# CHAPTER III

# BEHAVIOR AND FACTORS DETERMINING MONEY SUPPLY IN INDONESIA

## 3.1 Introduction

In recent years, there has been a growing realization that money does have an extremely important influence because it is the asset used by society, which minimizes the economic costs associated with collecting market information and conducting market transactions. Many researchers have demonstrated that changes in the money supply are a reliable summary measure of the effect of monetary policy action on activity. It was suggested that the monetary authorities could best be achieved through ultimate policy adjectives such as full employment and stable prices, by controlling the growth rate of the money supply.

In order to understand the supply of money, one must be familiar with the determinants of the money supply. Several economists have investigated the factors, which affect the money supply. The notable studies are Friedman and Schwartz (1963) and Cagan (1965). They found that the supply of money was influenced by various factors both endogenous and exogenous to the economic system.

Savaraj (1977) discussed the three determinants of the money in detail. He explored rigorously the contribution of each determinant on the money supply. He used

a simple model of the money supply from basic definition to shows the relationship between the money supply and its three determinants – the high-powered money, the reserve ratio and the currency ratio. Also, he used time series analysis using both ordinary least squares (OLS) and the Hildreth-Lu scanning technique was conducting to investigate factors influencing each of the three determinants.

The purpose of this chapter is to investigate the behaviour of the determinants of the Indonesian money supply and the various factors that affect them. Changes in the money supply will be analyzed by studying the behavior of the three sectors of the economy that determine the amount of the money supply namely, the government, the commercial banks and the public. Starting from the basic definitions of the theory of money supply, the supply of money is divided into three determinants namely, high-powered money, the reserve ratio, and the currency ratio. By using ordinary least squares (OLS) and elasticity we can show the rate of change of money supply related to the rates of change in each of the determinants. Data obtained from Bank of Indonesia, SEACEN Financial Statistics and IMF Financial Statistics will be applied to determine the contribution of each determinant to the Indonesian money supply.

## 3.2 The Behavior Analysis of Money Supply

The volume of the money supplied in an economy is determined by the behavior of three sectors in the economy – the government represented by the central banks, the commercial banks, and other financial institutions in the banking system such as the

finance companies and merchant banks, and the public. By studying the behavior of these sectors, changes in the money supply can be analyzed.

The "Old " view of the money supply gave no mechanism by which the public could increase or decrease the aggregate money supply. Money was a "hot potato" that individual wealth holders could pass from hand to hand but the public, as a group could not change. As a result, interest rates and asset prices were forced to adjust to the levels at which wealth owners willingly held the available stock of money.

In the "New" view one can analyze changes in the money supply by studying the behavior of three sectors of the economy that determine the amount of money supplied by the government as represented by the central banks, the commercial banks, and the public.

High-powered money or called base money (M0), which comprises currency held by the public plus the deposits at BI of the deposit money banks and the private sector, is government determined. Given the amount of high-powered money, as well as the levels of other policy variables, such as the discount rate and legal reserve requirement, open market operations, interest rates and asset prices adjust to the levels at which the balance sheets of the public and banking system are simultaneously in equilibrium.

Given the stock of high-powered money, the public and the commercial banks jointly determine its division between public holdings of currency and bank reserves. The currency ratio and reserve ratio plays an important role in determining the amount of the money supply. The higher the reserve ratio and currency ratio the less the money supplied, ceteris paribus.

We can use a simple identity to derive the relation between the supply of money and its three determinants – the amount of high-powered money, the currency ratio and the reserve ratio.[11] Let $H$ denote the high-powered money supply, which reflects the behavior of the government sector. $H$ is the summation of currency held by the public and the amount of reserves of the banking system, denoted by $C$ and $R$ respectively. Summation of the amount of deposit money, $D$, and the currency held by the public, $C$ is equal to the amount of total stock of money denoted by $M$. The reserve ratio which is influenced by the behavior of both the government and commercial banks may be denoted by $R / D$, and the currency ratio which is determined by the public may be denoted by $C / M$.

From definition, $H = C + R$

Divided by $M$

(3.1) $H / M = C / M + R / M$

From definition, $M = C + D$

Therefore $M / M = C / M + D / M$

[11] Cagan (1965) also used the simple identity in his work.

Or $D/M = 1 - C/M$

Multiply both sides by $R/D$, $(D/M)(R/D) = R/D(1 - C/M)$, or

(3.2) $R/M = R/D(1 - C/M)$

Substitute (3.2) into (3.1),

$H/M = C/M + R/D(1 - C/M)$

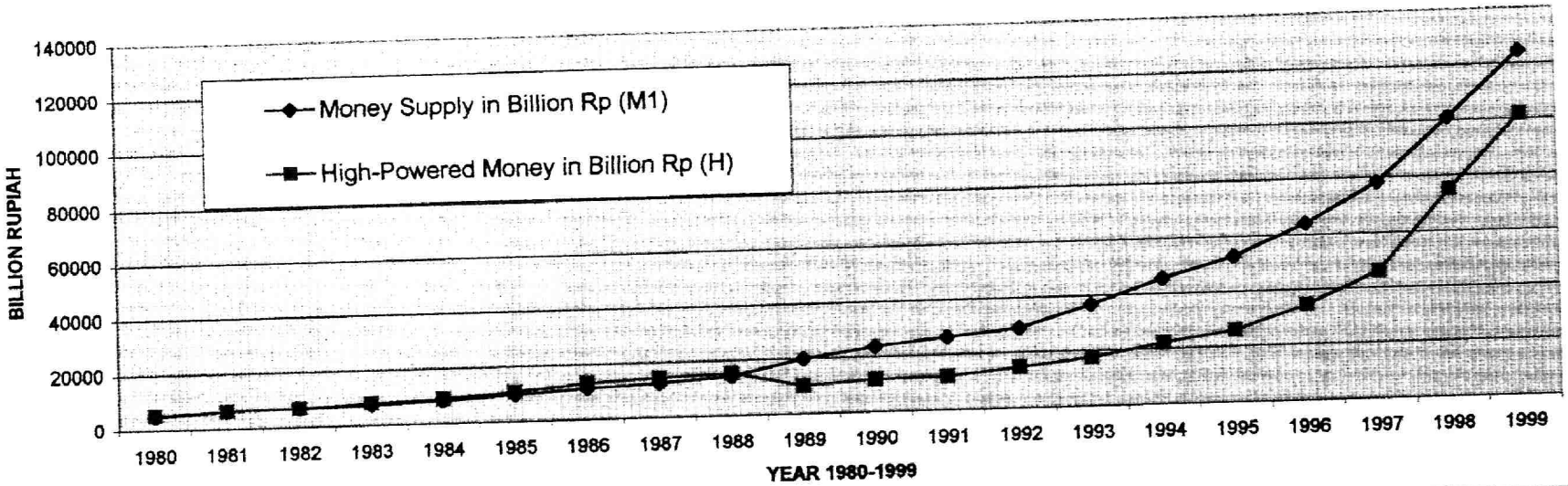
(3.3) $H/M = C/M + R/D - R/D * C/M$

Then we can get $M = \dfrac{H}{\dfrac{C}{M} + \dfrac{R}{D} - \dfrac{R}{D} * \dfrac{C}{M}}$ or,

(3.4) $$M = \frac{1}{\dfrac{C}{M} + \dfrac{R}{D}\left(1 - \dfrac{C}{M}\right)} * H$$

Equation (3.4) expresses the quantity of total money supply in terms of the high-powered money supply, the currency ratio and the reserve ratio. It shows that the quantity of money varies directly with the quantity of high-powered money and inversely with the currency ratio and reserve ratio. To illustrate the relationship between money supply and factors determinant, Figure 3.1 shows the movement of money supply, high-powered money, reserve ratio and currency ratio in Indonesia since 1980 to 1999.

FIGURE 3.1 THE MONEY SUPPLY AND THREE DETERMINANTS (HIGH-POWERED MONEY, RESERVE RATIO, AND CURRENCY RATIO) IN INDONESIA,1980-1999



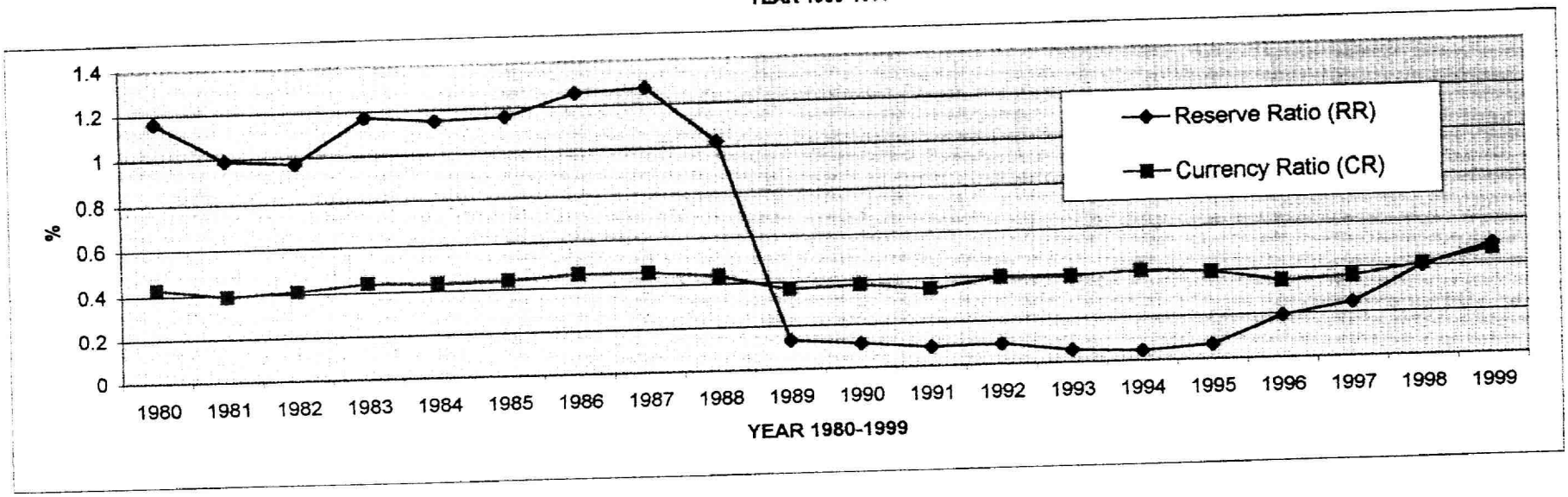
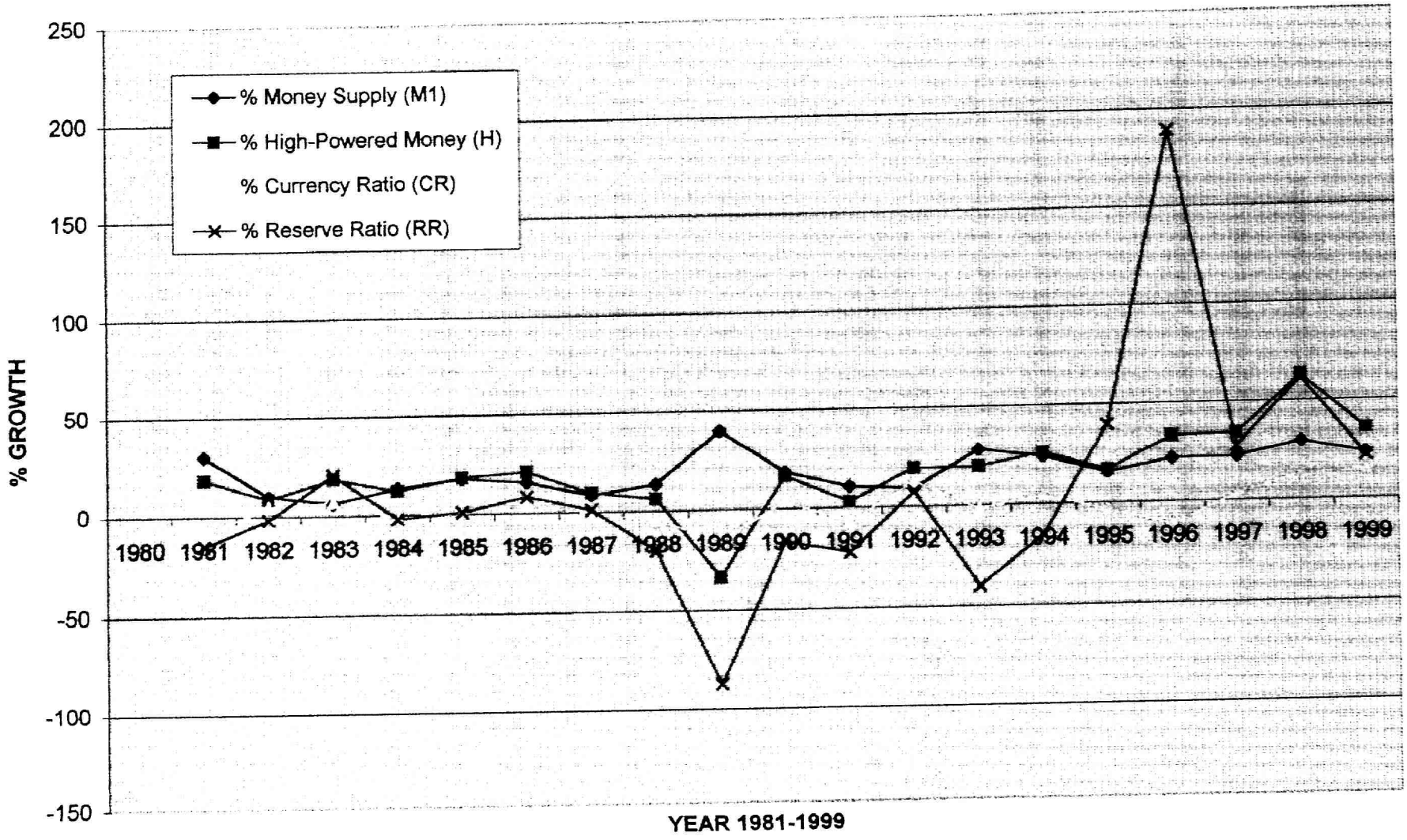



Figure 3.1 shows money supply and high-powered money increased slowly since 1980 to 1988, and since 1989 to 1996 increased rapidly because of during 1989 to 1996 growth in economic activities higher than in 1980-1988 period. During 1997 to 1999 money supply and high-powered money increased sharply because of exchange rate crisis that further developed into a deep financial crisis. This situation was further aggravated by the crisis confidence in the banking sector, which led to the massive withdrawal of deposit. As a consequence, currency in circulation increased dramatically. Meanwhile, shortages of basic commodities due to prolonged drought and increasingly expensive prices of imported raw material and panic buying brought about higher inflation.

Figure 3.1 shows in 1989, reserve ratio decreased sharply because of in October 1988 government reduce the reserve requirements from 15 per cent to 2 per cent, that has created a large excess reserve which in turn enable banks to expand credits to private sector. This phenomenon was also reflected in the continued increase in the money multiplier and increase in money supply. Figure 3.2 shows in Indonesia, there is no absolute positive relationship between money supply and high-powered money and there is no absolute negative relationship between money supply with reserve ratio and currency ratio. However, majority shows a positive relationship between money supply and high-powered money and there is a negative relationship between money supply with reserve ratio and currency ratio.

FIGURE 3.2 RELATIONSHIP BETWEEN MONEY SUPPLY, HIGH-POWERED MONEY, CURRENCY RATIO, AND RESERVE RATIO IN INDONESIA, 1981-1999



### 3.2.1 Empirical Results

The above discussion has developed the theoretical relationship between money supply, high-powered money, reserve ratio and currency ratio. It is worthwhile to investigate the relation between money supply and high-powered money, reserve ratio, and currency ratio. The following functions were tested to obtain same measure of the influence of high-powered money, reserve ratio, currency ratio on the level of money supply. In this study, we focus here on a simple definition of money. We conduct the analysis with M1 definition because it is less complicated and provides a basic understanding of the money supply. This portion of the study relies heavily on data obtained from the Bank of Indonesia, SEACEN Financial Statistics, and IMF Financial Statistics.

Testing the function.

(3.5) $$M1 = f(H, RR, CR)$$

Where:

$M1$: Money supply or total amount of money is defined as total currency plus total demand deposits of all commercial bank. (dependent variable)

$H$: High-powered money or money base (independent variable)

$RR$: Reserve ratio (independent variable)

$CR$: Currency ratio (independent variable)

If we assume a linear relationship, we can obtain a linear equation as follows:

(3.6) $$\hat{M}1 = \beta_1 + \beta_2 H + \beta_3 RR + \beta_4 CR + \varepsilon_1$$

$$\beta_2 > 0; \quad \beta_3 < 0; \quad \beta_4 < 0$$

$$\varepsilon_1 = \text{disturbance term}$$

Annual data from 1980-1999 are used for analysis. Employing ordinary least square (OLS) we found the following result:

(3.7) $$\hat{M}1 = 19027.3 + 1.206\,H - 17150.1\,RR - 19176.8\,CR$$

| | | | | |
|---|---|---|---|---|
| Std.Error | (5688.19) | (0.051) | (2458.4) | (13265.3) |
| t–Stat | (3.345)*** | (23.506)*** | (–6.982)*** | (–1.446)* |

$R^2 = 0.98$ DW = 1.63

Notes: * Significant at 10 per cent level
** Significant at 5 per cent level
*** Significant at 1 per cent level

The estimated variables show that the constant, high-powered money and reserve ratio are significant at both 1 and 5 per cent significant level. The estimated variable currency ratio is significant at 10 per cent level. The DW statistic shows no autocorrelation at one percent level. The results suggest that all variables have the correct sign. The $R^2$ value indicates that about 98 per cent of the variation of money supply may be explained in terms of high-powered money, reserve ratio and currency ratio.

Taking the differential of (3.7), we can arrange these equations in elasticity form as follow:

$$(3.8)\quad \frac{1}{\overline{M1}} d\,M1 = \left(1.206\frac{\overline{H}}{\overline{M1}}\right)\frac{d\,H}{\overline{H}} - \left(17150.1\frac{\overline{RR}}{\overline{M1}}\right)\frac{d\,RR}{\overline{RR}} - \left(66221.7\frac{\overline{CR}}{\overline{M1}}\right)\frac{d\,CR}{\overline{CR}}$$

where $\overline{M1}$, $\overline{H}$, $\overline{RR}$, and $\overline{CR}$ are the averages of $M1$, $H$, $RR$ and $CR$ respectively.

Substituting the values of $\overline{M1}$ = 34301.5, $\overline{H}$ = 23165.5, $\overline{RR}$ = 0.605 and $\overline{CR}$ = 0.409, into the parentheses of the above equation (3.8), we have,

$$(3.9)\qquad \frac{1}{\overline{M1}} \mathrm{d}\,M1 = 0.814\frac{d\,H}{\overline{H}} - 0.289\frac{d\,RR}{\overline{RR}} - 0.229\frac{d\,CR}{\overline{CR}}$$

Hence, the elasticity of money supply ($M1$) with respect to high-powered money ($H$) is 0.814, a one per cent increase in high-powered money will induce 0.814 per cent increase in money supply while the elasticity of money supply ($M1$) with respect to reserve ratio ($RR$) is 0.289, a one per cent increase in reserve ratio will induce a 0.289 per cent decrease in money supply, and a one per cent increase in currency ratio ($CR$) will induce a 0.229 per cent decrease in money supply. Our empirical results suggest that high-powered money play a central role in Indonesia: a one per cent increase in high-powered money will induce 0.814 per cent increase in money supply. From these empirical results, we can prove the theory that, there is a negative relationship between money supply with reserve ratio and currency ratio, and there is a positive relationship between money supply and high-powered money.

### 3.3 The Determinants of Money Supply

The previous explanation has shown that the high-powered money supply ($H$), the reserve ratio, currency ratio are the three determinants of the total money supply. The contribution of each determinant to the total change in the money supply was estimated for that period. The purpose of this second topic of money supply is to investigate those factors, which determine the equilibrium levels of each determinant. It is necessary to separate each determinant and discuss the basic economic theory concerning each of them. According to the theory concerning each determinant, several hypotheses will be made and statistical tests will be conducted. A time series regression has been chosen as a method of testing for all hypotheses. Data obtained from the Bank of Indonesia ,SEACEN Financial Statistics, and IMF Financial Statistics. will be used for computation.

#### 3.3.1 The High-Powered Money Supply (Base Money)

In general, the "monetary base" or "high-powered money[12]" is defined as the net monetary liabilities of the government (treasury and central bank) held by the public (commercial and nonblank public). More specifically, high-powered money is derived from a consolidated balance sheet of the treasury and central bank "monetary" accounts.

[12] High-powered money or called base money consists of currency in circulation, plus the deposits at BI of the deposit money banks and the private sector, and is important because BI's operations in the money and foreign exchange market affect the broader aggregates through their effects on the base.

The high-powered money supply is an important monetary aggregate, which measures the central bank input on economic activities and also as a main determinant of the money supply. Friedman and Schwartz (1963), Brunner and Meltzer (1964), and Cagan (1965), for example, treated high-powered money as a main determinant of the money supply in their model.

The high-powered money supply can be viewed either from the sources of base or the uses of the base. The uses of base reflect the banks' demand for vault cash and the public's demand for currency while the sources of base may be viewed as an asset supplied by the monetary authorities to the economic units that make up the economy. Given the amount of net source base supplied by the authorities, the banks and the public together determine the allocation between reserves held by banks and currency held by the public. The size of the stock of base and the rate at which it is supplied can be determined by monetary authorities while the uses of the base is determined by the public and the banks.

Summing the banks' reserves ($R$) often derives the uses of base and currency held by the public ($C$). The source base as a magnitude supplied by the monetary authorities should be distinguished from the demand for the base by other sectors of the economy. For adjustment process, working through the policy actions of the monetary authorities brings into equilibrium the supply and demand of the base and establishes the base as a strategic economic variable for monetary management and for interpreting of such management.

From the Bank Indonesia (BI) balance sheet, the source of base can be obtained as follows: source of base is defined as the sum of the Bank Indonesia credit and net foreign assets, minus all liabilities other than currency and bank reserves or the sources of base (SBASE) is assets of BI minus all central bank liabilities except currency in circulation ($C$), deposits of commercial banks, finance companies, merchant banks with BI, deposits of other financial institutions with BI and other deposits with BI (mainly deposits of Federal and State public authorities).

Uses of base ($H$) = Currency held by public ($C$)

+ Currency held by banks plus bank's deposit at BI ($R$)

or, $$H = C + R$$

Conceptually, the sources of base (SBASE) and uses of base ($H$) should be identical. However, the components are assembled from a variety of sources that are not entirely consistent in defining and reporting the items. From the sources of base as shown above, we can investigate factors influencing the high-powered money supply.

If other things remain the same, an increase in the assets of the central bank (BI) causes an increase in high-powered money. The monetary assets of the BI can be classified into two significant categories:[13] net foreign assets and net claims on central government.

### 3.3.1.1 Empirical Results

The above discussion has developed the theoretical relationship between high-powered money and monetary assets of BI. We are now interested in estimating the contribution of these factors to the high-powered money or monetary base. In this part we want to investigate the relationship between high-powered money with net foreign assets ($F$) and net claims on central government ($G$).

From the theoretical discussion above, there is a positive relationship among high-powered money with net foreign assets ($F$) and net claims on central government ($G$).

$$H = f(F, G)$$

Where

$H$ = High-powered money (dependent variable)

$F$ = Net foreign assets (independent variable)

$G$ = Net claims on central government (independent variable)

If we linearize this relationship we then can write a linear function as follows:

(3.15) $$H = \beta_1 + \beta_2 F + \beta_3 G + \varepsilon_1$$

$$\beta_2 > 0; \quad \beta_3 > 0$$

$\varepsilon_1$ = disturbance term

[13] The amount of coins does not appear in BI assets simply because it issued by the Ministry of finance.

Employing ordinary least square (OLS), using annual data from 1980 -1999, we get the following result:

(3.16)

$$\hat{H} = 6460.8 + 0.378\,F + 0.102\,G$$

| | | | |
|---|---|---|---|
| Std.Error | (939.3) | (0.020) | (0.019) |
| t – Stat | (6.878)*** | (18.849)*** | (5.163)*** |

$R^2 = 0.98$ DW = 0.75

Notes: * Significant at 10 per cent level
** Significant at 5 per cent level
*** Significant at 1 per cent level

The estimated variables show that all the variables are significant at both 1 and 5 per cent significant level. The results are satisfactory and all the variables have the correct sign. The $R^2$ value indicates that about 98 per cent of the variation of high-powered money may be explained in term of net foreign assets and net claims on central government.

Taking the differential of (3.16), we can arrange the equation in elasticity form as follows:

(3.17)

$$\frac{1}{\overline{H}}\,dH = \left(0.378\frac{\overline{F}}{\overline{H}}\right)\frac{dF}{\overline{F}} + \left(0.102\frac{\overline{G}}{\overline{H}}\right)\frac{dG}{\overline{G}}$$

where $\overline{H}$, $\overline{F}$, and $\overline{G}$ are the averages of $H$, $F$, and $G$ respectively.

However, this amount has grown steadily over time and is small and stable in relation to total assets.

Substituting the values of $\overline{H}$=23165.5, $\overline{F}$= 39383.6, and $\overline{G}$=17607.1. into parentheses of the above equation, we have,

$$\frac{1}{\overline{H}} dH = 0.643 \frac{dF}{\overline{F}} + 0.077 \frac{dG}{\overline{G}} \tag{3.18}$$

Hence the elasticity of high-powered money ($H$) with respect to net foreign assets ($F$) is 0.643, the elasticity of high-powered money ($H$) with respect to net claims on central government ($G$) is 0.077. Our empirical results suggest that net foreign assets play a central role in Indonesia: a one percent increase in net foreign assets will induce 0.643 per cent increase in high-powered money.

### 3.3.2 The Reserve Ratio

The second determinant of the money supply is the reserve ratio. The reserve ratio is the ratio between the total amount of actual reserves held by banks ($R$) and the total amount of demand deposits created by all banks ($D$). Total reserves can be divided into two categories: legal reserves (required reserves) and excess reserves. Excess reserves are the difference between total reserves and the required reserves.

Banks will try to maximize their profit by maintaining the minimum excess reserves consistent with their risk and liquidity objectives. Holding excessive reserves results in forgone earnings but such reserves protect banks against sudden and large

withdrawals of deposits. In addition, banks build up their reserve position when they are planning large portfolio changes. Thus a bank might have large excess reserves when they are in the process of negotiating large loans and investments.

The monetary authorities can control "bank money" by changing the legal reserve requirement since in this way they 'sterilize" high-powered money. With a given high-powered money or monetary base, the central bank can readily restrict the supply of demand deposits and the money supply by raising the required reserve ratio and vice versa. This is only partly true since banks can adjust their excess reserve holdings, which can affect the amount of demand deposits. The public, to a certain degree, is also important in determining the level of demand deposits. Therefore, the central bank, the commercial banks, and the public jointly determine the reserve ratio.

#### 3.3.2.1 Empirical Results

It is worthwhile to investigate the relation between commercial bank reserves with demand deposits, time and saving deposits. In this section, we only investigate on commercial banks reserves. Again, we expect a positive correlation between dependent and independent variables. Specifically:

$$BR = f(DD, TDSD)$$

Where

$BR$ = Actual bank reserves (dependent variable)

$DD$ = Demand deposits (independent variable)

$TDSD$ = Time deposits and saving deposits(independent variable)

The linearization of this function can be expressed as:

(3.19) $$RR = \beta_1 + \beta_2 DD + \beta_3 TDSD + \varepsilon_1$$

$$\beta_2 > 0; \quad \beta_3 > 0$$

$\varepsilon_1$ = disturbance t

Bank reserve data are the actual amount of reserve that commercial banks were holding in that time which is comprised of legal reserve requirements and excess reserves. Annual data are obtained from the Bank Indonesia, SEACEN Financial Statistics, and IMF Financial Statistics. Time series regression has been chosen for testing and the periods for analysis are from 1980-1999. Ordinary least squares (OLS) are employed in order to estimate the regression equation. The results of the regression are as follows:

(3.20) $$\hat{B}R = 2709.3 - 0.471\, DD + 0.204\, TDSD$$

| | | | |
|---|---|---|---|
| Std.Error | (2650.2) | (0.373) | (0.053) |
| T – Stat | (1.022) | (-1.263) | (3.861)[1] |

$R^2 = 0.91$ DW = 0.996

Notes: * Significant at 10 per cent level

** Significant at 5 per cent level

*** Significant at 1 per cent level

The estimated variables show that constant and demand deposits are not significant at 10 per cent level, while time and saving deposits is significant at both 1 and 5 per cent significant level. The sign of the coefficient on demand deposits is negative, contrary to what expected on a *priori* grounds. The $R^2$ value indicates that about 91 per cent of the commercial bank reserves may be explained in terms of demand deposits, time and saving deposits.

What is the problem of the wrong sign of the estimated coefficient of demand deposits? In formulating the regression for testing, it is specified that the expected sign of the coefficient of demand deposits is positive. There seems no reason on *a priori* ground for substantiating the possibility that demand deposits could indeed be negative or alternatively non-zero. It is illogical to argue that those demand deposits is negative, that is an increase in demand deposits at commercial banks will induce the bank to hold less reserves. Hence the variable demand deposits was dropped from the equation.

Taking the differential of (3.20), we can arrange these equations in elasticity form as follows:

$$\frac{1}{\overline{BR}} d\,BR = \left(0.204 \frac{\overline{TDSD}}{\overline{BR}}\right) \frac{d\,TDSD}{\overline{TDSD}} \tag{3.21}$$

where $\overline{BR}$, $\overline{TDSD}$ are the averages of $BR$ and $TDSD$ respectively.

Substituting the values of $\overline{BR}$ = 11264.2, and $\overline{TDSD}$ = 81847.4 into the parentheses of the above equation, we have,

$$\frac{1}{\overline{BR}} d\,BR = 1.482 \frac{d\,TDSD}{\overline{TDSD}} \tag{3.22}$$

Hence the elasticity of bank reserves (BR) with respect to the elasticity of time deposits and saving deposits is 1.482. Our results suggest that time and saving deposits play a central role in Indonesia: a one per cent increase in time and saving deposit will induce a 1.482 per cent increase in bank reserves.

### 3.3.3 The Currency Ratio

The currency ratio is the ratio of net currency to the total amount of money. The term net currency simply refers to currency issued minus cash in vaults of all commercial banks. Therefore, the currency ratio is always less than one. A high currency ratio indicates the public preference for currency over deposits. The total amount of money depends on which monetary aggregate is used. Money supply or ($M1$) is defined as currency holdings of the non-bank private sector plus total demand deposits of all commercial banks. Private sector liquidity or called broad money ($M2$) includes all the components of $M1$ plus "quasi money" consisting of private sector time and savings deposits at commercial banks.

Defining the term currency as the amount of currency held by the public, the publics' demand for currency plays an important role in the determination of the currency ratio. Based on the banking system in general, as the public withdraws currency from banks, the reserves of the commercial banks will be depleted and, the capacity for creating demand deposits will be reduced and vice versa.

Unlike high-powered money, the public's demand for currency is not subject to any of the regulations of the monetary authorities. They cannot regulate the behavior of the public. An analysis of the public's demand for currency can be conveniently expressed in terms of the currency ratio.[14] By the currency ratio, we mean the currency in circulation outside the banks, taken as a proportion of the money supply.

The public's demand for currency is an important factor that affects the supply of money. On the basis of fractional reserves, a withdrawal of currency by the public reduces the reserves of the commercial banks, and a flow of currency to the banks adds to their reserves. Unless offset by changes in the banks' excess reserves or by appropriate policy action, an increase in the public's demand for currency leads to a multiple contraction of earning assets and deposits, and a decrease in the public's demand for currency leads to a multiple expansion of earning assets and deposits.[15]

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[14] It might be useful to mention. At this point, that currency and demand deposits are not perfect substitutes; cash has its advantages depending upon the type of exchange undertaken.
[15] Khazzoom J.Daniel (1966).

The currency ratio is an important factor in affecting the money supply. A low currency ratio would mean that banks could increase their deposits by larger amounts, for a given quantity of reserves. Many economists agree that currency ratio is significant in affecting money supply.

The view that an inverse relationship exists between growth and the trend in the currency ratio focuses on the growth of banks, which, in turn, is associated with economic growth. The idea is simple: As people become more familiar with the general advantages of banking, they tend to hold a larger fraction of their money in the form of deposits. The money supply is inversely related to the currency ratio, if the currency ratio increased, the money supply will be decreased and vice versa. Some selected factors[16] and the simple hypotheses are presented in this selection.

People will hold currency up to certain levels beyond which a rise in real income will then lead to a decline in the currency ratio. From this point, the income elasticity of demand deposits is greater than the income elasticity of currency. Therefore, the currency ratio would tend to decline as real income per capita rose.

### 3.3.3.1 Empirical Results

#### 3.3.3.1.1 Narrow Definition of Currency Ratio

The development of financial institutions encourages the people to use banking services. The more banking facilities, the more checking accounts will be used and the less demand for currency. As we discussed above, it is expected that the coefficient number of bank offices will be negative. Increase in the banking services, including the widening network of bank offices and the attractive savings schemes offered by banks, encourage people to store their money in banks, it cause money supply reduce and currency in circulation reduce. Specifically:

$$\frac{C}{M1} = f\,(OFF)$$

Where

$\frac{C}{M1}$ = Narrow definition of currency ratio (dependent variable)

$OFF$ = No of bank offices (independent variable)

If we linearize it we can get the following linear equation:

(3.23) $$\frac{C}{M1} = \beta_1 + \beta_2 OFF + \varepsilon_1$$

$$\beta_2 < 0$$

$\varepsilon_1$ = disturbance term

[16] It should be noted that some factors are similar to the work of Freedman and Scwarthz (1963) and Cagan (1965).

The period selected for the analysis is from 1980 to 1999. Ordinary least square (OLS) is used for estimation. The numbers of bank offices were obtained from the Bank Indonesia. We obtained the following results:

(3.24)
$$\frac{\hat{C}}{M1} = 0.511 - 1.33\,OFF$$

| | | |
|---|---|---|
| Std.Error | ( 0.035) | (4.519) |
| t–Stat | $(14.536)^{***}$ | $(-2.975)^{***}$ |

$R^2 = 0.33$ DW = 1.13

Notes: * Significant at 10 per cent level
** Significant at 5 per cent level
*** Significant at 1 per cent level

The estimated variables show that the constant and the coefficient for the number bank offices have the right signs and they are significant at both 1 and 5 per cent significant level. As we expect, there is a negative relationship between currency ratio and number of bank offices. The development of financial institutions encourages the people to use banking services. The more banking facilities, the more checking accounts will be used and the less demand for currency.

Taking the differential of (3.24), we can arrange the equation in elasticity form as follows:

(3.25)
$$\frac{1}{\frac{\overline{C}}{M1}} d\left(\frac{C}{M1}\right) = -\left(1.33 \frac{\overline{OFF}}{\frac{\overline{C}}{M1}}\right) \frac{OFF}{\overline{OFF}}$$

where $\frac{\overline{C}}{M1}$ and $\overline{OFF}$ are the averages of $\frac{C}{M1}$ and $OFF$ respectively.

Substituting the values of $\frac{\overline{C}}{M1} = 0.74$ and $\overline{OFF} = 2.46$ into the parentheses of the above equation, we have,

$$\frac{1}{\frac{\overline{C}}{M1}} d\left(\frac{C}{M1}\right) = -4.42 \frac{d\,OFF}{\overline{OFF}} \tag{3.26}$$

The above results demonstrate that the elasticity of currency ratio with respect to number of bank offices is 4.42. Therefore, a one per cent increase in number of bank offices will induce 4.42 per cent decrease in narrow definition of currency ratio.

### 3.3.3.2 Broad Definition of Currency Ratio

If we consider a broader definition of money supply ($M2$), which is the summation of currency, demand deposits and time deposits, we then can use per capita income as independent variable. As we discussed above, it is expected that the coefficients of per capita income will be negative. As income rises, people will hold more demand deposit rather than currency. This implies that, in Indonesia, the income elasticity of demand deposit is greater than the income elasticity of currency. Specifically:

$$\frac{C}{M2} = f(Y)$$

Where

$\frac{C}{M2}$ = Broader definition of currency ratio (dependent variable)

$Y$ = per capita income (independent variable)

If we assume a linear relationship, we obtain:

(3.27) $$\frac{C}{M2} = \beta_1 + \beta_2 Y + \varepsilon_1$$

where $\beta_2 < 0$

$\varepsilon_1$ = disturbance term

The period selected for the analysis is from 1980 to 1999. Ordinary least square (OLS) is used for estimation. Per capita income data was obtained from the financial statistic, IMF. The results of our estimation are shown below:

(3.28) $$\frac{\hat{C}}{M2} = 0.202 - 3.75Y$$

Std.Error (0.017) (8.76)

t–Stat $(12.112)^{***}$ $(-4.277)^{***}$

$R^2 = 0.33$ DW = 1.13

Notes: * Significant at 10 per cent level

** Significant at 5 per cent level

*** Significant at 1 per cent level

In the above equation for the narrow definition of currency ratio, we find that constant and coefficient for the income per capita have the right signs, and they are significantly at both 1 and 5 per cent level. As we expeced, there is a negative relationship between currency ratio and per capita income. As income rises, people will hold more demand deposit rather than currency. This implies that, in Indonesia, the income elasticity of demand deposit is greater that than the income elasticity of currency.

Taking the differential of (3.28), we can arrange the equation in elasticity form as follows:

(3.29)
$$\frac{1}{\left(\frac{\overline{C}}{M2}\right)} d\left(\frac{C}{M2}\right) = -\left(3.75 \frac{\overline{Y}}{\left(\frac{\overline{C}}{M2}\right)}\right) \frac{dY}{\overline{Y}}$$

where $\left(\frac{\overline{C}}{M2}\right)$ and $\overline{Y}$ are the averages of $\frac{C}{M2}$ and $Y$.

Substituting the values of $\left(\frac{\overline{C}}{M2}\right) = 5.29$ and $\overline{Y} = 1.74$ in the above equation, we have,

(3.30)
$$\frac{1}{\left(\frac{\overline{C}}{M2}\right)} d\left(\frac{\overline{C}}{M2}\right) = -1.23 \frac{dY}{\overline{Y}}$$

We obtain that, the elasticity of per capita income with respect to the broader definition of currency ratio is equal to 1.23. Therefore, a one per cent increase in per capita income will induce 1.23 per cent decrease in broader definition of currency ratio.

In summary, our empirical results show that high-powered money is the most important factor influencing money supply in Indonesia. From these empirical results, we can prove the theory that, there is a negative relationship between money supply with reserve ratio and currency ratio, and there is a positive relationship between money supply and high-powered money.

Our empirical results suggest a positive relationship between high-powered money with net foreign assets ($F$), and net claims on central government ($G$). The results are satisfactory and all the variables have the correct sign. Net foreign assets ($F$) are the most important factor influencing the high-powered money in Indonesia. Demand deposits, time and saving deposits affect the reserve ratio as expected. Variable demand deposits is not significant at 10 per cent level, while variable time and saving deposits is significant at both 1 and 5 per cent level. The sign of variable demand deposits is negative, contrary to what is expected on a *priori* grounds. Hence, the variable demand deposits was dropped from the equation. Our empirical results suggest that time and saving deposits is the most important factor influencing bank reserves in Indonesia.

Our empirical results show that there is a negative relationship between currency ratio with number of bank offices and per capita income. The currency ratio for the narrow definition of money supply is affected by number of bank offices. For the broader definition of money supply, per capita income plays a central role in currency ratio. The use of checks are not limited, therefore Indonesian people prefer demand deposits to currency. From this point, in Indonesia, the income elasticity of demand deposits is greater than the income elasticity of currency. Therefore, the currency ratio would tend to decline as real income per capita rose.