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# An Econometric Model of Indonesia with Particular Reference to the Monetary Sector: 1970–1980*

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## I Introduction

The purpose of this paper is to provide an econometric framework for the Indonesian monetary sector and to investigate interactions between monetary and real phenomena by linking it with a simple supplementary model for the Indonesian real sector. The model of the monetary sector, i. e., the monetary submodel, focuses on the simultaneous determination of money supply, domestic credits and general price level which are then fed back into the model of the real sector, i. e., the real submodel, which in turn generates real income and trade balance for the monetary sector to complete an interdependent system for the monetary and real sectors. Our monetary submodel employs a version of the Yale approach to financial model building (e. g., Brainard and Tobin [1968], in which various financial assets on the balance sheets are determined together with the corresponding interest rates in a general equilibrium setting),[1] while our real submodel is of the Keynesian effective demand type without explicit allowance for supply capacity and capital accumulation.

The monetary submodel here depends exclusively on the balance sheets of the monetary authorities and the Deposit Money

* This is a revised and extended version of the report: "A Monetary Submodel for the BAPPENAS Econometric Model," which was proposed by the author for the BAPPENAS project and presented at a seminar in BAPPENAS in June 1982. The model in the original report was drastically changed in two directions into the present form after the author's return from Jakarta to Kyoto in July 1982. First, the mechanism of price determination was introduced into the monetary submodel. Second, a simple model for real sector was incorporated into the monetary submodel. (N. B. The BAPPENAS system has a comprehensive model for the real sector consisting of 55 equations.) The author is more or less indebted to all of the members of the BAPPENAS project in preparing the original report. Among others, Dr. A. Mooy, Dr. Slangor, Dr. Soedradjad Djiwandono, Dr. H. Tampubolon, Prof. J. L. Tamba, Mr. J. Sitompul, Mrs. Sumiyati Burlian, Mr. P. Widjojo, Mr. Mulyant, Mr. Panut, Mrs. Yuni, Miss Maartje, Prof. K. Kobayashi, Prof. S. Ichimura, Prof. Y. Kaneko, Prof. I. Sugiura, Mr. Y. Maenami and Dr. S. Odano are greatly appreciated. Discussions with Prof. A. Takayama and comments by two referees were also very valuable in preparing the present paper in Kyoto. Needless to say, however, the author is solely responsible for any errors in this paper and the views expressed in this paper are not those of BAPPENAS but of the author only.

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1) See also Takayama and Drabicki [1976] which includes a brief theoretical survey on the endogenous supply of money. See Horiuchi [1980] for a theory-oriented empirical study of the Japanese financial mechanism along similar lines with the Yale approach. See also a comprehensive study by Bryant [1980].

Banks and their consolidation for the monetary system.[2] Furthermore, it gives relatively heavy weighting to the bahavior of the Deposit Money Banks. On these two scores, the model may be said to differ substantially from several older models of the Indonesian financial sector.[3] Our approach, starting from the balance sheets, seems to have some merit in clarifying interactions and inter-relationships between various financial variables, thus making it possible to analyze changes in money supply and domestic credits in a consistent way from a more disaggregated base. In our monetary submodel, money supply is defined from the asset side as the sum of net foreign assets and net domestic credits in the monetary system. Neither of the two money components are, however, under the direct control of the monetary authorities, since the former depends on the balance of payments through exports, imports and capital inflow, while the latter includes the domestic credit supplies of the Deposit Money Banks in addition to those of the monetary authorities. Exports and imports are closely related to behaviors in the real sector, so that the behavior of the Deposit Money Banks is crucial in determining changes in the money supply through changes in domestic credits.

In our monetary submodel, the Deposit Money Banks are assumed to allocate their available funds mainly to credits to the public sector (government and government enterprises), credits to the private sector, and investment in foreign assets. We treat the first as an exogenous or policy variable, specify for the second a credit supply function dependent on the lending rate of interest, and determine the third as a residual. Major sources of funds for the Deposit Money Banks are, of course, demand deposits and time and saving deposits, for which demand functions of the non-bank public are specified.

2) In Indonesia, the financial sector consists of the following institutions: monetary authorities (Bank Indonesia as the central bank and the Treasury to the extent that it exercises monetary functions), Deposit Money Banks (five state commercial banks, 75 private national commercial banks, 10 foreign commercial banks, one joint venture bank, 26 regional development banks, one state-owned development bank, and one private development bank), and other Financial Intermediaries (development finance companies, investment finance companies, insurance companies, pension funds, etc.).
The monetary system, which comprises monetary authorities and Deposit Money Banks, accounts for 96% of the total gross assets of all financial institutions. Bank Indonisia alone accounts for 59% and the state commercial banks for another 29%. Among the Deposit Money Banks, the shares of state commercial banks in total assets, deposits and loans outstanding are 79%, 76% and 81% respectively. (N. B. Figures above are all for 1979.) Thus, government monetary institutions dominate the Indonesian financial sector indicating the government's active interventionist role in the allocation of financial resources. For the financial system and financial development in Indonesia, see Grenville [1976], Booth and McCawley [1981: Ch. 4], Soedradjad Djiwandono [1980], and various reports by such international organizations as the World Bank and the IMF.

3) See Aghevli [1976; 1977], Bank Indonesia [1979; 1980], Mailangkay and Hindromarsono [1977], Slangor and Hindromarsono [1980], SEACEN [1981: Chapter on Indonesia, 79–103], etc. for the existing models of the Indonesian financial sector. See also Boediono [1979] though the monetary sector is not the main aspect in his model.

Our monetary submodel is rather simple and not of the general type due to the specific nature of the Indonesian monetary economy. First, the financial markets in Indonesia are still immature in that government bonds do not exist and private securities are not significant. Therefore, the model can only deal with such domestic sector financial assets as currency, demand deposits, time and saving deposits, and loans and credits. Second, flow of funds accounts are not available yet in Indonesia, so that our model does not explicitly allow for the balance sheets of the non-bank public sector: government, government enterprises, and the private sector. Third, not only deposit rates of interest but also lending rates of interest are under the control of the monetary authorities. This means that interest rates are not adjustment factors for attaining equilibria in Indonesia. Nevertheless, equilibrium is maintained in our monetary submodel, where equilibrium values are derived either from demand functions or supply functions without explicitly introducing counterpart supply or demand functions. For example, a credit supply function is specified for the Deposit Money Banks assuming that debtors behave as quantity takers in their credit-demanding activities. Another example is demand and time and saving deposits, for which demand functions are specified under the assumption that banks behave as quantity takers in their deposit-supplying activities. The same is true for other financial variables of the Deposit Money Banks such as bank reserves and investment in foreign assets.

Our monetary submodel deviates from the Yale approach in one important respect: i. e., in our model the general price level (GDP deflator) is determined from the ratio of supply of money (broad) to *real* demand for money (broad) using the condition of monetary equilibrium. In our model, the supply of money is derived from the asset side of the monetary system as the sum of net foreign assets and net domestic credits, while real demand for money is the sum of its major components on the liability side: i. e., currency in circulation, demand deposits, and time and saving deposits, for which *real* demand functions of the non-bank public sector are specified. The condition for monetary equilibrium, i. e., nominal supply of money = price level × real demand for money, is a key equation in the monetary approach to the balance of payments.[4] Unlike the monetary approach to the balance of payments, however, our monetary submodel employs the equilibrium condition to determine price level but not balance of payments, treating price as an adjustment factor in the monetary equilibrium through interactions with the real sector as well as within the monetary sector. Price determination here is along similar lines to that of Aghevli [1977], but our model extends his contribution in several ways. For example, his model treats real income as exogenous, whereas our system incorporates a simple real submodel of the effective demand type to endogenize real income together with GDP components on the expenditure side. No restrictions are imposed on production capacity, so that real income

4) See Soedradjad Djiwandono [1980] for the monetary approach to the balance of payments and its application to Indonesia.

determined from GDP expenditures may be regarded as the equilibrium level in the real sector which leads to equilibrium in the money market.

This paper focuses mainly on the monetary aspects of the Indonesian economy: Section 2 deals with the balance sheets of the Indonesian monetary system; Section 3 discusses the equations system and empirical results; Section 4 analyzes testing and policy simulations; and Section 5 gives some concluding remarks.

## II Balance Sheets versus Monetary Submodel

The notation of the model is presented in Table 1. Using this notation, the consolidated balance sheets of the Indonesian monetary system are illustrated in Table 2. Needless to say, Table 2 corresponds exactly to actual accounts of the Indonesian monetary system shown in Table 3. In other words, Table 2 is derived from Table 3 by identifying item for item in Table 3. This identification is explained in Table 4, which shows the correspondence between monetary variables in Table 2 and items in the actual balance sheets in Table 3.

**Table 1** Notation

| | |
|---|---|
| *...MS* | = ... monetary system |
| *...MA* | = ... monetary authorities |
| *...MB* | = ... Deposit Money Banks |
| *NFA..* | = net foreign assets in.. |
| *CRG..* | = net claims on government by.. |
| *CRO..* | = net claims on official entities & government enterprises by.. |
| *CRP..* | = net claims on the private sector by.. |
| *NOI..* | = net other items of.. |
| *GDP* | = gross domestic product, nominal |
| *GDPR* | = gross domestic product, real |
| *PGDP* | = gross domestic product, deflator |
| *CPR* | = private consumption expenditures, real |
| *PCP* | = private consumption expenditures, deflator |
| *CGR* | = government consumption expenditures, real |
| *PCG* | = government consumption expenditures, deflator |
| *I* | = gross domestic capital formation, nominal |
| *IR* | = gross domestic capital formation, real |
| *PI* | = gross domestic capital formation, deflator |
| *X* | = exports of goods and services, nominal |
| *XR* | = exports of goods and services, real |
| *PX* | = exports of goods and services, deflator |
| *M* | = imports of goods and services, nominal |
| *MR* | = imports of goods and services, real |
| *PM* | = imports of goods and services, deflator |
| *PMI* | = price index for imports of investment goods |
| *NFIA* | = net factor income from abroad, nominal |
| *CAP* | = net capital inflow |
| *BOP* | = balance of payments (overall balance) |
| *BOPSD* | = balance of payments (overall balance), statistical discrepancy |
| *NFAMS* | = net foreign assets in *MS* |
| *NFAMA* | = net foreign assets in *MA* |
| *NFAMB* | = net foreign assets in *MB* |
| *CRGMS* | = net claims on government by *MS* |
| *CRGMA* | = net claims on government by *MA* |
| *CRGMB* | = net claims on government by *MB* |
| *CROMS* | = net claims on official entities & government enterprises by *MS* |
| *CROMA* | = net claims on official entities & government enterprises by *MA* |
| *CROMB* | = net claims on official entities & government enterprises by *MB* |

*CRPMS* = net claims on the private sector by *MS*
*CRPMA* = net claims on the private sector by *MA*
*CRPMB* = net claims on the private sector by *MB*
*NOIMS* = net other items of *MS*
*NOIMA* = net other items of *MA*
*NOIMB* = net other items of *MB*
*SMB* = supply of money, broad, *MS*
*DMBR* = demand for money, broad, real, *MS*
*MM* = money multiplier (*SMB*/*RM*)
*MK* = Marshallian *k* (*SMB*/*GDP*)
*CMBMA* = claims on *MB* by *MA*
*BMAMB* = borrowings from Bank Indonesia by *MB*
*BMBSD* = borrowings from Bank Indonesia by *MB*, statistical discrepancy
*RM* = reserve money, *MA*
*CUR* = currency outside banks and government, *MA*
*CURR* = currency outside banks and government, *MA*, real (*CUR*/*PGDP*)
*FODMA* = foreign currency and other deposits at *MA*
*RMO* = reserve money other than *CUR* and *FODMA*, *MA*
*DDPMA* = private sector demand deposits at *MA*
*RMB* = reserves, *MB*
*RMBSD* = reserves, *MB*, statistical discrepancy
*RRMB* = required reserves, *MB*
*RRR* = required reserve ratio, *MB*
*DD* = demand deposits at *MB*
*DDR* = demand deposits at *MB*, real (*DD*/*PGDP*)
*TSD* = time and savings deposits at *MB*
*TSDR* = time and savings deposits at *MB*, real (*TSD*/*PGDP*)
*FCD* = foreign currency deposits at *MB*
*RITSD* = rate of interest on time and savings deposits, *MB*
*RIDCR* = rate of interest on domestic credit, *MB*
*RIF* = foreign rate of interest

**Table 2** Consolidated Balance Sheets of the Indonesian Monetary System: An Illustrative Table Using the Model's Notation*

| | Monetary System ⟨*MS*⟩ | Monetary Authorities ⟨*MA*⟩ | Deposit Money Banks ⟨*MB*⟩ |
|---|---|---|---|
| Assets | | | |
| Net Foreign Assets (*NFA*) | *NFAMS* | *NFAMA* | *NFAMB* |
| Net Claims on Government (*CRG*) | *CRGMS* | $\overline{CRGMA}$ | $\overline{CRGMB}$ |
| Net Claims on Official Entities & Government Enterprises (*CRO*) | *CROMS* | $\overline{CROMA}$ | $\overline{CROMB}$ |
| Net Claims on Private Sector (*CRP*) | *CRPMS* | $\overline{CRPMA}$ | *CRPMB* |
| (Claims and Liabilities between *MA* and *MB*) | | *CMBMA* | $-\overline{BMAMB}$ |
| Liabilities | | | |
| (Claims and Liabilities between *MA* and *MB*) | | | $-RMB$ |
| ⟨*MA*⟩ Reserve Money | | *RM* = *RMO* | |
| | | *CUR* | |
| | | $\overline{DDPMA}$ | *DD* |
| ⟨*MS*⟩ Broad Supply of Money | *SMB* | | *TSD* |
| | | $\overline{FODMA}$ | $\overline{FCD}$ |
| Net Other Items (*NOI*) | *NOIMS* | $\overline{NOIMA}$ | $\overline{NOIMB}$ |

* See Table 1 for notation and Tables 3 and 4 for relationships with actual balance sheets. Barred variables are treated as exogenous in the model.

**Table 3** Actual Balance Sheets of the Indonesian Monetary System
(1980, Billions of Rupiahs)

| Monetary System (*MS*) | | Monetary Authorities (*MA*) | | Deposit Money Banks (*MB*) | |
|---|---|---|---|---|---|
| Assets | 10517 | Assets | 3242 | Assets | 7275 |
| Foreign Assets (net) | 6538 | Foreign Assets | 4216 | Foreign Assets | 2740 |
| | | (−) Foreign Liabilities | −30 | (−) Foreign Liabilities | −388 |
| Claims on Central Govt. | −3619 | Claims on C.G. | 604 | Claims on C.G. | 28 |
| | | (−) Govt. Dep. Current a/c | −3341 | (−) Govt. Deposits | −735 |
| | | (−) Govt. Dep. Aid C.F. | −175 | | |
| Govt. Blocked Account | −396 | (−) Govt. Dep., Blocked a/c | −396 | | |
| Claims on Official Entities & Pub. Enterprises | 3655 | Claims on O.E. & P.E. | 2414 | Claims on O.E. & P.E. | 1360 |
| | | (−) Import Deposits | −119 | | |
| Claims on Private Enterprises & Individuals | 4339 | Claims on P.E. & I. | 69 | Claims on P.E. & I. | 4270 |
| Loans | 4107 | Loans | 40 | Loans | 4067 |
| Other Claims | 232 | Other Claims | 29 | Other Claims | 203 |
| Liabilities | 10517 | Liabilities | 3242 | Liabilities | 7275 |
| Money & Quasi M | 7691 | | | | |
| Money | 4995 | | | | |
| Currency | 2153 | *Currency outside Bank & Government | 2153 | | |
| Demand Deposits | 2842 | *Private Sector D.D. | 47 | Demand Deposits | 2795 |
| Quasi Money | 2696 | Foreign Currency & O.D. | 41 | Time & Savings Dep. | 1481 |
| | | | | Foreign Currency Dep. | 1174 |
| Import Deposits | 365 | | | Import Deposits | 365 |
| Other Items (net) | 2461 | (−) Claims on D.M.B. | −1722 | (−) Reserves | −1172 |
| | | (−) Other Assets | −220 | (−) Other Assets | −552 |
| | | *Currency held by Banks | 192 | Borrowings from B.I. | 1636 |
| | | *Bankers' Deposits | 866 | Capital Accounts | 803 |
| | | Bankers' Restricted and FX Deposits | 101 | Other Liabilities | 745 |
| | | Capital Accounts | 966 | | |
| | | Other Liabilities | 818 | | |

* Reserve money of monetary authorities (*MA*)
Source: *Indonesian Financial Statistics*, July 1981 (p. 30 for *MS*, p. 18 for *MA* and p. 28 for *MB*).

**Table 4** Correspondence between Monetary Variables and Items in Actual Balance Sheets*

| | | |
|---|---|---|
| *NFAMS* | = foreign assets (net) | : *MS* |
| *NFAMA* | = foreign assets — foreign liabilities | : *MA* |
| *NFAMB* | = foreign assets — foreign liabilities | : *MB* |
| *CRGMS* | = claims on central government +government blocked a/c | : *MS* |
| *CRGMA* | = claims on central govt. — govt. deposits, current a/c — govt. dep., aid counterpart fund — govt. dep., blocked a/c | : *MA* |
| *CRGMB* | = claims on central govt. — govt. deposits | : *MB* |
| *CROMS* | = claims on official entities and govt. enterprises | : *MS* |
| *CROMA* | = claims on O. E. & G. E. — import deposits | : *MA* |
| *CROMB* | = claims on O. E. & G. E. | : *MB* |
| *CRPMS* | = claims on private enterprises and individuals | : *MS* |
| *CRPMA* | = claims on private enterprises and individuals | : *MA* |
| *CRPMB* | = claims on private enterprises and individuals | : *MB* |
| *CMBMA* | = claims on Deposit Money Banks | : *MA* |
| *BMAMB* | = borrowings from Bank Indonesia | : *MB* |
| *CUR* | = currency outside banks and government | : *MA* |
| *DDPMA* | = private sector demand deposits | : *MA* |
| *RMO* | = currency held by banks+bankers' deposits | : *MA* |
| *RM* | = currency outside banks & govt.+private sector demand dep.+currency held by banks+bankers' deposits | : *MA* |
| *RMB* | = reserves | : *MB* |
| *DD* | = demand deposits | : *MB* |
| *TSD* | = time and savings deposits | : *MB* |
| *FCD* | = foreign currency deposits | : *MB* |
| *FODMA* | = foreign currency and other deposits | : *MA* |
| *SMB* | = money and quasi money | : *MS* |
| *NOIMS* | = other items (net)+import deposits | : *MS* |
| *NOIMA* | = other liabilities+capital accounts +bankers' restricted & FX deposits — other assets | : *MA* |
| *NOIMB* | = other liabilities+capital accounts+import deposits — other assets | : *MB* |

* See Table 3 or *Indonesian Financial Statistics*.

It must be noted that *CMBMA* (claims on Deposit Money Banks by the monetary authorities) does not precisely equal *BMAMB* (borrowings from Bank Indonesia by Deposit Money Banks). The same is true for the equality of *RMB* (reserves of Deposit Money Banks) and *RMO* (reserve money other than currency in circulation and private demand deposit at monetary authorities). In these two cases, it is impossible to secure precise identity between the twin variables because *Indonesian Financial Statistics* are used as data sources, so that some missing items, though minor, are included in *NOIMA* and/or *NOIMB* (net other items of monetary authorities and/or deposit money banks).

From Table 2, we can derive two kinds of identities: column-wise identities (assets = liabilities) and row-wise identities ($MS = MA + MB$). For reference purposes, all of the identities implied in Table 2 are listed below:

(1) $NFAMS + CRGMS + CROMS + CRPMS = SMB + NOIMS$

(2) $NFAMA + CRGMA + CROMA + CRPMA + \underline{CMBMA} = RM + FODMA + NOIMA$

where $RM = CUR + DDPMA + \underline{RMO}$

(3) $NFAMB + CRGMB + CROMB + CRPMB + \underline{RMB} = DD + TSD + FCD + \underline{BMAMB} + NOIMB$

(4) $NFAMS=NFAMA+NFAMB$

(5) $CRGMS=CRGMA+CRGMB$

(6) $CROMS=CROMA+CROMB$

(7) $CRPMS=CRPMA+CRPMB$

(8) $SMB = CUR+DDPMA+FODMA+DD+TSD+FCD$

(9) $NOIMS = NOIMA+NOIMB-(CMBMA-BMAMB)+(RMO-RMB)$

Note that one of the 10 identities (including the definition of *RM*) above is redundant (i.e., linearly dependent on the others) due to an overlapping of row-wise and column-wise identities. This is the reason why *RM* is determined tautologically in two ways in our monetary submodel.[5]

## III Equations System

Table 5 presents a simultaneous system of equations for the whole Indonesian economy. The system consists of 33 equations, most of which are identities of a definitional nature but often with causal or behavioral implications. Our system includes 10 equa-

**Table 5** Simultaneous Equations System*

*Real Sector*

(1) $GDPR = CPR+\overline{CGR}+IR+\overline{XR}-MR$

(2) $GDP = PGDP * GDPR$

(3) $CPR = f(GDP/PCP, CPR_{-1})$

(4) $I = f(GDP, \Delta(CRGMS+CROMS+CRPMS)+\overline{CAP})$

(5) $IR = I/PI$

(6) $MR = f(GDPR, PGDP/\overline{PM}, MR_{-1})$

(7) $PCP = f(PGDP, PCP_{-1})$

(8) $PI = f(PGDP, \overline{PMI})$

(9) $X = \overline{PX} * \overline{XR}$

(10) $M = \overline{PM} * MR$

*Monetary Sector*

Balance of Payments:

(11) $BOP = X-M+\overline{NFIA}+\overline{CAP}$

(12) $NFAMS=NFAMS_{-1}+BOP+\overline{BOPSD}$

Monetary System:

(13) $SMB = NFAMS+CRGMS+CROMS+CRPMS-NOIMS$

(14) $CRGMS=\overline{CRGMA}+\overline{CRGMB}$

(15) $CROMS=\overline{CROMA}+\overline{CROMB}$

(16) $CRPMS=\overline{CRPMA}+CRPMB$

(17) $NOIMS = \overline{NOIMA}+\overline{NOIMB}-(CMBMA-\overline{BMAMB})+(RMO-RMB)$

(18) $CMBMA=\overline{BMAMB}+\overline{BMBSD}$

(19) $RMO = RMB+\overline{RMBSD}$

Monetary Authorities:

(20) $RM = NFAMA+\overline{CRGMA}+\overline{CROMA}+\overline{CRPMA}+CMBMA-\overline{FODMA}-\overline{NOIMA}$

(21) $NFAMA=NFAMS-NFAMB$

Deposit Money Banks:

(22) $NFAMB=\overline{BMAMB}+DD+TSD+\overline{FCD}+\overline{NOIMB}-(\overline{CRGMB}+\overline{CROMB})-CRPMB-RMB$

(23) $CRPMB=f((DD+TSD+\overline{FCD}+\overline{BMAMB}-RRMB), (\overline{CRGMB}+\overline{CROMB}), \overline{RIDCR}, \overline{RIF})$

(24) $RMB = f(RRMB, \overline{RIDCR}, \overline{RIF})$

(25) $RRMB = \overline{RRR} * (DD+TSD)$

Non-bank Public:

(26) $CURR = f(GDPR, g(PGDP)_{-1}, \overline{RITSD})$

(27) $DDR = f(GDPR, g(PGDP)_{-1}, \overline{RITSD})$

(28) $TSDR = f(GDPR, g(PGDP)_{-1}, \overline{RITSD})$

(29) $CUR = PGDP * CURR$

(30) $DD = PGDP * DDR$

(31) $TSD = PGDP * TSDR$

Monetary Equilibrium (Price Determination):

(32) $DMBR = CURR+DDR+TSDR+(\overline{DDPMA}+\overline{FODMA}+\overline{FCD})/PGDP$

(33) $PGDP = SMB/DMBR$

*Miscellaneous Equations Related to the System*

(Table 5 continued on next page)

5) See eqs. (20) and (R-2) in Table 5.

Reference Equations:

(R-1) $PCG = (GDP - PCP * CPR - I - X + M)/\overline{CGR}$

(R-2) $RM = CUR + RMO + \overline{DDPMA}$ (See eq. (20))

Supplementary Equations:

(S-1) $MM = SMB/RM = (CUR + \overline{DDPMA} + DD + TSD + \overline{FODMA} + \overline{FCD})/RM$

(S-2) $MK = SMB/GDP$

Alternatives for Equations with Statistical Discrepancies:

(A-1) $\Delta NFAMS = f(BOP)$ (See eq. (12))

(A-2) $CMBMA = f(\overline{BMAMB})$ (See eq. (18))

(A-3) $RMO = f(RMB)$ (See eq. (19))

* See Table 1 for notation. Barred variables are treated as exogenous in the system. $f(...)$ means a function of ... to be estimated. $g(PGDP)$ means growth rate of $PGDP$. See Table 6 for estimation results.

**Table 6** Estimated Equations (OLS Estimation)*

(3) $\ln CPR = 1.19187 + .51086 \ln (GDP/PCP)$ (4.98) (7.43)
$+ .33139 \ln CPR_{-1}$ (3.43)
1970–80, $R^2 = .998$, $D.W. = 1.94$

(4) $\ln I = -3.19135 + 1.1135 \ln GDP + .07014$ (10.6) (32.3) (1.23)
$\ln (\Delta CRGMS + \Delta CROMS + \Delta CRPMS + \overline{CAP})$
1970–80, $R^2 = .996$, $D.W. = 2.03$

(6) $\ln MR = -6.06228 + 1.29425 \ln GDPR$ (1.38) (2.06)
$- .45621 \ln (\overline{PM}/PGDP) + .25801$ (1.15) (1.14)
$\ln MR_{-1}$
1970–80, $R^2 = .992$, $D.W. = 1.01$

(7) $\ln PCP = 0.03325 + .62631 \ln PGDP + .24693$ (2.44) (9.26) (2.91)
$\ln PCP_{-1}$
1970–80, $R^2 = .998$, $D.W. = 1.38$

(8) $\ln PI = -.06603 + .68667 \ln PGDP + .20595$ (2.69) (8.77) (2.53)
$\ln \overline{PMI}$
1970–80, $R^2 = .995$, $D.W. = 2.01$

(23) $\Delta \ln CRPMB = -.41523 + 1.57514 \Delta \ln (DD$ (2.07) (3.36)
$+ TSD + \overline{FCD} + \overline{BMAMB} - \overline{RRMB}) - .48925 \Delta \ln (\overline{CRGMB}$ (3.55)
$+ \overline{CROMB}) + 0.02618\, \overline{RIDCR}$ (3.49)
$* (1 - \overline{D7880}) + 0.05037\, (\overline{RIDCR}$ (2.11)
$- \overline{RIF}) * \overline{D7880}$
1972–80, $R^2 = .792$, $D.W. = 2.81$

(24) $RMB = 385.713 + 1.09538\, RRMB - 20.8917$ (3.62) (7.01) (5.13)
$\overline{RIDCR} * (1 - \overline{D7880}) - 27.9780$ (2.04)
$(\overline{RIDCR} - \overline{RIF}) * \overline{D7880}$
1972–80, $R^2 = .986$, $D.W. = 2.33$

(26) $\ln CURR = -.51940 + .75702 \ln GDPR$ (.478) (6.74)
$- .28914 \Delta \ln PGDP_{-1}$ (1.56)
$- .01155\, \overline{RITSD}$ (1.64)
1971–80, $R^2 = .958$, $D.W. = 2.80$

(27) $\ln DDR = -11.15161 + 1.90803 \ln GDPR$ (5.58) (9.25)
$- .01936 \Delta \ln PGDP_{-1} - .00380$ (.057) (.294)
$\overline{RITSD}$
1971–80, $R^2 = .971$, $D.W. = 2.21$

(28) $\ln TSDR = -10.50156 + 1.72471 \ln GDPR$ (3.10) (4.93)
$- .75926 \Delta \ln PGDP_{-1} + .05247$ (1.31) (2.39)
$\overline{RITSD}$
1971–80, $R^2 = .825$, $D.W. = 1.51$

(A-1) $\Delta NFAMS = -36.043 + 1.24554\, BOP$ (.32) (9.31)
1970–80, $R^2 = .913$, $D.W. = 1.41$

(A-2) $CMBMA = -19.64628 + 1.04712\, \overline{BMAMB}$ (1.73) (68.3)
1970–80, $R^2 = .998$, $D.W. = 2.71$

(A-3) $RMO = 14.93714 + .92389\, RMB$ (1.59) (53.7)
1970–80, $R^2 = .997$, $D.W. = 1.26$

* $t$-ratios are shown in brackets. At the end of each equation are shown estimation period, coefficient of determination ($R^2$) and Durbin-Watson ratio ($D.W.$). Estimation by Ordinary Least Squares ($OLS$) method.

tions to be estimated: two statistical relations (eqs. (7) and (8)) and eight behavioral equations (eqs. (3), (4), (6), (23), (24), (26), (27) and (28)). They are estimated by the Ordinary Least Squares (OLS) method for either 1970–1980, 1971–1980 or 1972–1980 depending on the availability of data.[6] The estimation results are presented in Table 6. Our system consists of two main parts: real sector (real submodel) and monetary sector (monetary submodel), the latter of which is further split into six small blocks. Fig. 1 summarizes linkages between the real and the monetary sectors as well as interactions within the monetary sector with a simplified flow-chart.

Let us investigate our system of equations in Table 5, sector by sector and block by block, referring in case of necessity to the estimation results in Table 6 and the flow-chart shown in Fig. 1. First, the real submodel consists of eqs. (1)–(10), in which real and nominal incomes (*GDPR* and *GDP*) are determined through multiplier processes together with their expenditure components (*CPR*, *IR*, *MR*, etc.) at given levels of exogenous factors (*CGR*, *XR*, etc.) and the general price level (*PGDP*) to be given by eq. (33) in the monetary submodel. Our real submodel is an effective demand model without explicit allowances for production capacity through capital accumulation, assuming aggregate effective demand to be always matched by the corresponding supply or to lie within the supply capacity of the economy. Eqs. (1) and (2) define, respectively, real *GDP* and nominal *GDP* where the concept of *GDP* is used in the ordinary way as a

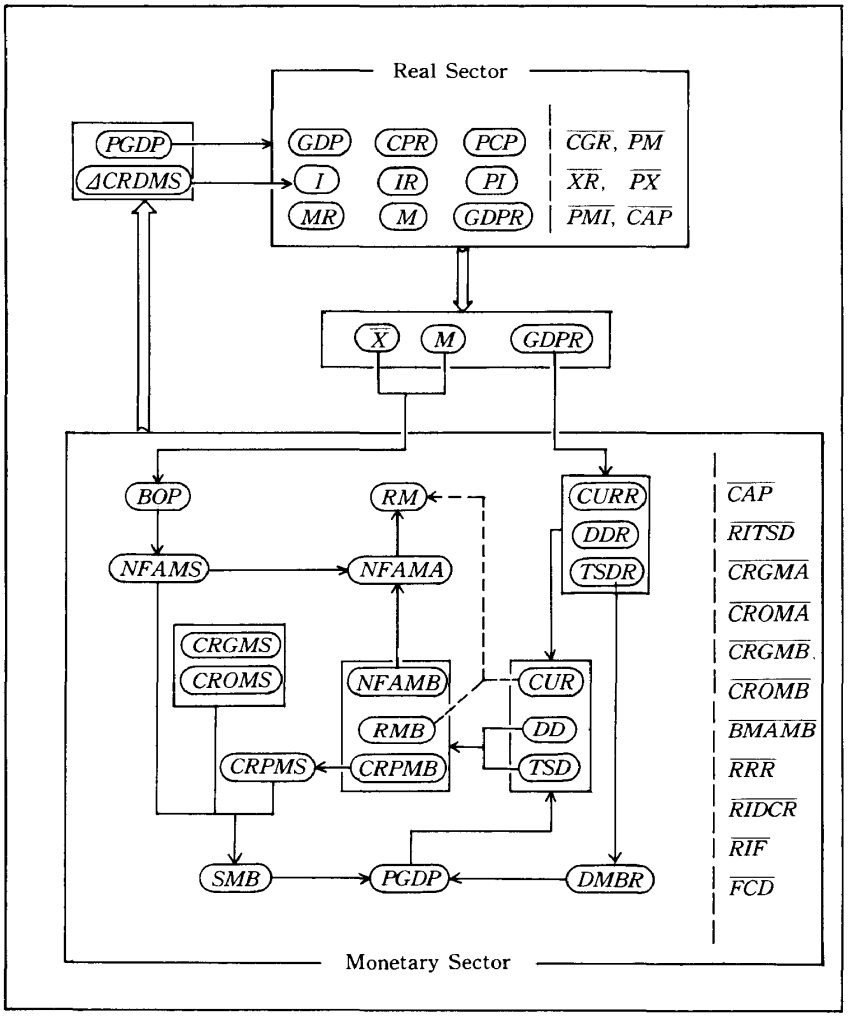



**Fig. 1** A Simplified Flow-chart of the Model

6) For example, the estimation period for eqs. (23) and (24) is 1972–1980 due to the lack of data on the rate of interest on domestic credits (*RIDCR*) for earlier years.

measure of aggregate income, expenditure and output in the domestic economy. Eq. (3) is a consumption function for the private sector where real income in terms of the consumption deflator is the main explanatory variable. The log-linear form is employed in estimation (Table 6) as it is for the other equations to be estimated except eq. (24). Eq. (4) is an aggregate investment function in nominal terms where total investment expenditures are determined basically by the availability of funds from both internal and external sources.[7] Eq. (5) converts nominal investment demand into real. Eqs. (7) and (8) are statistical equations which relate consumption and investment deflators to the *GDP* deflator, empirically only, for the purpose of endogenizing *PCP* and *PI* to be used in eqs. (3) and (5).[8] The last two equations (9) and (10) define nominal exports and imports in terms of prices and quantities to be used in the determination of overall balance in eq. (11) of the monetary submodel.

Our system of equations has two types of variables linking the real and monetary sectors, as seen in the simplified flow-chart (Fig. 1). The first are exports ($X$), imports ($M$) and real income ($GDPR$), which are endogenous to the real sector and are fed back into the monetary sector to determine the overall balance of payments ($BOP$) and the three components of the real demand for broad money ($CURR$, $DDR$ and $TSDR$). The second are general price level ($PGDP$) and net domestic credits of the monetary system ($\Delta CRDMS=\Delta(CRGMS+CROMS+CRPMS)$), which are endogenous to the monetary sector and are fed back into the real sector in the determination of various expenditure components of *GDP*. Interactions among real and monetary variables in the whole system are completed through these linkage variables.

Let us next consider the monetary submodel block by block. First, the balance of payments block with only two equations. Eq. (11) determines overall balance ($BOP$), treating trade balance ($X-M$) as given by the real submodel. Eq. (12) then determines the stock of net foreign assets in the mone-

7) The data for investment separated into private and government sectors are not yet available in Indonesia. A number of alternative specifications in both nominal and real terms were attempted in estimating an investment function, including that of Leff and Sato [1980] which specifies real investment as a function of increases in output, price and credit supply. However, the present version was adopted as the best among the possible alternatives. The investment function here is expressed in nominal terms but not homogeneous of degree one as seen from the estimated equation in Table 6, so that it may cause a misleading results when *all* the prices in the economy change in the *same* proportion, as in the case of denomination.

8) The homogeneity restriction was not imposed on the two price equations because of their empirical relations, so that they may be misleading in the case of the *same* proportionate change in *all* prices. Our real submodel has five price variables: $PGDP$, $PCP$, $PI$, $PX$ and $PM$, of which the first three are endogenous either in the monetary sector or in the real sector, while the latter two are treated as exogenous in the model. There remains one more price variable on the expenditure side of *GDP*: $PCG$ (deflator for government consumption), which should be determined in a consistent way with *GDP* identity as in eq. (R-1) (though not explicitly introduced into the system).

tary system (*NFAMS*), allowing for the balance of payments statistical discrepancy (*BOPSD*).[9] Then, *NFAMS*, while being allocated to monetary authorities (*NFAMA*) and Deposit Money Banks (*NFAMB*) by eqs. (21) and (22), becomes one of the factors that affect money supply (*SMB*) as shown in eq. (13). The causal relations outlined above seem to be almost contrary to the monetary approach to the balance of payments in that the direction of causality here is from the balance of payments to the money supply, not the reverse. However, our balance of payments block is along similar lines to what the IMF proposed to the Southeast Asian central banks as a prototype model for analyzing the relationship of money and credit to economic activity.[10]

The second block is concerned with the monetary system, where broad supply of money (*SMB*) is defined from the asset side by eq. (13). Components of money supply, except for *NFAMS*, derived from eq. (12), are determined by eqs. (14)–(17) as the aggregate of the monetary authorities and Deposit Money Banks. Note that net other items of the monetary system (*NOIMS*) is adjusted for missing or unidentifiable items in the twin variables (*CMBMA* versus *BMAMB*, and *RMO* versus *RMB*) between the balance sheets of the monetary authorities and Deposit Money Banks.[11] These twin variables are connected by introducing statistical discrepancies as shown in eqs. (18) and (19).

The third block is concerned with the monetary authorities, where reserve money (*RM*) is defined from the asset side by eq. (20). Almost all of the reserve money components, which appear on the right-hand side of eq. (20), are policy variables (or purely exogenous), including *CMBMA*, connected with the policy variable *BMAMB* by eq. (18). The only exception is *NFAMA* (net foreign assets of monetary authorities) determined endogenously by eq. (21) as the difference between *NFAMS* (eq. (12)) and *NFAMB* (eq. (22)). This specification assumes that the monetary authorities respond passively (at least in terms of primary effects) to the overall balance of payments and the behavior of Deposit Money Banks towards foreign assets. Note that reserve money (*RM*) may be defined from the liability side as in eq. (R–2). This definitional equation, however, is tautological with eq. (20) and redundant under the framework of our monetary submodel.[12]

The fourth block describes the behavior of Deposit Money Banks on the asset side. As shown in Table 2, the assets of the Deposit Money Banks consist of bank reserves (*RMB*), net claims on the private sector (*CRPMB*), net claims on official entities and government enterprises (*CROMB*), net claims on government (*CRGMB*) and net foreign assets (*NFAMB*). It is assumed in our monetary submodel that the Deposit

9) *BOPSD* is the difference between *ΔNFAMS* and *BOP* but not exactly equal to errors and omissions in the actual balance of payments account.

10) See SEACEN [1981]. See also footnote 17.

11) See Sections 2, second paragraph.

12) See Section 2, third paragraph. Eq. (R–2) may be introduced into the system independently as the condition for monetary equilibrium with respect to reserve money or high-powered money. In this case, eq. (R–2) will be used to determine the general price level in place of eq. (33), which is now tautological with eq. (13) and, therefore, redundant.

Money Banks allocate their funds (made available by deposits from the non-bank public and borrowings from Bank Indonesia) between these assets, giving top priority to the public sector while responding to both domestic and foreign rates of interest (*RIDCR* and *RIF*). Speaking recursively, *CRGMB* and *CROMB* are regarded as policy variables in the first place. Then, *CRPMB* is specified as a credit supply function which responds positively to the domestic lending rate but negatively to the foreign rate of interest (eq. (23)). At the same time, *RMB* is specified as a function of required reserves (*RRMB*) and interest rates (eq. (24)). Finally, *NFAMB* is determined as a residual using the balance sheet identity between assets and liabilities (eq. (22)). In Indonesia, domestic lending rates of interest are under the direct control of the monetary authorities. This means that *RIDCR* does not play the role of an adjustment factor to attain supply-demand equilibrium in the credit market. In our monetary submodel, *CRPMB* is determined only by the supply function, assuming that debtors behave as quantity takers in their credit-demanding activities. The same is true for *RMB* and *NFAMB* for which Bank Indonesia and foreign financial institutions are assumed to behave as quantity takers. As shown in Table 2, liabilities and sources of funds for the Deposit Money Banks consist mainly of *BMAMB* (borrowings from Bank Indonesia), *DD* (demand deposits), *TSD* (time and savings deposits) and *FCD* (foreign currency deposits). In our monetary submodel, *BMAMB* is regarded as a policy variable directly controllable by Bank Indonesia, while *FCD* is treated as exogenous because of the difficulty of specifying proper equations for its behavior.[13] As a result, our model includes behavioral equations for *DD* and *TSD* only. These are specified in the next block as the demand functions of depositors under the assumption that banks behave as quantity takers in their deposit-supplying activites.

The estimated credit supply function (eq. (23)) in Table 6 represents the best result obtained after many trials on alternative specifications. A notable feature of our estimation result is the fact that the domestic lending rate (*RIDCR*) is significant only until 1977, while the gap between domestic and foreign rates of interest (*RIDCR*−*RIF*) becomes more significant in the years after 1978.[14] Actually, 1978 is the year when *NFAMB* began to increase rapidly and steadily. Eq. (24) in Table 6 represents the best estimation for bank reserves. It can be transformed into the demand-for-excess-reserves function by changing the left-hand side to (*RMB*−*RRMB*). The same interest rates as in the credit supply function (23) but with opposite signs would seem to indicate that excess reserves (*RMB*−*RRMB*) are a close substitute for credit to the private sector (*CRPMB*). Note that eq. (25) defines required reserves (*RRMB*), based on the average required reserve ratio (*RRR*), which is slightly different from the official ratio since

13) *FCD* was relatively unimportant compared to *DD* and *TSD* until 1978. From 1979 onward, however, *FCD* increased quite rapidly reaching a level almost equivalent to *TSD* in 1980.

14) *RIDCR*=average interest rate on domestic credits by deposit money banks. *RIF*=interest rate on Euro Dollars, London.

its base ($DD+TSD$) is not the same as 'current liabilities' in the official definition.[15]

The fifth block is concerned with the behavior of the non-bank public, which is closely related to the liability sides of the monetary authorities and Deposit Money Banks as well as that of the monetary system. In other words, this block determines three major components of broad money in both real and nominal terms: currency in circulation (*CURR* and *CUR*), demand deposits (*DDR* and *DD*), and time and savings deposits (*TSDR* and *TSD*). For the three money components are specified real demand functions (eqs. (26)–(28)) with the same standard explanatory variables: real income (*GDPR*), rate of inflation in the previous year as a proxy for price expectation ($g(PGDP)_{-1}$ or $ln(PGDP/PGDP_{-1})$), and rate of interest on time and savings deposits (*RITSD*).[16] The estimation results in Table 6 are generally favorable judging from signs, $R^2$'s and $t$-ratios except for *DDR* (eq. (27)) where price expectation and interest rate make only small contributions with statistically insignificant $t$-ratios. Nevertheless the present form is employed for *DDR* in order to preserve symmetry with *CURR* and *TSDR* (eqs. (26) and (28)). Real levels of money components thus determined are converted to nominal levels by eqs. (29)–(31) to be used mainly in determining the availability and allocation of funds in the Deposit Money Banks.

The last block describes monetary equilibrium in relation to price determination. Here, the condition for monetary equilibrium, i. e., supply of money = price × real demand for money, is used to determine general price level (*PGDP*) as shown by eq. (33), where supply of money (*SMB*) is derived from the asset side by eq. (13), while real demand for money (*DMBR*) is defined from the liability side by eq. (32), as the sum of the three major component demands (*CURR*, *DDR* and *TSDR*) and several exogenous others.[17] This method of price determination assumes that *PGDP* plays the role of an adjustment factor in attaining monetary equilibrium through interactions not only within the monetary sector but also with the real sector as seen from the flow-chart in Fig. 1. Supply of money (*SMB*) and reserve money (*RM*) are thus not under the direct control of the monetary authorities but endogenously determined, depending on various uncontrollable activities in both the monetary and real sectors. As a result, the money multiplier (*MM* defined by eq. (S-1)) also changes endogenously in accordance with changes in the factors that affect money supply and reserve money.[18]

15) See *Indonesian Financial Statistics* for the definition of 'current liabilities.'

16) *RITSD* = average rate of interest on time and saving deposits by Deposit Money Banks.

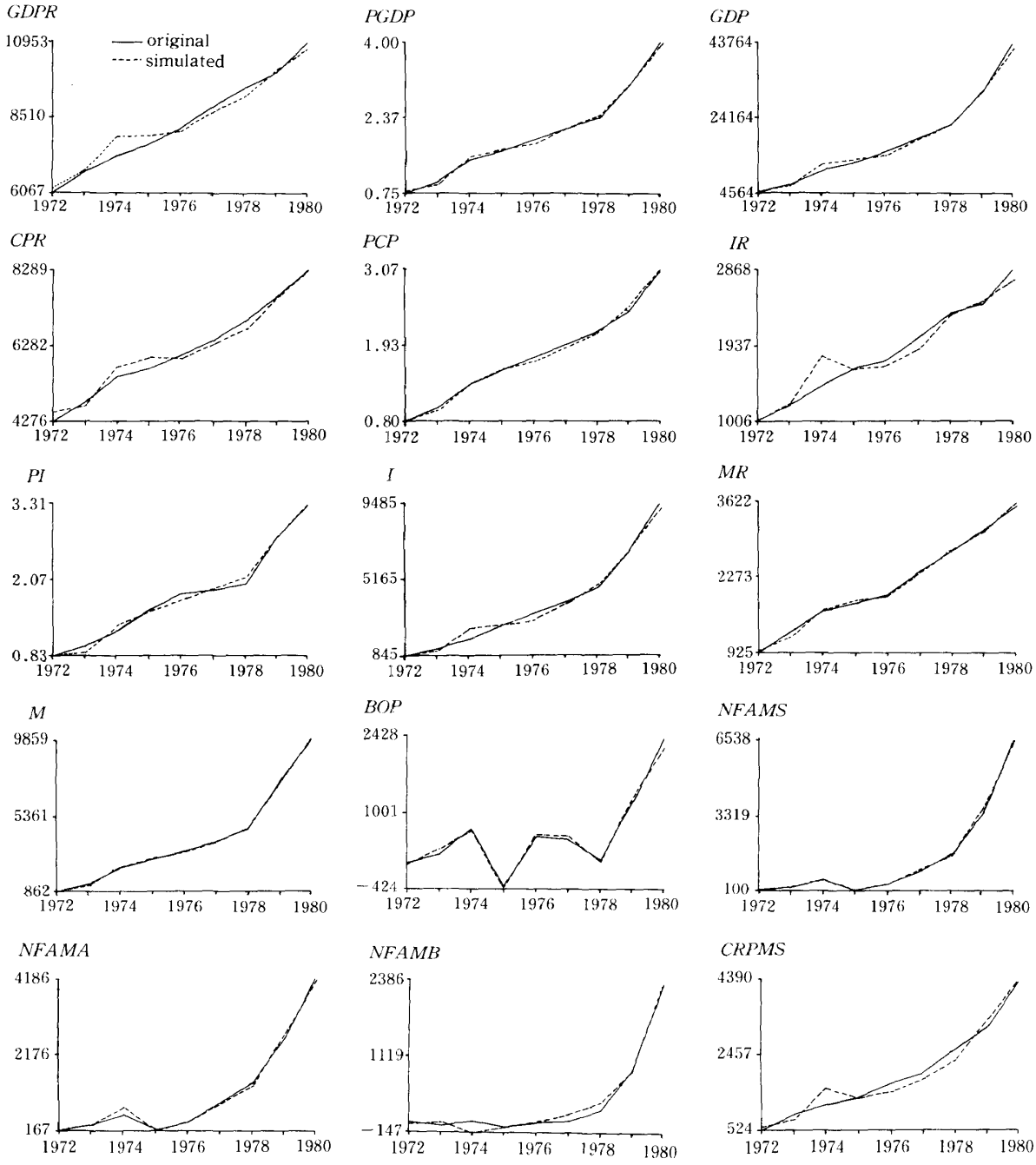
17) If demand functions are specified in nominal terms for major components of broad money (i. e., for *CUR*, *DD* and *TSD* but not for *CURR*, *DDR* and *TSDR*), monetary equilibrium will be attained through adjustments in the balance of payments (*ΔNFAMS* or *BOP*). In other words, the demand for money determines the equilibrium level of money supply which then determines the equilibrium level of balance of payments by eq. (13). In this case, however, the price level must be determined somewhere in the real sector in conformity with the balance of payments thus determined.

18) The same is true for Marshallian $k$ (*MK* defined by eq. (S-2)). Note that the three

## IV Testing and Policy Simulations

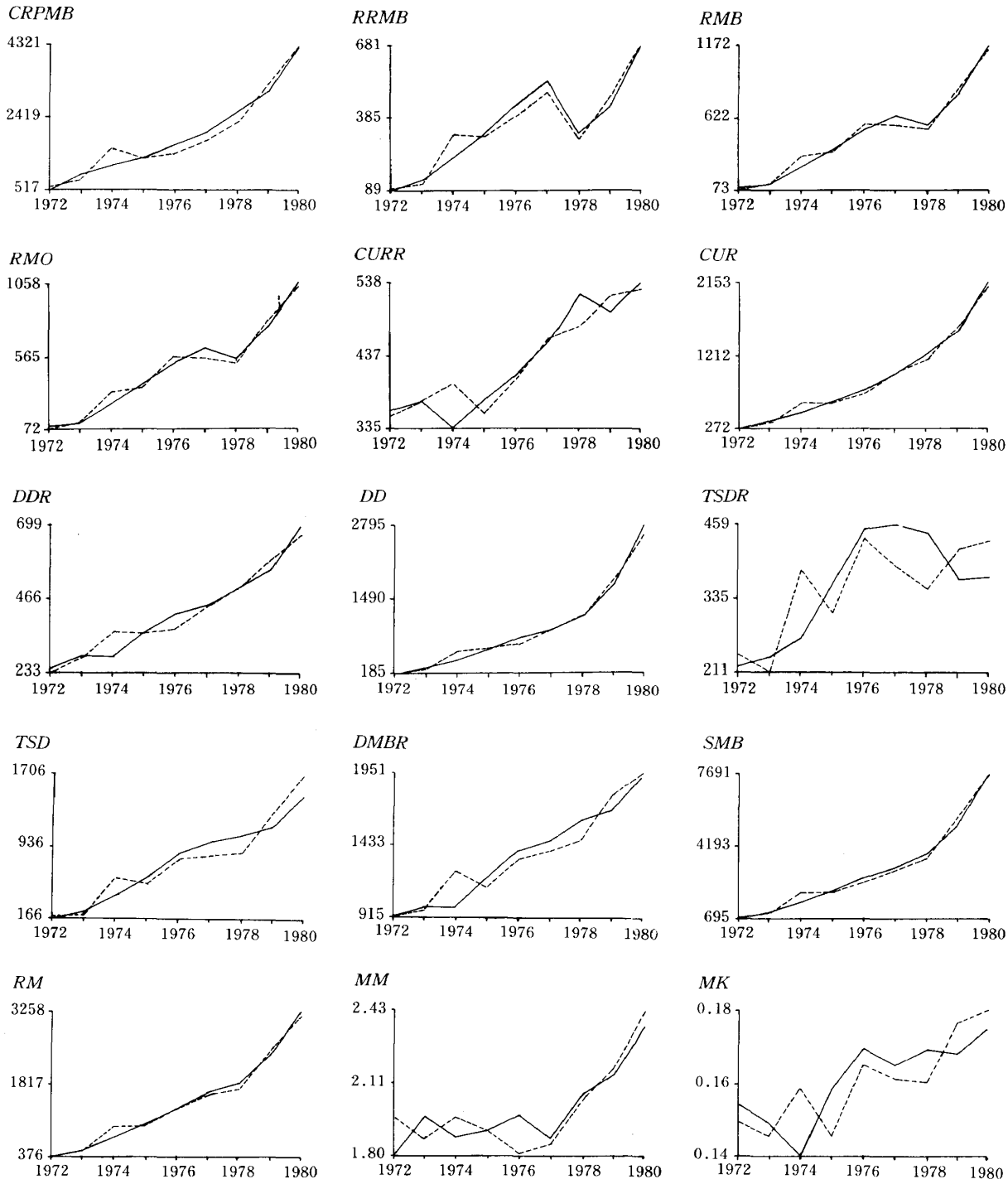
Our model for the whole Indonesian economy, shown in Table 5, is a non-linear system of 33 equations which determine 33 endogenous variables simultaneously. Traceability of the model was checked and tested

**Fig. 2** Dynamic Simulations (Final Test): 1972-1980




alternative equations (eqs. (A-1)-(A-3)) in Tables 5 and 6 are specified and estimated as statistical relations only for projections where data on statistical discrepancies are difficult to obtain.

**Fig. 2** (Continued)




by dynamic simulations assigning actual values (original data) for exogenous variables and simulated values (solutions) for lagged endogenous variables. This testing simulation (final test) was made for the period 1972–1980 using the Gauss-Seidel method which is popular for solving non-linear systems of equations. The test results are shown in graphical form in Fig. 2, from which we can see that the traceability of our model is

generally quite satisfactory except for a specific year (1974) and specific variables (*TSDR* and its relatives: *TSD* and *DMBR*). For 1974, percentage errors of the simulated against the actual are quite large in many cases, especially for *RRMB*, *TSDR* and *TSD* with errors of 41.4%, 42.5% and 49.4 % respectively, though such a key variable as *GDPR* has only a small error of 8.5%. Extraordinary factors related to the oil shock or oil bonanza seem to have caused these exceptional results for the specific year 1974. For a specific variable *TSDR*, our model does not trace well a downward trend from 1977 to 1980, though its percentage errors are not so large for the same period (−15.3%, −20.9%, 13.9% and 17.0%, respectively). Furthermore, its effects on closely related variables such as *TSD* and *DMBR* seem to be relatively small judging again from their percentage errors.[19] Traceability for most other endogenous variables is remarkably good in the latter half of the 1970's, for which the model was applied to policy simulations.

Policy simulations were made by giving external shocks to five exogenous variables for the period 1976–1980. Once-and-for-all shocks were given to three flow or flow-related variables: *XR* (real exports), *PX* (export deflator), and *RIDCR* (rate of interest on domestic credit), while sustained shocks were given to two stock or stock-related variables: *RRR* (required reserve ratio) and *BMAMB* (borrowings from Bank Indonesia).[20] The results of these shock simulations are summarized in terms of multipliers and elasticities and presented in Table 7. Note that, in the table, successive effects means total effects accumulated for 1977–1980 and the percentages used to obtain elasticities are calculated using as the base the 1976 simulation results without shocks. Note also that the multipliers of nominal against real (e.g., *SMB* against *XR*) or of real against nominal (e.g., *GDPR* against *BMAMB*) depend on the dimension of prices, i.e., the base year (1973) at constant prices. The results in Table 7, of course, reflect the principles and structure of our model so that their signs and magnitudes may be approximately traced according to the equations system of Table 5 or the flow-chart of Fig. 1. Successive effects often alternate in sign in each of the four years from 1977 to 1980, but their magnitudes are, on average, relatively small as seen from Table 7. Impact effects, on the other hand, are relatively large and their signs and magnitudes seem to be as expected and within a tolerable range. The implications of external and policy shocks, such as the second oil shock (1979–1980) and the 50 % reduction in required reserve ratio in 1978, can be understood from this table, though in a rough way.

19) Percentage errors in the period 1977–1980 are: −15.3%, −18.6%, 13.6% and 15.2% for *TSD*, and −4.9%, −9.0%, 6.2% and 1.4% for *DMBR*.

20) Note that sustained shocks on stock variables are equivalent to once-and-for-all shocks on flow variables. Shocks were also given to *CGR*, (*CRGMA*+*CROMA*) and (*CRGMB* +*CROMB*). For these exogenous variables, however, combined shocks seem to be more appropriate than independent shocks, since they are more or less related to each other through government accounts. For example, a somewhat misleading elasticity, −.16 was obtained for the impact effect on *PGDP* by giving independent shocks to *CGR*.

**Table 7** Shocked Simulations: 1976–1980*

| | *XR*[1] (multipliers) | | *PX*[2] (elasticities) | | *RIDCR*[3] (elasticities) | | *RRR*[4] (elasticities) | | *BMAMB*[5] (multipliers) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Impact effects (1976) | Successive effects (77–80) | Impact effects (1976) | Successive effects (77–80) | Impact effects (1976) | Successive effects (77–80) | Impact effects (1976) | Successive effects (77–80) | Impact effects (1976) | Successive effects (77–80) |
| *PGDP* | .41** | −.09** | .67 | −.10 | .69 | .06 | .09 | .01 | .14** | −.03** |
| *GDPR* | 2.83 | −.11 | .38 | .01 | .48 | .06 | .06 | .01 | 1.22 | −.08 |
| *CPR* | 1.94 | .65 | .53 | .21 | .59 | .10 | .07 | .02 | 1.13 | .34 |
| *IR* | 1.03 | −.42 | .85 | −.38 | 1.26 | .18 | .16 | .03 | .67 | −.28 |
| *MR* | 1.14 | .33 | .81 | .29 | .93 | .20 | .12 | .08 | .57 | .12 |
| *SMB* | 1.80 | −.20 | 1.16 | −.07 | 1.29 | .19 | .16 | .06 | .99 | −.19 |
| *CUR* | .41 | −.06 | .97 | −.06 | 1.06 | .15 | .13 | .03 | .25 | −.05 |
| *DD* | .67 | −.08 | 1.45 | −.07 | 1.61 | .32 | .20 | .09 | .35 | −.10 |
| *TSD* | .72 | −.07 | 1.37 | −.03 | 1.52 | .17 | .19 | .03 | .39 | −.05 |
| *RM* | .81 | −.09 | .99 | −.02 | −.45 | .13 | −.19 | −1.53 | .48 | −.06 |
| *DMBR* | .60 | −.02 | .46 | .02 | .60 | .07 | .07 | .01 | .25 | −.01 |
| *CURR* | .11 | .00 | .29 | .03 | .37 | .05 | .05 | .01 | .05 | .00 |
| *DDR* | .25 | −.01 | .74 | .01 | .93 | .15 | .12 | .04 | .11 | −.01 |
| *TSDR* | .26 | −.01 | .67 | .01 | .84 | .07 | .10 | .01 | .12 | −.00 |
| *BOP* | .52 | −.54 | 1.45# | −1.56# | −4.97# | −1.56# | −.62# | −.50# | −.95 | −.11 |
| *NFAMS* | .52 | −.05 | 2.09# | −.25# | −7.15# | −7.20# | −.89# | −5.39# | −.95 | −4.94 |
| *NFAMA* | .82 | −.09 | 3.33# | −.38# | −1.52# | .44# | −.64# | −5.12# | −.52 | −4.07 |
| *NFAMB* | −.29 | .05 | −22.4# | 2.40# | −118# | −158# | −5.93# | −10.5# | −.43 | −.87 |
| *CRPMB* | 1.28 | −.15 | 1.29 | −.05 | 4.09 | 2.33 | .51 | 1.62 | .19 | 4.75 |
| *RMB* | .40 | −.04 | 1.04 | −.09 | −2.45 | .10 | −.61 | −3.61 | .22 | −.02 |

* Once-and-for-all shocks were given to *XR*, *PX* and *RIDCR*, while sustained shocks were given to *RRR* and *BMAMB*. Successive effects mean total effects accumulated for 1977–1980. Percentage changes in endogenous variables were calculated using as the base the 1976 simulation results without shocks, to get elasticities not only for impact effects, but also for successive effects.

1 *XR* was increased by 100 (Rp billion at 1973 prices) in 1976.

2 *PX* was increased by 10% relatively in 1976.

3 *RIDCR* was increased by 10% absolutely but not relatively in 1976. This absolute change was compared with relative changes in endogenous variables to get 'elasticities' (with a somewhat different meaning from the ordinary concept of elasticities).

4 *RRR* was decreased by 10% relatively for the period 1976–1980.

5 *BMAMB* was increased by 100 (Rp billion in current prices) for 1976–1980.

** Elasticities but not multipliers.

\# Not very reliable due to the unstable nature of the base values in computing percentage changes in endogenous variables.

## V Concluding Remarks

In this paper, an econometric model for Indonesia in the 1970's has been constructed focusing on the monetary sector. The model of the monetary sector (monetary submodel) employed as its basic framework

the detailed balance sheets of the monetary system and assigned a relatively heavy weight to the behavior of the Deposit Money Banks. On these two scores, our model differed substantially from several existing models for the Indonesian financial sector. The monetary submodel was linked to a simple effective demand model of the real sector (real submodel) to handle interactions and interdependence between monetary and real phenomena. The whole system, consisting of monetary and real submodels, was applied first to testing simulations (final test) from which good traceability of the model was confirmed especially for the latter half of the 1970's, and then to policy simulations from which the implications of various external shocks have been derived in a rough way in terms of multipliers and elasticities.

The present model is simple and limited in scope. It may be regarded as one of the starting points in constructing a comprehensive analytical framework for the monetary economy and policies. There still remain several unsolved problems in the model. For example, first, government accounts are not explicitly allowed for, so that net claims on public sectors (*CRGMS* and *CROMS*) have no definite relation to deficits or surplus in those sectors. Second, foreign currency deposits at Deposit Money Banks (*FCD*) and related activities must be clarified in view of their weight in total deposits in recent years. Third, an analytical frame for credit ceilings must be developed and incorporated, allowing perhaps for the demand side of credits in some way or other.[21] Revisions and extensions of the present model are necessary to answer these unsolved problems.

**Data Appendix**

| Year | *GDPR* | *PGDP* | *X* | *M* | *NFIA* | *CAPUSD* | *RFEX* | *CAP* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 4820.4 | 0.564 | 245.0 | 403.1 | −35.0 | 355 | 326.00 | 116 |
| 1970 | 5182.0 | 0.625 | 429.0 | 529.0 | −50.0 | 471 | 365.00 | 172 |
| 1971 | 5544.6 | 0.662 | 529.5 | 611.1 | −66.7 | 495 | 393.42 | 195 |
| 1972 | 6067.1 | 0.752 | 753.8 | 862.4 | −159.0 | 835 | 415.00 | 347 |
| 1973 | 6753.3 | 1.000 | 1354.3 | 1315.6 | −245.7 | 1054 | 415.00 | 437 |
| 1974 | 7269.0 | 1.473 | 3105.1 | 2293.7 | −507.1 | 978 | 415.00 | 406 |
| 1975 | 7630.7 | 1.657 | 2850.6 | 2778.0 | −555.7 | 285 | 415.00 | 118 |
| 1976 | 8156.2 | 1.896 | 3429.6 | 3222.0 | −432.2 | 1869 | 415.00 | 776 |
| 1977 | 8870.8 | 2.143 | 4465.7 | 3817.2 | −678.5 | 1325 | 415.00 | 550 |
| 1978 | 9483.2 | 2.368 | 4787.7 | 4558.7 | −852.1 | 1720 | 442.05 | 760 |
| 1979 | 9989.7 | 3.105 | 9461.1 | 7380.5 | −1489.4 | 1013 | 623.05 | 631 |
| 1980 | 10953.8 | 3.995 | 13353.0 | 9683.6 | −2169.4 | 1480 | 627.00 | 928 |

21) In the present model, debtors are assumed to behave as quantity takers in their credit-demanding activities, while the supply of credits by Deposit Money Banks is assumed to be always below the level of credit ceilings. It is said that credit ceilings were actually not effective until very recently.

**Data Appendix** (Continued)

| Year | *BOP* | *BOPSD* | *NFAMA* | *CRGMA* | *CROMA* | *CRPMA* | *CMBMA* | *RM* |
|---|---|---|---|---|---|---|---|---|
| 1969 | −77.1 | 0.0 | −23 | −11 | 84 | 3 | 80 | 160 |
| 1970 | 22.0 | −6.0 | −4 | 8 | 85 | 6 | 111 | 207 |
| 1971 | 46.7 | −38.7 | 15 | 99 | 81 | 3 | 144 | 263 |
| 1972 | 79.4 | 128.6 | 191 | 21 | 66 | 7 | 149 | 387 |
| 1973 | 230.0 | −155.0 | 326 | 4 | 87 | 9 | 194 | 501 |
| 1974 | 710.3 | −346.3 | 611 | −121 | 170 | 9 | 294 | 773 |
| 1975 | −365.1 | −139.9 | 204 | −336 | 867 | 14 | 565 | 1038 |
| 1976 | 551.4 | −282.4 | 400 | −711 | 1158 | 17 | 640 | 1333 |
| 1977 | 520.1 | 47.9 | 945 | −842 | 1122 | 21 | 681 | 1670 |
| 1978 | 136.9 | 581.1 | 1462 | −1138 | 1820 | 33 | 846 | 1847 |
| 1979 | 1222.2 | 557.8 | 2598 | −1774 | 2017 | 45 | 1129 | 2429 |
| 1980 | 2428.0 | 627.0 | 4186 | −3308 | 2295 | 69 | 1722 | 3258 |

| Year | *CUR* | *DDPMA* | *RMO* | *FODMA* | *NOIMA* | *NFAMB* | *CRGMB* | *CROMB* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 116 | 10 | 34 | 0 | −28 | 6 | −16 | 25 |
| 1970 | 155 | 15 | 38 | 0 | −1 | 2 | −37 | 44 |
| 1971 | 199 | 13 | 50 | 3 | 77 | −9 | −30 | 69 |
| 1972 | 272 | 18 | 97 | 4 | 42 | 23 | −23 | 65 |
| 1973 | 375 | 11 | 115 | 3 | 116 | −37 | −39 | 102 |
| 1974 | 494 | 29 | 249 | 2 | 189 | 41 | −46 | 206 |
| 1975 | 625 | 31 | 381 | 4 | 272 | −57 | −84 | 544 |
| 1976 | 781 | 29 | 523 | 3 | 168 | 16 | −94 | 703 |
| 1977 | 979 | 68 | 623 | 1 | 256 | 41 | −171 | 733 |
| 1978 | 1240 | 56 | 551 | 3 | 1173 | 241 | −217 | 1049 |
| 1979 | 1552 | 97 | 780 | 27 | 1559 | 885 | −320 | 1150 |
| 1980 | 2153 | 47 | 1058 | 41 | 1665 | 2352 | −707 | 1360 |

| Year | *CRPMB* | *RMB* | *DD* | *TSFCD* | *TSD* | *FCD* | *BMAMB* | *NOIMB* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 135 | 35 | 58 | 50 | 50 | 0 | 70 | 8 |
| 1970 | 244 | 43 | 81 | 80 | 80 | 0 | 120 | 16 |
| 1971 | 337 | 49 | 108 | 145 | 145 | 0 | 149 | 13 |
| 1972 | 517 | 98 | 185 | 216 | 166 | 50 | 157 | 123 |
| 1973 | 923 | 117 | 284 | 316 | 235 | 81 | 204 | 262 |
| 1974 | 1178 | 250 | 414 | 513 | 395 | 118 | 306 | 395 |
| 1975 | 1362 | 380 | 593 | 724 | 596 | 128 | 548 | 280 |
| 1976 | 1716 | 536 | 793 | 1025 | 858 | 167 | 652 | 407 |
| 1977 | 2037 | 638 | 959 | 1124 | 984 | 140 | 635 | 560 |
| 1978 | 2572 | 568 | 1193 | 1317 | 1054 | 263 | 860 | 843 |
| 1979 | 3115 | 804 | 1737 | 1810 | 1140 | 670 | 1123 | 964 |
| 1980 | 4270 | 1172 | 2795 | 2655 | 1481 | 1174 | 1636 | 1361 |

**Data Appendix** (Continued)

| Year | *RRMB* | *DTSD* | *RRR* | *NFAMS* | *CRGMS* | *CROMS* | *CRPMS* | *SMB* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 27 | 108 | 0.250 | −18 | −26 | 109 | 138 | 233 |
| 1970 | 41 | 161 | 0.255 | −2 | −28 | 129 | 250 | 330 |
| 1971 | 48 | 253 | 0.190 | 6 | 69 | 149 | 341 | 469 |
| 1972 | 89 | 351 | 0.254 | 214 | −2 | 131 | 524 | 695 |
| 1973 | 130 | 519 | 0.250 | 289 | −35 | 189 | 932 | 987 |
| 1974 | 222 | 809 | 0.274 | 653 | −167 | 376 | 1187 | 1452 |
| 1975 | 320 | 1189 | 0.269 | 148 | −420 | 1411 | 1376 | 1978 |
| 1976 | 439 | 1651 | 0.266 | 417 | −804 | 1860 | 1732 | 2631 |
| 1977 | 536 | 1943 | 0.276 | 985 | −1012 | 1895 | 2017 | 3131 |
| 1978 | 321 | 2247 | 0.143 | 1703 | −1354 | 2796 | 2605 | 3809 |
| 1979 | 434 | 2877 | 0.151 | 3483 | −2095 | 3167 | 3159 | 5222 |
| 1980 | 672 | 4276 | 0.157 | 6538 | −4015 | 3655 | 4339 | 7691 |

| Year | *NOIMS* | *RITSD* | *RIDCR* | *RIF* | *MMB* | *D7880* | *PCP* | *PCG* |
|---|---|---|---|---|---|---|---|---|
| 1969 | −31 | 38.60 | 0.0 | 9.76 | 1.456 | 0 | 0.624 | 0.481 |
| 1970 | 20 | 23.20 | 0.0 | 8.52 | 1.594 | 0 | 0.673 | 0.605 |
| 1971 | 96 | 22.70 | 0.0 | 6.58 | 1.783 | 0 | 0.708 | 0.658 |
| 1972 | 172 | 18.20 | 20.04 | 5.46 | 1.796 | 0 | 0.795 | 0.738 |
| 1973 | 386 | 15.03 | 18.60 | 9.24 | 1.970 | 0 | 1.000 | 1.000 |
| 1974 | 595 | 20.67 | 19.20 | 11.01 | 1.878 | 0 | 1.330 | 1.312 |
| 1975 | 536 | 21.72 | 17.29 | 6.99 | 1.906 | 0 | 1.540 | 1.500 |
| 1976 | 574 | 21.86 | 11.24 | 5.58 | 1.974 | 0 | 1.735 | 1.774 |
| 1977 | 754 | 16.65 | 16.91 | 6.00 | 1.875 | 0 | 1.937 | 1.989 |
| 1978 | 1940 | 14.24 | 14.90 | 8.73 | 2.062 | 1 | 2.138 | 2.300 |
| 1979 | 2492 | 14.12 | 13.94 | 11.96 | 2.150 | 1 | 2.441 | 2.776 |
| 1980 | 2826 | 14.17 | 13.91 | 14.36 | 2.361 | 1 | 3.021 | 3.334 |

| Year | *PI* | *PMI* | *CURR* | *CPR* | *CR* | *PC* | *PM* | *I* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 0.589 | 0.708 | 205 | 3781 | 4195 | 0.610 | 0.681 | 317.0 |
| 1970 | 0.636 | 0.815 | 248 | 3847 | 4331 | 0.666 | 0.797 | 455.0 |
| 1971 | 0.661 | 0.976 | 300 | 3998 | 4516 | 0.703 | 0.837 | 580.0 |
| 1972 | 0.830 | 1.201 | 361 | 4276 | 4837 | 0.789 | 0.932 | 857.0 |
| 1973 | 1.000 | 1.000 | 375 | 4790 | 5506 | 1.000 | 1.000 | 1208.0 |
| 1974 | 1.248 | 1.280 | 335 | 5453 | 6094 | 1.329 | 1.374 | 1797.0 |
| 1975 | 1.558 | 1.944 | 377 | 5678 | 6514 | 1.535 | 1.543 | 2571.7 |
| 1976 | 1.832 | 2.540 | 411 | 6031 | 6928 | 1.740 | 1.655 | 3204.9 |
| 1977 | 1.887 | 2.643 | 456 | 6433 | 7477 | 1.944 | 1.605 | 3826.4 |
| 1978 | 2.002 | 2.668 | 523 | 6967 | 8123 | 2.161 | 1.658 | 4670.6 |
| 1979 | 2.751 | 4.248 | 499 | 7581 | 8926 | 2.491 | 2.357 | 6701.2 |
| 1980 | 3.307 | 4.643 | 538 | 8289 | 9958 | 3.074 | 2.722 | 9485.1 |

**Data Appendix** (Continued)

| Year | *GDP* | *MR* | *XR* | *IR* | *CGR* | *DDR* | *TSDR* | *DMBR* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 2718.0 | 591.8 | 679.4 | 537.8 | 414.0 | 102 | 88 | 413 |
| 1970 | 3238.0 | 664.0 | 799.6 | 715.3 | 483.9 | 129 | 128 | 528 |
| 1971 | 3672.0 | 729.7 | 890.8 | 866.9 | 518.3 | 163 | 218 | 708 |
| 1972 | 4564.0 | 925.3 | 1123.4 | 1032.0 | 560.9 | 245 | 220 | 923 |
| 1973 | 6753.3 | 1315.6 | 1354.3 | 1208.0 | 716.0 | 284 | 235 | 987 |
| 1974 | 10708.0 | 1669.0 | 1403.4 | 1440.0 | 641.0 | 281 | 268 | 985 |
| 1975 | 12642.4 | 1800.6 | 1266.8 | 1650.2 | 835.5 | 357 | 359 | 1193 |
| 1976 | 15466.6 | 1946.4 | 1425.2 | 1749.2 | 896.7 | 418 | 452 | 1387 |
| 1977 | 19010.6 | 2378.2 | 1744.0 | 2027.5 | 1044.4 | 447 | 459 | 1461 |
| 1978 | 22458.2 | 2749.2 | 1776.3 | 2332.9 | 1156.1 | 503 | 445 | 1608 |
| 1979 | 31022.8 | 3131.1 | 1758.7 | 2436.0 | 1345.0 | 559 | 367 | 1681 |
| 1980 | 43765.0 | 3557.7 | 1684.9 | 2868.5 | 1669.2 | 699 | 370 | 1924 |

| Year | *PX* | *MM* | *MMN* | *MK* | *FCDR* | *RFCDT* | *BMBSD* | *RMBSD* |
|---|---|---|---|---|---|---|---|---|
| 1969 | 0.361 | 1.456 | 1.143 | 0.086 | 0 | 0.0 | 10 | −1 |
| 1970 | 0.536 | 1.594 | 1.207 | 0.102 | 0 | 0.0 | −9 | −5 |
| 1971 | 0.594 | 1.783 | 1.221 | 0.128 | 0 | 0.0 | −5 | 1 |
| 1972 | 0.671 | 1.796 | 1.227 | 0.152 | 66 | 0.142 | −8 | −1 |
| 1973 | 1.000 | 1.970 | 1.333 | 0.146 | 81 | 0.156 | −10 | −2 |
| 1974 | 2.213 | 1.878 | 1.212 | 0.136 | 80 | 0.146 | −12 | −1 |
| 1975 | 2.250 | 1.906 | 1.204 | 0.156 | 77 | 0.108 | 17 | 1 |
| 1976 | 2.406 | 1.974 | 1.203 | 0.170 | 88 | 0.101 | −12 | −13 |
| 1977 | 2.561 | 1.875 | 1.201 | 0.165 | 65 | 0.072 | 46 | −15 |
| 1978 | 2.695 | 2.062 | 1.348 | 0.170 | 111 | 0.117 | −14 | −17 |
| 1979 | 5.380 | 2.150 | 1.394 | 0.168 | 215 | 0.233 | 6 | −24 |
| 1980 | 7.925 | 2.361 | 1.533 | 0.176 | 293 | 0.275 | 86 | −114 |

### Notes to Data Appendix

Almost all of the data for the model are available from published sources:

Bank Indonesia, *Indonesian Financial Statistics*, monthly.

Central Bureau of Statistics, *Statistical Yearbook of Indonesia*, annual.

————, *Financial Statistics*, annual.

————, *National Income of Indonesia 1975–1980*, August 1981.

Exceptions are *RIDCR* and *RITSD*, the data for which were collected and processed by Mr. Mulyant using the internal sources of Bank Indonesia.

Most of the data in the Data Appendix are concerned with the monetary variables for which data compilation is based on various issues of *Indonesian Financial Statistics* (*IFS*) for the period 1970–1980. Changes in definitions and inconsistencies in identities, however, are often found in the *IFS* series especially for the early years, so that the original data are processed in case of necessity to get consistent time series data.

Measuring units in the Data Appendix are all in billions of Rupiahs except for rates and indices.

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