturing Industry of Two Regions by Employment Size

	Employment Size				Total
	< 5	5-19	20-99	>= 100	
Java & Bali	1,663,709	169,422	18,645	5,296	1,857,072
(%)	89.6	9.1	1.0	0.3	
Others	837,860	59,556	3,639	1,213	902,268
(%)	92.9	6.6	0.4	0.1	
Total	2,501,569	228,978	22,284	6,509	2,759,340

Source: 1996 Economic Census, BPS