APPENDICES

APPENDIX I

When we change the specification of aggregate demand (supply) in equation (40) to make it as a function of time trend only, that is:

$$\log(Y) = d_0 + d_1 . \text{TIME} \qquad (40)$$

and maintain specifications of all other equations (see equations 1 to 39 of Chapter V), the results of computation are as shown in Table A.1.

Except for the sign of coefficient of import price ratio relative to domestic price in equation for value of total import (i_1), these results are not statistically different from the results in Table 5.1. In this specification of aggregate demand (supply), the sign of i_1 is reversed to become negative but its T-statistic is insignificant as before.

The results of simulation exercises in this specification of aggregate demand are not worthwhile reporting because they are basically the same as the results in Table 5.3. Nevertheless, simulation exercises of policy changes become irrelevant to aggregate demand (supply) because real income is exogenous in this specification.

Lastly, exogeneity of real income will also change the working of the model in the sense that there is no more interaction between prices, exchange rate, foreign prices, and interest rate on the real income.

With a little effort, structural equation estimates in this specification of aggregate demand (supply) can be constructed by multiplying the individual parameters and adjustment coefficient of each individual equation.

Data Sources and Definitions

Except where otherwise indicated, the data used in this book were obtained from the following sources:

A. *International Financial Statistics* (IMF-IFS), International Monetary Fund, Washington D.C.

B. *Indonesian Financial Statistics* (BI-INFS), Bank Indonesia, Jakarta.

TABLE A.1
Indonesia: Multivariate Regression Results of Individual Parameters

Parameter	Estimated Coefficient	T-statistic
	Price Level	
w	0.697	7.020
a_0	2.731	7.375
a_1	1.229	17.840
a_2	-0.003	2.661
a_3	0.031	0.725
	Supply of Money	
m_0	191.609	2.829
k	0.198	4.021
m_1	0.520	13.295
	Non-oil Tax Revenue	
t_0	-2.722	-5.761
t_1	0.874	16.844
t_2	0.022	2.762
t_3	0.510	5.547
t_4	0.234	2.554
t_5	0.212	2.335
	Value of Non-oil Export	
e_0	-3.180	-159.243
e_1	1.249	22.509
	Value of Total Imports	
i_0	-2.930	-43.939
i_1	-0.197	-0.640
z	0.494	·4.273
	Aggregate Demand	
d_0	3.265	127.283
d_1	0.020	27.052

C. *Indikator Ekonomi, Monthly Statistical Bulletin*, Biro Pusat Statistik (Central Bureau of Statistics), Jakarta.

The data in the above sources are frequently revised by the Indonesian authorities. Where available, the most recently revised series were used. A list of variables used in Chapter V, their definitions, and sources are given below:

The following variables are given in billions of current rupiahs:

C = domestic currency, sources A and B;
D = demand deposits, sources A and B;
QM = quasi-money (sum of time and savings deposits), sources A and B;
NM = C + D = narrow money, sources A and B;
BM = NM + QM, sources A and B;
RM = reserve money, sources A and B;
NOTAX = government non-oil revenue, source B;
OILTAX = government oil revenue, sources A and C;
GDR = total government domestic revenue, sources A and B;
GE = total government expenditures, source A;
YP = gross domestic product in nominal terms. The national income series are the only series used in Chapter V which are not available on a quarterly

basis. As explained in the text, the nominal income series is generated by first regressing annual nominal GDP with average money supply (MON), nominal value of total exports (EXP) and imports (IMP). The result of the regression was:

$$GDP_t = 515.73 + 5.11\ MON_t + 0.0005\ EXP_t + 0.003\ IMP_t$$

$$(1.21) \quad (3.61) \quad (0.93) \quad (1.98)$$

$R^2 = 0.99$; D.W. = 2.33 is used to generate quarterly series of nominal GDP by plugging the actual values of money supply, export, and import which are available on a quarterly basis;

EXP = value of non-oil exports in nominal terms, source C;
IMP = value of total imports in nominal terms, source C;
COG = banking system's net claims on government, source A;
COE = banking system's net claims on private sector, source A;
CAPFL = net banking flows as a residual of the reserve money identity, source A.

The following definitions are given for various price variables:

P = the Jakarta cost-of-living index, 1973 = 100, sources A and C;
R = nominal interest paid on time and savings deposits with maturity of one year or more, expressed on annual basis in percentage terms, source B;
ER = exchange rate, expressed in terms of number of rupiahs per US$, sources A, B, and C;
IPIM = the wholesale price index of imported goods, 1973:3 = 100, source C;
IPEX = the wholesale price index of non-oil exported goods, 1973:3 = 100, source C;
PW = the world price index which is constructed equal to one third of the sum of cost-of-living indices of Japan, the United States, and Germany, 1970 = 100, source A.

APPENDIX II

Selected Empirical Studies on the Indonesian Financial Sector, 1969–79

Gurley[1] examined the factors affecting money supply in Indonesia during the period 1953–69. In his descriptive study, he assumes that the real size of the monetary system, as measured by real total currency and deposits, is a function of expectation of inflation. By imposing equilibrium conditions in the money market, supply of money is equal to demand for it. He tests the function relationship between the two variables by putting them on a diagram and plotting the annual observations. He uses a very crude method to measure expectation. The expected rate of inflation of a particular year is the weighted average of actual inflation rates of the last two years and the particular year. He assigns arbitrary weights to them and for the best result he is finally settled at 0.6, 0.3, and 0.1 for each year. From this exercise he finds that due to the change in price expectations, the downward sloping demand for money function in Indonesia has been shifted twice to the right during the period 1953–69. The bottom equation is the demand for the

period 1953–57; the middle equation for the period 1958–65 and the upper right for the period 1966 to June 1969. Implicit in this study, the authority can control money supply, thereby influencing inflation.

In his study during the period 1960–71, Sundrum[2] recognized that money supply was not an exogenous policy-determined variable since, in the past, government budget deficits were always financed by banks' credits. Nevertheless, since he was more interested in computing the income velocity of money, he failed to expand his contribution into a rigorous model.

Aghevli and Khan[3] constructed a simultaneous model to explain the inflationary finance and the dynamics of inflation in Indonesia during the period 1951–72. They incorporated Sundrum and Dutton's[4] ideas of endogeneity of money supply, the Cagan type demand for money,[5] and the idea of inelasticity of tax revenue in less developed countries. The model explicitly asserts the idea that inflation has caused a widening of fiscal deficit financed through the banking system, leading to further increases in money supply and further increases in prices. This way, the model retains the monetarist assumption that inflation is generated by unjustified expansion in government deficits (financed for the most part by increases in the money supply) and in central bank loans to the public and to commercial banks. However, it differs from the older generation of monetarist models in that the Aghevli-Khan model has the increase in money supply involved in a two-way relationship with inflation. In this specification, the model explains the self-perpetuating process of inflation and increase in money supply. In their 1978 paper,[6] the applicability of the model has been tested for another four countries.

The model starts with the Cagan type demand for money, where the demand for real money balances is a stable function of real income (Y) and the expected rate of inflation (π^e) as an opportunity cost of holding money, as follows:

$$\ln(M/P)_t^d = \alpha_0 + \alpha_1 \ln Y_t - \alpha_2 \pi^e \tag{1}$$

where superscript d represents the desired level.

The actual stock of real money balances is assumed to be adjusted proportionally to the difference between the demand for real balance and the actual stock in the previous period. In this adjustment process they implicitly assume that prices are adjusted to the excess demand for money.

$$\Delta \ln(M/P)_t = \lambda[\ln(M/P)_t^d - \ln(M/P)_{t-1}] \tag{2}$$

The expected rate of inflation is also assumed to be generated by the Cagan's type of adaptive process:

$$\Delta \pi_t^e = \beta(\pi - \pi_{t-1}^e) \tag{3}$$

where β is the coefficient of expectation and π is the current rate of inflation.

By imposing equilibrium conditions on the money market, substituting equation (2) into (1) and solving for price, we get:

$$\pi_t = -\lambda\alpha_0 - \lambda\alpha_1 \ln Y_t + \lambda\alpha_2 \pi_t^e - (1-\lambda)\ln(M/P)_{t-1} + \ln M_t \tag{4}$$

Next, the desired government real expenditures (G/P) is a function of real income since they assume that the government is committed to meet certain real expenditures regardless of nominal cost overrun as follows:

$$\ln(G/P)_t^d = g_0 + g_1 . \ln Y_t, \; g_1 > 0 \tag{5}$$

The government adjusts its nominal expenditures from the desired to the actual levels (G) by following the same adaptive adjustment mechanism:

$$\Delta \ln G_t = \gamma(\ln G_t^d - G_{t-1}) \tag{6}$$

where γ is the coefficient of adjustment and $1 > \gamma > 0$.

From equations (5) and (6) above we obtain nominal expenditure as

$$\ln G = \gamma g_0 + \gamma g_1 . \ln Y_t + (1-\gamma)\ln(G/P)_{t-1} + \pi_t \tag{7}$$

Desired government's nominal revenues are assumed to be functions of nominal income:

$$\ln R_t^d = t_0 + t_1(\ln Y_t + \ln P_t),\ t_1 > 0 \tag{8}$$

Actual revenues are assumed to be adjusted to the difference between desired revenue and the actual revenue obtained in the previous period:

$$\Delta R_t = \tau(\ln R_t^d - \ln R_{t-1}^d) \tag{9}$$

where τ is the adjustment coefficient and $1 > \tau > 0$.

From equations (7) and (8) we obtain:

$$\ln R_t = \tau t_0 + \tau t_1(\ln Y_t + \ln P_t) + (1-\tau)\ln R_{t-1} \tag{10}$$

Since in this model the government is assumed to be committed to meet certain real expenditures, the government nominal budget deficit becomes a function of the inflation rate. The government nominal revenue in less developed countries usually lags behind the increase in nominal income because of low nominal income elasticities of their tax systems and long lags in their tax collections. As a result we expect the adjustment coefficient of the revenue (τ) to be less than the adjustment coefficient of the government expenditure (γ) even though the coefficients of revenue elasticity (t) and of government expenditures (g_1), both with respect to income, are equal.

The money supply is a multiple of the monetary multiplier (m) times the monetary base (B). The monetary base consists of government deficit plus changes in the central bank's claims on commercial banks and the private sector and changes in international reserves (DP) plus the previous year's monetary base (B_{t-1}):

$$M_t = m . (G_t - R_t + \Delta DP + B_{t-1}) \tag{11}$$

In this system, therefore, it is assumed that government deficits are financed by the creation of money, to represent the inability of less developed countries to raise revenues from issuing government bonds.

In logarithmic form, equation (7) can be written as:

$$\ln M_t = \ln m + k_0 + k_1 \ln G_t - k_2 \ln R_t + k_3 \ln(\Delta DP + B_{t-1}) \tag{10}$$

where the parameters k_0, k_1, and k_2 are all functions of the sample means of ln G, ln R, and ln E.

The Aghevli and Khan model explains the situation in Indonesia well before the year 1968 in the period when the government monetized its budget deficits. As we saw in Chapters I, II, and III, since 1968 the government has been balancing its budget with the help of foreign borrowings and since 1973 the budgets have always ended up with small surpluses which are made possible by continuous increases in oil revenues. Nevertheless, the model makes sensible policy recommendations to reduce inflation; the government has to decrease its budget deficit by increasing revenues that are related to real income to keep pace with its target real expenditures. In addition, it also has to

reduce the supply of money either from domestic credit creation or from foreign sources of the monetary base that the government can control such as neutralizing the oil revenues or reducing foreign borrowings.

Schydlowsky's short-run deterministic macro-economic model (1981) was intended as an aid for policy-makers in formulating short-run "monetary and fiscal policy management to protect a country's balance of payments and price stability".[7] He resolves the price stability problem by a perhaps oversimplified argument based on textbook assumptions: by assuming the country as a price-taker in the international market for both exportables and importables. By this assumption the domestic price of traded goods is simply equal to the world price plus freight, insurance, import tariff, and port charges. He talks about exportables, importables, services, and non-traded goods but his model has no explicit price equation.

The model contains six independent accounting equilibrium identities: income, import, export, accumulation of time and savings deposits, stock of liquidity, and the balance of payments. The whole story can be told by the income and the balance of payments identities because the other identities are incorporated in these two equations.

Equilibrium income is a product of an income multiplier coefficient and a set of exogenous variables in traditional Keynesian formulation. The multiplier coefficients depend upon the marginal propensities to save in the form of bank deposits, to absorb export and import competing commodities; the ratio of currency to money; the ratio of money to liquidity; changes in liquidity reserves requirements against rupiah demand deposits and against foreign exchange deposits. The exogenous variables are real output (export, agriculture, and industrial sectors), foreign private investment, credit to the private sector, and central bank and foreign lendings to the government including semi-official entities.

Import is a summation of increases in food stockpiles, impact multipliers of financial increases both domestic as well as foreign credits, impact multipliers of domestic value added to the agricultural sector, domestic value added of the manufacturing sector, impact multipliers of foreign investment projects, and impact multipliers of production of export goods.

Export is a summation of impact multipliers of production of export and import multipliers of value added in agricultural and manufacturing sectors and the financial sector plus annual loss of the Logistic Agency (Bulog) which monopolizes importation, storage, and distribution of foods.

Identities for accumulation of time and savings deposits and stock of liquidity are impact multipliers of domestic value added in the real sectors and changes in the financial sectors.

The balance of payments is a summation of reserves against rupiah savings and time deposits plus reserves against foreign exchange deposits minus central bank credit.

Since the only variables that are under government control to affect income are domestic credits of the banking system to both public and private sectors, then only money matters in this model. Contrary to the monetarist model, an increase in domestic credit does not affect price because of price-taker assumption, but the central bank's credit expansion directly deteriorates the balance of payments. Aside from credit, the model does not specify where the growth comes from nor does it tell the story of how the short-run equilibrium affects long-term development as it originally was intended to do.

The monetary sector affects income through the following channels: increase in credit is an injection to the income stream since it directly increases private and government expenditures. On the other hand, increase in quasi-money, mainly time and savings deposits, represents a leakage from the income stream and thus checks the increase in aggregate demand.

Because the model is both static and deterministic it neither tells how the economy moves from one to another equilibrium position nor does it address the problems of uncertainties that may occur during the movements. The whole system of identities relies on simple ratios and none of them is specified as a behavioural function of economic aggregates. Since the behaviour of economic agents is not static and no room is allowed to predict them in the identities, the model is hardly useful in making predictions about the future unless the user invents his own data based on his own value judgment as the author tested the validity of his model.

Due to the model's reliance on the reserve requirement ratios, he ignores the important facts in the Indonesian monetary sector during his calibration exercise, 1969–73: namely, credit ceiling and selective credit policies. Under these policies the authorities set the multiple of money multiplier and monetary base. In such a case, reserve requirement ratios are meaningless since the banking system is always in excess liquidity. On this line it also fails to recognize the impact of a balanced budget policy on money supply. As noted above, the model does not address price stability as it intended to, a short-run problem that is very crucial in Indonesia, especially after 1971, as has been discussed in Chapter I.

Another monetarist macro-model constructed by Aghevli[8] in 1977 had the main purpose of predicting the appropriate rate of monetary expansion that is consistent with the targeted rates of growth of real income and prices. The model starts with a specification of demand for real money balances as a function of real income and the expected rate of inflation which is adjusted adaptively. Originally the interest rate paid on savings and time deposits was included as an argument in the demand for money function, but he dropped it later because of statistical insignificancy in its estimated coefficient. Real income and interest rates are assumed to be exogenous, the latter being determined by the monetary authorities. Monies are defined in the narrow and broad senses. Narrow money consists of currency and demand deposits, while broad money consists of narrow money plus quasi-money. The latter is made up mainly of time and savings deposits at the state-owned banks.

He tried two specifications of supply for both definitions of money. In the first specification, money supply is equal to simple multiplication of constant money multiplier with reserve money. The money multiplier is a function of the ratios of demand deposits to currency, of quasi-money to demand deposits and of total deposits (demand and time deposits) to reserves. The second specification is that money supply is a Koyck transformation of the reserve money. As in the first one, the money multiplier is assumed to be constant in the second formulation of money supply. Reserve money is defined as a summation of the deficit in the domestic component of the government budget, the private sector's balance of payments, and changes in credit to the private sector.

As noted in Chapter III, "the balanced budget rule" in Indonesia means that the government finances deficits in the domestic component of its budget with the surplus in the foreign component of the same budget. Total government expenditures, domestic and abroad, and government foreign revenue are assumed exogenous; then, the only estimable equation is government domestic revenues. As noted in Chapter I, government foreign revenue consists of foreign borrowing and revenues in foreign exchange which are not withdrawals from domestic purchasing power, such as oil revenues.

Aghevli specifies domestic revenue as a function of real income and the inflation rate. The balance of payments consists of imports, non-oil exports, oil exports, and capital accounts. Oil export and capital account are assumed to be exogenous. Export is a function of export price relative to home prices and nominal income. Import is a function of total demand for goods and services and the price of import relative to domestic prices.

Aghevli tested his model empirically from the fourth quarter of 1967 to the first

quarter of 1973. With its simplicity the model captures the essential characteristic of the Indonesian monetary sector: the money supply and inflation rate are interdependent and reserve money is a function of expansion in domestic credit and the way government finances the domestic components of its budget via the balance of payments.

In his 1979 article, Boediono[9] developed a quarterly macro-economic model of the Indonesian economy. The model consists of 32 equations of which 18 are semi-logarithmic behavioural equations and 14 identities. Government revenue is estimated by five equations, and each of them is to estimate the following sources of tax revenue: oil tax, indirect tax on non-oil import, other (domestic) indirect tax, direct tax, and total domestic revenue. Oil tax is a function of net oil export, which is equal to its export minus its import, and two dummy variables. The first dummy is to detect the effect of oil contract renegotiation in 1975 and the other is to observe the effect of oil price increases since 1973. Import tax is a function on non-oil import value and two dummies, each of them to represent import tariff revision in 1973 and the anti-smuggling campaign in 1976. Other indirect tax and direct tax are functions on non-oil GDP and their respective previous values. Total government revenue is a linear function of the first four sources of tax revenue.

Real government expenditure is a function of total annual budget multiplied by a quarterly index and a dummy variable to represent increases in the price of oil since 1973.

Money supply is equal to the product of the money multiplier and reserve money. The money multiplier is an implicit function of some other variables, namely, GDP at 1973 market prices, ratios of government expenditure and of value of non-export to money supply, and some dummy variables.

There are ten price equations in Boediono's model, of which five are price identities. Four identities are to convert foreign prices into domestic currency and one to construct the GDP price deflator to base 1973 = 100. The general price index is a function of price indexes of goods that are consumed by the government sector, of consumer goods, of investment goods, of oil export, of non-oil export, and of total imports. The price index of goods that are consumed by the government sector and the price index of consumer goods are functions of the cost-of-living index only. In turn, the cost-of-living index is a negative function of domestic supply at 1973 market prices and a positive function of current money supply, price of imported consumer goods, previous cost-of-living index, quarterly dummy variables. Price of investment goods is a positive function of general price index of total import.

Boediono divides both export and import into two components. Export and import of oil are assumed to be exogenous, while export and import of non-oil are endogenous. Non-oil export is a function of the price index of non-oil export relative to the cost-of-living index, non-oil GDP at 1973 market prices, the price of non-oil exports in a previous period relative to the current price index of exported goods in international markets, one dummy for non-oil export and three quarterly dummies. Non-oil import is a function of domestic general price index of imported goods, private consumption expenditure, change in the central bank's direct credit and dummy variables to show the effect of import tariff revision in 1973 and the anti-smuggling campaign in 1976. Besides these two behavioural equations, there are three additional identities for foreign transactions. Identities for total export and import simply say that total export is equal to export of non-oil plus exogenous export of oil and total import is equal to import of non-oil plus exogenous oil import. The last identity is the balance of payment identity which is defined as equal to total export minus total import plus net exogenous private and official capital flows, plus exogenous services, and error and omission.

TABLE A.2
Main Characteristics of Econometric Models of the Indonesian Financial Sector

No.	Author(s)	Year Published	No. of Equations			No. of Variables		Estimation Technique	Data Used				Function(s) or Sector(s) Included
			Total	Behavioural	Identities	Total	Exogenous		No. of Observ.	Sample From	Sample To	Base	
1	Gurley	1970	1	1	none	4	3	graphic	17	1953	1969	annual	M^d
2	Sundrum	1973	1	1	none	4	3	OLS	11	1967	1971	annual	M^d
3	Aghevli & Khan	1977	4	3	1	8	3	FIML	22	1951	1971	annual	P, Gov't. sector, M^s
4	Schydlowsky	1980	7	none	7	28	22	?	4	1969	1973	quarter	Y, IM, EX, IM, CMD, I, B
5	Aghevli	1977	12	9	3	17	5	2 SLS	56	1960: 1	1973: 4	quarter	M^d, M^s, IM, EX, GDR, M^s
6	Boediono	1979	32	18	14	74	43	OLS(?)	29	1969: 2	1976: 3	quarter	Y, C, EX, IM, M^s, M^d, P Government sector

Private consumption expenditure is a positive function of current disposable income and the previous period's private consumption expenditure.

The last six identities are expenditure, income and supply identities. Current GDP is a summation of current private and government expenditures, export, investment, minus import, and plus statistical errors. Disposable income equals GDP minus oil and other direct taxes, minus factors' payments abroad and depreciation, plus statistical errors. GDP non-oil is equal to GDP minus value of oil export. Domestic supply at 1973 market prices is equal to GDP minus all export plus total import, all at 1973 prices. GDP non-oil at 1973 prices is equal to GDP minus value of export at the same market prices. Real GDP at 1973 market prices is a function of current GDP over general price index and of the previous period's GDP at 1973 market prices.

The flaws of Boediono's model are apparent from its specification and empirical findings. First, as has been discussed in Chapter I, about half of the government budget is for development expenditure and some of it is expenditure for investment goods, as well as for raw materials or intermediate goods since the government in Indonesia not only produces "public goods" but also "private goods". Even for provisions of "public goods" such as roads and dams, the government needs to buy investment goods. As a result, Boediono's specification that the price index of goods that are consumed by the government is only a function of cost-of-living index, is false. Second, the multiplier effect of an exogenous increase in government spending, according to the result of his first simulation, has yielded a negative GDP at current prices since the 17th quarter and at 1973 market prices since the 14th quarter. These results are contrary to multiplier theory which says that multiplier effect of an increase in exogenous variables always yields a positive effect on income. Third, the same holds true for the result of the multiplier effect of devaluation in his second simulation. According to it, a 10% devaluation yields positive effects on current price GDP until the 11th quarter, on GDP at 1973 market prices up to the 4th quarter, and on export of non-oil up to the 5th quarter. After those periods, devaluation yields negative effects on those variables. These results are diametrically contrary to the established J curve in international trade theory which says that devaluation will deteriorate the BOP and income in the earlier periods after devaluation and improve them in later periods.[10]

The main characteristics of econometric models of the Indonesian economy that have been discussed so far are summarized in Table A.2.

NOTES

1. John G. Gurley, "Notes on the Indonesian Financial System" (Paper presented at the Dubrovnik Conference of the Development Advisory Service of Harvard University, 20–26 June 1970).
2. Sundrum, op. cit.
3. Aghevli and Khan (1977), op. cit.
4. Ibid., p. 185.
5. Phillip Cagan, "The Monetary Dynamics of Hyperinflation", in *Studies in the Quantity Theory of Money*, ed. Milton Friedman (Chicago: University of Chicago Press, 1970), pp. 25–117.
6. Bijan B. Aghevli and Mohsin S. Khan, "Government Deficits and the Inflationary Process in Developing Countries", *IMF-SP* 25, no. 3 (September 1978).
7. Daniel M. Schydlowsky, "A Short Macroeconomic Model of the Indonesian Economy", in Gustav F. Papanek (ed.), ibid., ch. 7, pp. 185–277.
8. Bijan B. Aghevli, "Money, Prices, and the Balance of Payments: Indonesia 1968–73", *The Journal of Development Studies* 13, no. 2 (June 1977).
9. Boediono, "Sebuah Model Makro Triwulanan Untuk Indonesia", *EKI* XXVII, no. 3 (September 1979).
10. I am indebted to Dr David O. Dapice on this point.