The transmission mechanism of monetary policy in Indonesia

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1. The objective of monetary policy

As stipulated in Act No. 13 of 1968 concerning the central bank, the main task of Bank Indonesia is to assist the Government in (1) managing, safeguarding and maintaining the stability of the rupiah, and (2) facilitating production and development with the aim of promoting employment creation and improving the living standards of the population. Accordingly, Bank Indonesia is responsible for formulating and implementing monetary policy which is directed towards achieving several objectives, namely low inflation, a sustainable balance of payments and relatively high economic growth so as to increase per capital income and provide adequate employment opportunities. This implies that the objective of monetary policy in Indonesia is rather broad, so that, as a consequence, Bank Indonesia bears a considerably more difficult and complex responsibility than some other central banks which are able to focus only on a single policy objective, such as inflation control.

The choice of a single or multiple objective of monetary policy has been a topic of discussion among central bankers for many years. Adoption of a single objective of monetary policy by central banks in industrial countries is based on the following arguments: (1) as the situation and environment have changed, the need exists for much lower inflation on a durable basis. As a consequence, monetary policy should concentrate its instruments on one objective, free from any policy trade-off, thereby strengthening the implementation of monetary policy; (2) a single objective will increase the transparency, accountability and independence of monetary policy; (3) a single objective is more realistic in a deregulated and globalised economic and financial system; and (4) it is easier to observe the channels of transmission and, therefore, easier to determine the right instruments.

Meanwhile, counter-arguments against a single objective are: (1) economic objectives should be achieved simultaneously (in harmony), and

a single objective may disrupt that harmony; (2) monetary policy alone may not be able to bring down inflation further and more might need to be done in other sectors. Thus, central banks may need not "independence" but rather "co-ordination"; (3) it may be unwise to aim for a very low rate of inflation, in particular if this can negatively affect economic growth and employment; and (4) certain sectors in the economy may still need financial support from the central bank, which may not be possible under a single objective.

Since the early 1970s, Indonesia has undergone a number of far-reaching structural adjustments in all economic sectors. As in many other countries, the adjustments were strengthened by faster globalisation processes and have major implications for monetary management. This paper will discuss the Indonesian experience in implementing adjustment reforms and dealing with the impact of reform on monetary policy as well as on the monetary policy transmission mechanism.

2. Structural adjustment measures and the effectiveness of monetary policy

Over the past quarter century, Indonesia has undergone a period of structural adjustments and implemented a wide-ranging package of economic reforms with the aim of putting in place all the essential elements for sustainable economic development in the long run. In the late 1960s and the early 1970s, Indonesia launched a bold stabilisation programme to restore the economic stability necessary for laying the foundation for sustainable growth. This was followed by reform in the area of the capital account, with the introduction in 1970 of a free foreign exchange regime, and further liberalisation in 1982. This reform was primarily aimed at attracting foreign capital, especially foreign direct investment, by building and maintaining foreign investors' confidence and creating an environment conducive to investment.

Adjustment measures were also taken in the financial sector. Beginning in June 1983, the Government took its first deregulatory step by liberalising interest rates and streamlining Bank Indonesia's liquidity credit scheme. Concurrently, Bank Indonesia moved away from direct monetary control through credit ceilings, and at the same time introduced new indirect instruments, namely open market operations. The process of

financial sector liberalisation was taken one step further in October 1988. The reform package introduced then removed the restrictions on the establishment of new private banks, the opening of branch offices of banks, non-bank financial institutions and rural credit banks, and permitted foreign banks to form joint ventures with local partners and to branch out to six major provincial cities. The package also included a reduction of reserve requirements for commercial banks from 15 to 2%.

In January 1990, Bank Indonesia took further steps to improve the credit system. The policy, necessary to curb inflationary pressures as well as the excess liquidity that could unfavourably affect savings mobilisation, was aimed at improving credit structure, removing the distortions in the market mechanism by promoting more market-oriented interest rates, and increasing the efficiency in the allocation of funds. Meanwhile, in line with efforts to develop a sound banking system, the central bank in February 1991 introduced a new set of measures that included capital adequacy requirements based on Basle standards, regulations on legal lending limits, net open positions, loan-to-deposit ratios, loan loss provisions, and limits on foreign commercial borrowing. More importantly, reforms were also carried out in the legal framework with the passing of a new Banking Act in March 1992, superseding the earlier banking act of 1967.

Reforms also have been implemented in other sectors. In 1987 and 1988, the Government took steps to energise the capital market with the aim of boosting investor confidence and a propitious climate for investment. Furthermore, a new capital market law was enacted in 1995 to strengthen the legal foundation of the market. In the fiscal area, the Government has carried out tax reforms in 1983 and 1984 and has also embarked on wide-ranging trade and investment reforms since 1984.

Overall, the adjustment measures have led to significant improvements in the efficiency of resource allocation, and this has in turn stimulated high economic growth. At the same time, the structure of the economy has undergone fundamental change. Financial deepening and the diversification of financial products through innovation have helped build a considerably larger role for the financial sector. On the other hand, monetary management has become a much more challenging task. Rapid changes in the global financial environment in recent years have led to a

situation in which control of capital inflows has become a major monetary policy concern in Indonesia. While foreign capital, especially long-term funds, has been necessary for financing domestic economic activity beyond the capacity of domestic resources, high capital mobility with large inflows of short-term capital seeking speculative gains, has complicated the task of monetary management.

3. The framework of monetary management

As discussed above, the difficulties in identifying a mechanism through which Indonesia's monetary policy is transmitted arise from a number of factors such as the multiplicity of objectives (as against a single objective), changes in monetary instruments (from direct to indirect instruments), far-reaching financial and other structural reforms, and increased economic and financial globalisation. Under these circumstances, monetary management in Indonesia still uses, as a starting-point, a standard and rather broad framework.

Since 1983, Bank Indonesia has sought to achieve the multiple objectives of monetary policy primarily through control of monetary aggregates (M1, M2) at levels that are adequate to support the targeted rate of economic growth but avoid internal and external macroeconomic disequilibrium. Under this framework, monetary aggregates have essentially become the intermediate target, to be influenced in turn by controlling the amount of reserve money (M0 – the operational target) through open market operations. Monetary management has thus relied on the linkages between M0 and M2 and between M2 and the ultimate objectives (see Annex 1).

So far, Bank Indonesia has continued to rely on open market operations as the primary instrument for conducting monetary policy. However, the changing financial environment has necessitated the use of other instruments to reinforce open market operations, such as the changeover from reserve requirements to statutory reserve requirements, and other prudential regulations enacted for the banking system. Another measure aimed at strengthening monetary control is moral suasion which is supported by the monitoring of bank credit expansion plans. Moreover, monetary management will be assisted by a more flexible exchange rate policy.

(i) Stability of the demand for money, money multipliers and income velocity

The framework adopted by Bank Indonesia requires stability of the money demand function, money multipliers and income velocity. Recent econometric work, presented in Annex 2, shows that these have been generally stable despite a noticeable trend towards greater volatility in recent years. The results of this study are discussed briefly below.

Demand for money

The error correction mechanism (ECM) model shows that the demand for money, defined as M1, is relatively stable. Therefore, monetary management using such a monetary aggregate as an intermediate target is still relevant. As regards the M2 function, however, although the explanatory power of the equation (as reflected by a rather high adjusted R^2) is good, its stability has to be interpreted carefully given that its behaviour is very sensitive to changes in the financial structure.

Income velocity

A tendency for the degree of stability of the demand for money function to diminish could also be reflected by a weakening in the long-run relationship between monetary aggregates and both output and prices. This could be verified by testing for the stability of income velocity. Using stationarity and cointegration techniques, it can be concluded that the income velocity of M1 is relatively stable but that it tends to decline in line with structural changes.

Money multipliers

The stability of money multipliers is an important consideration in monetary policy implementation because, operationally, the central bank cannot control the money supply directly. Less stable money multipliers create the risk of inappropriate monetary policy implementation. Therefore, the central bank should monitor the behaviour of money multipliers carefully. Using stationarity and structural equation techniques, it can be demonstrated that the money multiplier of M1 is still stable and predictable, while that of M2 is not. Structural changes in the financial system over the past eight years also are shown to have reduced the degree of predictability of the money multipliers for both M1 and M2.

Relationship between intermediate targets and ultimate targets

The effectiveness of monetary policy guided by quantitative targets depends not only on the stability of the demand for money equation, but also on the closeness of the relationship between monetary aggregates and ultimate targets, such as GDP growth and inflation. Current research on this relationship, using a Granger-causality and vector autoregression (VAR) approach, that has sought to establish which indicators (quantity indicators or price indicators) have a closer relationship with the ultimate targets, has yet to yield conclusive results, although it would appear that the relationship between monetary aggregates and the ultimate targets has become weaker and more blurred.

(ii) The changing monetary policy transmission mechanism

Another challenge confronting Indonesia's monetary authorities is the current trend of changing channels and the emergence of new ones in the transmission mechanism of monetary policy. In a rapidly changing environment, it is indeed very difficult to identify with precision the channels through which monetary policy affects the economy. The remarkable development of the financial system in recent years has provided the business community with a much wider array of financing alternatives. Businesses are now able to avail themselves of a great diversity of products offered by finance companies and other non-bank financial institutions, which have experienced very rapid growth in recent years The growing trend of securitisation has also led to a greater marketability and liquidity of every type of economic activity or transaction. Each process of securitisation creates new instruments, opens up new financial markets and builds new linkages between instruments and financial markets. These developments indicate that the process of transition from a heavily regulated economy to a freer and more open economy and globalised financial markets is still under way. The direction is quite clear, but the speed, magnitude and impact on other aspects such as the transmission mechanism are less clear.

In response to the new developments, Bank Indonesia has been following a rather pragmatic (eclectic) approach. In the transition to a new mechanism of monetary control, a pragmatic approach is important in the Bank's view. In order to strengthen the operations in open markets, Bank Indonesia activated the instrument of reserve requirements, with

the ratio being raised from 2 to 3% from February 1996 and to 5% from April 1997. Another measure aimed at strengthening monetary control is moral suasion, which is supported by the monitoring of bank credit expansion plans. Moreover, in order to stem the inflows of short-term capital that led to a rapid expansion of the stock of money, Bank Indonesia widened the intervention band for the exchange rate several times before finally abandoning the band on 14th August 1997. Finally, although quantitative targeting is still relied upon, more attention has been given to price indicators, namely interest and exchange rates.

(iii) Monitoring broader indicators

In line with the adoption of multiple objectives and the eclectic approach mentioned above, Bank Indonesia monitors and analyses a wide range of indicators to determine the monetary policy stance and its effectiveness. In addition to the standard ones, the monetary authorities have thus monitored closely other indicators, such as international economic and financial market developments, asset price trends, capital flows, consumption, investment, and capacity utilisation.

Research conducted in this area to date shows that a number of variables such as interest rate differentials, nominal exchange rate movements and the output gap may be used as leading indicators. With the rapid development of the financial system and the growing efficiency of the payment system, interest rates have become more important as an indicator of the effectiveness of monetary policy. In these circumstances, changes in short-term rates brought about by monetary policy are likely to be transmitted quickly to the entire spectrum of medium and long-term rates offered by banks and other financial institutions. The speed of transmission and the magnitude of the pass-through of interest rates depend on market efficiency and the public's expectations of future interest rates and inflation These expectations will influence the behaviour of real interest rates, which in turn will affect private investment and consumption. Further research in this area is still under way.

The increasing importance of interest rates as an indicator of the effectiveness of monetary policy has made interest rates themselves more of a policy target. In addition to controlling monetary aggregates, Bank Indonesia is therefore also active in monitoring and trying to influence domestic interest rate movements. This takes place, among other things,

through changes in the discount rates for Bank Indonesia bills (SBIs) and bank-endorsed commercial paper (SBPUs).

(iv) Greater flexibility in exchange rate management

As noted before, rapid capital mobility has given rise to a number of problems in managing monetary aggregates. These difficulties tend to be heightened under a relatively fixed exchange rate system in which capital inflows will immediately boost the growth of the money supply, thereby undermining the effectiveness of measures designed to control monetary expansion. When this situation arises, closing an existing open economic system is no longer a realistic option. Neither is it possible to fend off capital inflows through intervention. Hardly any country in the world has a sufficient cushion of foreign exchange reserves to counter international capital movements, leaving the monetary authorities with little option but to make continuous adjustments to domestic monetary policy in line with international trends.

To strengthen the effectiveness of monetary management, Bank Indonesia sought greater exchange rate flexibility through a gradual widening of the intervention band for the rupiah exchange rate against the US dollar. This policy aimed at stemming heavy flows of speculative short-term capital while at the same time promoting interbank foreign exchange transactions. Subsequently, in order to adjust to the new monetary policy stance in the South-East Asian region and to deal with speculative attacks, Bank Indonesia removed the intervention band and left exchange rate determination to market forces. However, if necessary, Bank Indonesia can intervene in the market. As a result, banks are no longer relying on Bank Indonesia for their foreign exchange transactions, thus easing some of the complexities of monetary management.

Reliance on market forces for establishing exchange rates may also lead to more exchange rate volatility in the interbank foreign exchange market. Large capital flows tend to encourage rapid appreciation. On the other hand, large capital outflows will result in rupiah depreciation. All economic agents will have to adjust to this new system of greater exchange rate uncertainty. As this will take some time, the Bank's priority for now is to stabilise the foreign exchange market and, at the same time, to find a new "equilibrium".

(v) The co-ordination of macro and micro policy

Monetary policy is inextricably linked to other policies at the micro level affecting the operations of individual banks in various areas, such as credit policy, foreign commercial borrowing and bank supervision. These policies all have the objective of strengthening the soundness of the banking system as one of the fundamental conditions for sustainable economic development.

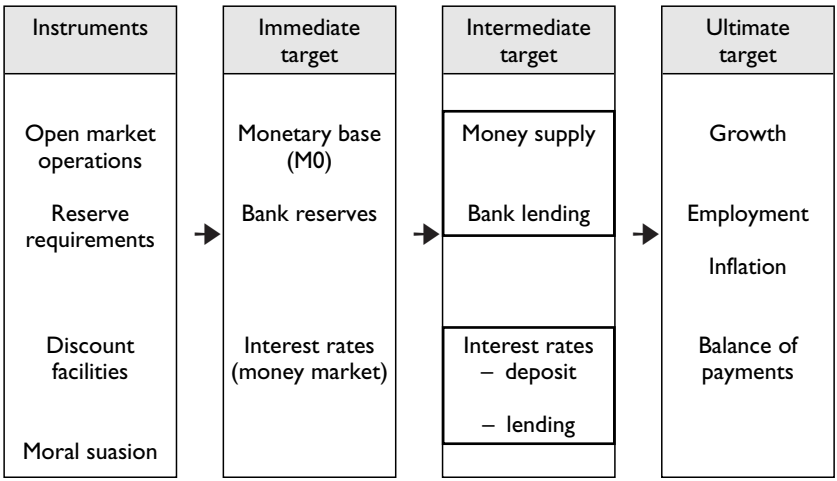
In view of the rapid growth of the financial and the banking system, the co-ordination of macro and micro policy has become a more important consideration in the conduct of monetary policy. Without such co-ordination, the achievement of the ultimate objectives of monetary policy becomes an impossible task. Poorly implemented monetary policy may disrupt macroeconomic stability which, in turn, will undermine the soundness of the banking system Conversely, a weak, vulnerable and badly managed banking system may undermine the effectiveness of monetary policy and put the entire economy at risk. The aim of co-ordination of macro and micro policy is to build optimum synergy for the achievement of policy objectives. Therefore, in the current era of globalisation it is important that the effort to build a sound and stable financial system be integrated into the overall task of macroeconomic management.

4. Concluding remarks

It is too early to have a clear view on how the process of financial reform has actually affected the monetary policy transmission mechanism in Indonesia. While searching carefully for the new transmission mechanism paradigm, Bank Indonesia has been following a pragmatic monetary policy approach by relying more on interest rates, by monitoring broad economic indicators, by applying much greater exchange rate flexibility, and by enhancing macro and micro co-ordination. Learning from other countries' experiences, including through the BIS, has been useful in the Bank's endeavours in this area.

Annex I

General framework of monetary policy



Annex II

1. Demand for money

The cointegration and error correction model is used to estimate the demand for money function.[1] Using quarterly data and the sample period 1983–96, the estimation results are as follows:

(i) Narrow money (M1)

Long-run equation (*cointegration equation)*:

$$M1R_t = \underset{(-24.49)}{-7.613038} + \underset{(41.17)}{1.155174}\ GDPFIS_t + U_t \qquad (1)$$

Short-run equation (*dynamic error correction equation*):

$$DM1R_t = \underset{(3.57)}{0.020638} - \underset{(-2.44)}{0.111621}\ U_{t-1} + \underset{(2.63)}{0.182413}\ DM1R_{t-1} + \underset{(2.18)}{0.15357}\ DM1R_{t-2}$$
$$+ \underset{(5.61)}{0.499883}\ DGDPFIS_t - \underset{(-4.36)}{0.922932}\ DCPI_t$$
$$+ \underset{(1.79)}{0.003416}\ DDEP3BL_{t-1} + \underset{(12.14)}{1.501802}\ DFIND_t + e \qquad (2)$$

$R^2 = 0.88$; R^2 adj.$= 0.85$; SER $= 0.015$; LM F-stat $= 0.48$; WH-stat $= 1.13$

where:

M1R =	narrow money, in real terms
U =	errors from long-run equation
GDPFIS =	quarterly GDP
CPI =	consumer price index
DEP3BL =	three-month deposit rate
FIND =	financial deepening index (M1/GDP)
D =	difference

(all data are expressed in natural logarithms)

[1] Note that t-values are shown in parentheses. The *LM F-stat* is the F statistic derived from the Lagrange multiplier test for serial correlation. The *WH-stat* is the outcome of White's Heteroskedasticity test.

(ii) Broad money (M2)

Long-run equation (cointegration equation):

$$M2R_t = -14.48588 + 1.871996\ GDPFIS_t + 0.006497\ DEP3BL_t - 0.007456\ DUMS + U_t \quad (3)$$

where:
M2R = broad money, in real terms
DUM = dummy for October 1988 deregulation (period before deregulation = 1, period after deregulation = 0)
DUMS = DUM times three-month deposit rates, used to capture a slope change
(all data other than the three-month deposit rates are expressed in natural logarithms)

Short-run equation (*dynamic error correction equation*):

$$DM2R_t = \underset{}{0.011976} - \underset{(-4.23)}{0.204534}\ U_{t-1} + \underset{(9.46)}{0.721591}\ DGDPFIS_t - \underset{(-3.09)}{0.310312}\ DGDPFIS_{t-5} - \underset{(-2.13)}{0.003227}\ DDEP\ 3BL_{t-3} - \underset{(-2.36)}{0.007893}\ DLIB_{t-1} + \underset{(9.72)}{0.439482}\ DFIND_t + \underset{(4.34)}{0.001011}\ DUM + e \quad (4)$$

$R^2 = 0.89$; R^2 adj. = 0.87; SER = 0.012; LM F-stat = 0.43; WH-stat = 1.14

where:
LIB = three-month LIBOR
DUM = dummy for Sumarlin shock in 1991
(all data other than the three-month deposit rates and the three-month LIBOR are expressed in natural logarithms)

Stability tests using the Chow-breakpoint test, the Chow-forecast test and the CUSUM-recursive test show that in general the demand for money (M1 and M2) is relatively stable.

2. Money multiplier

(i) Stationarity tests

The results of the stationarity test for the money multiplier of M1 (*mm1*) and M2 (*mm2*) using the Augmented Dickey-Fuller test are shown in the table below.

ADF test statistics

	lag	84.01–96.12	84.01–88.12	89.01–96.12	90.01–96.12
mm1 . .	2	−3.30**	−2.22	−2.65*	–
	4	−3.24**	−1.85	−2.60*	–
mm2 . .	2	−2.51	−2.00	−2.45	−3.02**
	4	−2.49	−2.12	−2.41	−2.97**

Note: The stationarity test for the period 1984–96 includes a dummy variable to catch the structural change after the 1988 financial deregulation (PAKTO 1988); observations after the 1988 financial deregulation =1.

* denotes rejection of the null hypothesis at the 10% significance level.
** denotes rejection of the null hypothesis at the 5% significance level.

Conclusion: For the sample period of 1984–96, *mm1* is stationary, which implies that *mm1* is stable. For the sample period of 1989–96, *mm1* still exhibits stationarity but the "degree of stationarity" decreases in line with structural change. By contrast, *mm2* is not stationary for the 1984–96, 1984–88 and 1989–96 periods. However, for the period 1990–96 (adjusted period), *mm2* displays stationarity. This implies that *mm2* tends to fluctuate around its long-run average.

(ii) Parameter stability tests

The structural equation for the *money multiplier* is based on the Beenstock approach.*

$$M^s = mm * M0$$

$$mm1 = \frac{CR + 1}{CR + RR * (QMR + 1)}$$

$$mm2 = \frac{CR + QMR}{CR + RR * (QMR + 1)}$$

* See Beenstock, Michael (1989): "The determinants of the money multiplier in the United Kingdom". *Journal of Money, Credit and Banking*, 21(4), pp. 464–80.

where:

M^s =	money supply
CR =	currency ratio, i.e. CR/DD
QMR =	time and savings deposit ratio, i.e. QM/DD
RR =	total reserve ratio, i.e. total reserves/(QM+DD)

The two-stage least squares (TSLS) method is used to estimate this structural equation. Using average quarterly data from 1987.3 to 1996.4, the following results are obtained:

$$\begin{aligned} LnCR = {} & 2.641 - 0.101 * LnPDBR - 0.005 * RDEPI(-1) - 0.044 * RDEP24 \\ & (4.03) \quad (-1.61) \quad (-1.76) \quad (-6.94) \\ & - 0.0003 * IHSG - 2.312 * FIND - 0.098 * DUM88 \\ & (-2.75) \quad (-4.76) \quad (-2.70) \\ & + 0.128 * DUM89Z - 0.045 * S3 \\ & (2.82) \quad (-2.57) \end{aligned}$$

$R^2 = 0.943$; SER = 0.038; LM F-stat = 0.145

$$\begin{aligned} LnQMR = {} & -6.585 + 0.193 * LnQMR(-1) + 0.809 * LnPDBR - 0.003 * RDEPI \\ & (-5.87) \quad (1.90) \quad (6.49) \quad (-1.85) \\ & + 0.010 * RDEP24 - 2.421 * FIND - 0.004 * DRdep24 \\ & (2.28) \quad (-6.63) \quad (-4.31) \\ & + 0.011 * Dinflows + 0.125 * DUM90Z - 0.070 * S3 \\ & (5.22) \quad (4.56) \quad (-5.60) \end{aligned}$$

$R^2 = 0.988$; SER = 0.024; LM F-stat = 0.068

$$\begin{aligned} LnRR = {} & 11.450 + 0.338 * LnRR(-1) - 1.219 * LnPDBR - 0.028 * RDEP24 \\ & (5.56) \quad (3.56) \quad (-5.90) \quad (-3.11) \\ & - 0.276\, DUM88 - 0.324 * DUM89Z + 0.580 * DUM96 \\ & (-3.83) \quad (-3.81) \quad (7.51) \end{aligned}$$

$R^2 = 0.975$; SER = 0.077; LM F-stat = 0.863

where:

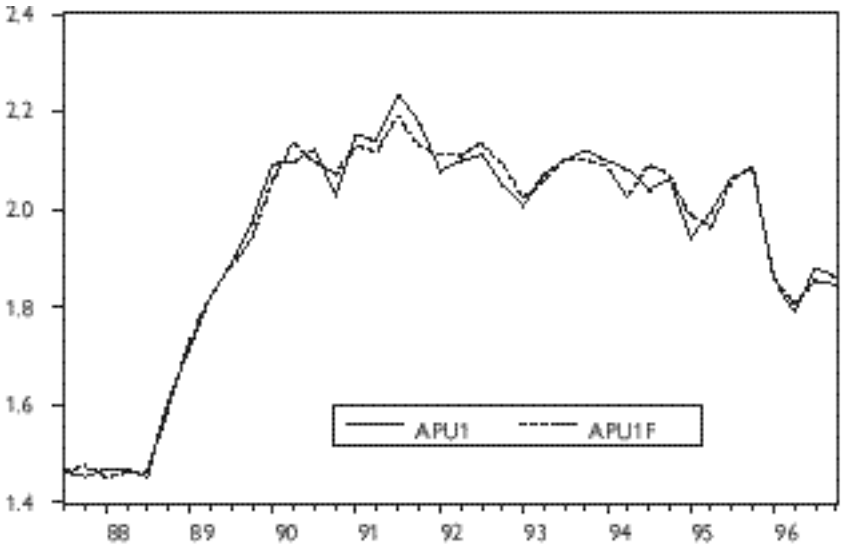
PDBR =	GDP at constant price
RDEP1 =	one-month deposit rate
RDEP24 =	24-month deposit rate
IHSG =	composite stock price index
DUM88 =	dummy for observations after the 1988 financial deregulation (PAKTO 1988) = 1
DUM89Z =	dummy for shocks in 1989.2 = 1
DUM90Z =	dummy for shocks in 1990.4 = 1
DUM96 =	dummy for observations after the increase of reserve requirements = 1
DRDEP24 =	interaction dummy for *RDEP24* after PAKTO 88
Dinflows =	interaction dummy for inflows (net foreign assets in the monetary system) after 1990.3
S3 =	seasonal dummy for the third quarter
Ln =	natural logarithm

From the estimated parameters, it can be seen that the exogenous variables are able to explain the behaviour of each component of the money multipliers. An autocorrelation problem can only be seen in the time and savings deposit ratio (*QMR*) equation. However, "true auto-correlation" can be detected by applying the test for errors regression of each equation *mm1* and *mm2* in an integrated way. Jarque-Bera statistics and correlation analysis show that the errors of regression for *mm1* and *mm2* are normally distributed and free of autocorrelation problems.

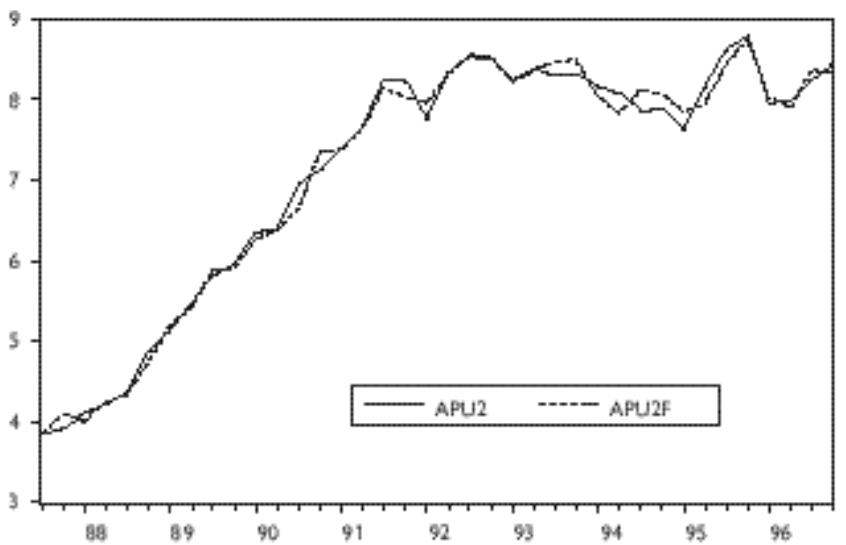
From the regressions above, the historical simulation for *mm1* and *mm2* can be presented as follows:

Graph 1

(a) Historical simulation for *mm1*



(b) Historical simulation for *mm2*



The structural equations developed above can explain the behaviour of the money multipliers. To test their predictability further, stability tests based on Chow's forecast test and the CUSUM of squares test should be conducted.

F-statistics from Chow's forecast test using a 1 to 2 year in-sample forecast are as follows.

	1995.1–1996.4	1996.2–1996.4
Currency ratio	0.533	0.182
Time and savings deposit ratio . . .	1.205	2.249*
Total reserve ratio	..	0.654

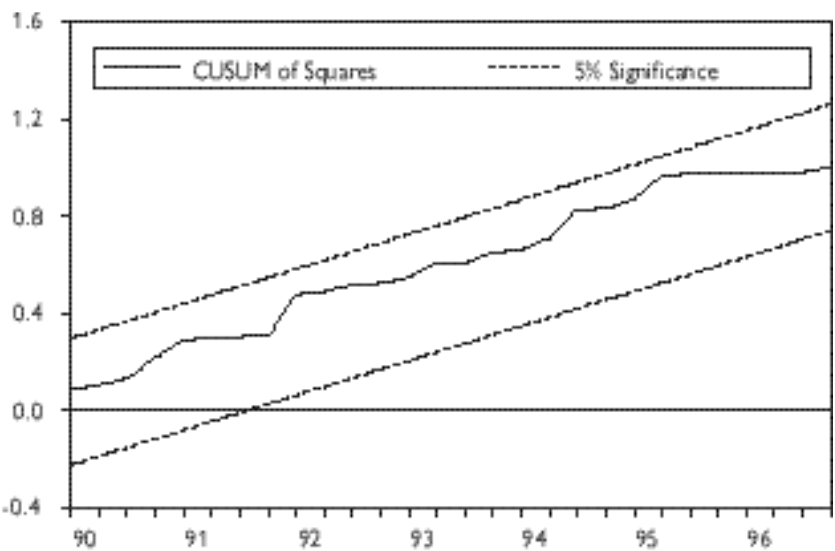
* denotes rejection of the null hypothesis at the 10% significance level.

The results indicate that the structural equation is correctly specified and has reasonable predictive ability. However, it should be noted that this predictive ability tends to decline in the equation for the time and savings deposit ratio.

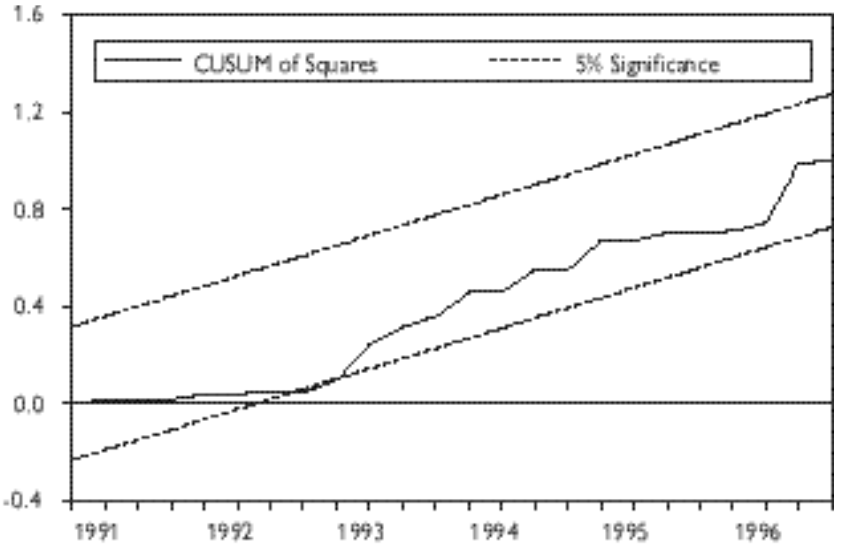
The results of the stability test using the CUSUM of squares (recursive estimates) test are as follows;

Graph 2

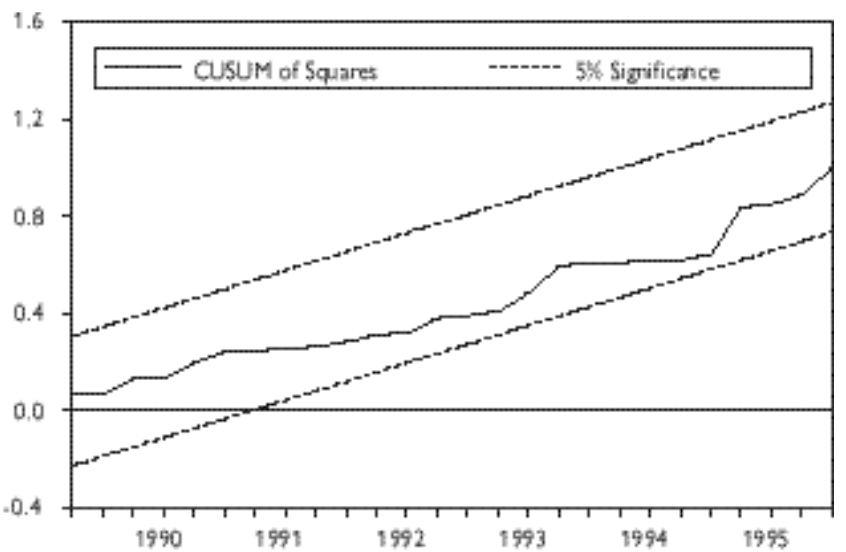
(a) Currency ratio equation



(b) Time and savings deposit ratio equation



(c) Total reserve ratio equation



The stability test for each component of the money multiplier shows that the behaviour of the money multiplier is generally rather stable. However, the potential for the errors of regression to move outside the toleration limit should be noted.

3. Income velocity

The stationarity tests for *income velocity* (M1 and M2) based on the Augmented Dickey-Fuller Test are shown in the table below.

ADF test statistics

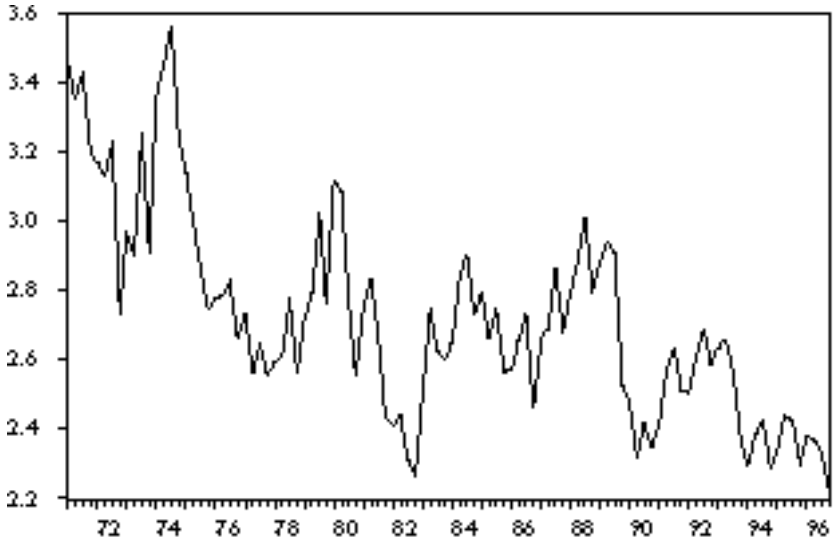
	lag	1971.1–1996.4	1971.1–1988.4	1989.1–1996.4
Velocity M1 . .	2	−3.23**	−3.35**	−1.60
	4	−2.84*	−2.83*	−2.54
Velocity M2 . .	2	−2.16	−2.20	−1.27
	4	−1.08	−1.20	−1.22

* denotes rejection of the null hypothesis at the 10% significance level.
** denotes rejection of the null hypothesis at the 5% significance level.

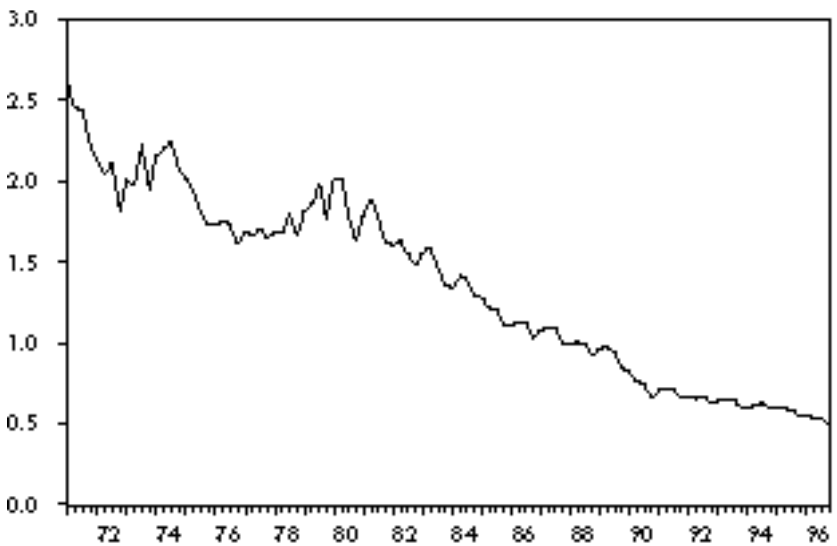
The table shows that the income velocity of M1 is stationary in the periods 1971–96 and 1971–88, although not in the period 1989–96. It can be seen that, in line with structural change, income velocity tends to fluctuate around its long-run average value. Meanwhile, the income velocity of M2 is not stationary in either of the three periods under review.

Graph 3

(a) Income velocity of M1



(b) Income velocity of M2



Another way to ascertain the stability of income velocity is to test the long-run relationship between money supply and output (nominal). A cointegration test is conducted by applying the two-step cointegration (Engle-Granger) method. The equation used is as follows:

$LnM = c + LnPDBN + error$

where:
M = M1 or M2
$PDBN$ = GDP at current prices

The ADF test statistics for the stability of the errors of the equation are:

ADF test statistics

	1971.1–1996.4	1971.1–1988.4	1989.1–1996.4
M1	−5.16***	−3.83***	−3.26**
M2	−2.14	−2.57	−1.56

** denotes rejection of the null hypothesis at the 5% significance level.
*** denotes rejection of the null hypothesis at the 1% significance level.

The ADF test statistics indicate that the errors of the regression of M1 on output are stationary, although the degree of stationarity declines over time. This implies that the income velocity of M1 is relatively stable. By contrast, the income velocity of M2 is not stable.

4. Relationship between intermediate targets and ultimate targets

Generally, the research was based on monthly and quarterly data for the sample period 1971–96. Owing to data limitations, the series of several variables, such as the (general) inflation rate and non-oil/gas imports, do not start in 1971. In order to capture shifts in the relationship between the various variables, the sample period is divided into three subperiods, namely 1971–83, 1984–88 and 1989–96. The first subperiod describes conditions before the first financial deregulation launched in June 1983, while the second subperiod relates to the period between the first

financial deregulation and the October 1988 deregulation. The third subperiod covers the period after the October 1988 deregulation.

Among the various monetary indicators used in this research are monetary aggregates (M0, currency, total reserves, M1, M2 and claims on the business sector), interest rates (interbank, three-month deposit rate, the rate on working capital credit and on investment credit, and the interest rate differential), and exchange rates (mid rates, interbank rates). In the analysis, the uncovered interest rate differential was used, i.e. the three-month deposit rate minus the three-month LIBOR rate, minus the depreciation of the rupiah. These variables are usually considered as intermediate targets. The ultimate targets are identified as the inflation rate (consumer prices), GDP at current prices and non-oil/gas imports.

To avoid problems of non-stationarity, all variables should be expressed in the form of annual growth rates. The methods to test the relationship between monetary indicators and ultimate target indicators are the Granger causality and vector autoregression (VAR) tests. The number of lags used in the Granger causality test were 2, 4 and 6. In the VAR test, 6 lags were used to explain the dynamic effect among the variables in the system, while the impulse response function and the variance decomposition were observed for 12 periods ahead. To obtain quarterly data of nominal GDP (period before 1980), annual data were interpolated by using the ACD-SEM interpolation method.

The results show that the shifting relationship between the variables is due to the structural changes in the economy. Unidirectional causality runs from monetary aggregates, such as M1, M2 and claims on the business sector, which have acted as intermediate targets to the indicators of the ultimate targets in the period before the second financial deregulation (October 1988). However, since the period after the second financial deregulation, the monetary aggregates have displayed bilateral causality. This indicates that the development of monetary aggregates also tends to be determined by the path of private consumption or aggregate demand. Therefore, the relationship between monetary aggregates and ultimate targets has become more weak and blurred.

Nonetheless, there are still several monetary indicators that consistently show unidirectional causality and play a significant role for the indicators of the ultimate targets. They include the interbank rate, the interest rate differential and the exchange rate (mid rate).