THE DETERMINATION OF THE MONETARY BASE IN DEVELOPING COUNTRIES

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IN THE NAME OF ALLAH, MOST GRACIOUS, MOST MERCIFUL

In recognition of

her deep appreciation for education,

her love and support,

who always taught me to excel,

I lovingly dedicate this thesis to

my late mother.

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CHAPTER 1

INTRODUCTION

Among the several macroeconomic policies used by governments in their pursuit of their nations' economic objectives is monetary policy. This dissertation is a study in the controllability of the monetary base, the principal tool in the execution of monetary policy.

Though much of the literature and discussion of the base has taken place in the context of developed countries, especially the United States, the ideas developed in that literature have been discussed and assumed to be relevant for less developed countries. This dissertation does not address the broader issue of the role of monetary policy in development, or the appropriate monetary aggregate, or the relevant proximate monetary indicator. Rather the central concern of this dissertation is the issue of the controllability of the base in less developed countries relative to the US.

The current framework for monetary policy has an integral part the contemporary money supply paradigm (Steindl 1982), an early version of which appeared in Meade (1935). The paradigm holds that the quantity of money (currency plus deposits) equals the product of a money multiplier and the monetary base:

$$M = mB \qquad (1.1)$$

The above identity suggests that the ability of a monetary authorities to control the money supply depends on the ability to change the monetary base and influence the money multiplier. It is common to see the assumption that the money multiplier is constant. Therefore when the monetary authorities want to change policy, they need only to deal with the monetary base.

The problem of how to *control the money supply* is part of the general problem of regulation and control. The most systematic studies of alternative modus operandi of regulation have been the 'tariffs versus quotas' debate in international trade theory and the arguments about how to control a country's pollution. Basically there are three alternative methods of restricting the production or consumption of a good. The first is to increase its price. The second is to ration it (i.e., impose a quantity control). The third is to reduce the efficiency of those who produce it. Outside the monetary field, the principle analysis of such instruments has been of non-tariff barriers to trade. However, the basic analysis of the application of such restrictions to banks in the form of reserve requirements is well developed. Could all three methods of control be applied to the problem of monetary control. Thus one increase the cost of holding money, ration it, or reduce the efficiency of those who holding it (banks).

Money is both an asset (to the holder) and a liability (of a bank or government). It is possible to analyze control by regarding money as either an asset or a liability, hence the multiplicity of techniques. Any method of controlling the money supply necessarily involves interference with the process of money creation. The authorities seek to change the behavior of actors in the process of money creation so as to either induce them to create more or less money than they would otherwise do. Thus understanding the process of money creation is necessary for the analysis of the techniques of monetary control.

The simplest case of money creation is that in an economy where currency is issued by the monetary authorities, the government, is the only form of money. In this case (called *closed economy*) the crucial point is that money is created when and only when currency is put into circulation. So in this simple economy any government spending, including the purchase of assets, would necessarily create money, i.e., increase the money supply, as would any purchase of government obligations like bonds etc. The process described needs to be expanded to include a description of the creation of bank deposits, the other form of money in most communities. Bank deposits are an asset to

their holders but are also a liability of the banks. Thus the creation of bank liability must involve the creation of bank assets. In this simple economy, there are *several methods that could be suggested to control the money supply*: Price effects and quantity effects on deposits; Price effects and quantity effects on bank lending; Price effects and quantity effects on private lending to public sector; Price effects and quantity effects on private lending to private sector.

In the *open economy*, the balance of payments may be either a target or a constraint of government economic policy. This may have implications for the government's preferred level of monetary growth. The authorities may wish or be forced to pursue a strict monetary policy to reduce a balance of payments deficit. Basically a balance of payments surplus increases (and deficit reduces) the money supply. This may lead to a conflict of objectives in official policy. It also adds a number of additional techniques of control to those mentioned above. Moreover the link between domestic credit expansion and the exchange rate should be considered.

Two different ways exists when considering the case of an open economy. The first from the fact that governments normally purchase and sell foreign currency in order to manage the foreign exchange rate, and to provide their citizens with foreign currency to purchase goods, take holidays abroad etc. Any such acquisition (or sell) will have exactly the same impact on the money supply as when the government buys or sells any other asset. These include government borrowing in foreign currency from any source including the IMF.

Also in an open economy, the impact works through the banking system. Foreigners may hold deposits with or borrow from native banks. One might choose to treat the foreigners as part of the non-bank private sector and so include their deposits in the money supply. One need not take note of the difference between a loan to a resident or to a non-resident; the impact of both on the money supply is identical. This simple internationalist viewpoint is not normally adopted, however, because it ignores the

political reality that transactions with foreigners are regarded as different; if only because balance of payments statistics are relevant to macroeconomic policy. Transactions between residents and foreigners which are settled by means of checks drawn on domestic banks will affect the money supply.

The second aspect of money creation involving an open economy is that a loan to a foreigner creates a deposit. This deposit may be held by a resident or by a non-resident. Hence loans to non-residents may increase the money supply but need not necessarily do so. This uncertainty can be resolved and the impact of deposit transfers incorporated by looking at net bank claims on foreigners (loans to foreigners less foreign-held deposits). If these rise, the money supply increases, and if net claims fall, the money supply reduced.

In this open economy, there are *several methods that could be suggested to control the money supply*:

a. Price effect on the openness impact. This method of monetary control could be used to induce transactions by foreigners which will cause the money supply to fall. Such transactions nearly appear on the debit side of the balance of payments. Thus this technique is to deliberately 'worsen' the balance of payments by some means or other so as to reduce monetary growth or vice versa. A capital outflow in some form or other is the likeliest way of achieving this in the short run.

b. Quantity effects on the openness impact. 'Quantity effects' here means some from exchange control designed to prevent an inflow or an outflow. Conventional exchange control that prevents outflows means that money supply is higher than it otherwise would be. Exchange controls have to be enforceable to be of any use, and many commentators have been sceptical of their possible efficiency.

1.1 Why is Money to be Controlled?

Some methods of controlling the money supply have been mentioned, and there are many variants of each so the total number of methods is large. As the authorities can combine any number of techniques of control into regimes of monetary policy, there are a very large number of possible regimes of control. With this on hand, why is money to be controlled? It is a standard feature of economics that the answer to any question is 'it depends on the objectives.' But in some cases the method of control may negate the principal or a secondary objective of monetary policy. For example, some governments have switched to monetary policy to avoid frequent changes of fiscal policy, or because spending and taxation cannot easily be changed, as in Italy and the USA. In general, the means must be consistent with the end. Moreover, the techniques should not interfere with whatever objectives governments may have, such as efficiency and income distribution.

1.2 Over What Period is Money to be Controlled?

Some schools of economics wish to maintain a stable rate of monetary growth. Others wish to vary it from year to year, like the US Federal Reserve system, under Chairman Volcker. Some authorities do not mind large fluctuations away from targets over the short run; others do.

1.3 The Monetary base

The relevant issue here is whether the central bank, in implementing monetary policy, can exercise a high degree of control over its policy instruments. Since the monetary base is the most important determinant of the quantity of money, and there is a high degree of association between those two, and the monetary base is determined not only by the domestic variables but also by the position of the balance of payments of the country, the relevant issue concerning the money supply control, then, is whether the foreign components of the monetary base can be offset by the actions of the central bank using domestic components.

1.4 Statement of the Problem

In less developed countries could the monetary authorities adjust the monetary base, and if they could, would they be able to control the growth of their money stock with a reasonable degree of accuracy? So the fundamental question of interest is:
Can the monetary authorities in less developed countries control the monetary base sufficiently, so that they can control their money stock growth?
This study emphasizes the problem of the foreign exchange flows in open developing economies, and its impact on the domestic economies.

1.5 The Objectives of the Study

The study attempts to investigate the ability of the monetary authorities in less developed countries to control the monetary base and therefore to affect growth of the money supply. In the process the following issues are addressed:

1. What are the components of the base in an open economy?
2. Which components change, and how much do they change?
3. Which of these changes are desired by the monetary authorities?
4. Which of these changes do they have to accommodate because of non-monetary reasons?

Because of the tendency of governments in LDC to use the central bank for development financing, those issues are of considerable importance. And after investigating them, would we be able to tell whether or not a central bank can pursue monetary policy according to the traditional view? So after defining the main determinants of the monetary base and then examining them in some LDCs to find their Central Bank's ability to sterilize the impact of the foreign reserve flow, would they be able to control the growth of money stock with a reasonable degree of accuracy?

For controlling base-money the monetary authority must offset the movements in the uncontrolled components through changes in the controlled component. If the Central Bank is to maintain control of the monetary base for pursuit of domestic goals, the impact of foreign reserves on the base-money must be sterilized by using sterilization policy instruments, things that will be investigated in the study, along with the ability of the monetary authorities in LDC to sterilize the impact of an outflow or inflow of foreign reserve on the monetary base because of the payment imbalances in these countries.

Since the supply of the monetary base in LDC is determined by the reaction of the Central Banks to those pressures that mainly come from the fiscal (government) and foreign sectors, the relevant issue concerning the money supply control, then, is whether

the foreign (endogenous) components of the base can be offset by the actions of the central bank using domestic components.

In the distinction between developed and developing countries, one important point is to be highlighted here. The main difference in the sources of the base-money is that in developed countries the major component of base money is claims on government (i.e. government securities), whereas in developing countries net foreign assets are the major component. This point is in effect part of this study.

Chapter two surveys the literature of the monetary base, followed by a distinction between the base as an analytical concept and the controllability of the base for ultimate macro-goals; then the controllability of the base to control monetary aggregate is discussed

Chapter three provides the constructions of the base, along with a survey on the consolidated balance sheets of the monetary authorities, commercial banks, and monetary system. After which, the way the base is calculated in seven different countries described.

Chapter four handles specific monetary features of LDCs. The effectiveness of different techniques depends considerably upon the structure of the economy. For example, the wider the range of financial institutions, the harder it is to make direct controls operate, and the less effective the base to be utilized. It shows how the sharp differences in the basic structure of the base exist between developed and developing economies.

Chapter five discussed the fundamental issue of the theoretical foundation for feedback effects. The transmission mechanism from the balance of payments to the money supply, and vice versa, and the role of autonomous expansion and the balance of payments are explored. These issues along with the international monetarism and the creation of money and credit are presented. The technique chose for controllability of the base must not be such as to interfere with the transmission mechanism appropriate to the economy concerned. If the monetary policy influences behavior through credit availability, then the

implications are clear-similarly if the mechanism is through interest rates. The means must not be self contradictory.

The relationships between the components of the monetary base are empirically tested in chapter six. It includes different kinds of statistical tests such as the stationarity tests on both the levels and the first differences that validate my findings. The cointegration test has been implemented along with the causality test, the results neatly presented with discussions. Finally in chapter VII summary and conclusions that explored whether or not the monetary base could be controlled or not in seven different countries.

CHAPTER II

THE BASE

The concept of the monetary base has a long history. It has particular appeal to those economists who have pushed for limiting monetary expansion to promote price stability. Proponents of the quantity theory of money, the classical long-run neutrality of money, and rational expectations have all tended to give prominence to the notion of a long-run anchor for the price level. Many of them have supported the use of the monetary base in that role. Other analyses have focused on more narrowly technical issues associated with using the base in one or another of its potential roles.

2.1 The History of the Name

Several names have been applied to what is now most often called the monetary base. For instance, Burgess (1936, 5-8), Friedman (1959), and Lothian (1976, 56-68) have named it "high-powered money." Gurley and Shaw (1960) introduced the term "outside money." They named it based on the idea that "outside money" is an obligation of the government (including the central bank) that is outside the private sector. In contrast, "inside money" is an obligation of the private sector.

These names of the monetary base reflect its role in the policy discussions. The monetary base consists of things that function as reserves of the banking system and are obligations of the government or the central bank. In terms of controlling the base, economists have argued that it should be feasible to control the base because:

- many of its components are in the Federal Reserve's balance sheet
- the base's behavior has the potential to affect broader monetary and economic variables, because of regulatory and behavioral linkages between the monetary base and various monetary aggregates that have been proposed as an intermediate target.

As long as currency is provided on demand, it is not directly controllable. Control would have to be achieved indirectly by influencing demand for money. So the monetary authorities can succeed if they use the base as an intermediate indicator rather than targeting it to be able to control the growth of nominal economic activity, such as real interest rates and reserves.

2.2 The Definition of the Monetary Base

The base concept can be developed from either the sources' side or the uses' side of the balance sheet of a central bank. This creates a number of possible approaches to define the monetary base. Two widely definitions are available, one of which is prepared by the Board of Governors and the other by the St. Louis Federal Reserve Bank.

The Board of Governors (1988) approached the construction of the monetary base in terms of its uses. They describe the base before adjustment for reserve requirement changes as:

- total reserves,
- required clearing balances and adjustments to compensate for float at Federal Reserve Banks,
- the currency component of the money stock less the amount of thrift institutions' vault cash holding normally included in the currency component of the money stock, and
- the excess of current vault cash over the amount applied to satisfy current reserve requirements at institutions not having required reserve balances.

The second approach defined the monetary base has been presented by the St. Louis staff, for instant, Glbert (1980, 3-10; 1984, 27-3; 1987, 24-29); Haslag and Hein (1988, 1-17; 1989, 1-15); and Hafer, Haslag, and Hein (1991, 1-23), in which the construction of the base conceptually from the source's side. It describes the base as:

- Federal Reserve credit-holdings of securities in the portfolio,
- loans by the discount window,
- gold stock,
- Special Drawing rights,
- Treasury currency, and
- other balance sheet items.

Several categories of liabilities are subtracted, namely:

- Treasury and foreign deposits at the Federal Reserve,
- Treasury holdings of currency, and
- certain miscellaneous items.

When they actually construct what they call the source base, they define it as currency in the hands of the public plus required reserves plus excess reserves. In other words, they define the base in terms of its uses, although they treat vault cash contemporaneously rather than in lagged form.

Gilbert (1980, 1984, 1987) presented a detailed description of the techniques of reserve adjustment, from which it could be seen that for years since 1980, the RAM has set the reserve ratio on transactions' deposits equal to 12 percent, the marginal reserve requirement on such deposits. The actual average reserve ratio has recently been about 8 percent because there are zero and 3 percent reserve limits. The RAM measure assumes a zero reserve requirement for other types of deposits, even though some of them are actually subject to a 3 percent ratio. For years before 1980, the ratio was equal to member bank deposits and only applies the ratio to such deposits, separate ratios for time and savings deposits was applied.

Haslag and Hein (1989, 1990) and Hafer, Haslag, and Hein (1991) suggested that it makes an important difference if the base is adjusted for reserve requirement changes. However, the different techniques of adjusting for reserve ratios are of limited importance over most time periods. The St. Louis base measure is larger than the Board measure since it uses a higher reserve ratio, and it thus gives more weight to deposits relative to currency. The movements of the bases often differ. However, the differences in rates of growth are generally slight for periods of a quarter or more.

2.3 The Logic of Using the Base

Using the monetary base to control the monetary aggregate or to achieve a national goal was questioned by many economists. Benjamin Friedman (1988) was one of those who commented on these policies. His criticism is that a large portion of the monetary base consists of currency, and the demand for currency is not well understood. In the meantime by considering the underground economy, some currency is used for illegal transactions that are not captured by GNP statistics. A portion is used for transactions in countries where the local currency is not stable or is not freely convertible.

In terms of the components of the base, should deposits be considered "money," or should money be defined to consist only of gold and other government obligations? Irving Fisher (1911) and other economists argued persuasively that deposits performed essentially the same payments and account services as currency and coin. Therefore ignoring them would lead to a serious understatement of existing monetary services. The subject was mostly left to rest until 1970s.

Lothian (1976) presented a justification for a narrow money measure such as the monetary base or currency. He argued that all financial assets provided a mix of money- and bond-type services. Currency and non-interest-bearing reserves have little

opportunity to provide bond-type services. Deposits, on the other hand, may pay interest either explicitly or implicitly, and the institutions accepting them may offer bond-type services to deposits. In an environment with variable regulations and inflation, the mix of money-and bond-type services provided by deposits may vary more than the mix provided by the non-interest-bearing monetary base. Consequently, Lothian concluded that the base was likely to be a better proxy for monetary services when deposit characteristics differed over time.

Different roles have been proposed for the monetary base in order to determine its contributions, and its nature within the components of a central bank balance sheet. After overlapping the conceptual and technical sides of the monetary base in an effort to figure out these roles, the issues that have been questioned are:

- whether the monetary base can be exogenously determined, and
- whether estimated relationships between the base and intermediate or ultimate policy goals would be sustained if appropriate efforts were made to control the base.

2.4 The Monetary Base as an Analytical Concept

Randolph Burgess (1936, 5-8) an officer at the New York Federal Reserve's open market desk in the 1920s and 1930s, described in 1936 what then seemed to be a common view of the monetary base, which he called high-powered money. He explains this idea by presenting the image that there are in any country two kinds of money, and for the sake of giving them names they may be called high-powered money and low-powered money. The central bank deals in high-powered money, the money that constitutes bank reserves. Then he adds that historically, this high-powered money has been closely related to a country's basic reserves of gold and currency, though the specific form of this relationship shows wide variations under different banking laws. He added that when the amount of

high-powered money increases, the amount of low-powered money tends to increase also, but in multiple relation to the high-powered money.

Burgess presented high- and low-powered money as analytical concepts to help explain how the purchase or sale of gold or securities would lead to growth or shrinkage of commercial bank deposits. Provision of high-powered money by the central bank makes it possible for the banks to create more low-powered money according to what has now become familiar as the money multiplier models.

Karl Brunner, and Allen Meltzer (1964, 240-283) defined the nominal money supply as a product of the money multiplier and the monetary base in the following identity:

$$M \equiv m\,B$$

where M: nominal money supply (currency plus demand deposits),

m: money multiplier,

B: monetary base.

The above identity suggests that the ability of monetary authorities to control the money supply depends on the ability to change both the monetary base and the money multiplier. The money multiplier can be a useful device if the underlying behavioral characteristics serve to make its ratios' stable, then the relating central bank actions will successfully affect the behavior of money. In that case, a change in the monetary base would be associated with a proportional change in money. Alternatively, money and the monetary base will not move closely together if the multiplier is not stable, i.e., if any one of its component ratios shifts frequently. Many economists over the years have expressed unease over the implicit weighting scheme that gives relatively heavy weight to currency, because they believe that the behavior of deposits has a major role in influencing activity. Nonetheless, during long stretches of time, the multiplier's ratios have been sufficiently stable so that many analysts have downplayed the worries about the low weight given to deposits.

2.5 The Controllability of the Base for Ultimate Macro-Goals

Targeting the monetary base itself in place of the traditional monetary aggregate in order to resolve the possible short-run control problems associated with such monetary aggregate, or to treating the monetary base itself as a narrow monetary aggregate to achieve national goals, has been proposed by many economists, and is the main point to be explored in this part.

The idea that the monetary base could be considered a monetary aggregate developed gradually. Lothian (1976) found that the monetary base showed a more consistent relationship with net national product than did a broad monetary aggregate. He posited that differential interest rates, inflation, and regulations such as interest rate ceiling and reserve requirements had a larger influence on the demand for deposits than they did on the demand for non-interest-bearing central bank monetary assets.

2.5.1 GNP and the Base

Some authors have substituted the monetary base for M1 or M2 in targeting the nominal income, generally GNP. Anderson and Jordan from St. Louis Federal Reserve developed that type of model in the late 1960s, and updated and modified it in subsequent years. Studies in the late 1970s and early 1980s compared the models' performance when the monetary base was used as the monetary aggregate with the models' performance when M1 was aggregate. The models were estimated with data covering the previous twenty to thirty years. The models generally achieved better fits for M1 than for the monetary base.

Anderson and Karnosky (1977, 2-7) used a simplified version of the St. Louis equation. They estimated their model from 1952 to 1961, using quarterly data, and then

extended it year by year through 1975. They used the estimated model to simulate the next four quarters, GNP. They found that in the equations using M1, the errors had modestly lower variance than the errors in the equations using the monetary base. However, the equations using the monetary base achieved lower mean errors and mean absolute errors. The authors concluded that it would be worthwhile to consider using the monetary base as an intermediate target because its forecasting performance was only slightly worse than M1, and it was easier to control.

Many other economists attempted to test the notion that the monetary base might have a role to play in the determination of GNP better than M1 or M2. Their work has been summarized in table 2.1 below.

Table 2.1

Empirical Studies on the Role of the Base in Determining GNP and M1 or M2

Author	Sample Period	Conclusions
Davis (1979-80, 1-10)	1961 to 1978	A significantly better fit for M1 than for the base. The limited relationship between the base and GNP derived from currency component, not total reserve component.
Cullison (1982, 3-13)	1959 to 1969, extended to 1973 then 1979	He shows much less of a gap between M1 and the base, if judged by the values for adjusted R^2
Gambs (1980, 3-15)	1953 to 1978	The base explained larger portions of the variation in GNP than it did in Davis' studies. He observed a sizable differential between M1 and the base.

Author	Sample Period	Conclusions
Hafer (1984, 85-93)	1960 to 1980	He achieved better overall results, because additional variables were included. He found that M1 showed only a slightly better fit than using the monetary base
Friedman and Kuttner (1989)	1988	A differential in the performance of M1 and the monetary base, but generally weaker relationships to GNP.
Board of Governors Staff (1988)	1961 to 1979 extended 1980 to 1988	The estimates using the monetary base were considerably poorer than those for M1, M1-A, or M2. The simulation for the next period show large errors for all measures, and bias monetary base
Stone and Thornton (1988)	1961 to 1980 extended to 1987	Over initial sample period, their results were similar to the others. Extending the period weakened the explanatory power but greatly reduced the differences among monetary measures and showed considerable deterioration with respect to both M1 and the monetary base.
Davis (1980, 214-229)	1981 to 1989	He offers updated versions of some of his earlier equations. He achieves the same ordering as Stone and Thornton, with the base improving and M1 deteriorating relative to the earlier period.
Darby, Poole, Lindsey, Bazdarich, and Milton Friedman (1987, 1-33)	1980s	They performed a slightly different exercise and reached a similar conclusion. They found that the base had the smallest standard deviation of M1, M2, although the differences among them were not dramatic.

2.5.2 Prices and the Base

Different studies have been presented to examine the impact of the choices of monetary variables (the monetary base, M1, and M2) on the rate of change in prices. All of these studies only examined the relationships through the 1970s. Compared with the GNP studies presented before, over the sample periods the monetary base did relatively better.

Hafer (1984, 85-93) in his equation that he used for GNP, he substitutes the rate of change in prices for GNP and included longer lags than his GNP equation. He observed a stronger relationship between the monetary variables and prices than between the monetary variables and GNP.

Fama (1982, 201-231) used a different approach from the others. He chose sample period from 1954 to 1976 with annual data at first then quarterly or monthly data. Inflation was expressed as a function of the monetary variable and nominal interest rates. He used current money and money lagged one period. He concluded that the monetary base was superior to M1 as a monetary measure. Hence, he concluded that the monetary base was the appropriate monetary variable to follow to achieve a price goal.

2.6 The Controllability of the Base to Control Monetary Aggregate

The monetary base would be controlled not for its own sake but in order to achieve the desired behavior of another variable, usually a monetary aggregate. Milton Friedman (1959) proposed targeting a monetary aggregate and suggested that manipulating high-powered money might be a reasonably effective way to attain the monetary targets. Karl Brunner and Allen Meltzer (1968) made a similar proposal and explored several aspects of the multiplier relationship.

Karl Brunner (1968) in his study "The Role of Money and Monetary Policy" found that the movements of federal credit dominated movements of other sources, and therefore determined most movements on the base. In the United States, 70 percent of the supply of the base consists of federal reserve bank credit to the government in the form of US. government securities purchasing. Therefore, in the US the money base is substantially under the control of Fed assuming some form of the Fed independence.

Anderson and Jordan (1968a, 1968b) and Burger, Kalish, and Babb (1971) developed in some detail the suggestion to target the monetary base. They presented multiplier relationships between the monetary base and M1. Rasche and Johannes (1987) presented a variety of multipliers they computed to make separate allowances for transactions' deposits and time deposits. They built an elaborate multiplier model that has been regularly updated for Shadow Open Market Committee meeting. Those economists promoting the control of the monetary base recognized the problems associated with differential weights given to currency and deposits, they doubted that these difficulties would prove to be serious on practice.

Those economists believed that the presence of binding required reserve ratios would make the ratio of reserves to deposits relatively stable as long as adjustments were made whenever the Federal Reserve changed the specified ratios. They expected payment conventions and the absence of banking crises to provide stability to the ratio of currency to deposits. Empirical analysis of the data covering the 1950s and 1960s generally gave some support to their expectation. Burger, Kalish, and Babb (1971) recommended a control procedure in which the monetary base would be targeted to achieve desired growth in M1. They proposed estimating the multiplier from recent behavior of its constituent ratios. Then they compared their model forecasts of the multiplier with the actual values of the multipliers. They found the errors to be small in size and observed that they were not cumulative. They concluded that if the proposed monetary base targets were achieved and the multipliers were the same as those that actually occurred, then

money growth would have deviated only slightly from a smooth path. From these results, they argued that following their procedures would produce a reduction in unwanted variation in money growth.

Balbach (1981, 3-12) supported a similar proposal, arguing that the central bank could control the monetary base since the base consisted of items on the central bank's balance sheet that could be observed with at most a one-day lag. He and Burger, Kalish, and Babb (1971) did not contemplate a limitation of Federal Reserve issuance of currency, but instead advocated offsetting undesired movements with increases in or restrictions on the provision of total reserves through open market operations. The Federal Reserve would have precise knowledge of the amount of currency it had issued, and therefore would know the size of offsetting adjustments in reserves needed as soon as any unwanted currency movements took place.

Meulendyke (1990, 28-31) on the other hand, did not support the proposal of controlling the monetary base, suggesting that the consequences of trying to control the base would be undesirable because the observed multiplier relationships on which such proposals were based are estimated when the monetary base was determined endogenously, and in practice the process is not so simple. Technically, the Federal Reserve cannot, through use of open market operations, achieve desired nonborrowed reserve levels with precision because there are a number of factors on its balance sheet, such as Treasury cash and Federal Reserve float, that it does not control and can only observe after the fact.

As an example she added, if the Federal Reserve attempted to control the base by offsetting undesired expansion of currency through a reduction in nonborrowed reserves, depository institutions might borrow at the discount window to obtain the reserves lost, lifting total reserves back to the level where they stood before the reduction in nonborrowed reserves occurred. Consequently, it would not be possible to control the

monetary base even though it would be possible to control what is often referred to as the nonborrowed base, which is the monetary base minus borrowed reserves.

In supporting the argument against controlling the base to achieve a certain level of monetary aggregate she added, if total reserve component of the monetary base target is achieved, a decline in nonborrowed reserves cannot be offset by an increase in borrowed reserves. A reduction in nonborrowed reserves can only result in an equal decline in total reserves if the lower level of nonborrowed reserves is consistent with existing demands for reserves to meet requirements, because excess reserves are larger than depository institutions desire, or if depository institutions adjust loans and deposits and reduce to reduce required reserves by the full amount of the reduction in nonborrowed reserves. In order to lower required reserves, deposits would have to fall by a multiple of the desired decline Whether such sharp adjustments to deposits over a short time period are feasible has been debated.

McCallum (1987, 1988a, 1988b, 1988c) focused on the base as an operating target, presenting an exception from those proposals concerning the monetary base since the early 1980s who have focused on the uses of the base as an intermediate target rather than an operating target. He has been influenced by the breakdown of the relationship between M1 and GNP in the 1980s. He suggested two modifications to the common monetary targeting proposal. First, he suggested that nominal GNP could serve as an intermediate target as long as it was chosen to insure that inflation would not be high. Second, he advocated an adaptive policy rule that contained the means for the procedure to recover when underlying relationships between the base and GNP shifted as a result of deregulation or other developments. He suggested that the monetary base could serve as the operating instrument, thereby arguing that the base be controlled directly on a day-to-day basis, although he only advocated a quarterly average growth target. McCallum did not discuss his assertion that the monetary base could be controlled. His equation for quarterly target growth of the monetary base consists of three terms. The first is a

constant, equivalent to the desired trend growth in nominal GNP. The second term subtracts from the constant the average increase in monetary base velocity over the previous four years. This term introduces a gradual response to changes in monetary base velocity so that the model will adapt to changing trends. The third term provides for a partial response to deviations of GNP from its constant growth target. McCallum recommended a 25 percent per quarter adjustment factor in response to such deviations. These relationships he presented in equation form as:

$$b_t - b_{t-1} = 0.00739 - (1/16)\,[x_{t-1} - x_{t-17} - b_{t-1} + b_{t-17}] + .25\,(x^*_{t-1} - x_{t-1}),$$

where b is the log of monetary base and x is the log of GNP. An asterisk indicates a target value.

Thornton (1982, 22-39) discussed the argument regarding lowering required reserves. In order to lower required reserves, deposits would have to fall by a multiple of the desired decline. Whether such sharp adjustments to deposits over a short time period are feasible or not has been his extensive debate. Those favoring short-run controls of the base generally argued that depository institutions could make quick adjustments to deposits if they were given the incentive to do so. In a parallel fashion, they believe that the depository institutions would respond to a shortage of nonborrowed reserves by contracting loans and deposits until required reserves had shrunk to the point that they were consistent with existing supplies of nonborrowed reserves.

The appropriate time period over which it was desirable to achieve control of the monetary base is the debate that took more attention of many economists. Very short-run control of the monetary base was never advocated for its own sake. Instead, it was seen as a mean to achieve a desired path for money and in turn for economic activity and prices. Thornton (1982), generally a supporter of monetary base targeting, recognized that very short-term control was not feasible because loan and investment decisions, under

any reserve accounting scheme, would not be closely linked with current reserve levels. Thus the adjustment would not occur instantly. He did not think that the delays would be a problem because banks would adjust over meaningful periods. His arguments on this point are not typical of the literature supporting base targeting.

Thornton and many of the supporters of a monetary base approach to money control argued for short-run targets for two reasons:

1. they were afraid that if deviations were permitted, the central bank would allow misses of sufficient duration to affect adversely economic activity and prices.
2. they believed close control was feasible at low cost.

Their critics had a range of views with regard to the first point but disagreed with the second. Many of the operational and stability concerns associated with monetary base targeting would be reduced if the time period for achieving the target was lengthened beyond the single reserve maintenance period cited in most of the control proposals. The conclusion with this regard is that the monetary base could be controlled with only modest errors over a one-to-two-quarter horizon if nonborrowed reserves were manipulated to bring the monetary base bake on track once evidence developed that it was deviating significantly from a desired path.

Meulendyke (1990) presented the question, whether the monetary base can be controlled in a way that does not introduce short-run instability to interest rates and money demand, and cited the difficulty to answer that question without actual empirical work. Nonetheless, the longer the control horizon, the more likely the answer will be that control of the base without unacceptable instability in rates and money demand is indeed possible.

Anther impediment to monetary base control was the way the discount window functioned. Many of the supporters of base control suggested that the discount window be closed or that the discount rate be set high enough to ensure that borrowing would be costly. The later option would not make the monetary base precisely controllable, since

banks still could borrow reserves in excess of those consistent with the target, but the high cost of doing so would discourage borrowing and make the monetary base approximately obtainable. The severe restrictions on borrowing would be presumed to limit deviations between the monetary base and the nonborrowed base.

CHAPTER III

THE CONSTRUCTION OF THE BASE

In less developed economies, the central bank and government policies are considered synonymous, and the central bank is an essential arm of the government's overall policy objectives. In short, the central bank acts as a director and executor of the government's financial and monetary policy in developing economies. However, the monetary analyses of developed economies, especially in the US after 1950, customarily treat the behavior of central banks as being an exogenous, independent influence on the monetary conditions. So the central banks in developed economies are the autonomous initiator, director and executor of the monetary policy.

The International Monetary Fund (1984, 22) defines the term "central bank" as the single financial institution that most closely resembles the functionally defined monetary authorities. Despite country differences, there is rarely any doubt which financial institution should be regarded as the central bank. If the central bank performs all the functions of the monetary authorities, the financial assets and liabilities will be recorded in its balance sheet. This balance sheet will provide the basic statistics necessary for the compilation of the monetary authorities' accounts and will be presented followed by deposit money banks' accounts, monetary survey' accounts, and the monetary system, the monetary base and the way it could be calculated in seven different countries will be after. For the purpose of international comparability the definitions and the tables will be consolidated to the criteria used by the International Financial Statistics.

3.1 Monetary Authorities

The monetary authorities perform a variety of functions. They issue notes and coins that circulate freely as a recognized mean of payments. As the holder of the economy's international reserves the monetary authorities stand ready to accept, or provide, foreign currencies in exchange for their own currencies as needed for balance of payments' purposes, or to make adjustments to the exchange rate for the national currency. Their supervision of the financial system requires the monetary authorities to determine the appropriate levels of liquidity, for domestic economy as well as for banks, and to influence the development of financial institutions' assets and liabilities accordingly. As the principal financial agent of the central government, the monetary authorities are called upon to validate the government's transactions both by providing credits, and by absorbing the surplus funds of the government.

In many countries a central bank has sole responsibility for all such functions. In other cases some of these functions are either or entirely carried out by central government or by other official institutions. In a few instances it is difficult to distinguish any central banking account within the government's accounts, either because of monetary policy is an integral part of overall government policy or because a country adopts a monetary policy stance that obviates the need for a resident monetary authority. It may permit the currency issue of another country's monetary authorities to serve as the local medium of exchange.

Given the variety of institutional arrangements existing throughout the world, it is necessary for purposes of international comparability that the data on the monetary authorities' accounts include all financial assets and liabilities ascribed to the performance of the above-mentioned monetary authorities' functions. The financial institutions are assumed to have, within the government regulations that may govern their activities, the freedom to determine the kinds of financial transactions in which they engage, the segments of the financial market in which they operate as sellers and buyers of financial

instruments, and hence the kinds of liabilities that they incur and the financial assets that they acquire.

A summary of the monetary authorities' accounts that are related to the performance of monetary authority type functions in a typical country is shown in the table 3.1 below.

Table: 3.1 Monetary Authorities: Detailed Account

Assets

Foreign Assets

Claims On Government
a. Central Government
b. State And Local Government

Claims On Nonfinancial Public Enterprises (Public Sector)

Claims On Private Sector

Claims On Deposit Money Banks
Commercial banks
Other monetary institutions

Claims On Nonmonetary Financial Institutions
Rest of financial system
Development banks
Saving banks

Others

Liabilities

Reserve Money

Of Which: Currency Outside Banks

Time, Saving, And Foreign Currency Deposit
State and local government
Nonfinancial public enterprises

Bonds

Foreign Liabilities

Long-Term Foreign Liabilities

Government Deposits

Counterpart Funds

Government Lending Funds

Capital Accounts

Other Items (Net)
Unclassified liabilities
Less: Unclassified assets

3.2 Deposit Money Banks (Banking System)

Deposit money banks comprise all banks and similar financial institutions that have appreciable liabilities in the form of deposits transferable by check or otherwise usable in making payments. This functional definition emphasizes the role of deposit money banks as the principal creators of deposit money for the economy through their extensions of credit to nonmonetary sectors.

The definition is functional rather than institutional, because institutional terminology varies greatly and the same terms may sometimes refer to what might appropriately be classified as deposit money banks in one country and nonmonetary financial institutions in another. Moreover, the functional characteristics of financial institutions may change overtime while the institutional terms that denote them remain unchanged and vice-versa. For example, saving banks have traditionally relied mainly on time and saving deposits placed with them by small savers, which they have in turn invested in a narrow range of financial instruments, notably government securities and mortgages. In many countries, however, such banks have expanded their financial activities to include the acceptance of demand deposits on a scale sufficient to qualify them as deposit money banks. The IFS regarded such financial institutions as deposit money banks once they have appreciable liabilities in the form of transferable deposits.

Deposit money banks' accounts that include their assets and liabilities presented in table 3.2. On the asset side, the primary distinction is between the foreign (nonresident) sector and the domestic (resident) sector. The domestic sector is subdivided into central government, the nonmonetary financial sector, and the rest of the domestic economy. The rest of the domestic economy further subcategorized into public sector and private sector. The public sector further broken down into the rest of general government and nonfinancial public enterprises.

On the liabilities' side, the distinction between sectors is generally less detailed in that only central government deposits and foreign liabilities are shown separately, and banks' liabilities to other domestic sectors distinguish only between demand deposits and time deposits. In some countries, special liabilities such as long-term foreign liabilities and counterpart funds shown separately as a source of banks' lending funds.

Table: 3.2 Deposit Money Banks: Detailed Account

Assets

Reserves
- *Currency*
- *Deposits with central bank*

Foreign assets

Claims On Government
- *a. Central Governments*
- *b. State and Local Government*

Claims On Nonfinancial Public Enterprises (Public Sector)

Claims on Private Sector

Claims On Nonmonetary Financial Institutions

Others

Liabilities

Demand Deposits

Time, Saving, And Foreign Currency Deposits

Money Market Instruments

Bonds

Foreign Liabilities

Long-Term Foreign Liabilities

Government Deposits

Counterpart Funds

Government Lending Funds

Credit From Central Bank

Liabilities To Nonmonetary Financial Institutions

Capital Accounts

Other Items
- *Unclassified liabilities*
- *Less: Unclassified assets*

3.3 The Monetary Survey

To identify factors responsible for the changes in the money supply, an accounting framework for a money-creation sector of the economy in a typical country is set up. We can see from the tables 3.1, and 3.2 above that by netting out the items appearing on the asset side and the liability side of the elements of the consolidated balance sheets of the monetary authorities and deposit money banks, we will be left with a picture of relationships existing between monetary sector and the rest of the economy.

The consolidation of the accounts of the monetary authorities (as derived in Table 3.1) and the deposit money banks (as derived in Table 3.2) is used to derive the monetary survey account. The details are shown in Table 3.3. The major aggregates on the assets' side are foreign asset and domestic credit, while those on the liabilities' side are money and quasi-money. Foreign assets are defined as the sum of the foreign assets of the monetary authorities and those of the deposit money banks less the foreign liabilities of these institutions. Domestic credit is the sum of claims on central government and claims on other domestic sectors. The domestic sectors have been breakdown into claims on state and local governments, claims on nonfinancial public enterprises, claims on private sector, and claims on nonmonetary financial institutions.

Table: 3.3 Monetary Survey: Detailed Account

Assets

Foreign Assets
- *Foreign assets (MA)*
- *Less: Foreign liabilities (MA)*
- *Foreign assets (DMB)*
- *Less: Foreign liabilities (DMB)*

Domestic Credit

Claims On Central Government (net)
- *Claims on central government (MA)*
- *Less: Central government deposits (MA)*
- *Claims on central government (DMB)*
- *Less: Central government deposits (DMB)*

Claims On State And Local Governments
- *Claims on state and local governments (MA)*
- *Claims on state and local governments (DMB)*

Claims On Nonfinancial Public Enterprises
- *Claims on nonfinancial public enterprises (MA)*
- *Claims on nonfinancial public enterprises (DMB)*

Claims On Private Sector
- *Claims on private sector (MA)*
- *Claims on private sector (DMB)*

Claims On Nonmonetary Financial Institutions
- *Claims on nonmonetary financial institutions (MA)*
- *Claims on nonmonetary financial institutions (DMB)*

(Table: 3.3 concluded) Monetary Survey: Detailed Account

Liabilities

Money
- *Currency outside banks (MA)*
- *Private sector deposits (MA)*
- *Other public sector deposits (MA)*
- *Nonmonetary financial institutions' deposits (MA)*
- *Demand deposits (DMB)*

Quasi-Money
- *Time, savings, and foreign currency deposits (MA)*
- *Time, savings, and foreign currency deposits (DMB)*

Bonds And Money Market Instruments
- *Bonds (MA)*
- *Money market instruments (DMB)*
- *Bonds (DMB)*

Long-Term Foreign Liabilities
- *Long-term foreign liabilities (MA)*
- *Long-term foreign liabilities (DMB)*

Counterpart Funds
- *Counterpart funds (MA)*
- *Counterpart funds (DMB)*

Government Lending Funds
- *Government lending funds (MA)*
- *Government lending funds (DMB)*

Other Items (Net)
- Other items (net) (MA)
- *Capital accounts (MA)*
- *Deposit money banks' cash (MA)*
- *Deposit money banks' deposits (MA)*
- *Less: Reserves (DMB)*
- *Other items (net) (DMB)*
- *Credit from central bank (DMB)*
- *Less: Claims on deposit's money banks (MA)*
- *Liabilities to nonmonetary financial institutions (DMB)*
- *Capital accounts (DMB)*

3.4 The Monetary System

So far, we have clarified the financial position of the monetary authorities and deposit money banks followed by the monetary survey, this helps us to observe their position in the money supply process. It is possible now to form a consolidated balance sheet for the monetary system netting out the items appearing on the asset side of consolidated balance sheets of the monetary authorities and the commercial banks, this will left us with a picture of relationships existing between the monetary sector as whole and the rest of the economy.

Through the elimination of all inter-bank transactions in the consolidations, the balance sheet of the monetary authorities will be condensed and looks like the one in table (3.4.A) below. However, the balance sheet for the deposit money banks will be like the one in table (3.4.B)

Table (3.4.A) Condensed Monetary Authorities Balance Sheet

Assets	Liabilities
Foreign Assets	Foreign Liabilities
Claims on:	Monetary Base:
Government	*Currency held by Public*
Public Sector	*Vault Cash at Deposit Money Banks*
Private Sector	*Banks' Deposits*
Deposit Money Banks	
Others	
	Government Deposits
Other Assets	Capital Account
	Other Liabilities

Table (3.4.B) Condensed Deposit Money Banks Balance Sheet

Assets	Liabilities
Foreign Assets	Foreign Liabilities
Bank Reserves	Demand Deposits
Claims on:	Quasi Money:
Government	*Time and Saving Deposits*
Public Sector	*Foreign Currency deposits*
Private Sector	
	Government Deposits
	Central Bank Credit
Other Assets	Capital Accounts
	Other Liabilities

Utilizing the information in the two condensed balance sheets above in tables (3.4.A) and (3.4.B), and after abstracting the details, looking for the essence, one can get a condensed balance sheet for the monetary system as a whole, which is table (3.4.C) below. Table (3.4.C) gives us a clear picture of how the money supply component formalized, where table (3.4.A) gives a clear picture of the formalization of the monetary base.

Table (3.4.C) Condensed Monetary System Balance Sheet

Assets	Liabilities
Domestic Credits:	Money Supply:
Government	*Currency held by Public*
Public Sector	*Demand Deposits*
Private Sector	
Net Foreign Assets	Quasi Money
	Other liabilities

The information in table (3.4.C) may be written as the following identity:

$$\text{Total Assets} \equiv \text{Monetary Liabilities} + \text{Non-monetary Liabilities} \qquad (3.1)$$

where

- Total Assets (Net Foreign Assets + Domestic Credits)
- Monetary Liabilities (Money Supply = Currency "held by public" + Demand Deposits)
- Non-monetary Liabilities (Quasi Money and Other Liabilities).

By rearranging the above identity we obtain:

$$\text{Monetary Liabilities} \equiv \text{Total Assets} - \text{Non-monetary Liabilities} \qquad (3.2)$$

Therefore, the narrow definition of the money supply is equal to the total assets of the monetary system minus the non-monetary liabilities. The monetary importance of the foreign assets and domestic credits is thus clearly demonstrated through the asset side of the monetary system. The above identity underlies the statements of the money supply and its determinants. In fact, it is one of the bases of the discussion of the LDC money supply process.

3.5 The Monetary Base

As an integral part with the identity (3.2) above, and as it appeared in the contemporary money supply paradigm (Steindl 1982), the current framework of the money supply holds that the quantity of money (currency plus deposits) equals the product of a money multiplier and the monetary base:

$$M \equiv mB \tag{3.3}$$

The identity suggests that the ability of a monetary authorities to control money supply depends on the ability to change both the monetary base and influence the money multiplier. If we assume a constant money multiplier the monetary authorities will be left to deal only with the monetary base to change policy. One of the exceptions is Weintraub (1967, 257-270) where he has found that in the United States, the Fed.'s ability to change the base in order to affect the money supply is reduced because of the corresponding changes in the money multiplier due to the operations.

In fact, the base may be regarded in either of two algebraically equivalent ways, the source base and the use base. The factors, from the assets and liabilities of the monetary authorities balance sheet table 3.1, that make the base available are called "sources." And the forms in which the base is held (currency in the hand of non-government, non-bank public, and commercial bank reserves), are referred to as "uses."

Both the sources and the uses are derived from the consolidated balance sheet of the monetary authorities' table 3.1. The sources are a supply of monetary base provided by monetary authorities, and the uses are demand by public and commercial banks. A computation of the base from the source side indicates the capability of any monetary authorities to control over their base. In the United States, 70 percent of the supply of the base consists of Federal Reserve Bank Credit to the government in the form of US

government securities purchasing. Therefor, the US supply of the base is substantially under the control of the Fed. Brunner (1968, 8-24) has found that the movements of Fed credits dominate most movements on the base. In a small open economy foreign assets and foreign liabilities are very important variables affecting the sources of the monetary base, and play a significant role in its behavior. This difference generates the corner stone between developed and developing economies and to be investigated theoretically in chapter 5, and empirically in chapter 6.

3.6 Calculating the Base

In an open economy, the monetary base is determined not only by the domestic variables but also by the position of the balance of payments of the country. So the relevant issue concerning the calculation of the base is to find its foreign components as well as its domestic components.

Table (3.5) Notation:

Capital accounts	CA
Claims on deposit money banks	CCB
Claims on government	CG
Claims on official entities	CPS
Claims on other financial institutions	CO2
Claims on private sector	CO1
Counterpart funds	CF
Currency held by public	CP
Demand for base	B^d
Deposit money banks reserves	CBR
Foreign assets	FA
Foreign currency and other deposits	FCOD
Foreign liabilities	FL
Government deposits	GD
Import deposits	ID
Long-term foreign borrowings	LTFB
Other items	OI
Other Sources	OS
Source base	B^s

The monetary base relates to components belong to its sources, from which it is called the source base (B^S). These components have been presented in table (3.1) above (the monetary authorities consolidated balance sheet), and could be presented algebraically to give us the typical source base equation in a typical country as:

$$B^S \equiv FA + CG + CPS + CO1 + CCB + CO2 - FCOD - ID - FL - LTFB - GD - CF - CA - OI \quad (3.4)$$

Those components can be netted so that:

1. Net Foreign Assets (NFA), that is foreign assets (FA) minus foreign liabilities (FL) minus long-term foreign borrowing (LTFB),
2. Government Account (GA), a discrepancy between claims on government (CG) and government deposits (GD),
3. Commercial Banks advances, that are claims on commercial banks (CCB),
4. Public Sector advances, that is claims on public sector (CPS), and
5. Other Sources (OS), which the net of [CO1, CO2, FCOD, ID, CF, CA, OI]

And algebraically these significant components, could be summarized, and represented again to give us another typical source base equation in a typical country as:

$$B^S \equiv NFA + GA + CPS + CO1 + CCB + CO2 - FCOD - ID - CF - CA - OI \quad (3.5)$$

This gives

$$B^S \equiv NFA + GA + CCB + CPS + OS$$

A careful look at these components of the base shows that the net foreign asset (NFA) reflects the position of a country's balance of payments, which is not under control of the central bank. Variations of credit from a central bank to the government, in some countries especially LDC, are also not under the bank's control, because a central bank adjusts passively to the government's budget position. Thus, NFA and GA are essentially uncontrolled components, and the monetary authorities are left to the rest of the components in equation (3.5) which is claims on commercial banks (CCB) claims on public sectors (CPS) and other sources (OS), through which monetary authorities try to control the base. So the source base equation could be written as:

$$B^S \equiv \text{Uncontrolled} + \text{Controlled} \tag{3.6}$$

Where

$$\text{Uncontrolled} = NFA + GA \tag{3.7}$$

$$\text{Control} = CPS + CCB + OS \tag{3.8}$$

We, therefore, can conclude that the controllability of the monetary base in a typical country depends primarily on the degree to which the movements of the central bank credits are offset by opposite changes in the uncontrolled components. If movements of central bank credits are offset to a large degree, there is a little base control. Which in turn can say that controlling the base to either the monetary aggregate or to achieve some macroeconomic goals are unattainable. This topic has been investigated empirically in seven different countries and presented in chapter six.

We have just discussed the "sources" side of the base. On the "uses" side, demand for the base (B^d) comes from the public and commercial banks. The base is used by the

public as currency (CP), and by commercial banks as reserves. Currency in circulation is divided into two parts, one part is held by the public and the other part is held by commercial banks as vault cash. The later, together with commercial bank deposits at the central banks, constitutes commercial banks' reserves (CBR). So the demand for base could be presented algebraically to give us the typical demand base equation in a typical country as:

$$B^d \equiv CP + CBR \tag{3.9}$$

Assuming the money multiplier, m in identity (3.3) is predictable, the most important relationship in determining the quantity of money supply is the equilibrium condition for the base, that is, supply of the base equals its demand:

$$B^s = B^d \tag{3.10}$$

Or,

$$B^s = CP + CBR \tag{3.11}$$

The monetary base is in equilibrium only when its supply (B^s), provided by the monetary authorities, equals the demand for the base by public (CP) and by commercial banks (CBR). If the disequilibrium exists, the supply and demand for the base are not equal, the balance sheet adjustments by commercial banks cause money supply to change.

The components of the base in my sample countries are summarized and presented in the next table 3.6, from which I was able to derive the source base equation for each country that has been presented after in table 3.7.

Table: (3.6)

The Components of the Base in Seven Different Countries

	CA	CCB	CF	CG	CO1	CO2	CPS	FA	FCOD	FL	GD	ID	LTFB	B^S	OI
EGY		♣		♣		♣		♣		♣	♣			♣	♣
IND	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣	♣
KEN	♣		♣	♣				♣		♣	♣	♣	♣	♣	♣
MEX	♣	♣		♣	♣	♣		♣	♣	♣				♣	♣
THAI	♣	♣		♣		♣		♣		♣	♣			♣	♣
UAE	♣	♣		♣		♣	♣	♣	♣	♣	♣			♣	♣
USA				♣				♣		♣	♣			♣	♣

♣ Indicates that the component exists

EGY	Egypt	1962.01 - 1991.05
IND	Indonesia	1969.06 - 1991.08
KEN	Kenya	1966.09 - 1991.06
MEX	Mexico	1957.01 - 1991.08
THAI	Thailand	1960.01 - 1991.09
UAE	United Arab Emirates	1975.01 - 1991.09
USA	United States	1957.01 - 1991.09

Table (3.7)

The Monetary Base Equations for Seven Different Countries

COUNTRY	THE CORRESPONDING SOURCE BASE EQUATION
EGYPT:	$B^S \equiv FA + CG + CCB + CO2 - FL - GD - OI$ (3.12)
INDONESIA:	$B^S \equiv FA + CG + CPS + CO1 + CCB + CO2 - FCOD - ID - FL - LTFB - GD - CF - CA - OI$ (3.13)
KENYA:	$B^S \equiv FA + CD - ID - FL - LTFB - GD - CF - CA - OI$ (3.14)
MEXICO:	$B^S \equiv FA + CG + CCB + CO1 + CO2 - FCOD - FL - CA - OI$ (3.15)
THAILAND:	$B^S \equiv FA + CG + CCB + CO2 - FL - GD - CA - OI$ (3.16)
UAE:	$B^S \equiv FA + CG + CPS + CCB + CO2 - FCOD - FL - GD - CA - OI$ (3.17)
USA:	$B^S \equiv FA + CG - FL - GD - OI$ (3.18)

Although the basic framework of analysis of the money supply is similar in all economies, the money supply process itself is highly differentiated depending on variety of factors, such as the openness of the economy or the system of trade and payments. Equation (3.4) presented the typical source base equation in a typical country, where equations (3.12) through (3.18) represent the source base in seven different countries, the reason for these differences is going to be explored with details in the coming chapter. For now, careful look to these equations, one can figure out the importance of foreign assets and foreign liabilities and their role in supplying the base. Beside this openness, we have to consider how each country maintains their system of trade and payments. Some of these payments' systems have been under a fixed exchange rate, where their domestic currency pegged to only one other foreign currency, or to a basket of currencies. Since 1971 the world has moved to floating exchange rate. The variability of exchange rates has necessitated a modification of monetary economics, and seemed more and more urgent to economists since that time.

CHAPTER IV

SPECIFIC MONETARY FEATURES OF LESS DEVELOPED ECONOMIES

4.1 Introduction

Discussing aspects of the limitations in the monetary sector in LDCs makes the comparative investigation of the monetary base clearer. Specifically, in these LDCs a significant deviation in the creation of the monetary base structure is inherited from unadjusted process of a previous period. For example, the creation of a large amount of monetary base close to the end of any period under consideration, may be carried over to the next period. The lower efficiency of financial organizations generated by a lower level of economic development, should be considered as a direct influence on the monetary base creation process.

Tables 3.6 and 3.7, the components of the base in seven different countries, show significant dispersion of the creation of monetary base in different economies. These differences usually were oversimplified to make a role applicable to many of the differentiated economic structures in institutional economic systems and economic development levels.

It is known that the main characteristic that distinguishes a modern from a primitive economy is that a modern economy is a monetary one, where transactions either involve the use of money or are expressed in monetary units, as when credit is extended. So the use of money as a medium of exchange is the major institutional datum of

developed Western economies. These economies are not barter economies, nor do they have large subsistence agricultural sectors.

The problem of monetization exists in LDC. In these countries monetary sector coexists with a subsistence or traditional (non-monetary) sector within the domestic economy. Monetization, defined as the enlargement of the sphere of the monetary economy, involves the extension through time and space of the use of money in all aspects (medium of exchange, unit of account, store of value) to the non-monetized sector. With economic growth, it is reasonable to expect that the proportion of the non-monetary sector to the monetary sector will decline.

Hla Myint (1971) describes the financial markets in a modern or monetized sector as composed of: (1) the organized money markets, and (2) the unorganized money markets. The first consists of institutional agencies of credit: central banks, commercial banks, and financial intermediaries (insurance companies and long-term lending institutions in urban areas, and various cooperative credit societies in rural areas). This market is quite sophisticated to the extent that one expects the speculative demand for money to vary with interest rates.

The unorganized money market, which is not homogeneous is made up largely of indigenous banks, money lenders, traders, landlords, and commission agents, some of whom combine money lending with trade and other activates. In those markets, while interest rates are expected to change with the risks and return on real assets, the supply of money may not affect interest rates significantly. The participants of this market are largely outside the direct control of central bank.

In many LDC, it is important to point out that the unorganized money market still dominates a significant sector of the money market, chiefly because of its presence in the agriculture sector. Attempts are being made to promote integration of the two types of markets. The policy objective of the central bank in these countries is for the organized money market to bring the unorganized sector within its fold.

The theory of money has not been fully explored in the LDC. Most decentralization is only possible because of the existence of money; so non-monetary economies, which are highly authoritarian in LDC, made their study difficult. It is not easy to determine exactly either the components of the money or the monetary base or what money does in many developing economies and still less to explain why this peculiar institution has arisen. Some studies that attempted to study the money in LDC focused their attention to different task than mine, like money and interest rates or money and inflation rates, but still studying them is helpful in terms of given a general explanation to the money market in LDC. Those studies could be summarized as:

Subrata Ghatak (1981, 26) argued that in many LDC, the interest rate is administrated by the central bank rather than market-determined in the organized sector. Under these circumstances, it is difficult to see how the interaction between the demand for and the supply of money could determine the interest rate. For this reason, investigators observe the expected rate of inflation, rather than the interest rate, as a major variable in influencing the demand for money in LDC (Deaver 1970, 9-27; Campbell 1970, 341-386; Wong 1977, 59-86; and Balino 1983, 279-298). In particular, in those countries that have experienced a hyperinflation, it has been shown that the demand for real cash balances is sensitive to the expected rate of inflation, which in the absence of any meaningful interest rates, is used as a proxy measure of the cost of holding money.

Aghevli, Khan, Narvekar, and Short (1979, 775-823) found that in LDC, the relatively thin markets for alternative financial assets make the substitution between money and real assets quantitatively more important than that between money and financial assets. Since changes in the administrated interest rates are made infrequently, it is difficult to detect any systematic empirical relationship between money and interest rates.

Other empirical studies, by Balino (1983, 279-298) on Argentina and by Wong (1977, 59-86) on several Asian countries, support the idea of using either the observed or expected rate of inflation as the opportunity cost of holding money.

Coats and Khatkhate (1983, 3-33); Park (1973, 379-418) presented the hypothesis that the monetary growth in developing economy is heavily influenced by the fiscal and foreign sector. On the basis of that they reached the conclusion that the ability to control the money stock is often more limited in less developed economies. Incidentally, their conclusion is coincide with my finding expressed in chapter 6.

4.2 Factors Influencing the Base's Component

The economic development level and the institutional economic system are two significant factors determining the components of the monetary base in LDC. Some other exogenous influences different from those two factors may have an influence on the monetary base and the money supply, but by focusing on the broad concept of the money supply, those are the primary factors that influence the monetary base components, and will be explored as follow:

4.2.1. Institutional Economic Systems and their Influences

It is better to explain what is meant by institutional economic systems before exploring their influences on the components of the base, and by doing that, it should be clear how and why the countries are different in either their financial institutions or the size of their public sector. So in the coming part the meaning will be discussed, followed by the influences on the components.

(a) The institutional structure of the economies system mainly involves many financial activities inside a country like:

- Financial transactions, foreign transactions, savings, investments, income distribution, pricing of goods and services, economic decision-making structured on the level of production.
- Ownership of the means of production, including a capitalist or socialist economic system, ideology, and relevant motivation of economic behavior.
- Integration mechanism, including free markets, central planning mechanism, or a combination of both.
- The type of economic units classified by institutional sector, reflecting the components of an economic system through private/socialist enterprise, government role in economic regulation, role of the rest of he world, and the household transaction structure.

Given the variety of institutional arrangements existing throughout the world, it is necessary for purposes of international comparability that the data on the monetary authorities' accounts include all financial assets and liabilities ascribed to the performance of the monetary authority's functions. In many countries a central bank has sole responsibility for all such functions. In other cases some of these functions are either partially or entirely carried out by the central government or by other official institutions.

When the central bank performs all the functions of the monetary authorities, the financial assets and liabilities recorded in its balance sheet will normally provide the basic statistics necessary for the compilation of the monetary authorities' accounts. But these balance sheets of central banks are tailored to conform to each country's legal and administrative arrangements. Such documents may not include all accounts effectively under the central bank's management or may include accounts that, in financial terms, should be excluded from the monetary authorities' account. The typical case of monetary authorities' accounts that are excluded from central banks' balance sheets relates to exchange stabilization funds. In the meantime if the central banks perform functions other than those of the monetary authorities, for example, act as administrators of the public

debt or operate various non-financial business ventures, these accounts should be excluded from the monetary authorities' account.

In decentralized economic decision-making, there is no significant direct influence by the institutional economic system. However, a significant indirect influence in institutional economic systems involving greater government economic intervention and less decentralization and freedom in economic decision-making.

(b) The influences of the institutional economic systems (being explained) on the financial system and after which on the components of the monetary base could be summarized in four categories:

- assuming greater central government and central bank power and responsibility to perform greater intervention, the central bank transactions that will generate the monetary base is expected to be more active in less developed economies alike
- The stronger the government control of balance-of-payments' transactions, the smaller the created share of the foreign transactions in the monetary base. So we would expect that the foreign transactions in the monetary base is going to diminish as we move from capital, to social decentralized, to social centralized economic decision-making
- creating the monetary base by domestic instrument, using central bank credit to the central government, with a similar logic as before, is going to diminish as we move from capital, to social decentralized, to social centralized economic decision-making. especially considering the great financial power of a central government with little need for it to use central bank credit
- Creating the monetary base by domestic instrument, using central bank credit to other monetary institutions, and central bank credit to non-monetary institutions, with a similar logic as before, is going to diminish as we move from capital, to social decentralized, to social centralized economic decision-making. Moor detailed in these topics could be found in Dimitrije and Macesich (1991, 67-83).

4.2.2. The Level of Economic Development and its Influences

The economic development level of an economy mainly involves the discussion of its entrepreneurial efficiency, labor and capital productivity, production structure, and balance-of-payments' transactions. Analysis of the per capita gross national product (GNP) is traditionally used as the basic criterion for classification of an economy by economic development level.

The manner by which the structure of monetary base could be influenced by the level of economic development could be summarized as:

- With less efficient financial markets in developing economies, and the needs of the central government to finance its expenditures for economic development, the central bank credits to central government (the most important source of the monetary base) is expected to be greater relative to the developed countries.
- The needs for central bank transactions may be greater in developing economies than developed economies.
- Central bank credits to other monetary institutions, should be relatively greater with less efficient financial markets in developing economies. Lower supply of deposits by non-monetary units, and low creation or withdrawal of money by foreign exchange transactions of these institutions, will force them to get their credits from central banks.
- Central bank credits to other non-monetary institutions, which are rare in developed economies with their more sophisticated financial organizations, should be more significant in developing economies. However, this source for the monetary base creation should be less significant than central bank crediting of other monetary institutions in developing economies.
- Finally, balance-of-payments' transactions of the developing economies with their greater sensitivity to the deterioration of foreign markets will be expected to lead to a

withdrawal of monetary base by foreign exchange transactions by central banks , i.e., a greater share of creation of monetary base by foreign transactions should be expected.

4.3 The Sample Countries

In choosing the sample seven countries three classification concepts have been considered. They are:

(A) The concept of classification of economies by institutional economic system contains several approaches. The assertion is that all economic systems should be classified somewhere between two opposite poles on a line featuring on one end the capitalist economic system, which is based on the freedom to make economic decisions on private ownership of the means of production, and perfect market competition, and on the other the socialist economies with full public ownership of the means of production, full government command of economic developments and central planning. All of the other countries have been classified somewhere in between by their market affinity or the government influence on economic developments. The appearance of developing economies and the diversification of both capitalist and socialist economies has led to a more flexible classification of economic systems.

A simple but practical solution for classification of economies by institutional economic system is the realistic presumption that the degree of freedom and decentralized economic decision-making may be considered representative of the institutional economic system. On the basis of this presumption, the practical but useful classification of economies in institutional economic systems may include three types in decreasing order of freedom and decentralization of economic decision-making:

(1) capitalist economies,

(2) socialist economies with decentralized economic decision-making, and

(3) socialist economies with centralized economic decision-making.

(B) The concept of classification of economies by economic development level has its own structural characteristics. It is common that the researchers assume that per capita GNP provides a practical indication of the basic level of economic development. It is widely observable to use the world bank classification of economies based on per capita GNP.

The large oil exporter is not included in the classification by per capita GNP, which would have appeared at highest level of economic development. To avoid the disturbing effects of these economies, the classification of economies by per capita GNP only is modified by using the classification by institutional economic system.

(C) The two-dimensional classification or the combined classification by institutional economic system and level of economic development in this analysis utilized the GNP modification and classifications made by the International Monetary Fund (International Financial Statistics) and the simplification by Dimitrijevic and Macesich (1991, 47). It classified all economies in five basic groups:

(1) industrial economies,

(2) developing economies with oil exporters,

(3) developing economies with non-oil-exporters,

(4) socialist with decentralized economic decision-making, and

(5) socialist with centralized economic decision-making.

A comparative statistical information that utilizes the information above and includes the countries with different institutional economic systems is presented in the table 4.1 below, with countries in italic letters and asterisk (*) represents countries used in this study's sample.

Table 4.1
Classification of Economies by Institutional of Economic system and Level of Economic Development.

Industrial economies			
Australia	Guatemala	Pakistan	Greece
Austria	Israel	Rwanda	Niger
Belgium	Jordan	Sierra Leone	New Zealand
Canada	Korea	Somalia	Netherlands
Denmark	Togo	Sri Lanka	Tunisia
Lebanon	Uganda	Finland	Turkey
Malaysia	Zaire	France	Peru
Mexico *	South Africa	Sweden	Portugal
United Kingdom	Spain	Switzerland	Singapore
United States *	Japan	Norway	Italy
Germany		Paraguay	
Ireland			

Oil-exporting economies

Algeria	Nigeria
Indonesia *	Oman
Kuwait	Saudi Arabia
Libya	*United Arab Emirates* *
Venezuela	

Capitalist Non-oil-exporting developing economies

$830-4,600 per capita GNP	$360-829 per capita GNP	Less than $360 per capita GNP
Argentina	Bolivia	Bangladesh
Brazil	Cameroon	Benin
Chile	*Egypt* *	Burkina Faso
Colombia	El Salvador	Burma
Congo	Ghana	Burundi
Costa Rica	Honduras	Central African Republic
Cote D'Ivoire	*Kenya* *	Chad
Dominican Republic	Papua New Guinea	Haiti
Equador	Philippines	India
	Senegal	Madagascar
	Sudan	Malawi
	Thailand *	Mali
	Yemen Arab Republic	Nepal

Socialist economies with decentralized economic decision-making

$830-4,600 per capita GNP	$360-829 per capita GNP	Less than $360 per capita GNP
Syrian Arab Republic	Nicaragua	Ethiopia
Yugoslavia	Zambia	Tanzania
	Zimbabwe	

Socialist economies with centralized economic decision-making

$830-4600 per capita GNP	Less than $360 per capita GNP
Hungary	China

For economies at a lower level of economic development, the study of money supply will contribute to a better understanding of the theoretical and practical aspects of those more highly developed economies in an attempt to incorporate their experience into the lower level economies. The data are not always as accurate as we would desire; in addition, there are substantial revisions in the data. Some of the difficulties faced in collecting and studying monetary data in LDC are as following:

1. The difficulty to decide the best definition of money, for instance, which approach you are going to use:

- the theoretical approach that defines money supply using economic reasoning, or
- the empirical approach that uses the measure that best predicts inflation and business cycles.

2. Central banks revise their estimates of the monetary aggregates by large amounts later on for expected two:

- the central banks has to estimate the amount of small depository institutions before they provide the actual figures at some future dates
- the central banks have to adjust the data for the seasonal variations.

3. The statistical discrepancy in LDC because some of them is unrecorded, due to smuggling, or negligence, or national secrecy.

4. The accounting practices generate three different aspects:

a. there are the differences that arise because some financial institutions maintain their accounts on a cash basis while others use accrual accounting

b. there are differences in valuation procedures arising from the difficulty of assigning a current value to certain financial instruments (particularly those that are non-marketable or are denominated in a foreign currency) and from variations in the timing of valuation adjustments and the consequent timing of the distribution of profits or losses

c. the proper coverage of a financial statement or balance sheet is an issue, particularly when a simple and direct causal link may be realized between a particular asset

and a particular liability, yielding what are regarded in the IFS as a paired account. Most financial statements pair only contingent accounts--that is, those involving the promise of future financial services if particular events transpire. However, the use of the term "contingency" varies among countries.

For this and all of the expected difficulties, different techniques used to adjust in each different country, the IFS has a standard procedure to adjust national sources to accord with their framework rather than to recommend fundamental changes in national reporting system. For these and other reasons as if different technique has been held, it is misleading to combine data from different resources, so I restricted myself to use data from one resource, the IFS.

CHAPTER V

THEORETICAL FOUNDATION FOR FEEDBACK EFFECTS

Although the basic framework of the analysis of the money supply is similar in all economies, the money supply process itself is highly differentiated depending on a variety of factors, such as the level of development in the financial institutions and the openness of the economy.

Based on the fact that policy cannot be analyzed without some theoretical framework, any judgment about monetary policy has to be rooted in some view of monetary theory. Put another way, any act of monetary policy must make some explicit or implicit assumption about monetary theory. For instance, one of the factors that influence the choice of techniques that seek controlling any measure of money is how it is thought money will influence behavior, e.g., substitution between assets.

In a closed economy, the monetary base is determined by the action of the central bank. In an open economy, the base is also affected by the position of the balance of payments. The base is created when the central bank acquires assets in the form of net foreign assets (NFA) and central bank credits (loans to the government, to the public sector, to the private sector and to commercial banks). Changes in the stock of NFA of the central bank are the result of the balance-of-payments development, i.e., changes in NFA of the monetary authorities reflect balance-of-payments conditions .

5.1 International Monetarism

Since the quantity theory of money ignores the existence of the overseas sector, it is a closed economy model. In response to this, the monetary approach to the balance of payments (the international monetarism) has been developed . Despite its name, this model is antithetical to monetarism in that it denies the direct money-income (price) link essential to orthodox monetarism in its approach and methodology but is radically distinct in its conclusions. The simplest form of international monetarism can be derived as a variant of the quantity theory model. One further assumption is made: the economy is a small one, it is a price taker and therefore is unable to influence the world price of any good. An increase in the money supply creates an excess demand for goods, services and assets. This excess demand is met by foreign suppliers (at the previously prevailing prices). Hence, there is no change in either domestic prices or output, so income is unchanged. Similarly, the price of assets is unchanged and no new domestic ones are produced. The effect of the increase in the money supply has merely been to create a balance of payments deficit by the purchase of foreign goods and assets.

If the balance of payments deficit (surplus) exists, it creates a negative (positive) overseas impact on the money supply. The money supply is thus reduced (increased), and this continues until it reaches original level. In models like that, equilibrium in the money market is restored not by change in income as in the quantity theory but, instead, by a balance of payments deficit (surplus). In consequence, any payments surplus or deficit is nothing but a temporary symptom of disequilibrium in the money market. These features of the international monetarist have been advanced by the hypothesis that changes in the money supply do affect income but only indirectly, through changes in the exchange rate. Hence, international monetarist models are Keynesian in two senses: changes in the money supply may not directly affect income; if they do, the changes are made through an indirect transmission mechanism.

5.2 Money, Credit, and Monetary Base Controllability

5.2.1 Money

Following David Gowland (1985, 12-17), money could be created in four and only four ways.

(i) The Public Sector Borrowing Requirement

There will be an increase in the money supply of exactly the same amount increases in the difference between the government's outlays and its receipts. As the name implies it is the amount the government must monetize to finance its outlays. Ceteris paribus, the government outlays are its expenditure on goods and services, expenditure on transfer payments, including interest payments, purchase of assets, and loans. As far as the influence on money creation is considered, each has the same effect. Public sector receipts consist of taxation and the proceeds from sales of assets. Money creation occurs as a direct and inevitable consequence of government expenditure, unless this is financed by taxation or by borrowing from the non-bank private sector. In this case money creation still occurs but is exactly offset by the money destruction caused by taxation or by non-bank private sector lending to the public sector.

(ii) Bank Lending to the Private Sector

This variable is seen clearly in the case of personal loans. A bank creates money, as the old adage puts it, "every loan creates a deposit." Moreover, this relationship is an exact one. The loan creates a deposit by the same amount, which came from the fact that a bank in making a loan exchanges a claim on itself for a claim on the borrower. The claim on itself is obviously a bank liability and so, by definition, part of the money supply.

(iii) Non-Bank Private Sector Lending to the Public Sector

The consequences on the money supply are just the same as that of taxation. The purchase or sale of Treasury securities is used control the money supply. If the goal is to

increase the money supply, a central bank may do so by purchasing Treasury securities. The central bank pays for these securities with checks drawn on it. These checks will be deposited at commercial banks. As the checks clear, the central bank will credit the deposits of member banks at central banks, thereby creating additional reserves for the banking system. In similar fashion, the money supply could decrease. This is often called an open market operation.

(iv) The Overseas Impact on the Money Supply

If a government acquires foreign currency by buying it with its domestic currency and its reserve rises, the money supply will rise. If it sells foreign currency, the money supply falls. Any such acquisition (or sale) will have exactly the same impact on the money supply as when the government buys or sells any other asset.

The crucial point of the analysis is that an acquisition of a foreign asset must be financed. The question posed is 'Has the government acquired or supplied any of the native currency?' If the answer is 'yes,' there is an overseas impact. This is positive if the government has supplied domestic currency and negative if it has acquired it. If the answer is 'no,' hence there is no impact. An example includes government borrowing in foreign currency from any source including the Eurocurrency market or the IMF. Another form of government borrowing which does not affect the money supply is foreign purchases of government securities, effectively these are bought with foreign currency.

The banking system can creates an overseas impact too. Foreigners may hold deposits with or borrow from domestic bank. One might choose to treat the foreigners as part of the non-bank private sector and so includes their deposits in the money supply, as the US authorities do. One need not take note of the difference between a loan to a resident and to a non-resident; the impact of both on the money supply is identical. This simple international viewpoint is not normally adapted, however, because it ignores the political reality that transactions with foreigners are regarded as different; if only because balance of payments statistics are relevant to macroeconomic policy.

The other aspect of money creation involving the overseas sector is that a loan to a foreigner will create a deposit. This deposit may be held by a resident or by a non-resident. Hence loans to non-residents may increase the money supply but need not necessarily do so. This uncertainty can be resolved and the impact of deposits incorporated by looking at net bank claims on foreigners (loans to foreigners less foreign-held deposits). If these rise, the money supply increases, and if net claims fall, the money supply reduces.

To summarize, the impact of the overseas sector may increase the money supply in two ways to be added to the primary causes of monetary expansion:

1. If the public sector acquires foreign assets and purchases them with native currency;
2. If a bank increases its net claims on foreigners.

In general, the money supply will be reduced in any country by:

1. Government sale of foreign currency,
2. An increase in foreign deposits with the banks,

And it will be increased by:

3. Government purchase of foreign currency,
4. An increase in bank loans to non-residents.

The sum of (1) to (4) is the overseas impact on the money supply.

Those four variables need not be independent of each other. Indeed, many real-world transactions may combine more than one transaction described above. This does diminish the above analysis of money creation, but instead makes it possible to make statements like the following:

- Government spending will cause the money supply to rise unless financed by taxation or sales of debt or foreign currency to the non-bank private sector.
- Non-bank private sector borrowing from a bank will increase the money supply unless the loan is used to buy foreign currency or government securities.

5.2.2 Credit

Since the creation of credit is likely to involve the creation of money and vice versa, it is important for completion to define money and credit.

Money is an asset hold by someone; credit is a debt owed by someone, although sometimes public sector borrowing is counted as part of credit and sometimes not. Bank liabilities are money, whereas bank assets are credit.

Keynesians, without exception, accept that credit can influence spending. Benjamin Friedman (1983), a prominent Keynesian, emphasized the importance of credit in Keynesian analysis. They have usually stressed the availability of credit. The rationale of this is that both individuals and companies are unable to carry out their spending plans because of a lack of credit to finance them. Thus availability of credit is a binding constraint upon expenditure. This, of course, assumes that borrowers cannot borrow as much as they would like, given prevailing interest rates; that is, there is non-price rationing in credit markets, either as a consequence of official policy or because of market imperfections.

Monetarists would not deny the possibility of this but claim that Keynesians assume that this is the only possible transmission mechanism for monetary policy and so treat monetary policy as a synonymous with credit policy. So when money and credit are simultaneously increased, the Keynesian looks at the borrower and said that this will stimulate the production of goods or services, hence output will increase, whereas the Monetarist looks at the effect on the holder of the deposit (the seller) and said that he would be influenced by the deposit (or strictly to behave differently because the loan and deposit were created).

5.2.3 Controllability of the Base

As far as control of the monetary base is concerned, changes in foreign assets and foreign liabilities, which are a reflection of the position of balance of payments, can not generally be considered as a variable to be directly influenced or controlled; hence they are named ***uncontrolled*** variables. The monetary authorities can directly ***control*** other variables, among which are net claims to the government, public sector, commercial banks and other private sectors. The latter altogether can be called "Central Bank Credits." We, therefore, can conclude that the controllability of any country's monetary base depends primarily on the degree to which the movements of the controlled variables ,Central Bank Credits, are offset by opposite changes in the uncontrolled components. If movements of Central Bank Credits are offset to a large degree, there is a little base control.

5.2.4 The Source Base as an Intermediate Target

To show why the source base growth may not bear any statistical relationship to monetary aggregate growth, consider the case in which a central bank has determined that the economy is growing too rapidly and decides to use open market operations to restrict the growth rate of a monetary aggregate. Reducing the rate of purchases of government securities decreases the growth rate of the source base. It has been expected that this decrease in base growth will be associated with a slower rate of growth of the monetary aggregates and, subsequently, a slower rate of growth of the economy. Now consider the four separate scenarios in figure 5.1. Scenarios 1 and 2 illustrate this chain of events, which follows closely the monetary policy process originating at the policy-maker's decision stage and leading ultimately to economic activity. The chain of events begins with a decision to decrease the base, implemented through open market operations.

In scenario 1 it is assumed that the decrease in controlled variables is associated with no change in NFA "the uncontrolled variables", assuming the foreign exchange rate clears the foreign market, which will not allow the capital mobility to interact, leaving NFA unchanged. decreasing the growth rate of monetary aggregate.

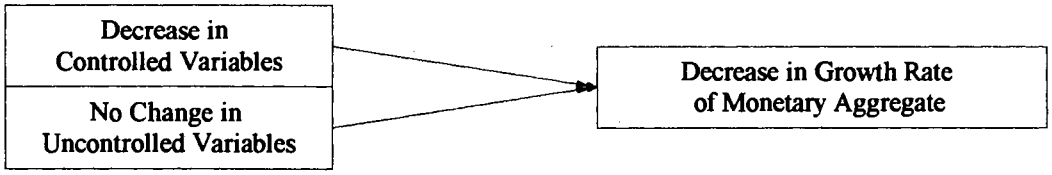
In Scenario 2 the decrease in controlled variables associated with a decrease in NFA. As a consequence, the reduction in source base growth is associated with a reduction in monetary aggregate growth. The two scenarios involve a positive association between source base growth and growth of monetary aggregate. So monetary policy has been successful in slowing the pace economic activity by reducing the monetary aggregate.

Consider next the third scenario, in which the central bank implements the same policy, but because of the initial increase in domestic interest rates (accompanied with the reduction in source base) an inflow of foreign assets induced, in turn, the foreign assets are greater relative to the foreign liabilities, that will lead to an increase in the uncontrolled variables (NFA), perhaps sufficient enough to offset the initial decrease in the controlled variables (Central Bank Credits). As a consequence, the observed association between the decrease in source base and monetary aggregate growth, as the third panel of figure 5.1 indicates, is zero monetary aggregate growth.

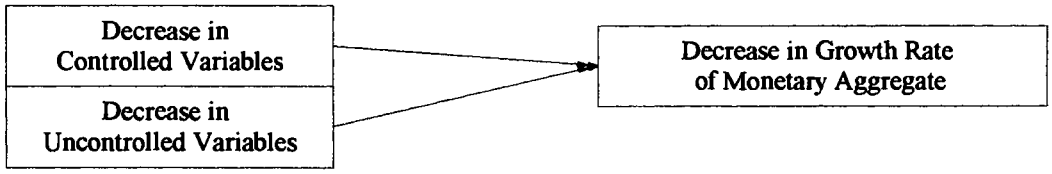
Finally, consider a scenario in which the central bank believes in restricting the present rate of economic growth by decreasing one of the controlled variables of the source base, however, NFA grows too fast generates a higher growth rates of the source base and, ultimately, faster monetary aggregate growth. In this case, there is an apparent absence of association between the monetary policy tools and monetary aggregate.

My primary inference from reviewing these four scenarios is that: in each case, the rate of growth of the controlled variables of the source base has declined. Yet in each case, the final implication for monetary aggregate growth is different. For this reason, the source base is a poor intermediate target, and has a potential fallacy in using it alone as a gauge of monetary policy.

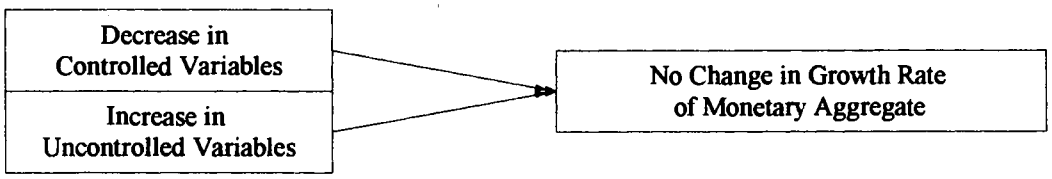
Scenario 1: Open Market Sale, No Change in NFA, Net Contractionary Effect



Scenario 2: Open Market Sale, Decrease in NFA, Net Contractionary Effect



Scenario 3: Open Market Sale, Incease in NFA, No Net Effect



Scenario 4: Open Market Sale, Great Increase in NFA, Net Expansionary Effect

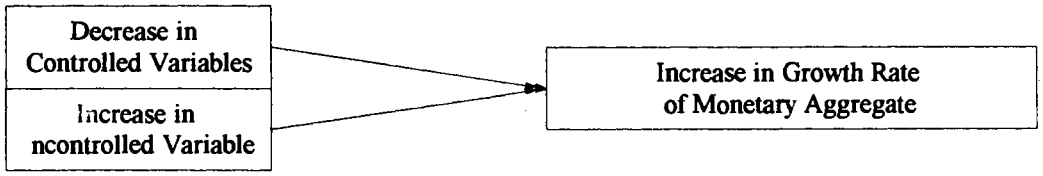


Figure 5.1
Four Scenarios Relating the Growth Rate of theSource Base
to the Growth Rate of Monetaty Aggregate

5.3 Balance of Payments and the Money Supply

A balance-of-payments transaction, surplus (deficit) in current accounts, and foreign exchange transactions by the monetary institutions has a significant influence on the money supply, especially in countries at a lower level of economic development. This effect is important because changes in the current accounts of the balance of payments are substantial in developing countries. These changes influence the foreign exchange transactions by monetary institutions, and in this way influence the creation of monetary base structure.

The influence of the balance of payments on the money supply occurs through two different channels:

1. current account surplus or deficit, a surplus of current account of balance of payments leads to the creation of money and reserve money, and a current account deficit leads to a reduction of it.
2. the involvement of monetary institutions in foreign financial transactions in the balance of payments associated with the involvement of non-monetary units in these transactions.

In the second group of influences on the money supply, the foreign exchange transactions by monetary institutions have an effect on the reserve money creation structure opposite to that from the surplus or deficit of balance-of-payments current account. If that is the case, we can say that the second group of influences on the money supply modifies the impact of balance of payments on the money supply. In this way, a surplus or deficit of current account balance of payments appears as an indirect source of influence on the money supply, while foreign exchange transactions by monetary institutions partly reflect their involvement in foreign financing representing the direct influence on the money supply. Consequently, this second effect source of balance-of-payments influence on the money supply may become more significant than the first.

The foreign exchange transactions could be summarized in three groups

1. foreign exchange transactions with foreign residents;
2. foreign exchange transactions by monetary institutions with domestic residents;
3. semiforeign exchange and semidomestic transactions by monetary institutions with domestic residents (buying/selling of foreign exchange for domestic currency) that involve different types of buying/selling of foreign exchange between monetary authorities, other monetary institutions and non-monetary units.

It may be concluded that the first two groups of transactions have a little direct effect on the money supply, so that the monetary effects of balance-of-payments transactions and related foreign exchange transactions are accomplished mainly by the third group: buying/selling of foreign exchange between central banks and other monetary institutions for domestic currency, influencing the amount of creation/withdrawal of reserve money. The buying/selling of foreign exchange between monetary institutions and non-monetary units for domestic currency influences the amount of creation or leakage of money in circulation or reserve money.

The influence of balance-of-payments transactions on the money supply reflects the effects of a combination of buying/selling of foreign exchange instruments for domestic currency, with central banks and other monetary institutions and non-monetary units as buyers and sellers. These transactions mirror the net changes in foreign assets and foreign liabilities in monetary institutions impacting on money supply, foreign assets, and foreign liabilities in the central banking system influencing the monetary aggregates, which in turn affect the economic activity. Figure 5.2 traces and clarifies the route of these effects.

Under modern banking institutions, the banking system can offset, or "sterilize," some or all of the payments imbalance, keeping it from having any effect on the domestic money supply. Sterilization can be achieved either by the central bank or by private banking. Thus, a payments surplus or deficit affects the money supply only if the banking system does not completely sterilize the payments imbalance.

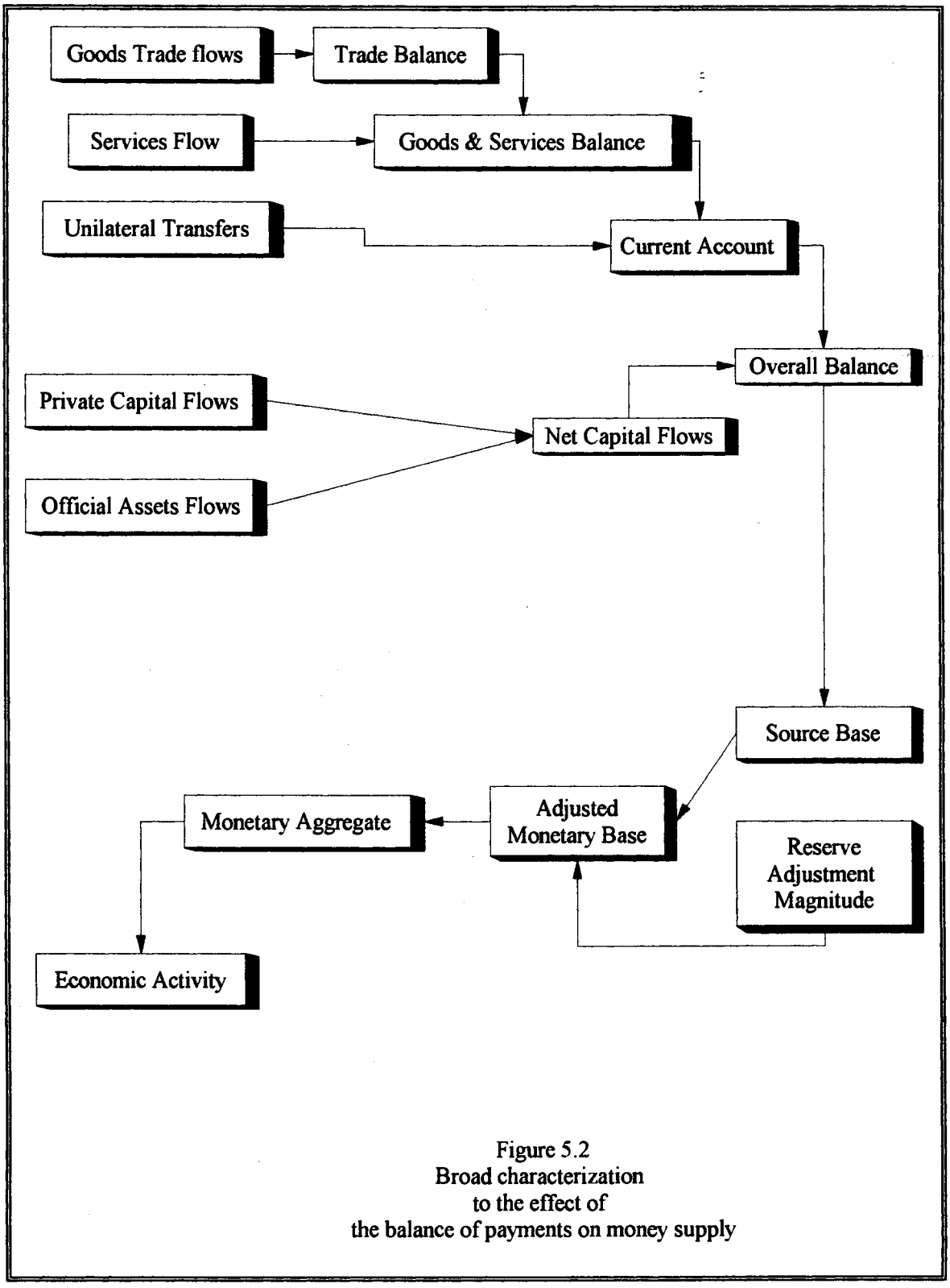


Figure 5.2
Broad characterization
to the effect of
the balance of payments on money supply

5.4 Money Supply and the Balance of Payments

Under some conditions of international capital mobility, and fixed exchange rates, monetary policy becomes so chained to the balance of payments that it loses all (or partial) control over the money market.

The availability of foreign currency should be balanced against the demand for it, within the balance of payments, and the foreign exchange market. In a fixed exchange rate world, we should think of the overall payments surplus as a net inflow of money from abroad, and a deficit as an outflow of money. The surplus effects could be divided into trade-flow effects and financial-flow effects. The trade balance, or the current account balance, depends negatively on our national product and positively on the exchange rate, i.e. the trade balance responds positively to devaluation of the home currency.

It is known that monetary policy will affect directly the domestic interest rate. The capital account of the balance of payments depends mainly on relative real interest rates (both home and abroad), a higher interest rate in our country will attract capital from abroad. This attraction will generate a balance-of-payments surplus, a money inflow, which is valid only in the short run. Over the longer run, this effect ceases or is even reversed, for at least two reasons:

1. All loans must be repaid. No country can use higher interest rates to attract capital (lending) to it without reflecting the fact that those higher interest rates would have to be paid back out, along with borrowed principal.
2. After the investors get attracted by the higher interest rate first, they will adjust the share of their stock of wealth held in loans in the home country. Soon the inflow will dwindle because wealth already been adjusted.

So in the long run a higher domestic interest rate has an ambiguous effect on the overall balance of payments in the home county.

Studying the money market in an open economy allows us to trace the effects of a countries' monetary policies on its balance of payments. Expanding the money supply worsens the balance of payments, especially at first. If the central bank offers private domestic banks extra loanable reserves (e.g. by buying government bonds in the open market), the banks will typically respond by making more loans to earn more. In the process, their competition to lend more is likely to bid down interest rates. As sketched in figure 5.3 below, the lowering of interest rates has two effects on the balance of payments:

1. The decline in interest rates causes some holders of financial assets to seek out higher interest rates abroad. Their switch from lending here to lending abroad takes the form of selling bank deposits in their home country in order to acquire interest-bearing assets in other countries. Later, the current lending will repaid with interest, bringing a positive feedback to the balance of payments.
2. The newly borrowed funds are used to engage in extra spending, which leads to a multiplied expansion of spending and national income, probably accompanied by rising prices. The rise in incomes and prices, in turn, raises imports and worsens the trade balance. In contrast to the interest rate effect, the trade balance negative effect will continue.

Thus an expansion of the money supply unambiguously worsens the overall payments balance in the short run. Conversely, a contraction of the national money supply unambiguously improves the overall balance. In both cases if the effect had not been sterilized, it would have had a feedback on the home country money supply. Figure 5.3 below traces and clarifies the route of these effects.

Perfect capital mobility can rob monetary policy of its ability to influence the domestic economy. During periods when exchange rates stayed fixed, central bankers found it hard to tighten (or loosen) credit. If they tried to do so, the supply available to borrowers in any country or any currency will not change when central bankers tried to change it, and they found enough lenders to keep the interest rates from rising at all.

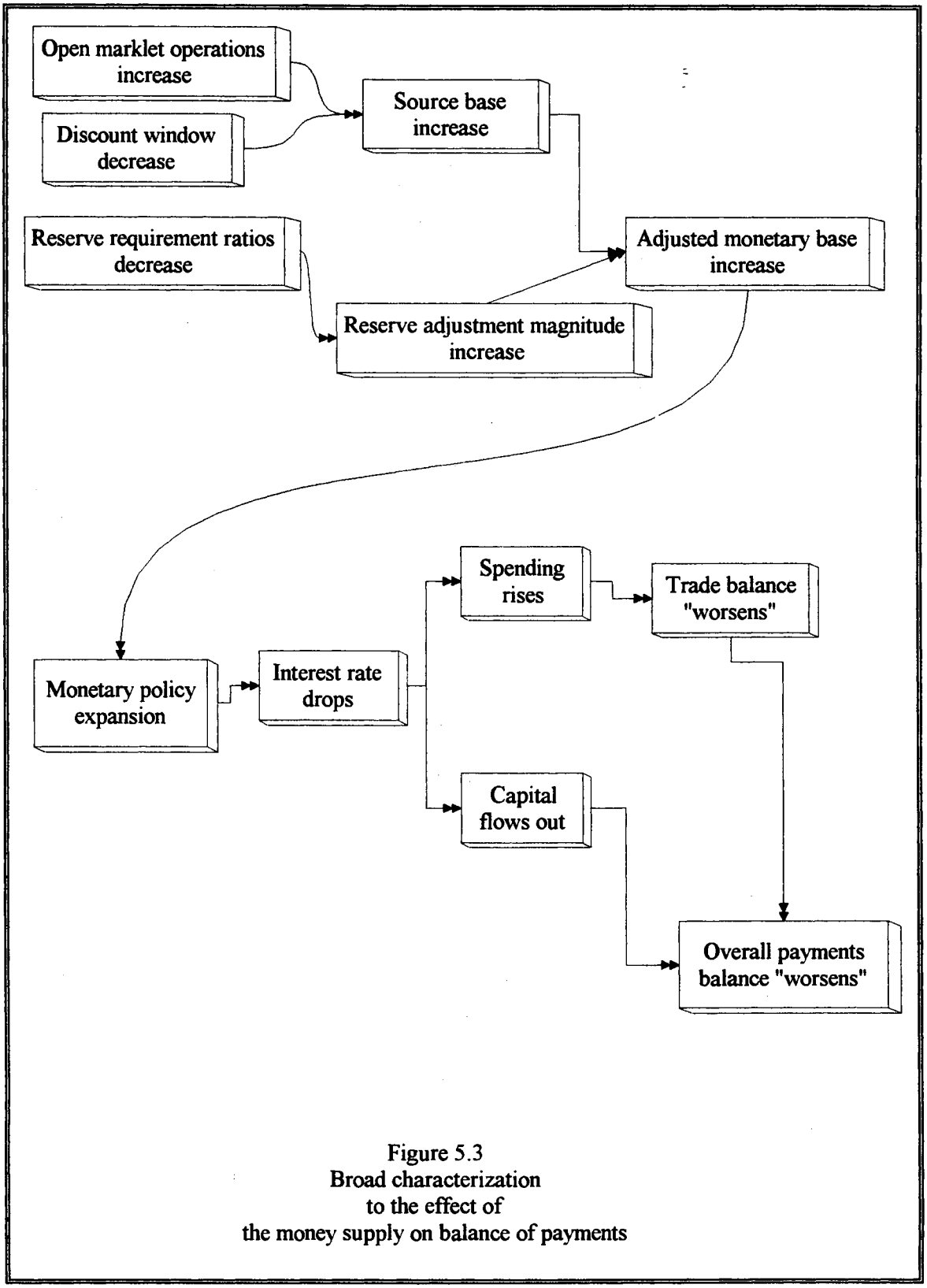


Figure 5.3
Broad characterization
to the effect of
the money supply on balance of payments

5.5 Autonomous Expansion and the Balance of Payments

Autonomous expansion affects the balance of payments both through an income effect and through an interest rate effect. For instance, in the case of expansionary fiscal policy, the extra government purchases are likely to expand spending throughout the economy, raising the national product. The extra desire to spend will spill over into extra import demand, decreasing the trade balance and the overall balance-of-payments surplus. But in short-run the interest-rate effect works in the opposite direction. The extra government purchases increase interest rates. The extra borrowing and higher interest rates should attract some lending from abroad. So it is possible that an expansionary fiscal policy will actually improve the balance of payments. In the long run, though, the lending attracted with higher interest rates must be repaid with interest, canceling the international reserves gained from the initial inflow of borrowed money. So the net result is probably a worsening of the balance, though there would be a short-run improvement if enough lending were attracted by the higher interest rates. Figure 5.4 below traces and clarifies the route of these effects until its final destination the economic activity.

Perfect capital mobility, for autonomous spending, means enhanced control over the domestic economy. Expansionary fiscal policies do not rise interest rates because the extra government borrowing is met by a large influx of lending from abroad. Thus, the borrowing does not tend to crowd out private borrowers with higher interest rates, allowing fiscal policy its fullest multiplier effects on the economy. In other words, with perfect capital mobility and interest rate fixed outside the country, fiscal expansion cannot be guilty of crowding out private investment from lending markets. This extra potency of fiscal policy under fixed exchange rates and perfect capital mobility may be a poor substitute for the loss of monetary control since governmental handling of spending and taxes is notoriously crude and subject to the vagaries of policies. Yet, this is apparently a fact of life for small countries under truly fixed exchange rates.

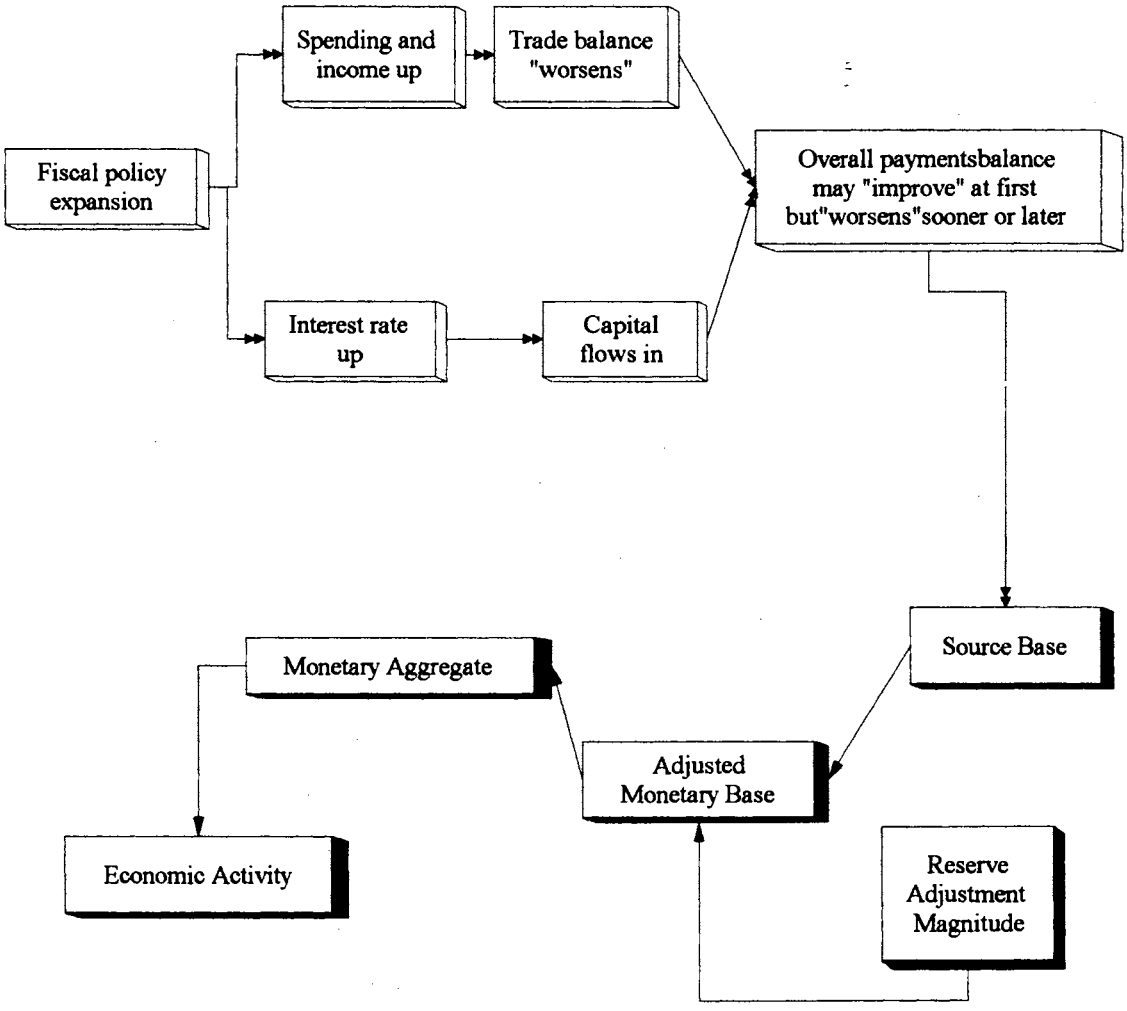


Figure 5.4
Broad characterization
to the effect of
the fiscal policy on balance of payments then to money supply

CHAPTER VI

TESTS OF MONETARY BASE ENDOGENEITY

6.1 Introduction

The empirical analysis of time series has a long tradition in economics, particularly as it concerned with the decomposition of a series into a set of unobserved components, traditionally taken to be the trend, cycle, seasonal, and irregular, these being associated with the ideas of secular evolution (or long swings), the concept of the business cycle, seasonal variation, and transitory influences, respectively.

Researchers were primarily concerned with developing techniques which were computationally feasible and based upon local trends and levels (Holt et al. 1960); (Winters 1960); (Brown 1963). Exponential smoothing techniques were later shown to have unobserved component representations for providing a more unified framework for analysis (Harrison 1967). Box and Jenkins (1967) developed a feasible model building procedure for the general class of auto-regressive-integrated-moving average processes.

The importance of synthesis between traditional econometric and time series techniques was brought into sharper focus by Granger and Newbold's (1974) illuminating analysis of the spurious regression problem. It was shown that regressing independently generated random walks lead to a very high probability of rejecting the correct hypothesis of no relationship between the two series.

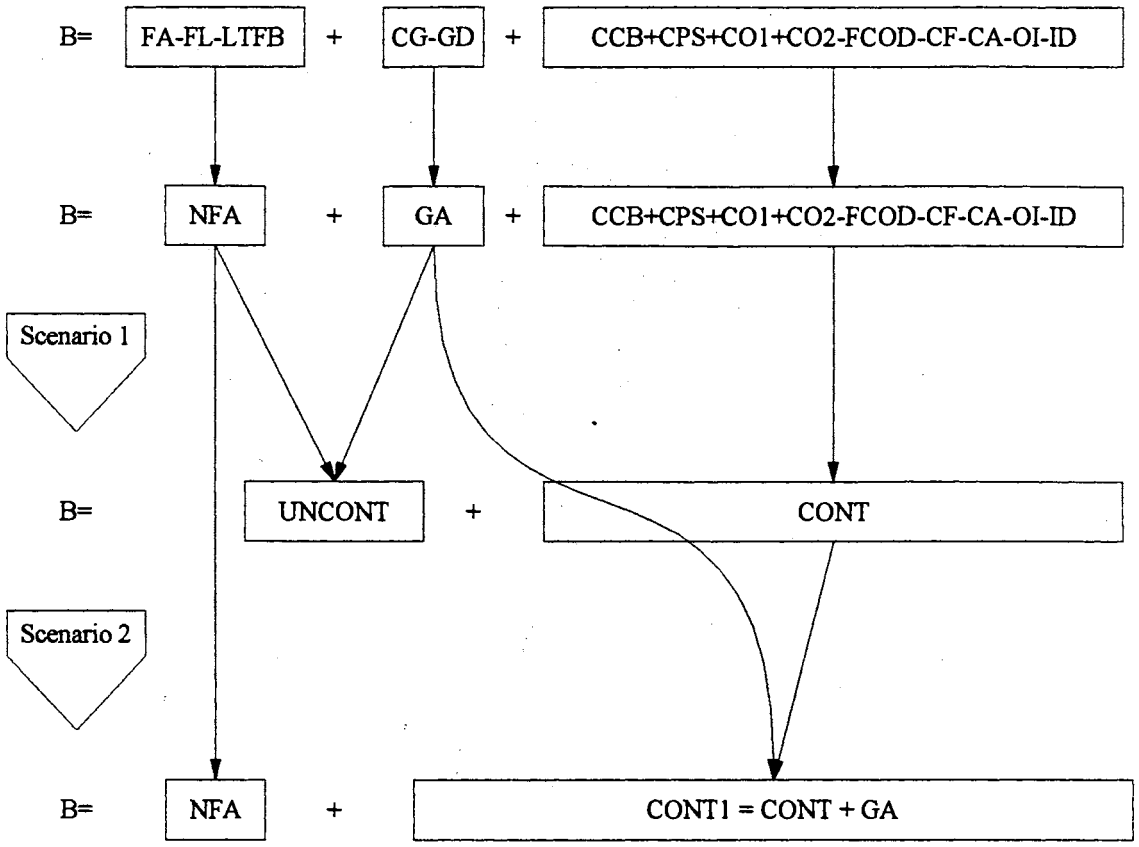
The groundwork for using cointegration vectors in the study of nonstationary of the data available comes from the work of Granger (1981); Granger and Weiss (1983); Granger and Engle (1985); and Engle and Granger (1987). The connection with error correcting models has been investigated by a number of authors, Davidson (1986); Stock (1987); and Johansen (1988) among others. The suggestion of estimating the cointegration relations using regression has been investigated by Stock (1987); Phillips and Durlauf (1986); Stock and Watson (1986); Phillips and Park (1986a, b, 1987); Phillips and Ouliaris (1986, 1987). Deriving the maximum likelihood estimators of cointegration vectors for an autoregressive process with independent Gaussian errors comes from the work of Johansen (1988).

6.2 The Model

In the preceding chapters, a discussion of the theoretical mechanism of the monetary base in seven different countries was produced. In this chapter, the elements that have been laid out in the preceding discussions are subjected to empirical examination. I rely on the theoretical relationships among variables presented earlier for a set of structural equations that can be combined to describe the monetary base in a typical country. This process will proceed with avoiding the complicated details in LDC, keeping in mind a high level of an explanatory power to explore the relationship between the base components.

Examining the behavior of the monetary base is important for understanding the ability of the monetary authorities in LDC to influence their monetary aggregates and achieves macroeconomic goals. The assumption of controllability of the monetary base is the particular corner of the testing. Especially, after the major determinants of the base are specified in order to check its controllability and endogeneity. The base components and their distribution reproduced in figure 6.1 below to be utilized in the coming sections.

Figure 6.1 Alternative Categorizations of the Base Components



The chart above facilitates the understanding of the base components, and how they are distributed to generate the coming two main base equations (6.5) and (6.7), that are to be utilized through the work on levels or differences, based on these definitions:

$$NFA = FA - FL - LTFB \quad (6.1)$$

$$GA = CG - GD \quad (6.2)$$

$$UNCONT = NFA + GA \quad (6.3)$$

$$CONT = CCB + CPS + CO1 + CO2 - FCOD - CF - CA - OI - ID \quad (6.4)$$

From equations (6.1) through (6.4),

$$B^S = UNCONT + CONT \quad (6.5)$$

Defining

$$CONT1 = CONT + GA \quad (6.6)$$

We get

$$B^S = NFA + CONT1 \quad (6.7)$$

The notation for differencing is:

From Scenario 1 in the chart above and equation (6.5) we can get

One lagged difference

$$A1 = UNCONT_t - UNCONT_{t-1} \quad (6.8)$$

$$A11 = CONT_t - CONT_{t-1} \quad (6.9)$$

Three lagged difference

$$A3 = UNCONT_t - UNCONT_{t-3} \quad (6.10)$$

$$A33 = CONT_t - CONT_{t-3} \quad (6.11)$$

Twelve lagged difference

$$A12 = UNCONT_t - UNCONT_{t-12} \quad (6.12)$$

$$A1212 = CONT_t - CONT_{t-12} \quad (6.13)$$

From Scenario 2 in the chart above and equation (6.7) we can get

One lagged difference

$$B1 = NFA_t - NFA_{t-1} \quad (6.14)$$

$$B11 = CONT1_t - CONT1_{t-1} \quad (6.15)$$

Three lagged difference

$$B3 = NFA_t - NFA_{t-3} \quad (6.16)$$

$$B33 = CONT1_t - CONT1_{t-3} \quad (6.17)$$

Twelve lagged difference

$$B12 = NFA_t - NFA_{t-12} \quad (6.18)$$

$$B1212 = CONT1_t - CONT1_{t-12} \quad (6.19)$$

Data employed were from the IFS, monthly, and vary in time periods between countries based on its availability to the IFS, as follow:

Egypt	1962.01 - 1991.05
Indonesia	1969.06 - 1991.08
Kenya	1966.09 - 1991.06
Mexico	1957.01 - 1991.08
Thailand	1960.01 - 1991.09
United Arab Emirates	1975.01 - 1991.09
United States	1957.01 - 1991.09

The centerpiece of the difference between equations (6.5) and (6.7) is GA, If GA is considered as an uncontrolled component, it is added to the UNCONT variable, leaving CONT variable as the rest of the components, equation (6.5). But, if GA treated as

controlled component, the controlled variable become CONT1 variable, leaving the NFA alone to be treated as the only uncontrolled variable, generating equation (6.7).

The relevant issue is whether fluctuations in the uncontrolled components in the source base can be offset by the actions of central bank, so that the monetary authorities are able to provide a particular quantity of base money. The controllability of the monetary base depends primarily on the degree to which the movements of a central bank credits are offset by opposite changes in the uncontrolled components. If movements of central bank credits are offset to a large degree, there may be a little base control, otherwise it is controlled.

It is generally recognized that estimation and testing of structural hypotheses using time series data must pay attention to the regression residuals. They may display systematic behavior that is inconsistent with the classical assumptions. In particular, it was recognized that the residuals from time series regressions are usually autocorrelated. Relying on classical regression methods when errors are serially correlated does not affect the unbiasedness or consistency of the estimators, but it does affect their efficiency. Tests for autocorrelation are the next topics to be taken up in this chapter.

The next section deals with stationarity test, followed by the cointegration test, then checking the stationarity of the first differences, after which the appropriate regression accompanied by Lagrange multiplier test statistic for autocorrelation will be applied, finally graphical display and the causality test.

It is important to note here that in each test there are three main parts:

a. description of the test,

b. the empirical results, and

c. conclusions and comments.

6.3 Stationarity

When considering the relationship between two or more time series variables, an important consideration that of stationarity. This requires the process to be in a particular state of 'statistical equilibrium' (Box and Jenkines 1976, 26.) A process is said to be stationary if its properties are unaffected by a change of time origin, in other words, the joint probability distribution at any set of times t_1, t_2, t_3,...., t_m must be the same as joint probability distribution at times $t_1 + k$, $t_2 + k$,....., $t_m + k$. where k is an arbitrary shift along the time axis. For m = 1, this implies that the marginal probability distribution at time t is the same as the marginal probability distribution at any other point in time. Hence the marginal distribution does not depend on time, which in turn implies that the mean and variance of any time series must be constant, i.e.,

$$E(x_1) = E(x_2) = E(x_3) = ... = E(x_n) = E(x_t) = \mu \quad (6.20)$$

and

$$V(x_1) = V(x_2) = V(x_3) = ... = V(x_n) = V(x_t) = \sigma^2 \quad (6.21)$$

and the covariances are functions only of the lag k, and not of time t, for all k,

$$Cov\ (x_1, x_{1+k}) = Cov\ (x_2, x_{2+k}) = ... = Cov\ (x_{n-k}, x_n) = Cov\ (x_t, x_{t-k}) \quad (6.22)$$

In short, if a series has a finite mean, finite variance and finite covariances, i.e., all of which are independent of time, this series is defined as stationary. For instance if we have

$$NFA_t = m + \rho\ NFA_{t-1} + e \quad (6.23)$$

Where m and ρ are parameters and the e's are assumed to be independently and identically distributed with zero mean and constant variance, the regression process is stationary if $1<\rho<1$. If $\rho = 1$ the equation defines a random walk with drift and NFA is then nonstationary. Thus the null hypothesis for testing nonstationarity is that the absolute value of ρ should equal unit:

$$H_0: \rho = 1$$

To test this hypothesis, equation (6.23) is re-specified as

$$\Delta NFA = m + \gamma NFA_{t-1} + e \qquad (6.24)$$

Where $\Delta NFA = NFA_t - NFA_{t-1}$, the first difference of the NFA series.
The unit root hypothesis is now

$$H_0 : \gamma = 0$$

By estimating γ, a t-statistic for $\hat{\gamma}$ may be used to test the significance of γ. It is important to notice here that in checking for stationarity, the t-statistic cannot be referred to the critical values in the standard 't' table. That table no longer applies, because of the possibility of nonstationarity existence. More recently Mackinnon "Critical Values for Cointegration Tests", Working Paper, University of California, San Diego, January 24, 1990, has implemented a large set of replications, and has estimated response surfaces regressions over these replications. These critical values are incorporated into the results in the corresponding appropriate places.

Using the regression which is referred to as the Augmented Dickey-Fuller (ADF) regression to generalize the previous regression to higher order process can be done by using the lag operator L, where

$$L^1 = NFA_{t-1},$$
$$L^2 = NFA_{t-2}, \text{ etc.} \quad (6.25)$$

The general autoregressive process of order p may be written in the form

$$A(L)\, NFA = m + e \quad (6.26)$$

where A(L) is a polynomial of degree p in the lag operator, that is

$$A(L) = 1 - \alpha_1 L - \alpha_2 L^2 - .... - \alpha_p L^p \quad (6.27)$$

Replacing L by unity gives

$$A(1) = 1 - \alpha_1 - \alpha_2 - .... - \alpha_p \quad (6.28)$$

So that A(1) indicates the sum of all the coefficients in the autoregressive scheme. To test whether the pth order process has a unit root, rewrite A(L) as

$$A(L) = (1-\rho L)B(L) \quad (6.29)$$

Where B(L) is a polynomial of degree (p-1) in the lag operator. Replacing L by unity in this expression gives

$$A(1) = (1-p)\, B(1) \quad (6.30)$$

Thus if the series under investigation has a unit root then A(1) equals zero, that is, the sum of all the autoregressive coefficient will be zero. Straightforward estimation of the AR(p) process yields estimates of the α_i coefficients. These do not permit a simple test of the null hypotheses since these coefficients are all functions of the ρ parameter. However, a simple test can be obtained by rearranging the autoregression to isolate the ρ parameter. The appropriate rearrangement is

$$\Delta(NFA) = m - A(1)NFA_{t-1} + \delta_2\Delta(NFA_{t-1}) + \delta_3\Delta(NFA_{t-2}) + \ldots\delta_p\Delta(NFA_{-p+1}) \tag{6.31}$$

Where the δ coefficients are functions of the α's. Thus under the null hypothesis of a unit root the coefficient of NFA_{t-1} will be zero. If $\rho<1$ the coefficient of NFA_{t-1} will be negative.

6.3.1 Empirical Results of Testing for Stationarity on the Levels

The components of the base that have been presented algebraically for a typical country in equation (3.5) and in figure (6.1), which rewritten again for simplicity

$$B^S \equiv NFA + GA + CPS + CO1 + CCB + CO2 - FCOD - ID - CF - CA - OI \tag{6.32}$$

These components have been netted in equations (6.5) and (6.7), that left the base with either UNCONT and CONT, or NFA and CONT1. The attempt to investigate the stationarity of these components by applying the previous application, in particular, the Augmented Dickey-Fuller regression (6.31), yields results that are summarized in table 6.1

Table 6.1 Stationarity Test on the Series Level

Country	Augmented Dickey-Fuller Test			MacKinnon Significant Levels		
Series	$\hat{\delta}$	ADF t-stat	# of Obs.	1%	5%	10%
Egypt						
UNCONT	0.0013	0.2993	350	-3.9821	-3.4221	-3.1339
CONT	0.0265	1.0596				
NFA	-0.0154	-1.1033				
CONT1	0.0062	0.6468				
Indonesia						
UNCONT	0.1373	-3.2098***	624	-4.0068	-3.4322	-3.1389
CONT	-0.1344	-3.3324***				
NFA	-0.0365	-1.5751				
CONT1	-0.0640	-2.1632				
Kenya						
UNCONT	-0.0089	-0.4348	295	-3.9943	-3.4271	-3.1364
CONT	-0.2290	-3.7697**				
NFA	-0.0420	-2.6747				
CONT1	-0.0070	-0.6317				
Mexico						
NFA	-0.0290	-2.6046	413	-3.9822	-3.4217	-3.1335
CONT1	-0.0253	-2.4547				

(Table 6.1 concluded) Stationarity Test on the Series Level

Country	Augmented Dickey-Fuller Test			MacKinnon Significant Levels		
Series	$\hat{\delta}$	ADF t-stat	# of Obs.	1%	5%	10%
Thailand						
UNCONT	0.0080	1.5730	378	-3.9899	-3.4248	-3.1349
CONT	0.0040	0.3793				
NFA	0.0305	8.4978 *				
CONT1	0.0302	5.8060 *				
United Arab Emirates						
UNCONT	-0.5466	-5.5778 *	198	-4.0042	-3.4323	-3.1398
CONT	-0.2743	-4.0100 *				
NFA	-0.2324	-3.4804 **				
CONT1	-0.1074	-2.4268				
United States of America						
UNCONT	0.0025	0.5079	414	-3.9821	-3.4216	-3.1334
CONT	-0.1829	-5.0047 *				
NFA	-0.0010	-0.3016				
CONT1	-0.0071	-0.9015				

Where:

$\hat{\delta}$ is the coefficient of the series at the previous period (t-1)

ADF Augmented Dickey-Fuller t-static, using MacKinnon critical values

* Statistically significant at 1 percent level

** Statistically significant at 5 percent level

*** Statistically significant at 10 percent level

6.3.2 Conclusions of Test on the Levels

In general, a larger t-statistic in absolute value allows the rejection of the hypothesis of a unit root and suggests that the series is stationary.

In table 6.1 failing to reject the null, that the series are nonstationary, is a common result for most of the series, the t-statistic is smaller in absolute value than the reported Mackinnon critical values, which indicates that the hypothesis of nonstationarity and the existence of a unit root cannot be rejected. In other words the unit root exists, and the series are integrated of order one, I(1). So we can tell that the variance goes to infinity as time 't' goes to infinity, and the autocorrelation coefficient goes to '1' as 't' goes to infinity. So the need for an extension to the analyses exists to get unbiased expectation hypothesis.

Thailand and United Arab Emirates are the only countries that have a stationary series, but the series are not cointegrated, as it shown in the coming test, after which their cases will be discussed.

6.4 Cointegration Test

As we have seen through the model building process outlined in the previous sections, stationarity of the monetary base components' series have not been achieved on the levels. A simple extension of the analysis enables sample autocorrelation and cross-correlation functions to be employed usefully in the model identification to get unbiased expectations hypothesis. The extension of the analysis called cointegration test.

Granger and Newbold (1974, 111-120; 1977, 202-214); Plosser and Schwert (1978, 637-660); and Nelson and Plosser(1982, 139-162) discussed the importance of transformation methods to achieve stationarity, especially in economic time series. They found that a great many economic time series are indeed adequately characterized as I(1)

process, and they examine how serially correlated errors invalidate conventional procedures of inference. Stationarity is by no means an innocuous one in the important context of inference in multiple time series regressions. Nonstationarity makes the regression equations have high R^2 statistics and typically display highly autocorrelated residuals, indicated by very low Durbin-Watson (DW) Statistics. They contents that, in such situations, the usual significance tests performed on the regression coefficients can be very misleading, and they provide Monte Carlo simulation evidence to show that the conventional significance tests are seriously biased towards rejection of the null hypothesis of no relationship, and hence towards acceptance of the false relationship.

These worries center around the existence of long-run, steady state equilibria, a concept that economic theory devotes considerable attention to. To develop this argument, consider having two time series, UNCONT and CONT, each of which is integrated of order one, I(1). Then in general a new series can be formed as a linear combination of UNCONT and CONT, integrated of order zero, i.e., stationary. The linear combination of the two series would be written as

$$\text{UNCONT} = \alpha + \beta\ \text{CONT} + \mu \tag{6.33}$$

or

$$\mu = \text{UNCONT} - \alpha - \beta\ \text{CONT} \tag{6.34}$$

After rearrangement, the disturbance term, , is a linear combination of UNCONT and CONT. To discover the relationship between the two series the disturbance term should be stationary. To put it differently, If the μ series has a unit root its variance will explode. CONT would then be of little use in explaining UNCONT. If, on the other hand, μ is stationary, UNCONT and CONT series are said to be cointegrated. Their time paths will tend to move roughly together and will not diverge without limit.

6.4.1 Empirical Results

Two or more variables are said to be cointegrated if individually each is nonstationary but there exists a linear combination of the variables that is stationary. I attempted to find the appropriate linear combination of the two series UNCONT and CONT from equation (6.5) on one hand, and the other two series NFA and CONT1 from equation (6.7) on the other hand, by estimating the cointegrating regression between the current values of the variables, then test whether that linear combination of the variables is stationary by applying the appropriate test to the residuals from the regression. I chose to produce test statistics using two lagged values in the augmented tests. The augmented cointegration tests of this study also use two lagged differences. The cointegrating regression estimated for UNCONT and CONT series is:

$$UNCONT = \alpha + \delta_1 CONT + \delta_2 \text{ Trend} \tag{6.35}$$

And then the residuals from this regression (6.35) are tested by:

$$D(RESID) = \phi_1 RESID_{t-1} + \phi_2 D(RESID_{t-1}) + \phi_3 D(RESID_{t-2}) \tag{6.36}$$

Repeating the same process for the other two series, the cointegrating regression estimated for NFA and CONT1 series is:

$$NFA = \omega + \lambda_1 CONT1 + \lambda_2 \text{ Trend} \tag{6.37}$$

And then the residuals from this regression are tested by:

$$D(RESID) = \psi_1 RESID_{t-1} + \psi_2 D(RESID_{t-1}) + \psi_3 D(RESID_{t-2}) \tag{6.38}$$

After which the test for stationarity (cointegration) against the null hypothesis of I(1) non-cointegration is implemented, using ADF test and MacKinnon critical values. The results are reported in table 6.2 below.

Table 6.2 Cointegration Tests Within the Monetary Base Components

Country	ADF Test		Mackinnon Significant Levels		
Series Regressed	ϕ_1 or ψ_1	ADF t-stat	1%	5%	10%
Egypt					
UNCONT & CONT	- 0.0137	- 1.6127	- 4.3678	- 3.8061	- 3.5160
NFA & CONT1	- 0.0288	- 2.1745			
Indonesia					
UNCONT & CONT	- 0.0479	- 1.9129	- 4.3936	- 3.8202	- 3.5241
NFA & CONT1	- 0.0290	- 1.4104			
Kenya					
UNCONT & CONT	- 0.0368	- 1.2805	- 4.3808	- 3.8135	- 3.5205
NFA & CONT1	- 0.0509	- 2.6115			
Mexico					
NFA & CONT1	- 0.0302	- 2.7111	- 4.3629	- 3.8031	- 3.5132
Thailand					
UNCONT & CONT	- 0.1493	- 5.1977 *	- 4.3706	- 3.8071	- 3.5153
NFA & CONT1	- 0.0420	- 3.1467			
United Arab Emirates					
UNCONT & CONT	- 0.1845	- 3.0849	- 4.4037	- 3.8279	- 3.5321
NFA & CONT1	- 0.1791	- 3.0317			

(Table 6.2 concluded) Cointegration Tests Within the Monetary Base Components

Country	ADF Test		Mackinnon Significant Levels		
Series Regressed	ϕ_1 or ψ_1	ADF t-stat	1%	5%	10%
United States of America					
UNCONT & CONT	- 0.0211	- 1.8721	- 4.3628	- 3.8031	- 3.5131
NFA & CONT1	- 0.0378	- 2.5475			

Where:

ϕ_1 & ψ_1	is the estimated coefficient of the regression' residual at the previous period (t-1) in equations (6.36) and (6.38) respectively
ADF t-stat	Augmented Dickey-Fuller t-statistic, using MacKinnon critical values
*	Statistically significant at 1 percent level
**	Statistically significant at 5 percent level
***	Statistically significant at 10 percent level
Note	Augmented Dickey-Fuller regression for each country is estimated over the whole periods indicated in the model above, in monthly bases

6.4.2 Conclusions of Cointegration Tests

Generally, as mentioned before, two or more variables are said to be cointegrated if individually each is nonstationary, i.e., has one or more unit roots, but their exists a linear combination of the variables that is stationary. In my attempted to find the

appropriate linear combination of the series by estimating a cointegrating regression between the current values of the variables, and then test whether that linear combination is stationery by testing the residual from the regression, and knowing that for a stationary disturbance the t-statistic will be negative and the hypothesis of a unit root is rejected if the t-statistic lies to the left of the relevant Mackinnon critical value. In the table 6.2 above all the t-statistic located to the write of the critical values, which means that we fail to reject the hypothesis of non-cointegration, and the unit root exists in the disturbance term, i.e., the linear combination of the series is non-stationary, which will not validate any regression on the levels and imposes the investigation and probably the uses of the first difference.

The case of Thailand and United Arab Emirates where series were stationary on the levels, after doing the cointegration test, all UAE's series and NFA, CONT1 series from Thailand was not cointegrated, which imposes the use of the first difference like all of the rest of the series for all the seven countries. The only exception I found so far is the UNCONT and CONT series in Thailand which are stationary on the levels and cointegrated, indicating the validation of the regression on the level. I executed that and their results, which are similar to the rest of the countries, have been presented separately in the coming model estimates section.

6.4.3 Empirical Results of Testing for Stationarity on the First Difference

Table 6.3 below represents an application for the Augmented Dickey-Fuller regression to the first difference of all the components of the monetary base. Although, many economic time series are not stationary, the first difference of the series could be stationary. If that is the case, as I mentioned before, the original series is said to be integrated of order one, I(1), i.e., nonstationary, and the first difference series is said to be integrated of order zero, I(0), i.e., stationary.

Table 6.3 Stationarity Test on the First Difference

Country	Augmented Dickey-Fuller Test			MacKinnon Significant Levels		
Series	$\hat{\gamma}$	ADF t-stat	# of Obs.	1%	5%	10%
Egypt						
UNCONT	-0.8585	-9.2829 *	349	-3.9826	-3.4222	-3.1340
CONT	-0.9484	-9.4779 *				
NFA	-1.5482	-12.6729 *				
CONT1	-1.3972	-12.8239 *				
Indonesia						
UNCONT	-1.5484	-12.4279 *	623	-4.0086	-3.4329	-3.1392
CONT	-1.6353	-12.3659 *				
NFA	-1.0734	-10.5239 *				
CONT1	-1.3261	-11.4050 *				
Kenya						
UNCONT	-2.2497	-14.3307 *	294	-3.9945	-3.4272	-3.1365
CONT	-2.2456	-13.9563 *				
NFA	-1.0125	-10.5417 *				
CONT1	-1.2179	-11.0329 *				
Mexico						
UNCONT	NA	NA	412	-3.9823	-3.4217	-3.1335
CONT	NA	NA				
NFA	-0.5146	-7.7151 *				
CONT1	-0.7098	-8.7947 *				

(Table 6.3 concluded) Stationarity Test on the First Difference

Country	Augmented Dickey-Fuller Test			MacKinnon Significant Levels		
Series	$\hat{\gamma}$	ADF t-stat	# of Obs.	1%	5%	10%
Thailand						
UNCONT	-0.9402	-10.4433 *	377	-3.9902	-3.4249	-3.1350
CONT	-1.1985	-11.9282 *				
NFA	-0.5158	-7.3141 *				
CONT1	-0.5624	-7.6059 *				
CONT2	-0.5623	-7.6054 *				
United Arab Emirates						
UNCONT	-2.1178	-11.9430 *	197	-4.0044	-3.4324	-3.1399
CONT	-2.0803	-12.3112 *				
NFA	-1.9232	-10.8269 *				
CONT1	-1.7380	-10.0856 *				
United States of America						
UNCONT	-1.6871	-16.4597 *	413	-3.9822	-3.4217	-3.1335
CONT	-1.4860	-14.7615 *				
NFA	-0.5266	-8.0428 *				
CONT1	-0.1653	-15.4346 *				

Where:

$\hat{\gamma}$ is the coefficient of the difference series at the previous period (t-1)

ADF Augmented Dickey-Fuller t-static, using MacKinnon critical values

* Statistically significant at 1 percent level

** Statistically significant at 5 percent level

*** Statistically significant at 10 percent level

6.4.4 Conclusions of Test on the First Difference

Although, most of the monetary base components' series are not stationary on the levels, ***the first difference of these series are stationary***. So we can tell that, in regression analysis, the variance of a series is finite, and the autocorrelation's coefficient decrease steadily in magnitude as time extended, so that their sum is finite, which validates that analysis. This facilitates testing the relationships between the monetary base components, and exploring the behavior of foreign sector, government, public scoter, commercial banks, private sector, and monetary authorities together in a typical country.

As far as control on the monetary base is concerned, NFA which is the reflection of the balance of payments, can not generally be considered as a variable to be controlled. GA on the other hand, could be seen in two different fashions. First, uncontrolled variations that can not be used as an active instrument to adjust the base and usually adjusted passively to the government's budget position. Secondly, as a controlled variable that could be used as an effective instrument in controlling the monetary aggregate or to achieve an ultimate macroeconomic goal. ***These issues along with others will be detected in the next section, the model estimates***.

6.5 Model Estimates

The regression to be estimated in scenario 1 is:

$$A1 = \alpha_0 + \alpha_1 A11 + \mu \tag{6.33}$$

And the regression to be estimated in scenario 2 is:

$$B1 = \beta_0 + \beta_1 B11 + \varepsilon \tag{6.34}$$

The above equations indicate how the endogenous variables of the model, either (NFA + GA) or (NFA only), respond to the policy action imposed by a central bank that tries to control the sources of the monetary base. The offsetting response is indicated by coefficient α_1 in scenario 1, and β_1 in scenario 2. If the uncontrolled components of the source base, either (NFA + GA) or (NFA only), are able to completely offset every change in controlled components, either α_1 or β_1 is minus one. This means that the central bank does not nave any capability to control the monetary base, every policy action will result in the opposite changes of the uncontrolled components. The long run effect will simply be to change the composition of the source base.

Table 6.4 represents the regression results of equations (6.33) and (6.34) for seven countries. Each sample period has been estimated with three kinds of data: monthly data (monthly growth), quarterly data (growth between quarters data), and yearly data (annual growth). This comparison is necessary to see how the changes of controlled components behave relative to any changes of uncontrolled components of the monetary base to restrain it, and vice versa how the uncontrolled components change relative to those who considered controlled to offset that changes, and when these behaviors take place. All the results are indicated in the following table, 6.4, and discussed in the section after.

Table 6.4 The Offsetting Power of Changes in UNCONT or NFA Over CONT or CONT1 Respectively in Seven Different Countries.

EGYPT			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t$ - $UNCONT_{t-1}$ (A1)	0.1107 (0.0631)	0.1696	2, 3, 8, 10, 11, 12
$UNCONT_t$ - $UNCONT_{t-3}$ (A3)	0.1984 (0.0604)	0.7328	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12
$UNCONT_t$ - $UNCONT_{t-12}$ (A12)	0.2590 (0.0566)	0.9284	1, 2, 4, 9
NFA_t - NFA_{t-1} (B1)	- 0.7242 (0.0134)	0.9095	2, 10, 11
NFA_t - NFA_{t-3} (B3)	- 0.7025 (0.0143)	0.9500	1, 2, 3, 4, 5, 6, 7, 9, 11, 12
NFA_t - NFA_{t-12} (B12)	- 0.6308 (0.0169)	0.9790	1, 2, 3, 6, 7, 8, 10, 11, 12
INDONESIA			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t$ - $UNCONT_{t-1}$ (A1)	- 0.7595 (0.0187)	0.8625	1
$UNCONT_t$ - $UNCONT_{t-3}$ (A3)	- 0.7917 (0.0202)	0.9215	1, 2, 3, 4, 6, 9, 10
$UNCONT_t$ - $UNCONT_{t-12}$ (A12)	- 0.8097 (0.0188)	0.9602	
NFA_t - NFA_{t-1} (B1)	- 0.7647 (0.0222)	0.7950	1, 3
NFA_t - NFA_{t-3} (B3)	- 0.8044 (0.0235)	0.9256	1, 2, 3, 4, 6, 9, 10
NFA_t - NFA_{t-12} (B12)	- 0.8292 (0.0222)	0.9755	

(Table 6.4 concluded)

KENYA			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t$ - $UNCONT_{t-1}$ (A1)	- 0.9563 (0.0399)	0.7306	1
$UNCONT_t$ - $UNCONT_{t-3}$ (A3)	- 1.0203 (0.0592)	0.6608	1, 2, 3, 4, 6, 8, 9
$UNCONT_t$ - $UNCONT_{t-12}$ (A12)	- 1.1426 (0.0597)	0.8173	1, 2, 3, 4, 12
NFA_t - NFA_{t-1} (B1)	- 0.4565 (0.0291)	0.4891	2, 9, 10
NFA_t - NFA_{t-3} (B3)	- 0.5078 (0.0278)	0.8367	1, 3, 4, 6, 7
NFA_t - NFA_{t-12} (B12)	- .5202 (0.0345)	0.9287	1, 3, 4, 12
MEXICO			
	Offsetting Coefficient	R^2	AR's
NFA_t - NFA_{t-1} (B1)	- 0.8691 (0.0252)	0.7184	1, 2, 3
NFA_t - NFA_{t-3} (B3)	- 0.7886 (0.0240)	0.9412	1, 3, 4, 6, 7, 9, 10, 11, 12
NFA_t - NFA_{t-12} (B12)	- 0.8689 (0.0226)	0.9878	1, 10
THAILAND			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t$ - $UNCONT_{t-1}$ (A1)	- 0.7003 (0.0500)	0.3684	2
$UNCONT_t$ - $UNCONT_{t-3}$ (A3)	- 0.7655 (0.0413)	0.8079	1, 2, 3, 10
$UNCONT_t$ - $UNCONT_{t-12}$ (A12)	- 0.9082 (0.0326)	0.9714	1, 2, 3, 10
NFA_t - NFA_{t-1} (B1)	- 0.7161 (0.0315)	.6241	2
NFA_t - NFA_{t-3} (B3)	- 0.8242 (0.0325)	0.9167	1, 2, 3, 10
NFA_t - NFA_{t-12} (B12)	- 0.9714 (0.0245)	0.9949	1, 2, 3, 6, 7, 10, 12

(Table 6.4 concluded)

UNITED ARAB EMIRATES			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t - UNCONT_{t-1}$ (A1)	- 2.1440 (0.0492)	0.9179	1
$UNCONT_t - UNCONT_{t-3}$ (A3)	- 2.0574 (0.0517)	0.9149	1, 3, 4, 6, 7, 10
$UNCONT_t - UNCONT_{t-12}$ (A12)	- 2.0144 (0.0490)	0.9313	1, 3, 4, 12
$NFA_t - NFA_{t-1}$ (B1)	- 2.1884 (0.0437)	0.9370	1
$NFA_t - NFA_{t-3}$ (B3)	- 2.1022 (0.0462)	0.9360	1, 3, 4, 6, 7
$NFA_t - NFA_{t-12}$ (B12)	- 2.0900 (0.0488)	0.9592	1, 3, 10, 12
UNITED STATES OF AMERICA			
	Offsetting Coefficient	R^2	AR's
$UNCONT_t - UNCONT_{t-1}$ (A1)	0.7253 (0.0623)	0.5216	1, 12
$UNCONT_t - UNCONT_{t-3}$ (A3)	0.8213 (0.0784)	0.4959	1, 2, 3
$UNCONT_t - UNCONT_{t-12}$ (A12)	0.8971 (0.0637)	0.9101	1, 3, 8, 9, 12
$NFA_t - NFA_{t-1}$ (B1)	- 0.0677 (0.0120)	0.1788	1
$NFA_t - NFA_{t-3}$ (B3)	- 0.0563 (0.0122)	0.7563	1, 2
$NFA_t - NFA_{t-12}$ (B12)	- 0.1714 (0.0199)	0.9657	1, 3, 7, 9, 11, 12

- Note: Standard Errors for coefficients appear in parentheses below relevant coefficients.
- Offsetting coefficients are α_1 and β_1 in equations (6.33) and (6.34) respectively.
- AR's Indicate number of serial correlated disturbances have been counted for as an indication of autocorrelated disturbances.

6.5.1 Model Estimates Conclusion

It was an interesting experiment to use the regression estimation explained in equations (6.33) and (6.34) to examine the controllability of the monetary base in seven different countries, and to explore how the endogenous variables of the model, UNCONT or NFA, respond to a policy action imposed by a central bank using the controlled variables, CONT or CONT1.

Table 6.4 presents the regression results. It gives a clear picture of the ability of the uncontrolled components (NFA + GA) or (NFA only) of the source base to offset any policy actions utilizing the controlled components. Put it differently, it gives clear picture of the ability of the controlled components (CONT) or (CONT1) of the source base to restrain any undesirable changes in its uncontrolled components. The difference between those two ideas, and which one initiate the interaction, will be explored in the causality test at the end of this chapter.

The offsetting response is indicated by coefficient α_1 in scenario 1 equation (6.33), and β_1 in scenario 2 equation (6.34). All the coefficient signs are negative, except for Egypt and USA in scenario 1 ($\alpha_1$coefficient). The major estimation results are as follows:

1. When one month lagged difference considered, the ability to offset changes in CONT movements by changes in (UNCONT) movements represented by $\alpha_1$coefficient ranked the countries as follow:

UAE (- 2.1440), Kenya (- 0.9563), Indonesia (- 0.7595), Thailand (- 0.7003), Egypt (0.1107), USA (0.7253)

Where the ability to offset changes in CONT1 movements by changes in (NFA) movements represented by $\beta_1$coefficient ranked the seven countries as follow:

UAE (- 2.1884), Mexico (- 0.8691), Indonesia (- 0.7647), Egypt (- 0.7242), Thailand (- 0.7161), Kenya (- 0.4567), USA (- 0.0677)

The explanatory power R^2 ranked from 16.96 % in Egypt to 93.70 % in UAE, indicating the variety of the ability to offset between the countries. In this interval, time is too short for the uncontrolled components of the base to adjust to the changes in central bank credits, and to induce making a generalized conclusion.

2. When three months lagged difference considered, the ability to offset changes in CONT movements by changes in (UNCONT) movements represented by α_1 coefficient is higher than the case above, it ranked the countries as follow:

UAE (- 2.0574), Kenya (-1 .0203), Indonesia (- 0.7917), Thailand (- 0.7655), Egypt (0.1984), USA (0.8213)

Where the ability to offset changes in CONT1 movements by changes in (NFA) movements represented by β_1 coefficient is also higher and ranked the seven countries as follow:

UAE (- 2.1022), Thailand (- 0.8242), Indonesia (- 0.8044), Mexico (- 0.7886), Egypt (- 0.7025), Kenya (- 0.5078), USA(- 0.0563).

The explanatory power R^2 is relatively high, and ranked from 49.59 % in USA to 95.00 % in Egypt, indicating the variety of the ability to offset between the countries like the case above. In this interval, the time is reasonably longer to show that the offsetting ability is higher for the uncontrolled components of the base to adjust to the changes in central bank credits.

3. When twelve months lagged difference considered, the results are dramatically high, using the corresponding domestic currency for each country, every 100.00 of that currency change in CONT variable will be offset by a very big opposite change in UNCONT variable reached 201.44 in United Arab Emirates and 114.26 in Kenya, that offsetting power is represented by α_1 coefficient, and shown in the table below that included ranking the countries for the purpose of simple clear comparison:

Country	α_1	R^2
UAE	- 2.0144	.931
Kenya	- 1.1426	.817
Thailand	- 0.9082	.971
Indonesia	- 0.8097	.960
Egypt	0.2590	.928
USA	0.8971	.910

Where the ability to offset changes in CONT1 movements by changes in (NFA) movements represented by β_1 coefficient is also very big reached 209 percent in UAE and 97.14 percent in Thailand, and ranked the seven countries as follow:

Country	β_1	R^2
UAE	- 2.0900	.959
Thailand	- 0.9714	.995
Mexico	- 0.8689	.988
Indonesia	- 0.8292	.976
Egypt	- 0.6308	.979
Kenya	- 0.5202	.929
USA	- 0.1714	.966

The explanatory power R^2 is very high, and ranked from 81.73 % in Kenya to 99.49 % in Thailand, indicating that the very high ability to offset for those countries are explained well by the explanatory variables. In this interval, the time is long enough to show that the

offsetting ability is higher for the uncontrolled components of the base to adjust to the changes in central bank credits.

4. The results indicated support the hypothesis that every policy action concerning central banks' credits will be either neutralized or overcome significantly by opposite changes in either the NFA plus GA (considering GA uncontrolled variable) or NFA only, especially in LDC.

In detecting the controllability of the base, more study to the behavior of NFA is needed to see with more insight its offsetting power. NFA reflects the balance of payments' position in a typical country, and comprises a high percentage of the source base, especially in the LDCs. To detect the offsetting power of NFA that varies positively with the countries' degree of openness, the series Export, Import, and GNP in the seven countries under investigation in an annual bases from the IFS data were used. By adding Export plus Import and dividing the results by GNP for each country, as a measure of openness, I got the results presented in the table below that roughly could represent how each country is open to the rest of the world, by measuring how much international trade it gets engaged in. The results below supports my previous results in the sense that, the more open the economy, the less the controllability power of the country's central bank over their monetary base, and changes in monetary base, in turn, are linked to the positions of balance of payments and in some sense government budget.

Country	Openness
UAE	1.0396
Kenya	0.6092
Thailand	0.4753
Egypt	0.4578
Indonesia	0.4105
Mexico	0.2244
USA	0.1543

6.6 Graphical Display

In the process of examining the controllability of the base, the charts of the variables supported the proceeding regression results. It confirms with the results and makes it very clear that the long run effect of changing one of the controlled components of the source base will be ended up with changing in the composition of the source of the monetary base only. In other words, any changes in the central bank' credits imposed will cause opposite changes in either NFA plus GA or NFA only, lifting the long run effect with changing the composite of the base. Two charts followed for each country, one plot UNCONT against CONT, and the other plot NFA against CONT1, the series that has been defined before and used in the regressions. The graphed has been scaled to the nearest logical upper and lower limits automatically, and designed to get more understandable picture about the relation between the variables exhibited.

I should mention that although data displays are easier to interpret than tabular representations of the same data, it could also be unhelpful, exaggerated and even deliberately deceiving. They can also be one of the most powerful techniques of exploratory analysis available and become a mean of conveying complex and changing relationships in a simple flexible manner.

This part is explicitly concerned with the Graphical Display as an area of exploratory time series analysis to the relationships between variables under investigation, it shows how they move in opposite directions that made the controllability unattainable, this will lead to better models, more efficient and greater understanding of the relationships between the data at hand, the underlying economic theory, and the modeling techniques employed accompanied by its results.

A great deal of research has been carried out recently on the theory of graphical perception, leading to a much deeper understanding of the scientific foundations underlying graph construction, Tufte (1983), Cleveland and McGill (1987). Tukey and Wilk (1970), Tukey (1977), and Chambers et al. (1983).

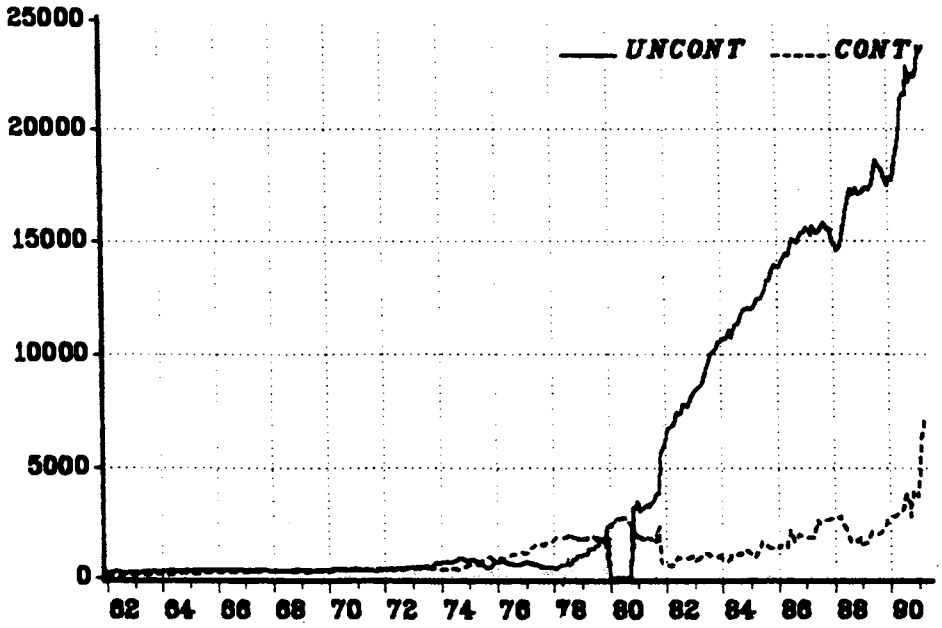


Figure 6.2 *EGYPT*: Changes in UNCONT and CONT Variables

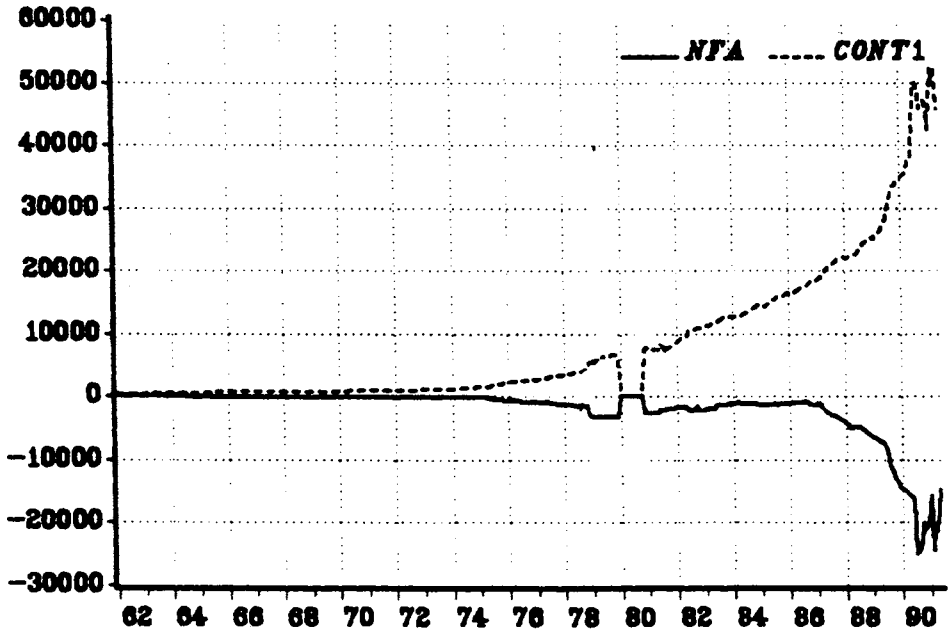


Figure 6.3 *EGYPT*: Changes in NFA and CONT1 Variables

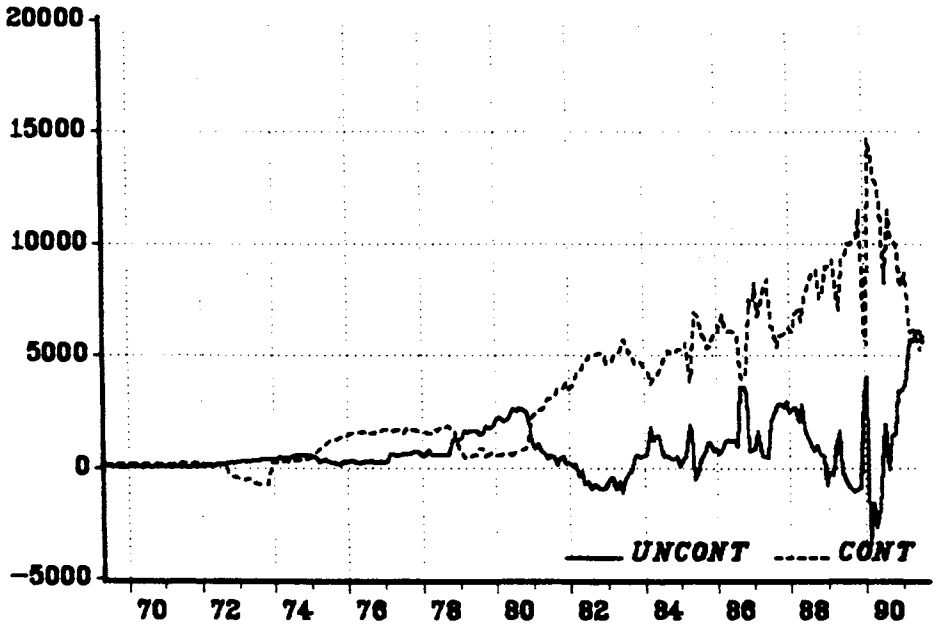


Figure 6.4 ***INDONESIA:*** Changes in UNCONT and CONT Variables

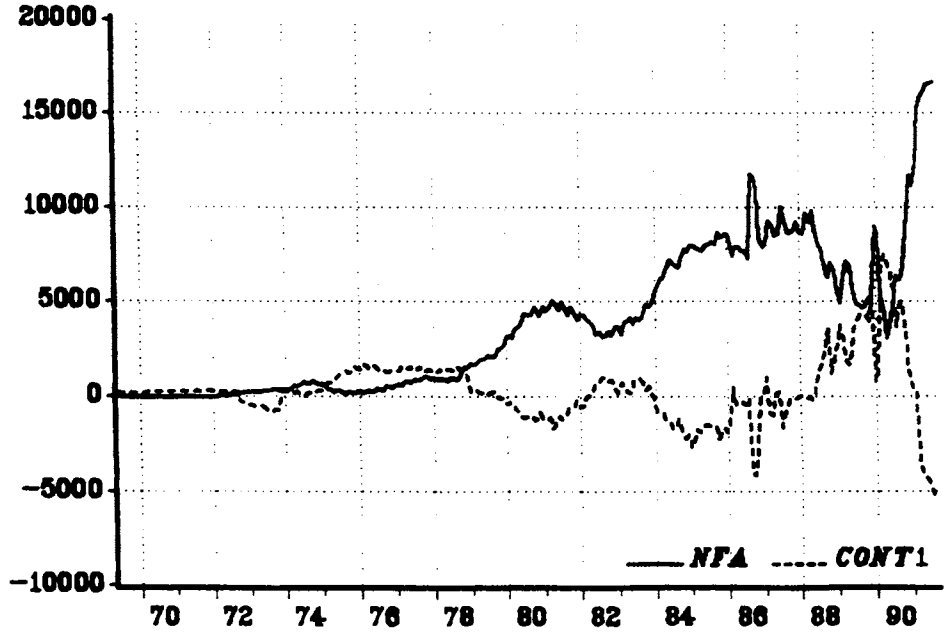


Figure 6.5 ***INDONESIA*****:** Changes in NFA and CONT1 Variables

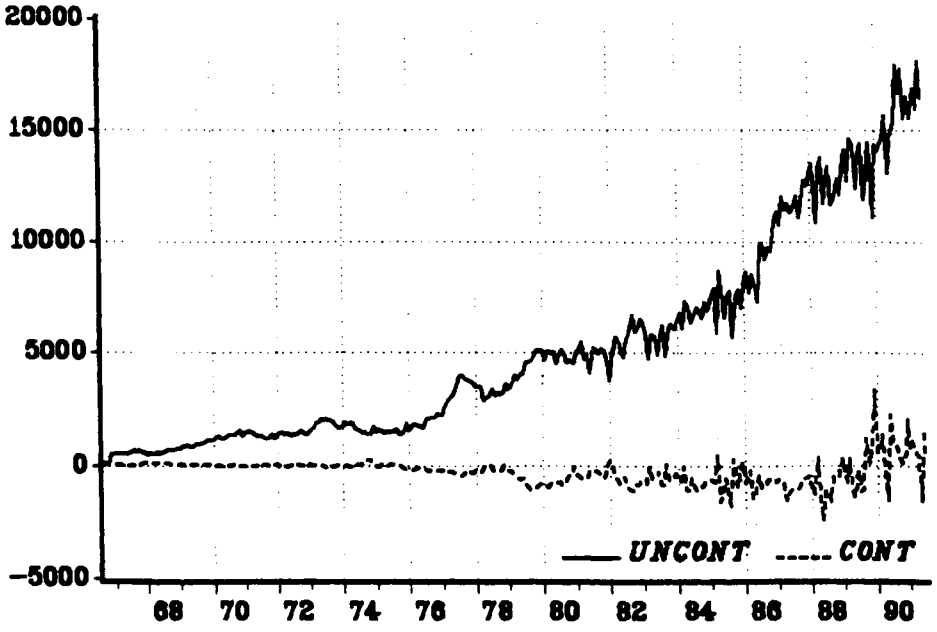


Figure 6.6 ***KENYA:*** Changes in UNCONT and CONT Variables

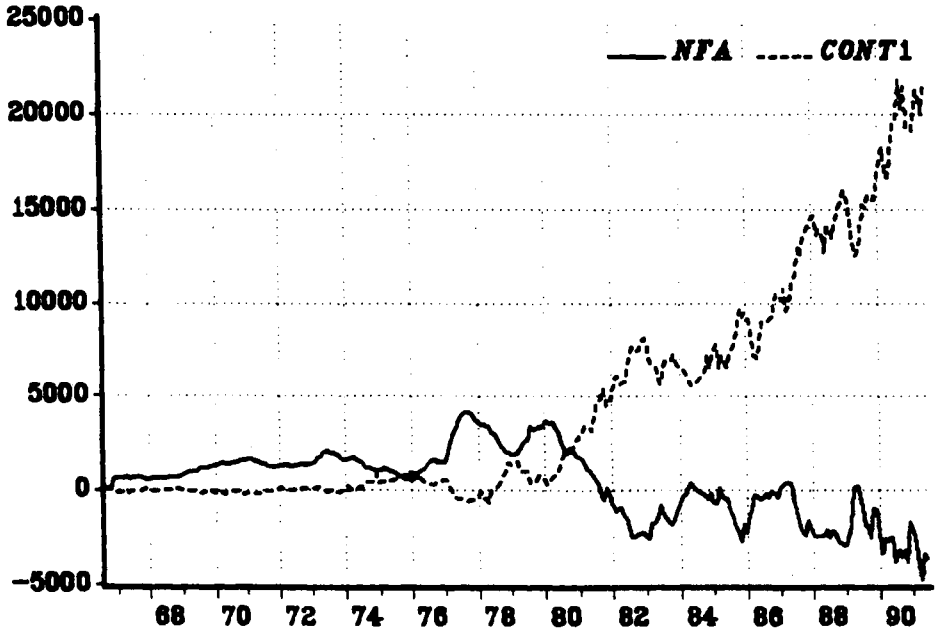


Figure 6.7 ***KENYA*:** Changes in NFA and CONT1 Variables

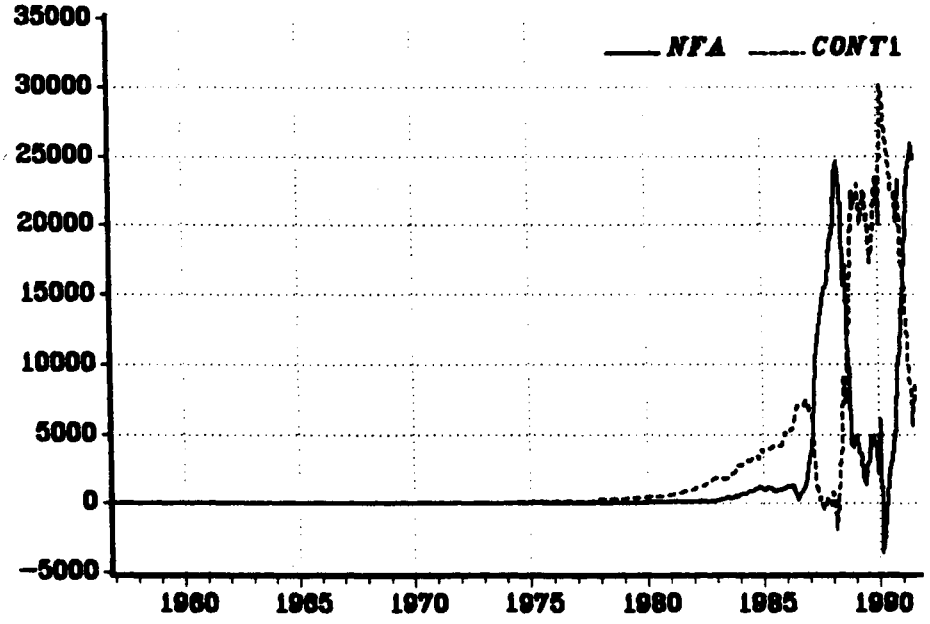


Figure 6.8 ***MEXICO***: Changes in NFA and CONT1 Variables

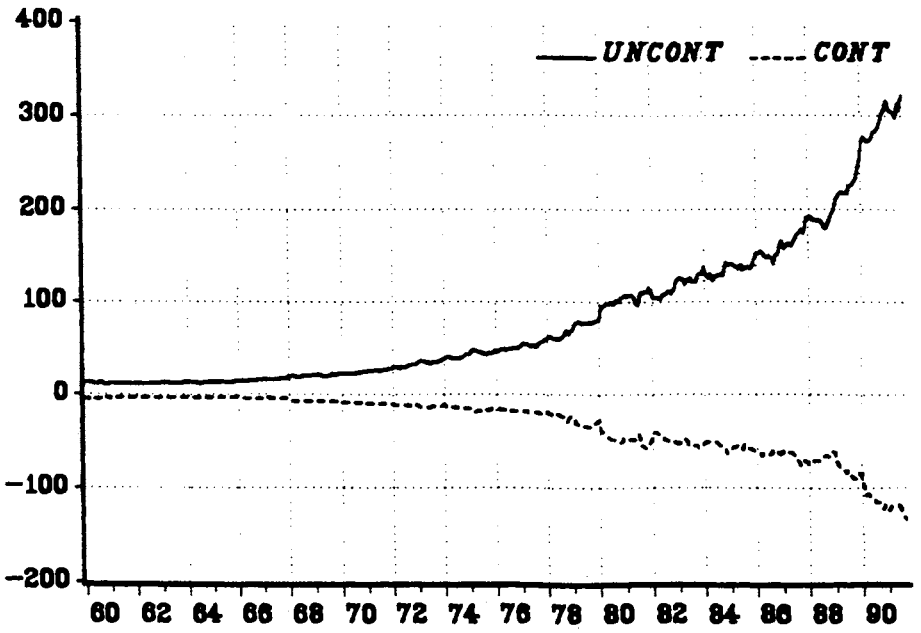


Figure 6.9 ***THAILAND:*** Changes in UNCONT and CONT Variables

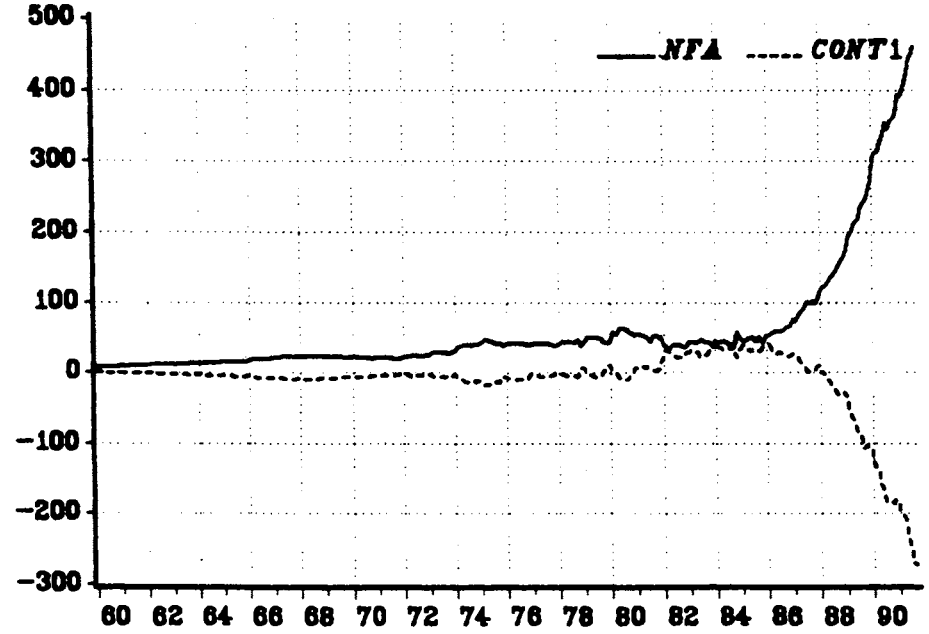


Figure 6.10 ***THAILAND***: Changes in NFA and CONT1 Variables

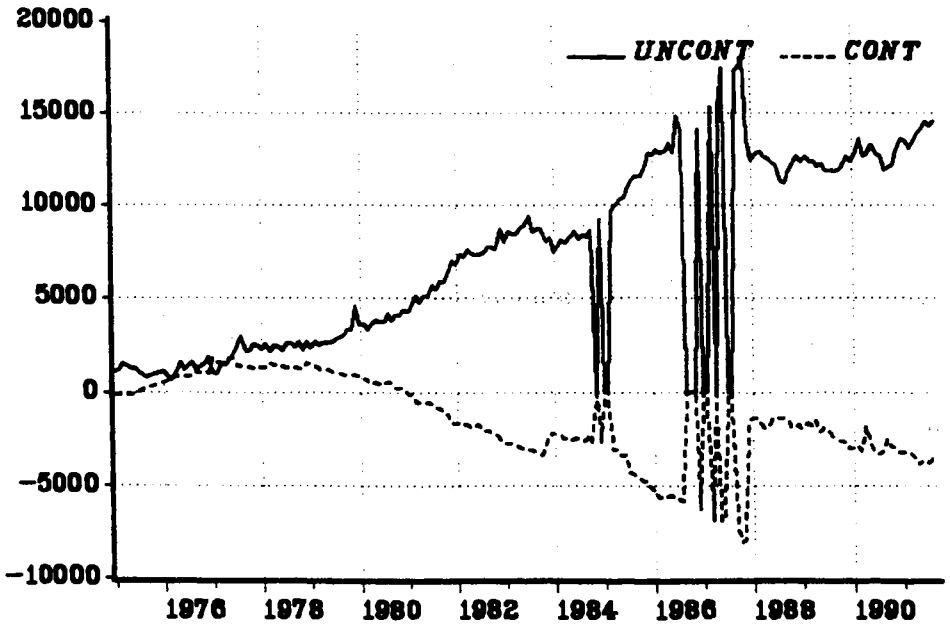


Figure 6.11 ***UNITED ARAB EMIRATES:*** Changes in UNCONT and CONT Variables

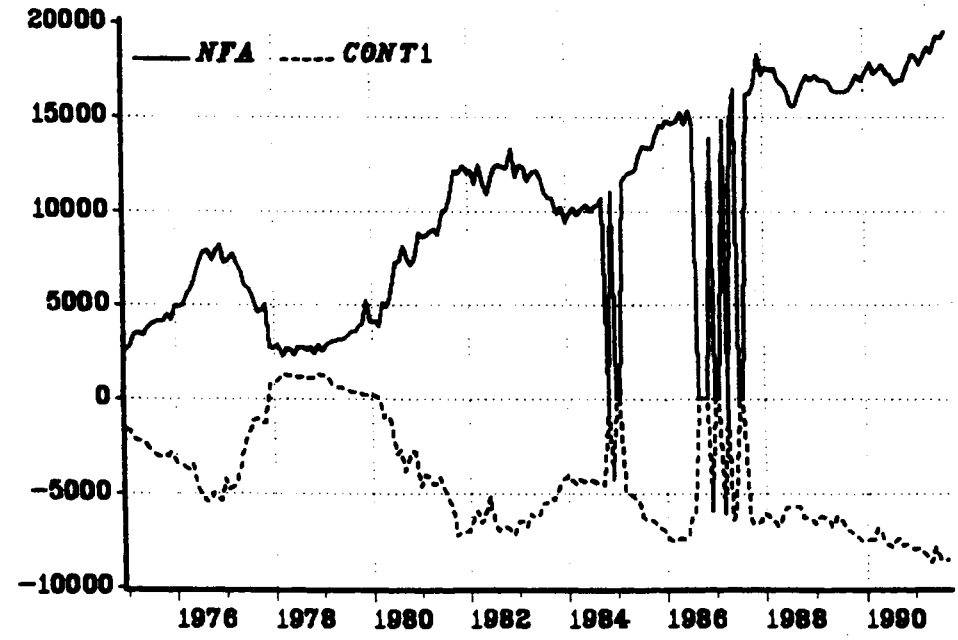


Figure 6.12 ***UNITED ARAB EMIRATES:*** Changes in NFA and CONT1 Variables

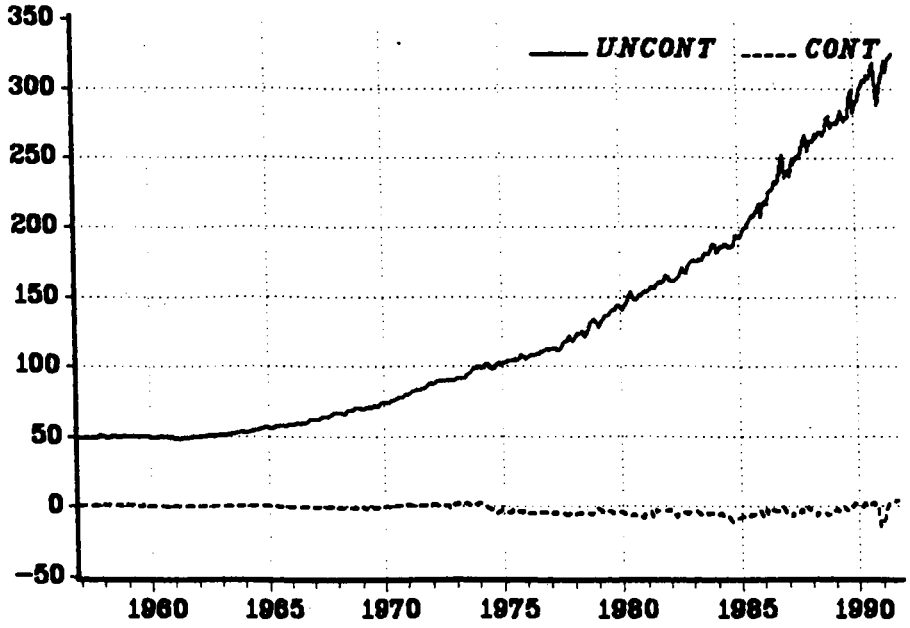


Figure 6.13 *USA:* Changes in UNCONT and CONT Variables

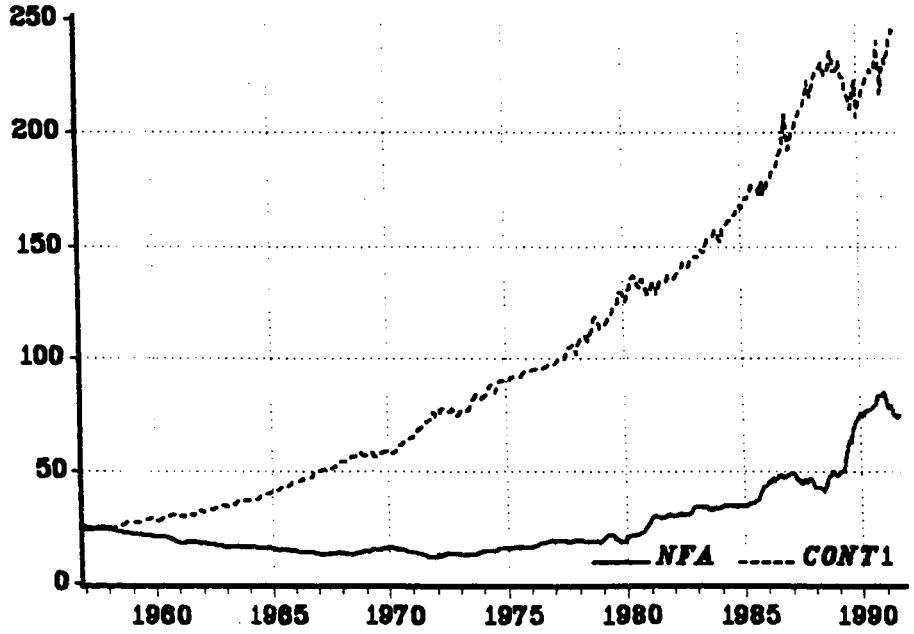


Figure 6.14 *USA*: Changes in NFA and CONT1 Variables

6.7 Causality Test

Does NFA cause CONT1 variables? Does CONT1 variable cause NFA? This can be determined by examining whether or not lagged information on CONT1 has any significant role in explaining NFA in the presence of lagged NFA itself, what has come to be known in economics as Granger causation testing. In the outset, it has to be noted that correlation does not necessarily imply causation in any meaningful sense of the word. The test considers the following equations:

$$NFA_t = \lambda_1(\Gamma)NFA_{t-1} + \lambda_2(\Gamma)CONT1_{t-1} + \varepsilon_{1t} \quad (6.35)$$

$$CONT1_t = \delta_1(\Gamma)NFA_{t-1} + \delta_2(\Gamma)CONT1_{t-1} + \varepsilon_{2t} \quad (6.36)$$

Where $\lambda_1(\Gamma)$, $\lambda_2(\Gamma)$, $\delta_1(\Gamma)$, and $\delta_2(\Gamma)$ are polynomials in the lag operator, Γ.
For example, $\lambda_1(\Gamma)$ might be

$$\lambda_1(\Gamma) = \alpha_{10} + \alpha_{11}\Gamma + \alpha_{12}\Gamma^2 + \cdots\cdots + \alpha_{1k}\Gamma^k \quad (6.37)$$

$\lambda_2(\Gamma)$, $\delta_1(l)$, and $\delta_2(\Gamma)$ are similarly formulated with unknown coefficients α_{2j}, β_{1j}, β_{2j}, respectively.

If in the presence of lagged NFA, lagged CONT1 make no significant explanation of NFA_t in equation (6.35), then we say, "CONT1 does not cause NFA in the Granger sense." Similarly, if lagged NFA' s make no significant contribution to the explanation of CONT1 in the presence of lagged CONT1' s in equation (6.360, then NFA "does not cause" CONT1. Thus if $\lambda_2(\Gamma)$ is zero, but $\delta_1(\Gamma)$ is not, then NFA is causal. If both $\lambda_2(\Gamma)$ and $\delta_1(\Gamma)$ are zero, neither variable is causal, and if neither $\lambda_2(\Gamma)$ nor $\delta_1(\Gamma)$ is zero,

CONT1 and NFA are mutually causal. No deep philosophical meanings are attached here to the word "causal." I simply distinguish the cases in which another variable's lags either do or do not make a net additional explanatory contribution once the dependent variable's own autocorrelation has been accounted for.

6.7.1 Empirical Results

Given this framework, with classical assumptions applied to the error terms, and with the sufficient data at hand, I used the approximate F statistic for the Granger causality test. To test for CONT1 causation, I run a regression of NFA on lagged NFA' s and lagged CONT1' s as the unconstrained regression, drop the lagged CONT1' s, regressing NFA only on the lagged NFA' s for the restricted regression, and compute the F statistic in the usual way. The regression errors, α_{1t} and α_{2t}, if correlated, required the use of a method of estimation called "Seemingly Unrelated Regressions."

6.7.2 Conclusions

The results are very sensitive to the number of lags included and each variable (either NFA or CONT1) has a role in explaining the other. In USA, Indonesia, Mexico, and Kenya using just one lag the conclusion is that we fail to reject our null hypothesis that CONT1 variables are not Granger caused by NFA, while CONT1 variables do play a significant role in the explanation of the NFA! With three lags these conclusions are reversed, then from the fifth lag NFA plays a significant role in explaining CONT1 variables. By observing the results from the sixth lag the powerful explanation of NFA decline gradually while CONT1 variables roles get stronger until the 24^{th} lag at which their significance gets equalized.

For Egypt the sensitivity to the number of lags is obvious too. Using just one lag, the conclusion is that each variable has a role to play in the determination of the other, while CONT1 variable is a little bit powerful than NFA. They equalized at lag 7^{th} then the results are reversed after that, where NFA take the lead in terms of significance until the 24^{th} lag.

Thailand and United Arab Emirates the situation is different, although CONT1 variables play a role in the determination of the NFA, NFA has a very significant role in the explanation of CONT1 variables from the first lag to the 24^{th} lag.

CHAPTER VII

SUMMARY AND CONCLUSIONS

There were several interesting findings in this study, especially for the monetary authorities in developing countries. The findings provide those authorities with a better understanding of the possibilities and preconditions for an appropriate use of the experiences gleaned from monetary policy experiences in developed economies in monetary planning, implementation of planned targets, and usage of monetary instruments for this purpose. It contributes to a better understanding of the need for (1) monetary policy methods of control over monetary base, (2) adjustments in monetary policy instruments, and (3) the appropriate structure of institutional changes. The findings are useful in cases of strong exogenous influences on monetary processes from deteriorating foreign markets and balance of payments influencing the monetary process and economic developments especially in developing economies.

Although the basic framework of analysis of the money supply is similar in all economies, the money supply process itself is highly differentiated depending on variety of factors, such as the openness of the economy. Each country maintains its balance of payments. Some of these Payments' systems have been under a fixed exchange rate, where their domestic currency pegged to only one other foreign currency, or to a basket of currencies. Since 1971 the world has moved to floating exchange rates. That leads to highly differentiated monetary base components in all economies, a phenomena that has been revealed in the study.

7.1 Summary

Given the variety of institutional arrangements existing throughout the world, it is important to know that in many countries a central bank has sole responsibility for all monetary functions. In other cases some of these functions are either partially or entirely carried out by the central government and/or by other official institutions. In fulfilling its obligations as a lender of last resort, a central bank may encounter conflicts with its responsibility to manage the nation's monetary policy, especially, in LDC where the theory of monetary policy has not been fully explored. It is important to determine exactly either the components of the money or the monetary base or what money does, and to explain why this peculiar institution has arisen. With this in mind, *Can the monetary authorities in less developed countries control the monetary base sufficiently, so that they can control their money stock growth?*

The Base

The base may be regarded in either of two equivalent ways, the source base or the use base. The factors, from the assets and liabilities of the monetary authorities balance sheet, that make the base available are called "sources." Where the forms in which the base is held are referred to as "uses."

The Source Base

Utilizing the information in the two condensed balance sheets, central bank and demand deposit banks, and after abstracting the details, looking for the essence, I got a condensed balance sheet for the monetary system as a whole. From which, by netting the items appearing on the asset side of consolidated balance sheets of the monetary authorities and the commercial banks, a picture of relationships existing between the monetary sector as whole and the rest of the economy, a clear picture of how the money supply components formalized, and a formalization of the monetary base.

The source base components can be netted as:

1. Net Foreign Assets, that is foreign assets minus foreign liabilities minus long-term foreign borrowing,
2. Government Account, a discrepancy between claims on government and government deposits,
3. Commercial Banks advances, that are claims on commercial banks,
4. Public Sector advances, that is claims on public sector, and
5. Other Sources.

The Use Base

The monetary base relates to components belong to its uses consists of things that function as reserves of the banking system and are obligations of the government or the central bank. Put another way, reserve requirements and currency.

The components of the base in the seven different countries in the study: Egypt, Indonesia, Kenya, Mexico, Thailand, United Arab Emirates, and United States show significant dispersion of the creation of monetary base in different economies. These differences usually were oversimplified to make a role applicable to many of the differentiated economic structures. The ***institutional economic system*** explains how and why the countries are different in either financial institutions or the size of their public sector that formalize the structure of either the economies system or the financial activities inside a country, and how these factors influence the components of the monetary base. For instances, it includes financial transactions, foreign transactions, income distribution, ownership of the means of production including capitalist or socialist economic system, and integration mechanism including free markets and/or central planning mechanism.

The structure of monetary base could be influenced by the level of ***economic development***. The needs for central bank transactions are greater in developing economies than developed economies. Central bank credits to other monetary institutions are relatively greater with less efficient financial markets in developing economies. Central

bank credits to other non-monetary institutions are more significant in developing economies. Greater sensitivity to deterioration of foreign markets in developing economies leads to a greater share of creation of monetary base by foreign transactions.

The Controllability of the Base

A careful look at these components of the source base shows that the net foreign assets (NFA) reflects the position of a country's balance of payments, which is not under the control of the central bank. Variations of credit from a central bank to the government (GA), in some countries especially LDC, are also not under their central bank's control, because a central bank adjusts passively to the government's budget position. Thus, NFA and GA are essentially ***uncontrolled*** components, and the monetary authorities are left to the rest of the components, which is claims on commercial banks, claims on public sectors, and other sources, the ***controlled*** components, through which monetary authorities try to control the base.

In the distinction between developed and developing countries, the main difference in the sources of the base-money is that in developed countries the major component of base money is claims on government (i.e., government securities), whereas in developing countries net foreign assets are the major component. In the United States, 70 percent of the supply of the base consists of federal reserve bank credit to the government in the form of US government securities. Therefore, in the US the money base is substantially under the control of Fed assuming some form of the Fed independence. In a small open economy foreign assets and foreign liabilities are significantly consist the sources of the monetary base, and play an important role in its behavior. This fact generates a major difference in the base structures between developed and developing economies.

The relevant issue concerning the money supply control, then, is whether the foreign components of the monetary base can be offset by the actions of the central bank using domestic components. If a Central Bank is to maintain control of the monetary base

for pursuit of domestic goals, the impact of foreign reserves on the base-money must be sterilized by using sterilization policy instruments.

Many LDCs are unable to influence the world price of any good. An increase in the money supply creates an excess demand for goods, services and assets. This excess demand is met by foreign suppliers (at the previously prevailing prices). The effect of the increase in the money supply is to create a balance of payments' deficit by the purchase of foreign goods and assets.

If the balance of payments' deficit (surplus) exists, it creates a negative (positive) overseas impact on the money supply. The money supply is thus reduced (increased), and this continues until it reaches original level. In models like that, equilibrium in the money market is restored not by change in income as in the quantity theory but, instead, by a balance of payments deficit (surplus).

Summary of the Empirical Results

The elements that have been laid out in the preceding discussion, of the theoretical mechanism of the monetary base in seven different countries, were subjected to empirical examination. The relevant issue is whether fluctuations in the uncontrolled components in the source base can be offset by the actions of central bank, so that the monetary authorities are able to provide a particular quantity of base money. The controllability of the monetary base depends primarily on the degree to which the movements of central bank credit are offset by opposite changes in the uncontrolled components. If movements of central bank credits are offset to a large degree, there may be little base control, otherwise it is controlled.

The centerpiece of the difference is GA, If GA is considered as an uncontrolled component, it is added to the NFA generating the UNCONT variable, leaving CONT variable as the rest of the components. But, if GA treated as controlled component, the controlled variable become CONT1 variable, leaving the NFA alone to be treated as the only uncontrolled variable.

It is generally recognized that estimation and testing of structural hypotheses using time series data must pay attention to the regression residuals. They may display systematic behavior that is inconsistent with the classical assumptions. In particular, it was recognized that the residuals from time series regressions are usually autocorrelated. Relying on classical regression methods when errors are serially correlated does not affect the unbiasedness or consistency of the estimators, but it does affect their efficiency.

Stationarity requires the process to be in particular state of 'statistical equilibrium' which in turn implies that the mean and variance of any time series must be constant. In short, if a series has a finite mean, variance and covariances, i.e., all of which are independent of time, this series is defined as stationary.

After the components of the base of the seven countries have been netted and left the base with either UNCONT and CONT, or NFA and CONT1, the attempt to investigate the stationarity of these components by applying Augmented Dickey-Fuller regression provides the existence of a unit root, and the components of the base in the sample countries are integrated of order one, I(1). So we can tell that the variance goes to infinity as the time 't' goes to infinity, and the autocorrelation coefficient goes to '1' as 't' goes to infinity, which invalidates the empirical work on the levels.

Two or more variables are said to be ***cointegrated*** if individually each is nonstationary but there exists a linear combination of the variables that is stationary. In the attempt to find the appropriate linear combination of the series by estimating a ***cointegrating regression*** between the current values of the variables, and then test whether that linear combination is stationary by testing the residual from the regression, we fail to reject the hypothesis of non-cointegration, and the unit root exists in the disturbance term, i.e., the linear combination of the series is non-stationary, which will not validate any regression on the levels and imposes the investigation and the uses of the first difference.

In testing on ***the first difference***, all the data series for the seven countries are stationary, which facilitates testing the relationships between the monetary base components in a typical country. So we can tell that, in regression analysis, the variance of a series is finite, and the autocorrelation's coefficient decrease steadily in magnitude as time extended, so that their sum is finite.

Model Estimates

After refining the data base series, it was an interesting experiment to examine the controllability of the monetary base in the seven different countries, and to explore how the endogenous variables of the model, UNCONT or NFA, respond to a policy action imposed by a central bank using the controlled variables, CONT, or CONT1. As far as control on the monetary base is concerned, NFA which is the reflection of the balance of payments, can not generally be considered as a variable to be controlled. GA on the other hand, could be seen in two different fashions. First, uncontrolled variations that can not be used as an active instrument to adjust the base and usually adjusted passively to the government's budget position. Secondly, as a controlled variable that could be used as an effective instrument in controlling the monetary aggregate or to achieve an ultimate macroeconomic goals.

When one month lagged differences or three months lagged differences are considered the empirical tests indicated that any movement in the controlled variables have an opposite changes in the uncontrolled variables with variety of the ability to offset between the countries. In this interval the time is too short for the uncontrolled components of the base to adjust to the changes in central bank credits, and to induce making a generalized conclusion. It worth to note here that in the three months lagged difference, the time is reasonably longer to show that the offsetting ability is higher for the uncontrolled components of the base to adjust to the changes in central bank credits.

When twelve months lagged difference are considered, the results are dramatically high, using the corresponding domestic currency for each country, every one unit change

of that domestic currency in CONT variable will be more than offset by a very large opposite changes in UNCONT variable reaching 201.44 in United Arab Emirates and 114.26 in Kenya. Where the ability to offset changes in CONT1 movements by changes in (NFA) movements is also very big reached 209 percent in UAE and 97.14 percent in Thailand. The explanatory power R^2 is very high, indicating that the very high ability to offset for those countries is explained well by the explanatory variables. In this interval, the time is long enough to show that the offsetting ability is higher for the uncontrolled components of the base to adjust to the changes in central bank credits.

This finding presents evidence that every policy action to control the monetary base by changing central bank claims on domestic sector has been more than neutralized by opposite movements in net foreign assets only, or net foreign assets and government account. The long run effect is simply to change the composition of the source of the base. Even though the process is different, the results of this study support the idea of monetary approach to the balance of payments concerning the ***inability*** of the monetary authorities to control money supply in an open economy.

More detection has been done to the behavior of NFA to see with more insight its offsetting powerful. Utilizing the series: Export, Import, and GNP in the seven countries under investigation in an annual bases from the IFS data, by adding Export plus Import and dividing the results by GNP for each country gave the results that roughly could represent ***how each country is open to the rest of the world***, by measuring how much international trade it gets engaged in. The results supports the previous results in the sense that, the more open the economy, the less the controllability power of the country's central bank over their monetary base, and changes in monetary base, in turn, are linked to the positions of balance of payments and in some sense government budget.

In an attempt to find if NFA causes CONT1 or if CONT1 causes NFA, ***Granger Causality test*** has been Iimplemented. With the sufficient data at hand, I used the approximate F statistic to find whether or not lagged information on one variable has any

significant role in explaining the other. The results are very sensitive to the number of lags included, and each variable either NFA plus GA (UNCONT) or NFA only with the controlled variables, both have a significant role in explaining the other from the first lag to the 24th lag.

Graphical display presented as an area of exploratory time series analysis to the relationships between variables under investigation, it shows how they move in opposite directions that made the controllability unattainable, this lead to better understanding of the relationships between the data at hand, the underlying economic theory, and the modeling techniques employed accompanied with its results. The charts supported the proceeding regression results. It confirm with the results and make it very clear that the long run effect of changing one of the controlled components of the source base will be ended up with changing in the composition of the source of the monetary base only.

Analytical structure

A set of links relating to monetary base helps us to interpret certain recurring news items and also helps us to build the analytical structure used in the research. In a close economy, the monetary base is determined by the action of the central bank. In an open economy, the base is also affected by the position of the balance of payments. If the balance of payments deficit (surplus) exists, it creates a negative (positive) overseas impact on the monetary base. The monetary base is thus reduces (increased), and this continues until it reaches original level. The equilibrium in the money market, in model like that, is restored not by changes in income as in the quantity theory but, instead, by a balance of payments deficit(surplus).

The influence of the balance of payments on the money supply occurs through two different channels:

1. current account surplus or deficit, a surplus of current account of balance of payments leads to the creation of money and reserve money, and a current account deficit leads to a reduction of it.

2. the involvement of monetary institutions in foreign financial transactions in the balance of payments associated with the involvement of non-monetary units in these transactions.

Studying the money market in an open economy allows us to trace the effects of a countries' monetary policies on its balance of payments. It is known that monetary policy will affect directly the domestic interest rate. The capital account of the balance of payments depends mainly on relative real interest rates (both home and abroad), a higher interest rate in our country will attract capital from abroad. This attraction will generate a balance-of-payments surplus, a money inflow, which is valid only in the short run. Over the longer run, this effect ceases or is even reversed.

Autonomous expansion affects the balance of payments both through an income effect and through an interest rate effect. It is possible that an expansionary fiscal policy will actually improve the balance of payments. In the long run, though, the lending attracted with higher interest rates must be repaid with interest, canceling the international reserves gained from the initial inflow of borrowed money. So the net result is probably a worsening of the balance, though there would be a short-run improvement if enough lending were attracted by the higher interest rates.

The effect of monetary and fiscal policy on the balance of payments are quite similar. With either policy, expanding the economy will result in a negative income effect on the balance of payments in the short run. The two policies differ mainly in their effects on interest rates, which are bid up by expansionary fiscal policy but bid down by expansionary monetary policy. This difference imparts only a temporary difference in balance-of-payments effects: if one attracts foreign funds and the other repels them, sooner or later these international lending flows will be repaid with interest. The more durable effect of either policy on the balance of payments is the income-related effect they have in common.

7.2 Conclusions

The increased interdependence of economies reflects the widespread foreign indebtedness of developing economies and their need to borrow from developed economies. The study provides better understanding between lenders and borrowers at different levels of economic development and with economic systems. A better understanding of economic climate in developing economies along with their financial organization may contribute to finding an optimal solution for economic policy.

In developing economies there is a greater sensitivity to the deterioration in foreign markets, which results in deterioration of balance of payments and wider involvement by monetary institutions in foreign financing, as reflected in the withdrawal of money and reserve money by foreign exchange transactions by monetary institutions. This means that foreign exchanges' transactions in developing economies have a stronger influence on leakage of money and reserve money. For illustration, a sharp improvement in the balance-of-payments current account -- a surplus, instead of the traditional deficit in this account -- this will result in a creation -- instead of the traditional leakage -- of money and reserve money by foreign exchange transactions by monetary institutions in these economies.

Economic theory considers the quantity of money and its rate of change an important determinant of how the economy functions. The study found that it is not the behavior of the monetary authorities alone that determines the quantity of money in the economy. The money supply process is, to some degree, influenced by the behavior of monetary authorities, commercial banks, the public, the foreign sector (balance of payments), and the government budget position.

The money supply process in any economy is determined by changes in the monetary base, where changes in the source base, in turn, are linked to the positions of balance of payments, and government budget, so the main feature of this situation is that

the movements of the source components of the base are beyond full control of the monetary authorities. Since there is a close relationship between the monetary base and money supply, difficulties face a central bank in any country to fully control the monetary base implies inability to control the money supply.

The analysis of the monetary base and other monetary process in the study contributes to the realization that some variables and relationships are neglected in existing monetary theories. The interpretation of some variables and ratios is oversimplified, assuming conditions existing only in a relatively small number of economies at the highest level of economic development, with the monetary and financial organization at the highest level of differentiation and efficiency. This may cause a readjustment of the existing equations about the money supply that would include variables, ratios, and parameters reflecting the influence of the institutional economic system and economic development level.

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