Theoretical and Empirical Aspects of the

Money Supply Process in the Lebanon

BY SOUHEIL WADI-HADDAD, B.A., M.Sc.(Econ)

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The early pages of this thesis present a theoretical study of the theory of money supply. The theoretical analysis has been developed in order to show the importance of money supply and to emphasise the relationship between the monetary base and the controlability of money supply.

This thesis argues that the changes in the Lebanese money supply are dependent on the activities of the Bank of Lebanon, the commercial banks, the public, and the foreign sector. A macro-economic model has been developed so as to include these activities and to show their influence on the money supply in the Lebanon through the adjusted monetary base and the money multipliers; short-run and long-run multiplier.

The empirical work of my thesis (1965-1974) is an investigation showing the link between the monetary base which is dependent on changes in commercial banks' reserves and their net foreign assets, and the money multipliers in the Lebanon. According to my empirical results, both the short-run and the long-run money multipliers have an elasticity of less than one, and changes in commercial banks' net foreign assets are dependent on and responsive to changes in the Lebanese balance of payments, and less responsive to changes in the differences between the Euro-dollar rates and the Bank of Lebanon discount rates.

The last sections of this thesis argue that monetary policy in the Lebanon has not been used efficiently by the Bank of Lebanon in order to control the expansion in the adjusted monetary base for the period 1965-1974. The Bank of Lebanon must have a certain strategy for controlling the monetary expansion; one of the suggested methods is the establishment of a strong government bond market so as to enable the Bank of Lebanon to make use of open-market operations in order to control the monetary base and money supply.
To My Parents
My grateful thanks are extended to my supervisor Mr. S.F. Frowen for his invaluable guidance and apt comments. I am also grateful to my fellow researchers Paul Remington and Chris Timms for their valuable assistance in my empirical investigations.

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CHAPTER I

The Theory of Money Supply

1 - Base Money

Two of the major money supply hypotheses are 1) the linear hypothesis and 2) the non-linear hypothesis. The linear hypothesis describes two mechanisms; the portfolio response of banks to surplus reserves, and the process generating surplus reserves independent of the banks' induced portfolio responses. The difference between actual and desired reserves gives surplus reserves. Banks like other business firms are interested in maximising their profits and do not wish to hold idle balances except of course for precautionary purposes. So when a bank has surplus reserves it would be induced to acquire earning assets. When such an acquisition happens it generates a loss of reserves to other banks, an outflow of currency and an increase in required reserves.

One bank's loss of reserves emerges as surplus reserves at another bank (assuming there are no leakages in the system). The new deposits may be converted into currency at the receiving banks or re-allocated in different ways between demand and time deposits. These responses induce banks to readjust their portfolios until the repetitive redistribution of surplus reserves, and portfolio adjustments absorb the initially available surplus reserves. The total portfolio response of the system to a prevailing level of surplus reserves is equal to:

\[ dE = \frac{1}{\lambda - \frac{P}{(1-n)} s} \]

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1 K. Brunner and A. Meltzer, "Some Further Investigation of Demand and Supply Functions for Money", J.F. 1964, p240-283
E is the system's portfolio of earning assets, s the prevailing volume of surplus reserves, \( \lambda \) the average loss-coefficient of the banks in the system. \( P \) is the average spillover of deposits in the system from expanding banks to other banks, \( n \) is a linear combination of spillover rates in the currency and time deposits on the secondary level occurring at the banks receiving deposits from expanding banks. The expression \( \lambda - p(l-n) \) is the money multiplier, it describes the built-in leverage of the system's response to prevailing surplus reserves.

A relationship connecting surplus reserves with observable entities emerges from a systematic inquiry into the processes generating a surplus independent of the banks' portfolio adjustment. The surplus reserves stimulate the multiplier mechanism and are eventually absorbed into the process. The relationship contains, the monetary base, \( B \), the sum of changes in required reserves and the distribution of existing demand deposits between classes of banks with different requirement ratios.

The non-linear hypothesis takes a specific view of the credit market where money stock and interest rate emerge from the interaction of the public's asset supply to banks and the banks' portfolio adjustment. The basic theory behind the non-linear hypothesis describes the banks' desired rate of portfolio adjustment as a function of surplus reserves.\(^2\)

The desired reserves \( R^d \) are a function of demand deposits, \( D \), time deposits, \( T \), a vector of interest rates, \( i \), and the discount rate, \( u \).

\[
R^d = R^d(D, T, i, u)
\]

The desired reserves are derived from required reserves \( R^r \), excess reserves \( R^e \), and banks' vault cash outside legal reserves, \( v \), with \( r^d \) and \( r^e \) being average requirement ratios for demand deposits and time deposits.\(^3\) A money multiplier could be derived for the non-linear hypothesis.

\(^{2}\)ibid p.249-256

\(^{3}\) \[ R^d = R^r + R^e + V \]
\[ R^r = r^d \Delta D + r^tT \]
\[ R^e = R^e(i, u, D+T) \]
hypothesis where money stock is responsive to base money, reserve requirements, discount rate, the public's behaviour with demand deposits and cash.

The monetary base can be calculated by adding currency in circulation and member bank deposits at the central bank, or by adding currency held by the non bank public and banks' reserves including vault cash of non member banks. The reserves can be expressed as a proportion of total bank deposits.

\[ R = r(D + T + G) \]

D being demand deposits, T is time deposits and G is the Treasury's deposits with commercial banks. If we assume that the public holds a fixed total amount of currency, then all changes in the supply of base money by the central bank would remain in the commercial banks in the form of deposits, the amount depending on the legal reserve requirement ratios for different types of deposits. But if the public always desired to hold a fixed ratio of currency to demand deposits say £0.20 for every £0.80 of demand deposits, in this case the deposit creating potential of the banking system is less than in the fixed total amount case. There is a certain ratio of currency drain directly linked to the value of d, where \( d = \frac{c}{D} \), c being currency. The value of the ratio d must be taken into account in determining how much base money must be supplied to achieve a desired increase in the money stock. The behaviour of the currency to demand deposit ratio is influenced by many factors such as income levels, credit facilities and uncertainty regarding the general economic situation.

Banks are required to hold reserves behind time deposits, the public's desire of holding a certain ratio of time deposits plays a part in determining the change in the stock of money which follows the changes in the monetary base, with the t-ratio being equal to

\[ t = \frac{T}{D}, \quad T = \text{time deposits}. \]

The t-ratio is influenced by various

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factors, chief among many is the competition among banks for individual and business savings. Banks pay interest on time deposits up to ceiling rates set by the central bank. As banks compete for more deposits the interest rate on time deposits increases. The interest rates offered on time deposits are themselves dependent on the opportunities available for profitable investment by the banks. If there is a high demand for bank loans then the interest rates on bank loans are expected to be rather high and banks would compete for more deposits in order to have more funds available for lending, thus increasing the rate of return offered on deposits.

Commercial banks are required to hold a certain proportion of reserves against government deposits. The amount of government deposits in commercial banks is determined by the flow of Treasury receipts relative to Treasury expenditures, and by the Treasury’s discretion about what proportion of its balance to keep with commercial banks rather than the Central Bank. Let $G$ be the government deposits, it can be expressed as a proportion $g$ of private demand deposits $D$; $G = gD$, $g + G/D$

Let $M$ the money supply be equal to currency $C$ plus deposits $D$, and the monetary base $B$ equals $R$ plus $C$, we have:

$$R = r(D + T + G)$$

$$C = dD, \quad T = tD, \quad G = gD$$

From this information we could develop a multiplier-base framework within which the money stock $M$ is expressed as

$$M = mB$$

$m$ being the money multiplier and is influenced by changes in $d$, $t$ and $g$, and the changes in these parameters reflect the actions of the public, banks, and the Treasury with respect to deposits. $B$ is the monetary base which is taken as the control variable for the process of controlling the money stock. The money multiplier is the connecting link between the monetary base and the money stock.
The high-powered money or the monetary base is held either by the public as currency $C$ outside banks or by banks as reserves $R$, $B =$ base money.

$$B = C + R \quad \text{divide by both sides by } M$$

we get:

$$\frac{B}{M} = \frac{C}{M} + \frac{R}{M}$$

$$\left( \frac{R}{D} \right) \left( 1 - \frac{C}{M} \right)$$ can be substituted for $\frac{R}{M}$

Let us consolidate all commercial banks into one hypothetical unit, then the aggregate reserve-deposit ratio of the banking system is denoted by $\frac{R}{D}$

then

$$\frac{B}{M} = \frac{C}{M} + \frac{R}{D} - \frac{R}{D} \frac{C}{M} \quad \text{OR}$$

$$B = M \left[ \frac{C}{M} + \frac{R}{D} - \frac{R}{D} \frac{C}{M} \right] \quad \text{OR}$$

$$M = \frac{B}{\frac{C}{M} + \frac{R}{D} - \frac{C}{M} \frac{R}{D}}$$

This expresses the total money stock in terms of the quantity of the monetary base the currency-money and reserve ratio.

The monetary base as defined by Cagan\(^5\) includes currency held by the public and bank reserves\(^7\) is ultimately under the control of the monetary authorities. The components of the monetary base as used by Cagan are gold coin or certificates and other money fully backed by gold, paper money or deposit balances not secured by gold reserves but constituting a liability of the Treasury, and bank rates issued as the liability of national banks.


\(^6\) Ibid

\(^7\) Ibid p. 45-117
The monetary base satisfies the following equation:

\[ B = DA + R + C - (d + o + f + TC) \]

- \( DA \): discounts and advances of the central bank to commercial banks
- \( R \): bank reserves
- \( C \): Treasury currency outstanding
- \( d \): Treasury deposits at the central bank
- \( o \): Central Bank's other deposits plus other accounts
- \( f \): Foreign deposits at the Central Bank
- \( TC \): Treasury cash

Cagan used three sources of changes in the monetary base for selected periods from 1876-1955. The three sources of changes are:

a) the monetary gold stock, 
b) Federal Reserve operations and 
c) Treasury operations.

Cagan's work tells us that gold flows have important effects on the quantity of high-powered money, and the changes in the monetary gold stock offset high-powered money directly, and in "the long-run there is a mutual dependence between the stock of gold and high-powered money." Cagan's findings support his view that the gold stock dominated the long-run movements in the U.S. quantity of high-powered money from 1876-1914, and became less predominant after 1914, and eventually lost their primary role in determining the quantity of high-powered money.

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8 K. Brunner and A. Meltzer op. cit. p. 245

9 P. Cagan, op. cit., p. 51

10 Ibid, p. 53
The operations of the Federal Reserve System as used by Cagan studies the relationship between changes in Federal reserve credit outstanding and changes in the monetary base. Throughout 1920 Federal Reserve credit outstanding was stable for the U.S. and began to decline around the end of that year, and afterwards it fell drastically for 1921-22. The significance of the absence of large increases in Federal Reserve Credit outstanding during the 1920's means that the Reserve banks were not using the excess gold reserves to increase the monetary base. The other point tells us that due to the large increases in the gold stock during 1921-24, it seemed proper to reduce Reserve Banks Credit outstanding in order to offset any expansion in the monetary base caused by increases in the gold stock. And the increases in Reserve Credit outstanding in 1925 and 1928, almost wholly counteracted concurrent losses of gold, which could have lead to falls in the monetary base.

Cagan's results show that the Treasury operations in the U.S. have not in the long run made a significant contribution to the monetary base. Cagan mentions four instances in which Treasury operations were used to offset the monetary base:

a) preparations for resumption of specie payments in 1875-79.
b) sale of bonds to augment the Treasury's gold reserve in 1895-96.
c) support of New York banks during stringencies of credit from 1900-1914, and
d) gold sterilization during 1936-38

The main conclusion is that these Treasury operations produced random effects on the monetary base.12

11 Ibid, p. 68-71
12 See ibid, p. 78-86 for more details
The monetary base cannot be explained simply as the sum of the sources of change, because the sources are partly determined by the behaviour of the aggregate and of each other.\textsuperscript{13} Federal Reserve operations were related to the other sources of change, because the Reserve Banks worked to offset undesired movements in the monetary base produced by the other sources. The Treasury operations which were examined by Cagan were all connected with gold flows, and represented attempts to offset movements in the gold stock and changes in the monetary base.\textsuperscript{14}

The Central Bank has the power to stop commercial banks from having discounts with it, or it can make discounting with the central bank rather unattractive. On the other hand the Central Bank cannot make the commercial banks more willing to demand advances and discounts from it. The discounts could be made more attractive, and the commercial banks have the option of either borrowing or not borrowing from the Central Bank. In other words the commercial banks could refuse to borrow from the Central Bank. I think it would be better analytically to subtract discounts and advances of the Central Bank to commercial banks from the base $B$, thus having an adjusted base $B^a$.

The above mentioned argument can be carried one step further, in an open economy /In a country such as the Lebanon/ the commercial banks have the ability to borrow money from foreign banks and markets. Let us assume that commercial banks borrow money from foreign markets when the domestic rate is higher than the foreign rate, the net result would then be an increase in capital inflows. Such capital movements are not only responsive to interest differentials, but also responsive to changes in the value of the Lebanese currency with respect to other currencies such as the dollar and the pound. My empirical results support this argument.

\textsuperscript{13} Ibid, p. 96
\textsuperscript{14} Ibid
The adjusted monetary base $B^a$ should be re-adjusted to allow for the movements and changes in capital flows by adding net foreign assets or subtracting if net foreign assets have a negative sign to the monetary base $B^a$.

$$B^L = B^a + \text{NFA}$$

where $B^L$ is the re-adjusted monetary base.

My argument for controlling the money supply in an open economy deals with the factors that determine the monetary base $B^L$, they are, the public, the commercial banks, the Central Bank and the foreign sector, and the relationship between $B^L$ and the money supply $M$ via the money multiplier, $m$.

$$M = mB^L$$
2 - The Traditional View

The traditional monetary view holds that the behaviour of the monetary authorities dominates the behaviour of the public and commercial banks in its effect and influence on the money supply. The monetary base according to the traditional view is a more important determinant of the money supply than income and the rate of interest. The traditional view argues that money supply bears a very close and predictable relation to variables under the control of the Central Bank. Money supply is partly an endogenous variable determined by market forces, but is mostly an exogenous variable determined by the monetary policy of the Central Bank.

Brunner and Meltzer\(^1\) treat money and bank credit as endogenous variables where their partial equilibrium responses to monetary policy changes include a response to the changes in interest rates induced by policy operations. Then they argue that if the money supply and other monetary variables are treated as endogenous variables this permits the factors determining the differences in the relative responses to policy operations of money supply and bank credit to be analysed and to lead to the conclusion that open market operations induce a larger relative change in the money supply than in bank credit.\(^2\)

The Brunner Meltzer arguments make use of money multipliers and their links with the monetary base. It is assumed that the money multiplier is dependent on an index of interest rates representing yields on loans, government securities, and other earning assets included in the banks' portfolios, on the reserve requirement ratios. Interest rates are assumed to change the monetary multipliers through three

\(^1\)Brunner and Meltzer "Liquidity traps for Money Bank Credit and Interest Rates" J.P.E. 1968, p 1-37

\(^2\)Ibid for more details on this argument.
relations expressing desired ratios, a) the ratio of desired excess reserves to total deposits is assumed to depend on market interest rates and on the rediscount rate, b) a similar dependence is assumed for the ratio of the desired volume of member-bank borrowing to total deposits, c) the index of market interest rates, the interest paid by banks on time deposits. But the money multiplier is the connecting link between the monetary base and the money stock, where the base is the control variable and is taken to be an exogenous variable according to the traditional view. And the control of the base itself could be achieved by using open market operations and a reserve aggregate target.

Money is held by three different holders; the public, banks and the monetary authorities in different types. \( S \) is the public's holding of specie, \( S_b \) is the banks' holding of specie, \( D \) is deposits, \( O \) is the obligation of the monetary authorities to the public, and \( O_b \) is the obligations of the monetary authorities to banks which is equal to currency plus the deposit obligations of the monetary authorities. Let us assume that the obligations of the monetary authorities are considered as perfect substitutes for specie. And the banks desire to maintain some ratio of \( D \) to \( R \),

\[
R = S_b + O_b,
\]

\( R \) represents the reserves of the banks and is divided into two major parts; a) legal reserves, and b) precautionary reserves. \( S_b \) and \( O_b \) constitute the legal reserve requirements, while precautionary reserves reflect the bank's own judgment of the amount of \( S_b \) it wishes to hold. Banks are indifferent about the proportions in which \( R \) consists of \( S_b \) or \( O_b \).

The public also maintains a certain ratio between D and C, 

\[ C = S + O \]

C being currency

The public is indifferent about the proportions in which currency consists of \( S \) and \( O \).

Let us assume that the authorities do not hold deposits at banks, and

\[ M = C + D \]

\[ R = S_b + O_b, \quad C = S + O \]

the sum total of specie and the consolidated obligations of the monetary authorities is referred to as the monetary base, \( B \), 

\[ B = S + S_b + O + O_b \]

and

\[ M = B \frac{D}{D} \left[ \frac{1 + \frac{D}{C}}{D} \right] \]

Let \( \frac{D}{R} = b \), the banks' ratio, and let \( \frac{D}{C} = p \) the public's ratio then we get:

\[ M = B \frac{b(1 + p)}{(b + p)} \]

the change in the money stock depends on the monetary base, \( B \), and on \( b \) and \( p \).

\[ M = B \cdot b(1 + p) \cdot (b + p)^{-1} \]

base, \( B \), can be adjusted by subtracting from it the total borrowings of the commercial banks from the Central Bank, thus having an adjusted base \( B^a \), with:

\[ M = B^a \cdot b(1 + p) \cdot (b + p)^{-1} \]

we are interested in the relative changes in \( B^a \), \( b \), and \( p \), and in their effects on changes in the money supply in order to do so we take the logarithmic form of the above equation getting;
\[ \log M = \log B^a + \log b + \log (1 + p) - \log (b + p) \]

and in order to find the continuous changes we take the total derivative of \( \log M \). \( B, p \) and \( b \) can be calculated and the changes in them could be easily measured. The Traditional theory argues that the monetary base \( B^a \) is an important determinant of the money supply.

The determinants of the stock of money as defined by Friedman and Schwartz \(^4\) are the monetary base the ratio of deposits to reserves, and the ratio of deposits to currency. Their work has shown a close parallelism between the money stock and the monetary base, and changes in the monetary base were found to be the major contributors to changes in the stock of money, and the monetary base could be put under the control of the Federal Reserve Banks.

The determinants of the money stock according to Cagan \(^5\), the monetary base, the currency ratio, and the reserve ratio have different effects on the money stock. His analysis is based on the contribution of each determinant to the rate of change in the money stock rather than its absolute level. "The chief reason for using the rate of change in the money stock rather than the quantity of money, is to eliminate the strong upward trend in the quantity, which obscures fluctuations." \(^6\) The rate of change in the stock of money attributed to changes in each of the three determinants has been derived as follows:

\[
M = \frac{B}{\frac{C}{M} + \frac{R}{D} - \frac{C}{M} \frac{R}{D}}
\]

the derivation of this equation was presented in section 1 of this chapter, it can be expressed in terms of change by taking natural

\(^4\) Ibid, p. 119-134, p 270-279, and Appendix B

\(^5\) P. Cagan, op. cit.

\(^6\) Ibid p. 4.
logarithms and then differentiating with respect to time

\[
\log M \equiv \log B - \log \left[ \frac{C}{M} + \frac{R}{D} - \frac{C}{M} \frac{R}{D} \right],
\]

\[
\frac{d \log M}{dt} \equiv \frac{d \log B}{dt} + \frac{M}{B} \left( 1 - \frac{R}{D} \right) \frac{d \left( \frac{C}{M} \right)}{dt} + \frac{M}{B} \left( 1 - \frac{C}{M} \right) \frac{d \left( -\frac{R}{D} \right)}{dt}
\]

The right hand side of the equation gives the contribution of the rate of change in the monetary base, in the currency ratio, and in the reserve ratio respectively to the rate of change in the money stock.

The contributions in percentage rates of change and in relative terms were calculated by Cagan for the years 1875-1955. For all years the monetary base has shown a relative contribution of 91%, currency ratio 9% and reserve ratio 2%. Cagan's calculations show that increases in the monetary base accounted for nine-tenths of the growth of the money stock. Cagan adopted the use of specific cycle stages of the money series to compute various averages of the relative contributions. In this case the chief contributor to specific cycles in the rate of change in the money stock is the currency ratio. The contributions of the monetary base were very irregular and did not parallel the money series closely for the periods 1877-1953, 1877-1913 and 1918-53. The contributions of the reserve ratio have shown a fairly regular cyclical pattern, but with a comparatively small amplitude compared to that of the currency ratio.

The interdependence among the three determinants is in Cagan's words "hazardous," and the inferences made must be viewed as highly tentative. Cagan treats the monetary base as being a variable under the control of the Federal Reserve, and it could be used to offset the combined

7Ibid, p. 18-21
8Ibid, p. 25, 26, 29, 32, 33, 34 and 36
contribution of the other two ratios, the currency ratio, and the reserve ratio. The reserve ratio itself involves activities of the monetary authorities, while sources of variation in the currency ratio involve action of innumerable holders of money, or the public.

The view that the growth of the money stock could be under the control of the monetary authorities if they wish to do so was also voiced by Gibson and Thom. Their approach is a base-multiplier method which considers the monetary base to be under the control of the Central Bank and changes in the monetary base bring about corresponding changes in the stock of money which is determined by the size of the multiplier.\(^9\)

\[
m = \frac{1}{b - bk + k}
\]

\(b = \frac{R}{D}\) bank's cash ratio, \(k = \frac{C}{M}\) non-bank public cash to money ratio

\(b\) and \(k\) are assumed to be less than one.

Goodhart provides a number of arguments against the base-multiplier method which treats the base as an exogenous variable, and develops his model which treats the monetary base, and the money supply as endogenous. "The first step in arriving at a satisfactory theory of the determination of the money stock is to abandon the assumption of a given stock of high powered money and to proceed to an examination of the factors which determine this total."\(^10\)

The method followed by Goodhart develops an accounting identity, which is taken from the accounts of the flow of funds which describe how the financial surplus or deficit of each sector is financed by flows of funds through the different financial markets. The accounting identity is composed of the public sector deficit PSD after taking account

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\(^9\) N.J. Gibson and D.R. Thom, "Can the Money Stock be Controlled?" The Bankers' Magazine, 1971, p. 206-211.

\(^10\) Goodhart, "Analysis of the Determination of the Stock of Money", in Parkin and Nobay (eds.) Essays in Modern Economics, p. 250
of various financial transfers, OMD is the outcome of the authorities' operations in marketable debt, NMD is the outcome of transactions in non-marketable debt, MAT is the required use of funds to pay off maturing debt, ECF gives the total finance obtained from accepting external currency flows and ΔH is high powered money or base money:

$$\text{PSD} = \text{OMD} + \text{NMD} - \text{MAT} + \text{ECF} + \Delta H$$

$$\Delta H = \text{PSD} - \text{OMD} - \text{NMD} + \text{MAT} - \text{ECF}$$

Some of the financial flows in the above equation are outside the control of the government; such as the short-term variations in the size of the deficit which is outside the control of the monetary authorities. C. Goodhart argues that it is difficult to devise fiscal measures that can be frequently altered without involving considerable disturbance of one kind or another. And there are lags which intervene between the policy changes and the resulting effect on monetary flows, so that the public sector deficit in any given year may be conditioned as much by the previous Budget as by current fiscal changes.

For all the abovementioned reasons the monetary authorities cannot hope to vary the size of the public sector deficit in the short-run as a flexible instrument for the purpose of achieving some desired rate of growth in the monetary aggregates.\(^{11}\) I think this argument is in the tradition of analysing the possibilities of the co-ordination between fiscal and monetary policy.

The main issue which we are concerned with is that the traditional monetary view is based on a theory which is of a long-run nature and is mainly interested in variables which constitute the money multiplier and in the monetary measures which could influence changes in the monetary base and with its exogeneity. The Goodhart method leads to the use of

\(^{11}\)Ibid, p. 252
a reduction in tax and its effects on disposable income, and the effects of an increase in government expenditure on the national income. Such a method makes us aware of the various ways economists have followed in order to resolve the dispute between the endogeneity and exogeneity of the monetary base and the money supply, and leads to the conclusion that the quantity of money is not an autonomous variable controlled by the government, but is an endogenous quantity.

The monetary flows affecting the level of the monetary base are the public sector deficit, and the required funds to pay off maturing debt are to some considerable extent outside the control of the authorities. And the outcome of transactions in non-marketable debt, and the total finance obtained from accepting external currency flows tend to respond perversely to interest rate changes, in that an increase in domestic interest rates will tend to lead to flows from these sources causing increases in the monetary base.\(^\text{12}\)

The total finance obtained from accepting external currency flows as treated by Goodhart is assumed to be only responsive to changes in interest rates. I think it would be more realistic to include in the analysis of external currency flows, the responsiveness of such flows to changes in the value of the currency /devaluations and re-valuations/ of the country in question with respect to the major world currencies. We must also take into consideration investment facilities, political and economic stability.

In any country where the commercial banks have the ability to borrow money from the external markets, then the Central Bank control over external currency flows would be greatly reduced. The monetary base should be adjusted so as to include the movements and changes in capital flows, and the new monetary base would be responsive to domestic and external interest rate changes, and to fluctuations in the values of the domestic currency with respect to the major currencies.

\(^{12}\text{Ibid, p. 254}\)
The traditional monetary view argues that when given a set of institutional arrangements and predictable behaviour on the part of those engaged in market activities, then changes in the monetary base produce predictable changes in the money stock. The objective is to identify and measure the monetary base, because the monetary base can be used as a predictor of the money stock and as a variable whose control implies the control of changes in the quantity of money. But in order to identify and measure the monetary base the behaviour of the public, and the commercial banks should be described to show their relationship with the monetary base. But the Central Bank's behaviour and control over the monetary base, dominates the banks and the public's effects and influence on the money supply.

James Tobin's point is that "the quantity of money as conventionally defined is not an autonomous variable controlled by governmental authority but an endogenous or inside quantity reflecting the economic behaviour of banks and other private economic units." Such a point leads to the argument, that the theory of the determination of the money stock should be treated as one branch of the more general theory of portfolio adjustment in response to relative changes in interest rates. And the time path of the process depends on the various speeds of adjustment of the various sectors to relative changes in the rate of interest.

Other forms of macro-economic models have been developed in order to analyse the determination of the money stock. One of the known methods uses a set of equations that are composed of the income equation, a consumption function, an investment and saving functions, demand and supply equations and the monetary base. The demand and supply of money, the monetary base, the consumption, investment and saving functions are treated as endogenous variables. Such method also treats or assumes that the demand for money $Md = Ms$ the supply of money.

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where money supply is dependent on changes in the income levels, a rise in income (other things being equal) tends to increase money supply. An increase in the rate of interest and in the monetary base would lead banks to increase their holding of earning assets. The idea behind the above equation is that the money supply is determined jointly by the behaviour of the monetary authorities, the commercial banks and the public.

The monetary base when treated as being only partly exogenous then it would be determined by income, open-market operations, and the borrowing requirements of the government. As income increases, people would reduce their holdings of base money in order to hold other assets, mainly earning assets due to higher interest rates, and some of these assets are usually government bonds.

The monetary base could be treated as the control variable for the process of controlling the money supply. In this case the major component of the monetary base would be the Central Bank holdings of government securities, and the monetary base is attained by the use of open market operations. And changes in the money multiplier reflect portfolio decisions by banks and the public, and Central Bank policy actions.

Tinbergen derived a money supply equation involving short-term interest rates and the net indebtedness of the member banks. Tinbergen studies the business cycle mechanism in the United States (1919-1932). The money supply relation was regarded as a price-fixation relation for short money. The banks regulate the amount of credit granted by changing their interest rates. They do this in such a way in order to keep their debt position with the Federal Reserve Banks within the prescribed limits.

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The debt position can be indicated by

\[ Bi - Re, \]

\[ Bi = \text{rediscounts}, \text{and} Re = \text{surplus reserves}, \text{and} \]

\[ ms = 4\sqrt{Bi - Re} + 2 \]

\[ ms = \text{the short-term interest rate}, \text{and according to Tinbergen's work} \text{ms has shown a high correlation}^{15} \text{with Bi - Re}. \]

The above equation was found by rough approximation for the period 1917-1932, where the right hand side had to be expressed in terms of the corresponding quantity of money. Such correspondence is reflected in the balance sheet of the Federal Reserve Banks and in the legal reserve requirements for deposits prevailing in the United States.

According to Tinbergen the factors that determine \( M \) the money supply are: \( ms \) the rate of interest, which is taken instead of \( Bi - Re \), the gold reserves \( A \), the policy of the monetary authorities which determines \( P \), where \( P = \text{bills of Exchange, and bonds bought in open market, and on} M' \text{ or} M'' \), where \( M' = \text{Bank notes in circulation, and} M'' = \text{The member-banks outstanding deposits}. \)

\( M'' \) has shown that it has a linear relation to \( R^r \) reserves of banks,\(^{16}\)

\[ R^r = 0.038M'' \text{ (omitting a constant)}, \]

and \( Bi - Re = M' + R^r - \sqrt{A} + P \)

by substitution we get:

\[ Bi - Re = M' + 0.038M'' - \sqrt{A} + P \]

we have \( ms = 4\sqrt{Bi - Re} + 2 \)

\( M' \text{ and} M'' \text{ are the two components of money Tinbergen assumed that} M' \text{is given and is much less important than} M''. \text{ We can derive from the above equations the following equation for the supply of money;}

\[...............\]

\(^{15}\)Ibid, p. 139, see Figure 14

\(^{16}\)Ibid, p.140
\[ 0.038M = 0.038M' + M'' \frac{\Delta M}{\Delta s} - 0.962M' + A + P \]

or \[ M = 6.6\Delta s - 25M' + 26A + P \]

In this case we have a supply relation for money from which an elasticity can be calculated.
3 - The New View

The monetarist hypothesis of the money supply process assigns to the behaviour of the monetary authorities an important role in the determination of money supply behaviour. The behaviour of the banks and of the public is acknowledged by the monetarists, and it dominates in particular the shortest-run variations of the money stock but declines in relative importance beyond the short-run. The monetarists' investigations establish that the longer the period or the larger the relative change of the money supply, the greater is the role of the monetary authorities in the behaviour of the money stock.

A countercritique
rapidly emerged and launched its arguments under the flag of the New View. "In the general approach of the Yale School monetary theory broadly conceived is simply the theory of portfolio management by economic units: households, business, financial institutions and governments. It takes as its subject matter stocks of assets and debts and their values and yields; its accounting framework is the balance sheet. One of the major implications of this approach is the necessity to regard the structure of interest rates, asset yields and credit availabilities rather than the quantity of money as the linkage between monetary and financial institutions on the one hand and the real economy on the other."  

James Tobin argued that commercial banks do not possess, either individually or collectively, a widow's curse which guarantees that any expansion of assets will generate a corresponding expansion of deposit liabilities. According to the New View the essential function of financial intermediaries, is to satisfy simultaneously the portfolio preferences of two types of individuals. On one side we have the borrowers who wish to expand their holdings of real assets beyond the limits of their own net worth. On the other side we have the lenders who are willing to hold some (or all) of their net worth in assets of stable money value. The assets of the financial intermediaries are obligations to the borrowers, and their liabilities are the assets of the lenders.

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According to Tobin the banking system can expand its assets either (i) by purchasing or lending against existing assets; (ii) by lending to finance private investment, or buying government securities financing public deficits. In case (i) there is no increase in private wealth, and no new private investment and saving. In case (ii) new private saving occurs, but in neither case will there be an automatic increase in demand for bank deposits equal to the expansion in bank assets. Though there is an increase in private wealth in case (ii) - yet the community will not ordinarily wish to put all of its new saving into bank deposits.9

Tobin and Brainard10 tried to find answers to the following questions: Does the existence of uncontrolled financial intermediaries vitiate monetary control? What would be the consequence of subjecting these intermediaries to reserve requirements or to interest rate ceilings? Their main approach is to set up models of general equilibrium in financial and capital markets and to trace in these models the effects of monetary controls and of structural changes. And their conclusion states that "the presence of banks even if they are uncontrolled, does not mean that monetary control through the supply of currency has no effect on the economy. Nor does the presence of non-bank intermediaries mean that monetary control through commercial banks is an empty gesture."11

9 ibid, p. 6
10 J. Tobin and W.C. Brainard, "Financial Intermediaries and the Effectiveness of Monetary Controls" in Hester and Tobin op. cit. p 55-93
11 ibid, p. 56
The main purpose of Tobin and Brainard's work is to study the effects of financial intermediation by banks, the consequences of leaving their operation unregulated, and the effects of regulating them in various ways. The argument uses three Financial Regimes; a regime is characterised by listing the assets, debts, financial intermediaries, and interest rates which play a part in it. In all three regimes net private wealth is equal to fixed capital stock valued at current replacement cost; and the non interest-bearing debt of the government, taking the form either of currency publicly held or of the reserves of banks and other intermediaries. The public is divided into two parts: wealth owners and borrowers. (A borrower may be also a wealth owner).

Let us take Regime one where there are no financial intermediaries and no credit market.

Fig. 1

\[ Ro = \text{return on capital, } ow = \text{total private wealth divided} \]
between the supply of currency $OC$ and the replacement value of capital $CW$. Curve $DD^1$ is a portfolio choice curve showing how wealth owners wish to divide their wealth between currency and capital at various rates, $R_o$. The sole monetary instrument is a change in the supply of currency relative to the supply of capital. An increase in the supply of currency relative to capital stock is shown by shifting $CC^1$ in Figure 1 to the right, thus lowering the rate of return.

In regime two we introduce a financial intermediary and study two cases, (a) that of an uncontrolled intermediary; (b) that of a controlled intermediary. For case (a) assume that the intermediary is not required to hold reserves and does not hold any, its sole assets are loans. In this case the demand for capital is divided into two parts; the direct demand of wealth owners measured leftward from the right vertical axis to curve $KK^1$. And the demand for capital by borrowers measured rightward from line $CC^1$ to curve $LL^1$. While the horizontal difference between $DD^1$ and $KK^1$ is the borrowers demand for the liabilities of the intermediary. In this regime there is a second interest rate to be determined the rate $R_2$ on intermediary liabilities while $Y_2$ is the rate on intermediary loans. In case (a) a reduction in the supply of currency will raise the required rate of return on capital and it will also raise the intermediary rates. The intermediary will make the monetary control less effective in the sense that a pound reduction in the supply of currency brings about a smaller increase in $R_o$ when it can be counteracted by expansion of the intermediary.
For case (b) assume that there is some quantitative restriction on the expansion of the intermediary, and that the government non-interest bearing debt is divided into two segregated parts: currency held by the public and reserves held by the intermediary pursuant to a legal fractional reserve requirement. Assume that this requirement is effective, so the margin between the intermediary's lending and borrowing rates is greater than is needed to compensate for risk and administrative costs. A reduction in the supply of currency will raise \( R_0 \) higher than that of case (a) because the expansionary response by the intermediary is prevented in case (b).

In Regime Three introduce the commercial banks, and they hold a certain fraction of their deposits as reserves in currency. Assume that interest on bank deposits is competitively determined, and is subject to an effective legal ceiling. In regime three, there are two sources of demand for currency; the direct demand of the public, and the banks' reserve requirement. Let us consider separately the conditions of equilibrium in the market for currency and in the market for loans in order to understand the equilibrium in regime three.

\[ \text{Fig. 2} \]

\[ \text{ibid, p. 65-73} \]
CC is the supply of currency. AA is the demand for currency in relation to the deposit rate R (it includes both the direct and the indirect demand for currency.) Assets could be either complements or substitutes in the system as a whole. In figure 2(a) the assets (currency, or government bonds, or other securities) are substitutes, and we have a downward sloping AA curve.

Figure 2(b) represents the case of the complementarity with an upward sloping AA curve. In each case the position of the demand curve depends on the level of R, the dashed curve shows a higher R, thus reducing the demand for currency to C. From this relationship we can have a locus of pairs of rates R and R which equate demand and supply for currency. For figure 2(a) the locus would be a downward sloping curve, and for figure 2(b) the locus would be an upward sloping curve.

Figure 3 shows us the loan market where BB is the supply of loans is essentially the public demand for deposits, after allowance for the fractional reserve requirement. LL is the demand for loans curve. The positions of both curves BB and LL depend on the rate of return on capital R.
A greater $R_o$ shifts both curves upward as observed in Figure 3 where the dotted lines represent the new demand and supply of loans. The locus of the two rates $R_o$ and $R_2$ would be an upward-sloping curve $E_1$ in Figure 4. $E_c$ is the currency equilibrium curve, with $Y_2$ being the loan rate. If there is an increase in the controlled deposit rate, the effect depends on whether currency and deposits are taken as substitutes or complements. If they are substitutes, an increase in the controlled deposit rate will reduce the net demand for currency thus $R_o$ which balances the supply and demand for currency will be lower, in Figure 4 a movement of $E_c$ to the left to $E'_c$. There will be an increase in the supply of loans i.e. a downward shift in curve $E_1$ to $E'_1$. In this case an increase in the deposit rate is an expansionary monetary action. On the other hand if currency and deposits are complements the result of an increase in the controlled deposit rate is the reverse. So in this case the increase in the deposit rate is a deflationary monetary action.

The new view pushed forward three themes, the basis similarity between money and non-money substitutes, and between banks and non-bank financial intermediaries. It also directed attention to the operation of an economic mechanism governing the banks' acquisition and deposit supply. The new view never examined the nature of money, and its similarity arguments
(between bank and non-banks financial intermediaries) is based on a formula with minimal content. Such as, both banks and other intermediaries supply liabilities to satisfy the preference of the ultimate lenders. The argument is of an aggregative nature, it should allow for the differences inherent in the financial market, and for the different services offered by different intermediaries.

The new view suggests that in the absence of reserve requirement ratios and ceiling rates the money supply and bank credit are independent of the monetary base. Karl Brunner\(^\text{13}\), criticised Tobin's approach because it ignored the marginal productivity of excess reserves. So the Tobin monetary analysis did not really recognise the role of money and its effects on the real opportunity set. It also missed the role of cash assets, Tobin assumes that cash assets in excess of required volume are zero. The new view omits the interaction between existing stocks and new production flows and rejects the idea that excess supply expands output and changes the price levels. Finally the new view is "remarkably short on testable or tested theoretical propositions about the way the economy works, and specifically how it responds to monetary impulses, when the interaction of the monetary and the real sector is taken into account"\(^\text{14}\)

\(^{13}\) K. Brunner, op. cit

\(^{14}\) H.G. Johnson, "Recent developments in Monetary Theory - a Commentary", op. cit. p. 41
4 - The Real Balance Effect

Newcomb emphasised that changes in the quantity of money affect prices only through their prior effect on the demand for commodities, but he did not clearly distinguish between money considered as an income or expenditure flow, and money considered as a reserve balance. Fisher was influenced by Newcomb, but his exposition of the real-balance effect issue is more revealing. Fisher's main assumptions are, a constant \( Q \) (quantities) constant \( V \), and there cannot be surplus money and deposits without a desire to spend it, and there cannot be a desire to spend it without a rise in prices. Let us suppose that there is a doubling in the currency.
in circulation, and this doubling in the currency does not raise prices at once. Prices being unchanged the individual has double the amount of money he usually holds. He will try to get rid of this surplus money by buying goods. The surplus money will be transferred to someone else, he in turn will want to transfer this surplus to someone else and so on. Fisher assumed a constant Q and V, so the net effect of doubling money will be a doubling in prices.

The Cambridge cash-balance tradition as we know begins with Marshall, Pigou and continues with Keynes and Robertson. They all have indicated their recognition of the real-balance effect. Keynes in the General Theory clearly argues that the real-balance effect does not directly influence the commodity market.

"It is therefore, on the effect of a falling wage and price-level on the demand for money that those who believe in the self-adjusting quality of the economic system must rest the weight of their argument; though I am not aware that they have done so. If the quantity of money is itself a function of the wage and price-level, there is indeed nothing to hope in this direction. But if the quantity of money is virtually fixed, it is evident that its quantity in terms of wage-units can be indefinitely increased by a sufficient reduction in money wages ... We can, theoretically at least, produce precisely the same effects on the rate of interest by reducing wages, whilst leaving the quantity of money unchanged."56

Keynes' argument simply states that an increase in the money supply influences effective demand through its prior influence on the rate of interest. Keynes like Pigou emphasises that the alternative to holding money is to hold bonds,

56 J.M. Keynes, *The General Theory* op. cit. p. 266
and so an increase in the money supply will lead to an increase in the demand for bonds. There is never any indication that the surplus money may also be diverted to purchasing commodities.

Let us assume that an economy is in equilibrium, and for every set of given conditions there corresponds one and only one equilibrium position, and prices change during the tatonnement in an equi-proportionate manner. The demand and supply for nominal money holdings are represented respectively by DD and SS. The demand curve has an elasticity which is generally less than Unity. Let $E_N$ be the elasticity of demand for nominal money and $E_R$ be the elasticity of demand for real balances. At any given price level $E_N = 1 - E_R$, and since the normality of real balances means that $E_R$ is positive then $E_N$ will be less than Unity.  

Assume that the initial money supply at $M_0$ is doubled so that the total quantity of money in the economy rises to $2M_0$. This will cause a shift

in the supply curve SS to the right, to S'S' in Figure 1. By definition the amount of money demanded is equal to the initial holdings of money plus the amount of excess demand for money. The amount of excess demand for money is not affected by a proportionate change in all money prices and in the initial amount of money. Then it follows that demand for real money balances depends only on real wealth and relative prices.\textsuperscript{58} The real-balance effect in the money market is represented by a rightward shift from DD to D'D'; at the same level of absolute prices, individuals because of their increased wealth feel themselves able to indulge in a higher level of liquidity, (assuming no money illusion). Curve D'D' shows twice the amount of money demanded at DD, as R lies on curve DD, point T lies on curve D'D'. But T must also lie on curve S'S'. Thus D'D' necessarily intersects S'S' at point T, corresponding to a price level of 2P\textsubscript{o}. Similarly if money supply is increased to 3M\textsubscript{o}, the new demand curve must intersect the new supply curve at the point V, with the price level being 3P\textsubscript{o}. At price P\textsubscript{o} if the quantity of mondy is doubled, then there will be an amount of excess supply equal to UQ. The excess in the money supply means an excess demand for commodities. There is a pressure on the price level in the commodity markets; and the price will be driven up, and since P goes up then \( \frac{1}{P} \) must come down.

"Nevertheless, we ultimately reaffirm the conclusion; that an increase in the quantity of money causes a proportionate increase in equilibrium money prices".\textsuperscript{59}

There are at least two notions of the Consumers demand for money, one supposes, in essence, that people hold money because they want to. They gain utility from so doing. The utility accrues directly the real balances rather than to money as such, but it is money that is held. The other approach, supposes that money is held, not because people want to hold it, but because they must. They are constrained to do so by the functioning of the economic system.

\textsuperscript{58} ibid, p. 27
\textsuperscript{59} ibid, p. 48
According to C.L. Lloyd, the consumer chooses those quantities $x_1, \ldots, x_n$ of commodities 1, \ldots, n that maximise his utility function, $U = U(x_1, \ldots, x_n)$, subject to a budget constraint:

$$\sum_{i=1}^{n} x_i p_i + M = L + Y,$$

and to $M = K \sum_{i=1}^{n} x_i p_i$.

where $Y$ is money income, $L$ is initial money holdings, $M$ is final money holdings, $K$ is a positive constant, and $p_i$ is the price of commodity i.

Combining the above two equations will give us:

$$\frac{M}{K} + M = L + Y; \quad (1 + K) M = K(L + Y);$$

$$M = \frac{K}{1 + K} (L + Y).$$

Let us assume that money does not depreciate and cannot be traded except during some weeks. And the amount of money with which the individual begins week $t$ is the same as the amount with which he ends week $t - 1$, so we have the following equation:

$$M_t = \frac{M_t - 1}{1 + K} M_t - 1 + \frac{K}{1 + K} Y, \text{ with } 0 < \frac{K}{1 + K} < 1.$$

$$M_t = \left(\frac{K}{1 + K}\right)^t (M_0 - KY) + KY, \text{ which converges monotonically to }$$

$$M = KY,$$

having observed the value of $K$, it is possible to predict the amount of additional cash which will be hoarded by the consumer in each subsequent period so long as his income does not change unpredictably. Such information may be aggregated in order to predict the future demand for money to hoard for the entire economy. $M_t$ converges monotonically for all $K > 0$, and for any consumer then, the time path of money hoarding will converge monotonically to some level $KY$. Let us use as an example a certain individual who has no money hoarded yet and his income is £300 per week.

\[\text{------------------------------------------}\]

and his $K = 2$. According to $M = KY$ his equilibrium money hoard will be £600. The theory presented in the previous page predicts that during period one he will hoard £200:

$$M_t = \frac{2}{3} M_{t-1} + \frac{2}{3} (300), \quad M_{t-1} = 0 \text{ so } M_t = £200$$

During period two we have: $M_t = \frac{2}{3} (200) + \frac{2}{3} (300); \quad M_t = £333.3$

his hoarding increased by £133.3 during the second week, and so on.

The above model presents consumers as members of an economic society where the individual is constrained to hold a certain part of the value of what he spends on consumption in the form of money.

Some economists have argued for the invariance principle, which implies that an exogenous change in real-money balances has only a temporary effect on consumption and on real money, leaving their long-run equilibrium values unchanged. In other words a windfall gain will not alter the individual's standard of living in the long-run.\(^6^1\) Let $W_t$ be the consumer's wealth at the beginning of period $t$, $M_t$ his holdings of real balances and $C_t$ his consumption of goods and services, with $W_t = C_t + M_t$, where $W_t = M_{t-1} + Y, Y =$ income, and there are no windfalls. So the allocation of a person's wealth between consumption and real-balances is subject to a budget constraint at time $t$. If we regard money as being the only asset then $M_t$ represents also planned wealth for the period $t+1$, (interest rate is zero). Since there are no windfalls then $W_{t+1}$ would consist of planned wealth for $t+1$, i.e. of $M_t$ only. As the individual moves from $t$ to $t+1$ a new income $Y$ appears. $Y$ is not planned for, so the actual change in wealth will consist of the planned change plus the unexpected change $Y$.

$$W_{t+1} - W_t = M_t + Y - \left[ C_t + M_t \right] = Y - \Delta_t$$

The situation will change if we introduce the bonds market, where the consumer may hold bonds as well as money.\textsuperscript{62} We have a new situation where \( r \) is a fixed positive rate of interest and \( \frac{1}{1+r} \), as the value of a bond. Let \( P_t \) be the present value of wealth planned for period \( t+1 \) in a money-and-bond model.

\[
P_t = W_t - C_t - \frac{r}{1+r} M_t; \quad \frac{r}{1+r} M_t \text{ is the cost of using the liquidity services of money balances.}
\]

The new budget constraint will be:

\[
W_t = P_t + C_t + \frac{r}{1+r} M_t
\]

In order to simplify the argument let us take \( r \) as fixed then the relative price of consuming goods \( C_t \) and liquidity services rendered by \( M_t \) is constant, we have:

\[
C_t = C_t + \frac{r}{1+r} M_t
\]

In the money bond model \( W_{t+1} = (1+r)P_t + Y \), which means that:

\[
W_{t+1} - W_t = rP_t + Y - \bar{C}_t. \quad rP_t = \bar{C}_t - Y.
\]

and so for a given \( Y \), a long-run equilibrium can be consistent with any value of \( \bar{C} \) and not only with a single value as in the money model.

The presence of money increases real income properly conceived; and the gain in real income from the presence of money is higher if the money is credit money than if it is commodity money, and higher again if the money pays some return on holding it. In our modern world the monetary authorities are able to induce changes in the price level, either upward or downward. A deflationary monetary policy induces downward pressures on prices, as a result holders of money are offered an asset which bears a positive yield in real terms additional to the utility yield of money. The holders of money in such a situation will be induced to hold larger quantities than they would hold at a constant price level, and this increases the utility yield they enjoy. The fall in prices creates some capital gain, and people in general

\[\text{---}\]

will want to hold larger real balances, and the increase in purchasing power so created will not in the aggregate ever be exercised, and so leads to an increase in the aggregate income. Both elements—utility yield and capital gains must be included in the concept of the income gain from the holding of real balances.\textsuperscript{63}

Using the same analysis it then follows that the influence of the rate of inflation adopted by the monetary authority is a compound of two influences on real income working in opposite directions. The lower rate of return on holdings of real balances means that the utility yield obtained from holding money balances is now lower, thus lowering the amount of national income available for investment. And on the other hand it lowers the ratio of desired real balances to income, which means that the proportion of any given amount of savings that has to be invested in the accumulation of real balances will be lower.

5 - Optimal Money Supply

"The question of monetary optimality, like most questions in Welfare economics, is important not so much for its own sake as for the stimulus it has given to monetary theorists to re-examine the foundations and strengthen the superstructure of their subject. Perhaps we shall never have a definitive answer to the optimality problem but we shall certainly have many attempts at it. And in the process we shall get what is most urgently needed: an improved theoretical understanding of the actual working of the economy in which we live.\textsuperscript{64}" The main question is, "Is there an optimal money supply?" This question can be approached from two different angles; by welfare analysis of the existing monetary arrangements of actual economies, and by studying and exploring various models of a monetary economy.


Let us start by using the welfare analysis of the existing monetary arrangements. The government through its monopoly of legal tender, its ability to force commercial banks to make an interest-free loan directly to the Central Bank, and prohibition of interest payments on demand deposits, creates a state of sub-optimality of the stock of real balances held in comparison with a fully-free competitive economy. Elimination of the various regulations and the payment of competitive interest rates on government and central bank obligations would achieve optimality of the real money stock. The payment of competitive interest on money is one way of achieving the optimal money supply.65

The argument can be taken one step further by assuming that the monetary authority controls the nominal money stock in such a way as to maintain a stable price level. In addition to fixed prices, assume a fixed single period of analysis and stationarity. Feige and Parkin66 used these assumptions to analyse and improve the inventory theory in relation to optimal money supply. The study is presented in one model which is divided into two main parts, in part one we have the case of individual optimum, in part two the case of social optimum.

Part one assumes that the economy consists of representative family units which maximise the utility function: \( U = U(P_9) \), where \( P_9 \) is the money volume of commodities consumed, \( U \) is the utility index. The utility function is maximised subject to the constraint:

\[
A = Y + R - P_9 - T
\]

\( Y \) being balance income, \( R \) the net return from inventory management, and \( T \) is taxes. \( R \) is the profit, and is defined as the return of capital \( K \), bonds \( B \), money \( M \), and commodities net of transaction costs \( P_Q \) and inventory carrying costs \( C \).

65 H.G. Johnson, "Is there an optimal money supply?" J.F., 1970, p. 437 and 439
\[ R = K + B + M - PQ - C \]

The individual is subject to a wealth constraint, and he wants to maximise his utility function which is subject to his budget and wealth constraints. Feige and Parkin concluded the argument by revealing that the demand for average cash balances, commodity inventories, and bonds, depends upon disposable human and non human income, as well as interest rates, transactions costs, and inventory carrying costs.

Part two is concerned with the social optimum, and so it deals with the sources and uses of resources for the entire society. Given the stationarity constraint and assuming a total population of \( N \) families, the total non human wealth for the society is \( NW = N(K + PQ) \), where \( K \) is the average stock of capital in current dollars, and the total income available to society is \( N \left( \bar{Y} + r_k(W - PQ) \right) \), where \( r_k \) is the rate of return on capital. For society as a whole the opportunity cost of holding commodity inventories is the income foregone by not utilising these inventories as productive capital. Society must allocate its resource flow among the following uses: holding money, bond inventories, commodity inventories, capital inventories at a cost, and transacting in the bond markets at a cost, and also pay an interest rate on money. Thus forming a social constraint against which society will maximise the utility function.

The main theme of the argument reveals that the only way that individuals can be induced to undertake the socially optimum number of transactions, and hold the socially optimum stocks of inventories, is to pay interest on cash balances and bonds equal to the net rate of return on capital. And optimum individual consumption will equal optimum social consumption if, and only if, \( r_m = r_b = r_k - \kappa_k \), where \( r_m \) is the rate of return on cash balances, \( r_b \) the rate of return on bonds, \( r_k \) the rate of return on capital and \( \kappa_k \) is the cost per dollar of carrying capital inventories. According to Feige and Parkin the Parato-efficiency requires

\[ \text{ibid p. 344} \]
that interest rates should be paid on cash balances which is equal to the rate of return on bonds and the net rate of return on capital. And the inventory theory approach makes the problem of optimal money supply dependent on the problems of optimal bond inventories, commodity inventories, and capital stock. The effects of paying interest on money are: 1 - cash balances will increase, 2 - bond holdings will decrease, 3 - commodity inventory holdings will decrease, 4 - physical reproductive capital will increase, 5 - commodity market transactions will increase, 6 - consumption will increase.

The second type of analysis makes use of various models of a monetary economy. Economic theory made it possible for the students of economics to examine any economy in which money has one function, say as a medium of exchange. But such analysis is not enough, and so economic theory and logic combine to give us more methods and tools of analysis, thus the analysis can be extended to include the other functions of money (mainly the function of money as a store of value). A barter economy might have an organised market whose function is to act as a medium of information. In this case economic life takes a new form, with reduced search costs. Because in a barter economy we have the double coincidence of wants before any trade can take place. The market brings together all those who are interested in trading, but the market does not reduce those costs of barter which arise from the necessity for a double coincidence of timing of transactions. The introduction of money eliminates the necessity of a double coincidence of wants. In an economy where money functions only as a medium of exchange monetary theory is based on two assumptions about constraints and one hypothesis about behaviour.
The two assumptions about constraints are, (a) there are resource costs in converting income into a desired bundle of goods in a money economy, and (b) there are costs in converting money into assets. The behavioural hypothesis is based on the idea that people maximise utility subject to both an income constraint and a transactions cost constraint.

The optimum pattern of transactions between money and goods, and the costs of transactions between money and assets and the yield of assets determine the quantity of money demanded. As far as society is concerned the optimum quantity of money is determined solely by the optimum pattern of transactions between money and goods (only if money has one function: medium of exchange). In case the quantity of money is not at its social optimum, (because the costs of transactions from money to assets is less than the yield) payment of interest on money will not achieve the social optimum, because it will distort the optimum transactions pattern between money and goods. The second best solution for minimising total resource costs can be attained by paying interest on money but not necessarily equal to that of assets.

Let us take an economy in which money is held specifically as a form of wealth. Assume that the economy has no assets, and we only have contingency inventories (wealth). The economy has two goods, current consumption and a stream of insurance services yielded by wealth. Assuming utility maximisation in equilibrium $\frac{MU_c}{MU_i} = \frac{P_c}{P_i} = 1$, the first term $\frac{MU_c}{MU_i}$ is the marginal rate of substitution between current consumption and the insurance services yielded by a unit of goods, and $\frac{P_c}{P_i}$ the relative price is equal to unity because the alternative cost of holding one extra unit of goods in the form of inventories is one unit of goods consumed currently.
Now introduce commodity money and pure assets into the economy, in such an economy the individual has the choice among present consumption, future consumption (due to the pure assets) and precautionary services (due to money commodity) The individual can exchange the money commodity either for present consumption by buying goods or future consumption by buying assets. In equilibrium we have:

$$\frac{\text{MU}_s}{\text{MU}_{s+1}} = r$$

The three ratios represent the marginal rates of substitution between present and future consumption, between precautionary services and future consumption, and between precautionary services and present consumption, respectively. Changes in the quantity of the money commodity would change the margins between precautionary services and current consumption and between precautionary services and future consumption. The increase in the quantity of the money commodity would raise all prices, because of the increase in the demand for both goods and assets. A return to equilibrium would be achieved at higher prices.

According to Professor Friedman the optimum quantity of money depends on the shape of the demand curve for real balances and the change in the cost of holding money balances required to attain the optimum quantity. Friedman argues his case by supporting the demand studies which show that the quantity of money demanded is rather inelastic with respect to changes in the rate of interest. A change in market interest rates is partly offset by a change in the rate of interest paid on money. To allow for this Friedman suggests to take a cost elasticity rather on the high side, about -0.5 when the interest rate is about 5 per cent. This would mean that a one percentage point change in the interest rate would change real balances in the opposite direction by 10 per cent.

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69 M. Friedman, "The Optimum Quantity of Money", op. cit p. 42-43.
Professor Friedman pushes the argument further and tells us that at an internal rate of discount of 5 per cent, the optimum quantity of money would be attained with a rate of price decline of 5 per cent per year, or given the assumption that prices are currently anticipated to rise at 2 per cent per year with a 7 percentage point decline in the cost of holding non-interest-bearing balances, this implies that money balances would at least double. Friedman is in fact using the following demand function:

$$\log M = a - 10 \left( \frac{1}{P} \frac{dP}{dt} \right)$$

where the 10 per cent (due to the one per cent point change in the rate of interest) is treated as the change in the natural logarithm of money balances. According to the above equation (demand function) a decline of 7 percentage point means a change in \( \frac{1}{P} \frac{dP}{dt} \) by -0.07, or in \( \log M \) by +0.7 whose antilog is about 2. "At an ultimate internal discount rate of 17 per cent, the optimum quantity of money would be attained with a rate of price decline of 17 per cent per year, or a shift of 19 percentage points in the cost of holding non-interest-bearing balances". 70

70 ibid, p. 43
In macroeconomics we have two opposing ideas, monetarism and fiscalism, the first seeks to control the stock of money in order to stabilise the growth in money income and prices. The second, is mainly based on income-expenditure models and emphasises the importance of budgetary surpluses and deficits. My main research is based on monetary doctrines and monetary models, and my task is to prove that such models are relevant to our economic life; they can explain some of the economic phenomena we experience in a capitalist system.

Lawrence Klein argues that monetarism is governed by a single simple reduced form type relationship expressing the quantity theory of money, and this makes their position depend on the adequacy of simple and reduced models. Then he adds that large structural models stand up at least as well as small reduced form models, and given enough time with repeated forecast testing, Klein feels that their superiority (large models) will become evident. But Klein admitted that though the crude quantity theory breaks down if it is stated as a simple stable relationship between money supply and the value of production; Milton Friedman's attempts to save the quantity theory by "generalising the relationship with different lag distributions, and the more flexible form stands as a candidate along with other hypotheses about money holdings that cannot be refuted by available data." Perhaps when econometrics becomes much more sophisticated we will be able to use new methods (or dimensions) and improve our models.

---


Needless to mention that most of the data available on money supply is estimated with a great margin of error, and the demand for money is measured by being assumed to be equal to the supply of money. One hopes that in the near future we will be supplied with better data and more advanced econometric tools.

Klein analysed three different macro-models and used his results for comparison purposes. The three models are: the Wharton Model, the Federal Reserve Board - MIT - Pennsylvania Model, and the St. Louis Federal Reserve Model. According to Klein's empirical work the three models all fit the data fairly well. They have been tested in individual equations fitting, ex post simulation, and in ex ante forecasting applications. Dynamic simulation was used and was obtained by solving the system as a set of finite difference equations, where the central relationship of the monetarist scheme is:

\[ \Delta Y_t = 2.84 + \sum_{i} \Delta M_{t-i} + \sum_{i} \Delta E_{t-i} \]

\( \Delta Y \) is the change in current priced GNP, \( \Delta M \) change in money stock and \( \Delta E \) is the change in high employment federal expenditures. The results show an error of $3.84 billion in one-quarter forecasts of GNP, while the error shown by a structural fiscal model is around $2.5 billion; because it uses a priori information while the St. Louis model does not use a priori information. Klein's objection to monetarist models is based on the idea, that their models are not convenient for the insertion of a priori information as is the case with structural models.

The research method of the monetarists generally speaking is to determine GNP from a single equation version of the quantity theory and then to decompose it into segments of the economy. The fiscal research method (Wharton-model) adds up all the separate components determined from individual equations and the result gives the estimates of the GNP. The fiscal models do not have a single dominant relation in the system.

---

14 The Wharton model is a Keynesian model based on the theory of income and employment determination.
It seems to me that the basic difference between the two methods of model building is partly philosophical dispute. The monetarists have a certain idea or theory which they present in one equation, and then decompose it into various parts. While the other school of thought (fiscal models) believes in doing the opposite, adding up various equations to give us the general equation, though there is no single dominant relation in the system. Klein tried to answer this dispute empirically and his results were in favour of the fiscal models, but we know a priori that he belonged to the fiscal school from the way he built his models.

I am not claiming that Klein's models or the other models are not argumentatively valid, but the answer to the dispute is not entirely empirical. One must accept the view that a theory or a hypothesis can be tested by testing the ability of its predictions; but at the same time we must also note that any method used for empirical work is itself based on certain methods which are determined by the individual's beliefs and ideas, (philosophy). Economists do not build models which will give them good results or bad results, i.e. they do not use models whose results can a priori be known. Models are based on certain theories and theories are based on certain ideas and beliefs. Each theory has its own methods of model building which is consistent with the main idea of the theory itself. In fact the dispute between the two theories is the result of two different ideas, and the answer is not only empirical but also philosophical.

Klein examined the central monetarist equation, from a statistical point of view. Money supply is of course (according to the monetarists) statistically and theoretically more significant than government expenditures. The Klein thesis is that we can get different statistical interpretations from the monetarist equation; instead of using first differences of variables and high-powered government expenditure, Klein used the levels of money supply and government expenditure on goods and services:
where $G =$ government expenditures on goods and services, (The D.W is 1.90).

the implications are; government expenditures are just statistically
significant, while the money stock is not. Of course we will get
different results if we do not use first differences and high-powered
government expenditure. Monetarist models are interested in the changes
in the money supply, and not in the levels of money supply. Monetary
theory argues that changes in money supply cause changes in the price
level, so when we built a monetary model we usually treat the changes in
money supply rather than the levels of money supply. Money multiplier
models we are mainly interested in the percentage changes of the variables.

The quantity theory relates income to the money stock, assuming
that money is exogenous and determined by the government. In theory
the monetary authorities can control the stock of money by controlling
the reserves of the commercial banks; (banks have some flexibility, for
they are able to hold excess reserves in times of low interest rates,
and use it when rates are high). The empirical results of any study
are to some extent dependent on the period used or considered by the
experimentor. Barrett and Walters, 15 studied the stability of the
Keynesian and monetary multipliers in the U.K. They used a simple
quantity theory hypothesis where

$$Y_d = \kappa M + \kappa o, \quad Y^d = C + A,$$

with $C = \kappa M + \kappa o - A, \quad Y^d =$ disposable income

$C =$ consumption, and $A =$ autonomous expenditure. 16

$A = \rho M + A^*, \quad A^*$ being the true autonomous expenditure, then

$$C = (\kappa - \beta) M - A^* + \kappa o$$

The statistical version of the simple quantity theory if put in a
stochastic model would be as follows:

15 C.R. Barrett and A.A. Walters, "The Stability of Keynesian and Monetary

16 Autonomous expenditure has more than one definition, Friedman and Meiselman
treat investment as the excess of exports over imports, and government
deficit is exogenous. Accelerator theorist treat investment as being
determined by expectation about future demand, expectations are measured
by past changes in output. Barrett and Walters consider government revenue
\[ Y^d = \kappa M + \kappa o + \mathcal{M} ; \quad \mathcal{M} \text{ is a random variable with zero mean.} \]

Lags were introduced into both models on the basis of Friedman's permanent income hypothesis; \( C_t = \gamma Y_t + \mathcal{M} C_{t-1} \). \( Y_t \) is gross national product.

The final form of the models which were tested by Barrett and Walters are:

**Keynesian model:**

\[ C_t = \frac{1}{1 - \gamma} (Y_t A_t + C_{t-1}) ; \quad \gamma > 0, \quad 0 < \lambda < 1 \]

**The monetary model:**

\[ C_t = \frac{1}{V} (M_t - \lambda M_{t-1}) - A_t ; \quad V > 0 \quad \text{and} \quad 0 < \lambda < 1 \]

Five periods were used; 1878-1914, 1920-38 and 1948-63, 1878-1914, and 1921-38, 1948-63, 1879-1938. The results tell us that money is much more significant than autonomous expenditure before world war I. The inter-war years are strongly in favour of the Keynesian model. For the period 1948-63, the results were closer to a quantity theory hypothesis. The main conclusion of such an empirical work is that both money and autonomous expenditure are important factors in the determination of aggregate consumption. But their relative importance or significance depends on the economic conditions and the periods chosen for empirical testing.

Let us go back to the St. Louis model which is based on the quantity theory of money; the model accepts the idea that changes in the money supply influence only nominal magnitudes in the long-run; total spending and the price level. Output and employment are not affected, in fact output is determined by the economy's natural resources, productive potential, capital, labour and productivity. The St. Louis model\(^{17}\) is as follows:

\[ \Delta Y_t = 2.67 + \sum m_i \Delta M_{t-i} + \sum e_i \Delta E_{t-i}. \]

---

\( \Delta Y_t \) is the change in total spending, \( \Delta M_{t-i} \) is the change in money stock, \( \Delta E_t \) is the change in high-employment Federal expenditures, money stock (changes) is an exogenous variable. The above equation is the backbone of the St. Louis model; price changes are estimated as a function of current and past demand pressure, and anticipated price change.\(^\text{18}\)

The model uses ex post dynamic simulations for sub-periods (1955-1969), the results tell us that the model is able to trace the movements of the endogenous variables \( Y^t, P^t, D^t, X_t, \) rate of interest, \( U_t, \) and \( G_t, \) see footnote 18) quite well during 1955-1969.

Ex ante dynamic simulation was also used and it extends beyond the sample period. The whole model was re-estimated up till 1967, and the period used for ex-ante simulation is 1968 and 1969. The results show some confidence in the tracking ability of the model in estimating the economy to monetary and fiscal actions. Simulation was used to find the effects of possible future increases in the money stock on spending, output, prices, unemployment and interest rates. Three cases were taken into consideration, (a) No change case, (b) three per cent case, and (c) six per cent case, (in money stock). The first case is a restrictive monetary action, which leads to a fall in the rate of increase in total spending, upward pressure on prices due to the post-inflation, and a fall in output during 1971. Case (b) is a moderate increase in the stock of money (corresponds to 1961-65 in the U.S.A.) it would maintain a steady growth in the rate of total spending, but due to past inflation output will fall slightly through 1970. Long-term interest rate will not change, while the short-term interest rate will fall slightly. Case (c) is a sudden increase in the money supply, again the main influence will fall mostly on the rate of change in total spending, while the other variables will be

---

\(^{18}\) The other equations of St. Louis model are:

\[
D_t = \Delta Y_t - (X^F_t - X_{t-1}) \quad \text{The demand pressure } D_t; X^F_t \text{ is potential output.}
\]

\[
\Delta P_t = 2.70 + \sum_{t-i} \Delta D_t + 0.86 P_t, \quad \text{the price equation,}
\]

\[
U_t = f(G_t, G_{t-1}) \quad \text{the unemployment rate equation.}
\]

\( G_t = \text{GNP gap}, U_t = \text{unemployment rate} \)
Perhaps the main advantage of using a simple model like the St. Louis model is in its dependence primarily on two variables, money stock and high employment. It is considered as an advantage, because we have to collect information about two variables, and in many countries a lot of information cannot be obtained and some of the data is not very reliable. The main purpose of the model is to study and measure the general influence of monetary and fiscal actions on certain important economic variables.

The St. Louis model is small in size and is not designed for quarter-to-quarter forecasting. The projections of the St. Louis model in early 1970 show that there was little prospect of strong economic recovery in 1970 because of the lagged effect of monetary restraint in 1969. When the model was interpreted in light of its objectives, it succeeded in sharing out the average time path of total spending, real product, prices, unemployment, and interest rates during the period from late 1969 to mid 1971. For evaluating the model three sets of simulations were used, the simulations were designed to identify the sources of error underlying model projections based on constant growth rates of money and Federal expenditures during the six-quarter period. Total error is equal to the difference between the observed value of a variable and the value projected in the ex ante simulation. The results show that the average error for total spending attributable to the assumption of steady growth of the policy variables is the largest, (amounting to one percentage point) The total error for price projections was 0.35 percentage points. The total error for the unemployment rate averaged 0.43 percentage points.

Another form of monetarist models was also tested by many economists (money multiplier models), this form includes the behaviour of the base money, the public and the commercial banks. (The Theoretical background for such models was presented in Chapter III part I). The main equation of the model is $M = mB$, where $M$ is the money stock, $B$ is the base and $m$ is the money multiplier. The money multiplier can be obtained by using one of three methods: (a) Definitional method, (b) regression method and (c) behavioural method. Method (a) treats the multiplier base framework as an identity; method (b) expresses the money multiplier as a function of variables that are known to the monetary authorities at a certain time (c) expresses each ratio of the multiplier as being dependent upon other variables such as interest rates, policy instruments, and other factors influencing the deposit behaviour of the banks and the public. Burger, Kalish III, and Babb\(^{20}\) used method (b) where each month's multiplier is forecast using the three-month moving average of past values of the multiplier, reserve adjustments, dummy variables (accounting for seasonal factors), and an adjustment for autocorrelation. The model used the simulation method for money stock control. It assumed a constant four per cent seasonally adjusted annual growth rate for money over the control period. The net source base is adjusted monthly. The model used two control periods 1962-65 and 1966-69. The money stock achieved by the control stock is computed by multiplying the net source base by the value of the multiplier that actually prevailed in that month.

The empirical results,\(^{21}\) of simulating money stock control over the sample periods show us the differences between the controlled level and the desired level i.e. controlled level in 1969 $I = 188.54$ Billion $\$ while

\[\text{The money multiplier (by Burger, Kalish and Babb)}\]

\[m_t = b_0 + b_1 x_1 t + b_2 x_2 t + \varepsilon_{i2} d_i + \rho \epsilon_{t-1},\]

where $x_1$ is three month moving average of past value of the multiplier, $x_2$ is the reserve adjustment magnitude in the forecast month, $d_i$ = dummy variables, $p$ is the correlation coefficient, and $\epsilon_{t-1}$ lagged value of the error.


\(^{21}\)The money multiplier (by Burger, Kalish and Babb)
Theoretical & Empirical Aspects of The Money Supply Process With a
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the desired level is 188.27 billion $. The results show the mean, variance, mean square and median of the errors. The idea behind using models is not final, our main objective is to produce some policy recommendations; controlling the stock of money is a means to an end, not the end in itself. The Burger, Kalish, Babb model uses a four per cent growth rate in the money supply as a policy objective. They move one step further and compare the desired GNP growth rate for money with the growth of GNP attained with controlled money, for the same two sample periods used above. Their results show some kind of success in achieving the desired GNP in both periods. The main conclusion is that the money stock control procedure does not require the use of any information which the Federal Reserve does not already have available. The errors were not high, the largest was less than one per cent.

The interest elasticity of the money supply was given considerable attention by many economists, such as Brunner, Meltzer, Teigen, De Leeuw, Goldfeld and Kane. The work of these economists show us that the long run elasticity of the money supply function was less than 0.5 and the short run elasticity was not greater than 0.10 to 0.15. If the goal is to control money through changes in reserve aggregates then the issue of elasticity would have to be concentrated around the relationship between the money stock and reserve aggregates. Teigen used an econometric investigation of the money supply function, he treated the stock of currency and demand deposits at non-member banks as an exogenous variable. He also assumes that time deposits at member banks and government deposits (at member banks) to be exogenous. His estimated coefficients of elasticity are - 0.1695 for the discount rate and 0.1950 for the commercial paper rate.

De Leeuw used another method for estimating the interest elasticity for currency demand and time deposit demand at commercial banks. De Leeuw's results show us that there is an obvious degree of inelasticity in both functions in the short-run and in the long-run. In the short-run the highest value obtained by De Leeuw for elasticity is 0.070 (time deposit demand) and in the long-run the highest value for elasticity is 0.683 (both cases are inelastic). In another model De Leeuw aggregated the excess reserves and borrowings equations into one single function to explain free reserves. The function is interest inelastic in the short-run and in the long-run.

K. Brunner and A. Meltzer, have estimated the interest elasticity of the money supply relationship using annual data for the period 1930-1959, and quarterly data for the period 1949 I - 1962 IV. The study uses both definitions of money \( M_2 \) and \( M_1 \), three elasticities are revealed, the elasticity of the public's asset supply to banks with respect to the interest rate, \( i \), and the interest elasticities of the monetary and asset multipliers. The results are due to ordinary least-squares estimates, and to two stage least-squares estimates. The main importance of their results are their findings that the elasticity of the money supply function with respect to the adjusted monetary base is insignificantly different from one. The Brunner, Meltzer study is really utilised to or can be interpreted as estimating the elasticity of the reserve multiplier. Using \( M_1 \) and TSLS the estimate of the Treasury bill rate elasticity is 0.657 using annual data, (1929-1959), using \( M_2 \) gives 0.721 for elasticity. The results show that the \( M_2 \) supply function always has a larger interest elasticity than the \( M_1 \) function, and regressions with adjusted base yield


\[24\] ibid Table 2, p. 254
larger interest elasticities than those regressions involving an unadjusted base. M without an adjusted base using TSLS shows an elasticity of 0.019 while with an adjusted base its elasticity is 0.657. M\textsuperscript{2} without an adjusted base using TSLS shows an elasticity of 0.276, and an elasticity of 0.721 using an adjusted base. The D-W test gives poor support to the Brunner, Meltzer study. The autocorrelation could have been caused by the approximation involved in their procedure. The model in question is a non-linear one, and the Durbin-Watson (D-W) test is inappropriate for testing for higher order serial correlation or for other forms of autocorrelation.\textsuperscript{25}

S.M. Goldfeld produced massive work on the equations of the demand for excess reserves and the demand for borrowings from the Central Bank. The results obtained by Goldfeld show large interest elasticities for the borrowings equations, but the excess reserve interest elasticities are negligible. The borrowing elasticities in the short-run are - 0.98 (discount rate) and 0.88 (Treasury Bill rate); in the long-run the elasticities are - 2.382 (discount rate) and 2.134 (Treasury Bill rate), using only City banks, country banks show similar elasticities as city banks in the short-run, and a bit higher in the long-run. The elasticities for currency demand are significantly less than one in the short-run and the long-run (-0.008 to 0.14). The elasticities for time deposit demand varies from 0.028 to -1.62. His findings support the idea that banks respond quite quickly to disequilibrium in excess reserve holdings.\textsuperscript{26} Most of the empirical estimates tell us that the money supply function has a rather low interest elasticity.


\textsuperscript{26} S.M. Goldfeld, Commercial Bank Behaviour and Economic Activity, Amsterdam, 1966 Look also S.M. Goldfeld and E.J. Kane "The Determinants of Member-Bank Borrowing: An Econometric Study", J.F. vol. 21, 1966.
The velocity of money is one of the important parts which constitute the quantity theory of money. Our main object in this section is just to analyse one of the most recent empirical models which deals with the income velocity of money. Income velocity is equal to GNP divided by the money stock. The use of income velocity is based on the monetary theory which assumes that at a given time holders of money desire a certain ratio of money to income and equilibrium income velocity is the inverse of this desired ratio. L.C. Andersen tested a monetary model of income determination in order to observe movements in income velocity. The theoretical model of income determination is based on the central postulate; that the rate of change in nominal spending by households and business firms for newly produced final goods and services responds to a discrepancy between the rate of change in actual and desired nominal money balances. The model treats the desire for nominal money balances as having two functions or purposes - can be used to conduct market transactions and to be held as a store of value. The demand for money balances is positively related to the perceived price, and to the amount of goods and services that perceived nominal income can purchase.

Nominal income is taken to equal nominal spending for both domestic and foreign product $Y^d$, spending by all units of government for both domestic and foreign product $G$, foreign spending on domestic product $X$, and $IM$ (imports): $Y_t = Y^d_t + G_t + X_t - IM_t$. The model consists of three relationships, the above identity and weights involved in it, and of the change in the rate of change in spending by households and business firms which is equal to:

---


\[
\frac{d \ln Y^d}{dt} = \lambda \ln M_t - \kappa o \ln E_t - \kappa_1 \ln Y^p_t - \kappa_2 \ln r_t
\]

\(M\) being the desired nominal money balances, \(E\) is the technical efficiency of the payments system, \(Y^p\) the perceived level of nominal income, and \(r\) is the nominal short-term interest rate.

The above model is in terms of changes in time which are infinitesimally small while data on the variables are available only for discrete points in time separated by a month or a quarter of a year. At the same time there are no measurements of the technical efficiency of the payments system - so it is assumed to increase at a constant rate. A linear approximation in discrete time is used in order to deal with the first problem about discrete points in time. And the first difference of natural logarithms of a variable between two discrete points in time is presumed to approximate its rate of change.

The main purpose of the empirical model is to test whether the theoretical model can be accepted or not, and to test the ability of the model to forecast nominal income. The ability of the model to forecast is determined by dynamic simulations. The results (period used 1955-73) show a variability in the rate of change in the observed velocity. This can be explained by the changes in the rates of change in money, government spending, and the interest rate. We also observe that the model simulation projects a 3.6 per cent annual rate of increase in observed velocity from 1955 I to 1966 IV the same as the actual increase. For the period 1966 IV to 1971 I there is a 0.5 per cent error in the forecasting of the observed velocity and a 0.4 per cent error for the period 1971 I to 1973 IV. The results finally tell us that neither short-run nor long-run movements in observed velocity, taken alone, provide evidence in the debate about the predictability of the response of income to a change in money growth.
The money supply process plays an important role in our economic life, and is dependent on many variables, the banking system, the central bank, the public, and the foreign sector. Some monetary economists believe that the monetary base is the most important determinant of the money stock, and so have developed various econometric models to test this idea. In fact according to A.E. Burger, the empirical evidence supports the view that the growth rate of money would adjust to the growth rate of the monetary base if the central bank follows certain guidelines such as: (a) decide upon a growth path for money over a twelve-month period; (b) control the growth of the monetary base at the same rate as the policy determined growth of money; (c) disregard the monthly errors in the growth of money, i.e. hold the growth of the base constant. The results obtained by A.E. Burger state quite clearly that in the short-run the growth of the monetary base will be substantially different from the growth rate of the money stock. In the long-run the deviations between the growth of the money stock and the monetary base are reduced significantly.

Many empirical attempts were made to estimate the degree of influence between the monetary base and the money stock, and the general view among the monetarists, simply states that the changes in the base contribute or influence to a very high degree the changes in the money stock. Some studies are used to test the ways through which the monetary base affects the amount of credit, and interest rates in a money market. Such a study was undertaken by A. Fazia for Italy. Fazia's model defines the monetary base in Italy to be made of currency, deposits held with the central bank, Treasury bills, liquid foreign assets held by banks, commercial discounts.

by banks and issued for the financing of compulsory wheat stock pilings, and post office deposits. Italy is an open-economy and the inclusion of foreign liquid assets is a must, because they can be converted at any time into Italian currency. The supply of credit function is the following:

\[ CR = \alpha_1 + \beta_1 BMB_t + \beta_2 BMB_{t-1} + \ldots + \gamma_1 D_1 + \gamma_2 D_{t-1} + \delta G_t + \delta_2 G_{t-1} \]

CR is bank credit, \( BMB_t \) is the adjusted base, \( D \) is a dummy variable and \( G \) the level of interest rates (long-term bonds). The results tell us that the banks are very sensitive to change in the rate of interest, and a change in the monetary base brings about only a limited change in the effective amount of credit. The model is not really complete and fails to tell us about the importance of the base in relation to the rate of interest. The model is meant to study the affects of the monetary base on credit and interest rates, the result is a model which is only able to present an empirical support to the influence of the rate of interest on the supply of credit in the short-run, and some support for a limited influence by the monetary base.

A monetary model focusing on commercial banks' behaviour and their influence on the stock of money through their demand for borrowed reserves is based on the following hypothesis:\[31\]

\[ oM + RD = f(P,A) , \quad f'(P) > 0 , \quad f'(A) < 0 \]

where \( p \) is the net return to bank credit expansion and \( A \) equals total bank reserves \( (R) \), \( oM \) is open market, and RD are rediscounts. The hypothesis can be produced in a more sophisticated form:

\[ oM + RD = a_0 + a_1 P - a_2 (T+F-C+L) + u; \quad o < a_2 < 1. \]

where \( T + F - C + L = A^0 = \) adjusted non-borrowed reserves. \( T \) is the Bank of France's advances to the Treasury, \( F \) is foreign assets, \( C \) is currency and \( L \) is legally required reserves - \( A^0 \) could be replaced by \( A^* \) which is entirely independent of any bank recourse to \( oM \) and RD i.e. \( A^* \) is tied

---

to OM and RD. This model uses $M_2$ ($M_1 + \text{Time deposits}$) and assumes that the ratio of currency to money remains constant even when there is a change in the borrowed reserves thus having the following relationship:

$$C^* = C_{t-1} + \left[ (C/M_2)_t - (C/M_2)_{t-1} \right] M_2^{t-1}$$

The statistical analysis used quarterly data for the period 1959 I - 1971 IV inclusive. And the results show a striking feature of the French conditions, there is great significance for bank profits and for unborrowed reserve base in determining the supply of money in France.

In an open economy the net capital flows influence a country's stock of foreign reserves and its monetary base. M. Willms\(^3\) presented the German case in relation to two different hypotheses. The first hypothesis argues that in an open economy, a country with continuous balance of payments surpluses is unable to control the money supply without an adjustment in the exchange rate. This argument assumes a rather high interest elasticity of international capital flows. The second hypothesis assumes a rather low interest elasticity of international capital flows, and argues that the monetary authorities can control the money stock in an open economy even under a system of fixed exchange rates. The final decision is based on empirical evidence.

The model used by M. Willms is a money multiplier model, with net base $B^n$ and $m^n$ as the money multiplier, $k^B$ as bank credit, and $k^B$ as the credit multiplier, we have the following:

$$M = m^n B^n \quad \text{and} \quad k^B = k^B \cdot B^n$$

where $B^n = B - DB + (FA^B - FL^B) + (FA^P - FL^P)$

$B$ is the monetary base, $DB$ = discount borrowings $FA^B$ and $FL^B$ are short-term foreign assets and liabilities respectively of commercial banks, $FA^P$ and $FL^P$ are foreign assets and liabilities respectively of non-bank public (short-term). The interest elasticity of the money supply according

to this model is determined by the interest elasticities of the money multiplier, the bank credit multiplier and the demand for bank credit by the public. In the regressions the market interest rate is a function only of the net monetary base and national income, while the money supply is a function of the net monetary base, real non-human wealth, the rate of change in the price level, and the domestic money market rate.

The results of the regression estimates the money supply elasticity to be equal to 0.77, so we may conclude that for the estimated period 1960 II - 1970 II the Bundesbank had control over the money supply. Such a statement is only true for the average of the period under consideration which includes two revaluations of the German Mark against the Dollar. It seems that commercial banks respond to changes in domestic and foreign interest rates, particularly with respect to short-term foreign assets, and discount borrowings. In an open economy the monetary authorities are able to act or respond to changes in the total amount of foreign reserves by adjusting the components of the monetary base:

$$\Delta (B - FR) = \beta_1 + \beta_2 \Delta FR,$$

where FR = Foreign reserves at the central bank. According to the results (period used 1958 I - 1970 II) the monetary authorities on average offset about 86 Marks out of each 100 mark change in foreign reserves through opposite changes in the domestic component of the monetary base.

Another model was presented by J. Siebke\(^3\) to study the contribution of three sectors to changes in the money supply. The model is used to derive a money multiplier and is dependent on the behaviour of the monetary authorities, the commercial banks and the public.\(^4\)


\(^4\)The money supply equations is: \(M = m.B^t\), where \(m\) is the money multiplier and \(B^t\) the adjusted monetary base.
While the multiplier itself is dependent on the reserve ratio, the liquid assets ratio, and the ratio of banks' borrowing to deposits. Accordingly the central bank controls only indirectly the money supply by inducing movements in the multiplier, that is by influencing borrowing of banks and their holdings of liquid assets. But it can influence the supply of base money directly by changing reserve requirements. In Siebel's model the portfolio decisions of banks plays an important role in determining the money supply function. The portfolio decisions are responsive to changes in the interest rates, the policy variables of the monetary authorities, and to structural changes in the financial assets holding of non-banks.

In a paper presented at the University of Surrey Conference on the West German monetary development, M.J.M. Neumann\(^{35}\) used a non-linear money supply hypothesis to analyse the money supply process in an open-economy. The money supply process and the development of the money stock, bank credit and interest rates are explained simultaneously by the interaction of commercial banks and the public in the credit market, subject to constraints imposed on them by the monetary authorities. The monetary base as defined by Neumann includes liberated reserves (L) in order to account for the required reserve policy, and the extended base is:

\[
B^e = R + C + L
\]

The extended base \(B^e\) was adjusted by subtracting from it RF, and foreign liabilities, so we get another monetary base \(B^a\) (adjusted); \(RF\) = borrowing through rediscounting. Accordingly we have two money multipliers, \(m^e\) the extended multiplier, and \(m^a\) the adjusted multiplier. The money supply can be expressed as the product of a multiplier and the respective base:

\[
M = m^e.B^e; \quad M = m^a.B^a.\]

The empirical testing of the hypothesis shows that

and are more stable than . Generally speaking for both and , the contribution of the domestic public to the long-run growth of the money supply was found to be rather negligible. On the other hand the contribution of the international reserve flows empirically constituted the most important determinant of the German monetary growth, for the period 1958-1972.

The results show a high positive interest responsiveness of commercial banks' borrowing from the Bundesbank. The average contribution to monetary growth through selling of bills and mobilisation paper was during periods of rising interest rates more than double the contribution during periods of decreasing interest rates, banks reduced their borrowing drastically, thus contributing negatively to monetary growth.

A money supply function was postulated by treating the money stock as an endogenous variable and taking as exogenous the magnitudes over which the Deutsche Bundesbank has more direct control. Then the model of the monetary sector was integrated with a macroeconomic relationship focusing on the real sector, and econometric techniques were used for the estimation of the whole model.

The supply of money function used by Frowen and Arestis is:

\[ M_t = m_0 + m_1 r_t + m_2 r_{dt} + m_3 B_t \]

where \( M_t = M_2 t \), \( M_2 = M_1 \) plus time deposits with maturities of less than four years, seasonally adjusted, DM millions. \( M \) = money supply.

\( B_t \) = Central Bank money stock, which is currency in circulation and minimum reserves on domestic liabilities.

\( r_t = r_{4t} \), \( r_4 \) is the average money market rate on three-months loans in Frankfurt and the net rate of three-months loans in the Euro-dollar market. The reasons for using \( r_{4t} \) are; a) because it is a

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short term rate, b) the three-months money market rate is supposed to reflect the going rate charged on bank credit, and c) the Euro-dollar rate, can be thought of as a measure of the degree of substitution between domestic and foreign financial assets.37

\[ r_{dt} = \text{discount rate of the Deutsche Bundesbank} \]

\[ E_t \text{ and } r_{dt} \text{ are treated as exogenous variables determined by the Bundesbank,} \]

\[ r_{dt} \text{ is treated as an endogenous variable determined by the forces of supply and demand for money.} \]

Frowen and Arestis hypothesised \( M_{2t} \) to be positively related to \( r_{dt} \) and argue that since ceteris paribus one should expect the banks to expand their earning assets when market interest rates rise, thus increasing the money supply; and the same should also happen when the base money increases.38

The real sector is represented by an income determination equation, where the real sector is assumed to be a function of the money stock, autonomous expenditure and lagged income, thus we have:

\[ Y_t = \alpha_0 + \alpha_1 M_t + \alpha_2 E_t + \alpha Y_{t-1} \]

\( Y_t \) being real GNP, and \( E_t \) is the sum of government expenditure, investment and exports. They argue that changes in monetary conditions affect income in two ways; a) through consumption, and b) through investment via changes in the rate of interest, \( E \text{investment is treated as an exogenous element.} \]

The reasons for treating investment as part of \( E_t \), and \( Y_t \) as a function of \( M_{2t} \) are, "because changes in the short-term rate which the model accounts for must work through the whole spectrum of interest rates before the impact on investment is felt, and consequently there must be a lag here before investment decisions are influenced which will affect the level of income."39

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37 Ibid, p.157
38 Ibid, p.158
39 Ibid p.158-159
The supply of money function and the income determination equation were combined with a demand for money function and two-stage least square techniques were used to estimate the system. $B_t$ showed a very strong relationship with the money supply, and $B_t$ as used could be though of as being determined by the same variables as the money supply. A more suitable definition of $B_t$ may include free liquid reserves where $B^*$ is equal to the monetary base plus liquidity reserves. The authors also argue that $r_{4t}$ definition of the short-term rate of interest is not the relevant one, and $r_{3t}$ should be used instead of $r_{4t}$. $r_{3t}$ being the money market rate on three-months loans in Frankfurt.

$M_{1t}$, $r_{3t}$ and $B^*$ were tested empirically, and the results showed an improvement in the t-statistics of $r_{3t}$ and $B^*$ variables. But the free liquid reserves came out to be insignificant according to t-statistics of 1.107. This may be explained by the fact that even though the Bundesbank at times was able to control bank lending via changes in free liquid reserves, the variations in the stock of money often tended to be affected more by international capital movements during periods of fixed exchange rates.

According to the empirical results of Frowen and Arestis the money-supply function provides satisfactory and encouraging estimates. The discount rate is significant, and their results support the argument that the Bundesbank can have a strong influence on the money stock by pursuing a conscious discount rate policy. And also the German monetary authorities can have a powerful impact on the money stock via changes in the base money which they are assumed to control. Their most significant result shows a strong relationship between $r_{4t}$ and $M_{2t}$, and between $r_{3t}$ and $M_{1t}$. And the only variable in the supply function

\[ \text{Ibid, see pages 159 and 161} \]

\[ \text{Ibid p.162} \]
which is not under the control of the monetary authorities is \( r_4 t \) or \( r_3 t \). Finally the authors conclude that the money-supply function is shown to be well explained by the short-term interest rate, along with other variables, and there is a strong link between the monetary sector and the real sector via some interest rate.

The short-run money supply concept gives the supply response on the assumption that the public's demand for currency in circulation outside the banks' vaults \( C \), and for time deposits at all commercial banks is restricted.\(^\text{42}\)

\[
M_s = f(X, r_b; T, C; Y)
\]

where \( Y \) is the vector of real sector variables; \( GNP, DI \) and durable consumption \( Y \), \( X \) is a vector of policy controlled variables such as the monetary base, discount rate, and reserve requirement on bank deposits. \( r_b \) is the treasury bill rate.\(^\text{43}\) The above function assumes that all variables in the real sector of the economy, including stocks of real assets and flows such as consumption and investment are held constant.

The \( M_s \) function can be represented in a different form

\[
M_s = f(X, r_b, \frac{\partial C}{\partial M}, \frac{\partial T}{\partial M}, Y)
\]

This form makes it possible to have additional adjustments by permitting the autonomous components of currency and time deposits to vary.\(^\text{44}\) The above two \( M_s \) functions are defined so as to permit only short-run leakages, and the \( M_s \) concept is dependent on the public behaviour which is defined by their holding of currency, and time deposits, and on the banks' behaviour which is defined by free reserve adjustment and the supply of demand deposits, and on the vector \( X \). The empirical results derived from these two \( M_s \) functions seem to support the view that money is an independent factor.\(^\text{45}\)


\(^{43}\) See S. Goldfeld, op. cit.

\(^{44}\) See Brunner and Meltzer, op. cit.

\(^{45}\) D. Fand, op. cit. p. 387.
The money supply concept has been defined in such a way so as to measure the movements in the stock of money in response to adjustments in the entire financial sector. "To derive this money supply we solve all the equations in the financial sector simultaneously. Variables such as the Treasury bill rate and the rate on time deposits which are endogenous to the financial sector will therefore be determined and can no longer enter as arguments in the money supply function."[46]

The money supply function which is a reduced form for the entire range of financial assets while holding the variables in the real economy constant takes the following form:

\[ M_s = f(X, Y) \]

it measures the supply response due to a change in any of the policy controlled variables including their effect on other endogenous variables in the financial sector. If we allow some substitution between demand deposits and time deposits, and currency, and we could obtain a \( M_s \) equation with an estimate of the substitution possibilities in the form:

\[ T = T(r_b) \]
\[ C = C(r_b) \]

given \[ M_s = f(X, r_b, T, C, Y) \]

then \[ M_s = f(X, r_b, Y) \]

and since \( T(r_b) = T(X) \)
\[ C(r_b) = C(X) \]
\[ r_b = r_b(X) \]

then \[ M_s = f(X, Y) \]

and if \( Y = Y(X) \)

Then \( M_s = f(X) \) is a reduced form equation for both the financial and the real sector. The elasticities for this money supply equation

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46 Ibid, p.389
and for those of $M_s = f(X, Y)$ were calculated by De Leeuw, Goldfeld, and Teigen. 47 $M_s$ was used for money. The elasticities of $M_s$ with respect to the discount rate $r_d$ ranged from $-0.004$ to $-0.028$, and for $M_s = f(X)$ the elasticities of $M_1$ with respect to $r_d$ ranged from $-0.008$ to $-0.066$. The empirical results of these money supply equations show that the elasticities of the money supply with respect to the interest rate [discount rate] are all less than one. 48 The elasticities of $M_1$ with respect to the monetary base are as follows; Brunner and Meltzer 0.76, 0.34, 0.64, and 0.34. Goldfeld 2.28, 1.11, and 0.88, and Teigen's 3.85, 2.22, and 1.10. These results tell us that $M_1$ is more responsive to changes in the monetary base than to changes in the discount rate.

The monetary base as used by Brunner and Meltzer and the Federal Reserve Bank of St. Louis includes the effect of deposits shifting between banks with different reserve requirements. However, such monetary base does not include the effect of shifts in deposits between demand and time deposits or between member and non-member banks, and this Base distorts the effect of Federal Reserve policy actions on the growth in the money supply during periods when reserve requirements do not change. This recurs because the rate of growth in $B + L$ will not, in general, be equal to the rate of growth in $B$ during these periods. 49 $L$ being liberated reserves.

48 See Brunner and Meltzer, op. cit.
Peter Frost shows that the rate of growth in the monetary base will understate the expansionary effect of an increase in the source base if the cumulated sum of the liberated reserves is positive, and overstate the expansionary effect of an increase in the source base if the cumulated sum of liberated reserves is negative.

\[
\frac{d \ln (B + L)}{dT} = \frac{dB}{B + L} \leq \frac{dB}{B} = \frac{d \ln B}{dT} \quad \text{as } L > 0
\]

Frost suggests an alternative logarithmic reserve adjustment variable.\(^{50}\)

\[
\frac{d \ln (B + L^*)}{dT} = \frac{d \ln B}{dT} - G_r \frac{dy}{dT}
\]

\[G_r = -l(r + k), \quad r \text{ is the reserve ratio, and } k \text{ is the currency ratio}\]

\[L^* \text{ is the reserve adjustment variable, and the behaviour of the reserve adjustment variable can be seen by the following equation:}
\]

\[
\frac{dL^*}{dt} = \frac{L^*}{B} \frac{dB}{dt} + (B + L^*) \frac{dT}{dt}
\]

T is the cumulative sum of \(-G_r\) during periods when reserve requirements do not change \(\frac{dT}{dt}\) is zero and consequently, the percentage change in \(L^*\) is equal to the percentage change in \(B\). As a result, \(B\) and \(B + L^*\) grow at the same rate. Empirical results show a substantial difference between \(L\) and \(L^*\), but "this difference, does not indicate which reserve adjustment variable, when added to the source base, gives the more accurate reflection of Federal Reserve action."\(^{51}\)

Frost's results show that short-run fluctuations in the monetary multiplier played an important role in determining year to year fluctuations in the rate of growth in the money supply.\(^{52}\) The money multiplier is \(m = (1 + k)/(r + k)\) and \(M = mB\).

The results also show the relative contributions of several determinants of the rate of growth of the money supply for each year from 1961-74, which are the currency ratio, the monetary base, and the reserve ratio.

The currency ratio according to the empirical results is an important

\(^{50}\)Ibid p.169-171

\(^{51}\)Ibid p.172

\(^{52}\)Ibid Table 2, p.174
determinant of the cyclical movements in the rate of growth of the money supply. The monetary base \( B \) and \( B + L^m \) came out to be more related to changes in the money supply than the currency ratio, and the reserve ratio for the period 1961-1974 (for the U.S.A.)

Before developing and testing my macroeconomic model for the Lebanese money supply, it is important to note that:

a) I am aware that there are other possible methods and models to study the influence of the Central Bank, the commercial banking systems, the public and the foreign sector on the money supply, than the model used in Chapter III of this thesis.

b) A sample of the other models applied to other countries than the Lebanon has been presented analytically in the last section of this chapter.

The main reasons for using a macroeconomic model based on the relationship between the monetary base and the money supply with the money multiplier as the link are:

1 - Because a macroeconomic model in this form makes it possible to analyse the many factors that influence both the monetary base and the base multiplier which are linked to the money supply; and are the activities of the commercial banks, the Bank of Lebanon, the public and the foreign sector.

2 - We can also use the method followed in Chapter III to analyse and trace specifically the influence of the foreign sector on the monetary base in the Lebanon.

3 - The macroeconomic models which use multiple equations such as the consumption function, income, investment and saving functions, and the demand and supply of money, require the use of data on interest rates and return on various Treasury bills and local authority bills for empirical testing; such as

short-term bond rates
long-term bond rates
Treasury bill rates
Unfortunately we do not have a bond market in the Lebanon. Therefore, I do not think it is realistic to develop a macro-model and test it empirically for the Lebanon, if its equations include certain variables which are rates of return on Treasury bills and short-term, and long-term bonds, for they do not exist in the Lebanon.
Chapter II

The Financial Institutions of the Lebanon

The central bank of the Lebanon is the Bank of Lebanon, established in April 1964.

The other financial institutions can be divided into the following categories:

I  Commercial banks
II  Semi-public financial institutions
   (a) The Agricultural, Industrial and Real Estates Credit Bank, and
   (b) The National Bank for Industrial and Touristic Development
III  Other private financial institutions
I The Commercial Banks in the Lebanon

At the end of 1974 there were 74 commercial banks operating in the Lebanon. These are divided into three groups.

1. Banks owned mainly by non-Arabs
2. Banks owned mainly by Arabs
3. Banks owned mainly by Lebanese

These three groups of banks are wholly owned by the private sector of the economy.

The main activities of the commercial banks in the Lebanon are divided into two fields, firstly the field of accepting deposits, and secondly the field of lending. The liabilities side of the banks' balance sheet shows that deposits are divided into (a) demand deposits and (b) time and foreign currency deposits. The published figures include so-called secret deposits, i.e. deposits about which no information regarding ownership is obtainable.

The commercial banks' activities in the field of lending are divided into lending to the private sector and lending to the government. Lending to private individuals consists of short-term loans. Lending to the business sector is composed of two types of credits: overdrafts, and short-term loans. There is a clear lack of medium-term and long-term loans to the private sector. The Lebanese public authorities finance themselves partly by borrowing from the commercial banks. For the period 1965-1974 the amount borrowed by the government from the commercial banks amounted to roughly 1.5% of the total borrowed by the private sector.

Ownership of the commercial banks in the Lebanon and the names of the main shareholders of each bank are as follows:

\[\text{\textsuperscript{1}IMF International Financial Statistics, Oct. 1975, p.237}\]
<table>
<thead>
<tr>
<th>Name of Bank</th>
<th>Main Shareholders</th>
<th>Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Bank of Lebanon and Syria</td>
<td>B.K. de Paris et Des Pays Bas</td>
<td>70%</td>
</tr>
<tr>
<td>The Franco-Lebanese Bank</td>
<td>CIE, Francaise de Suez</td>
<td>70%</td>
</tr>
<tr>
<td></td>
<td>Trankhaus et Burkhart</td>
<td>6%</td>
</tr>
<tr>
<td>The General Lebanese Company</td>
<td>STE Generale de Banque</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Bruxelles</td>
<td></td>
</tr>
<tr>
<td>Sebay Bank</td>
<td>Banque de l'indocline</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td>Banco Commerciale Italiana</td>
<td>25%</td>
</tr>
<tr>
<td>The French Bank of the Middle East</td>
<td>Banque de l'indocline</td>
<td>70%</td>
</tr>
<tr>
<td>Trad Bank</td>
<td>Credit Lyonnais</td>
<td>45%</td>
</tr>
<tr>
<td>British Bank of the Middle East</td>
<td>British Bank of the Middle East</td>
<td>97%</td>
</tr>
<tr>
<td>Leetex Bank</td>
<td>BK Bulgare de Commerce</td>
<td>98.5%</td>
</tr>
<tr>
<td>The First National Bank of Chicago</td>
<td>The First National Bank of Chicago</td>
<td>96%</td>
</tr>
<tr>
<td>Name of Bank</td>
<td>Shareholders</td>
<td>shares</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Royal Bank of Canada</td>
<td>Royal Bank of Canada</td>
<td>95%</td>
</tr>
<tr>
<td>The Lebanese-Pakistan Bank</td>
<td>United Bank LTD (Karachi)</td>
<td>95%</td>
</tr>
<tr>
<td>Reef Bank</td>
<td>Commerz Bank (W.G.)</td>
<td>30%</td>
</tr>
<tr>
<td>Machrek Bank</td>
<td>Morgan Garantee</td>
<td>40%</td>
</tr>
<tr>
<td>Trans-Eastern Bank</td>
<td>Kesmit Roosveld</td>
<td>80%</td>
</tr>
<tr>
<td>Continental Illinois Nat. BK Trust Co.</td>
<td>Continental Illinois Nat. BK Trust Co.</td>
<td>60%</td>
</tr>
<tr>
<td>Credit Suisse</td>
<td>Credit Suisse</td>
<td>80%</td>
</tr>
<tr>
<td>Rabieh Bank</td>
<td>Chemical Bank N.Y.</td>
<td>40%</td>
</tr>
<tr>
<td>Mediterane Bank</td>
<td>Fidelity Bank</td>
<td>80%</td>
</tr>
<tr>
<td>Itifad Bank</td>
<td>United California Bank</td>
<td>43%</td>
</tr>
</tbody>
</table>

**Group II - Banks Owned Mainly by Arabs**

<table>
<thead>
<tr>
<th>Name of Bank</th>
<th>Shareholders</th>
<th>shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bank of Egypt and Lebanon</td>
<td>Egypt</td>
<td>over 90%</td>
</tr>
<tr>
<td>The Bank of Beirut and the Arab Countries</td>
<td>Saudi Arabia</td>
<td>40%</td>
</tr>
<tr>
<td>Bank of Beirut and Riad</td>
<td>Saudi Arabia</td>
<td>20%</td>
</tr>
<tr>
<td>Bank Medabo</td>
<td>Iraq, Kuwait, S.A. and Jordan</td>
<td>80%</td>
</tr>
<tr>
<td>Reef Bank</td>
<td>Kuwait</td>
<td>50%</td>
</tr>
<tr>
<td>Machrek Bank</td>
<td>Kuwait and Ratar</td>
<td>50%</td>
</tr>
<tr>
<td>Awda Bank</td>
<td>Kuwait</td>
<td>50%</td>
</tr>
</tbody>
</table>
Group III - Banks Owned Mainly by Lebanese

The Lebanese Bank for Commerce, The United Lebanese Bank, Saradar Bank, Farhon and Shiha Bank, Byblos Bank, Adcom Bank, the Lebanese Brazilian Bank, the Lahor and Industrial Bank, Bank of Beirut for Commerce, the Lebanese African Bank, Gagah Bank, Majdalani Bank, Cedar Bank, Liberal Bank, Beelsa Bank, Mahjar Bank and some other smaller banks.

The banks' share of the money market can be divided into three different sections:

<table>
<thead>
<tr>
<th>Section A</th>
<th>Total Loans 4171 million LL</th>
<th>Total deposits 6235 million LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-Arab Foreign Banks</td>
<td>28.03%</td>
<td>27.11%</td>
</tr>
<tr>
<td>Lebanese banks - main shareholders non-Arab Foreign banks</td>
<td>32.05%</td>
<td>29.88%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arab Banks</td>
</tr>
<tr>
<td>Lebanese Banks - main shareholders Arab Banks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanese Banks - main shareholders Lebanese</td>
</tr>
<tr>
<td>100%</td>
</tr>
</tbody>
</table>

The above figures were taken from Al-Nahar paper 26.1.1974. According to the figures shown in sections A, B and C the foreign banks control about 78.10% of the lending market, and about 80% of the commercial bank deposits. Lebanese banks have only 21.9% of the lending market and 20% of bank deposits. One of the main characteristics of banks operating in the Lebanon is their heterogeneity. They range from banks with half a billion L.L. in deposits to those with four million L.L.
It seems that one of the weaknesses of the Lebanese banking system has been the financial assets side. Commercial banking in the Lebanon has been offered limited opportunities for portfolio diversifications in domestic financial assets. Banks in the Lebanon have shown some willingness to invest in illiquid assets and to undertake a certain amount of risk by speculating in the foreign exchange market.

Table 1 shows the development of the commercial banks' assets over the period 1965-1975. It tells us that commercial banks in the Lebanon have high liquidity with reserves and foreign assets. From 1967 foreign assets grew more rapidly than claims on the private sector around 1970 they became of equal importance. Due to unexpected fluctuations in exchange rates and buoyant domestic demand the banks became less willing to invest in the foreign markets. The Lebanese pound showed relative stability during the period 1971-1975, this plus the fact that the Bank of Lebanon has been willing to accumulate foreign exchange made it possible for the commercial banks to treat their foreign assets or consider them to be equivalent to cash. The division of commercial banks according to three groups shows up that most of the strong banks in the Lebanese market (group I and group II) are owned mainly by big non-Lebanese banks that operate in America and Europe. These big banks are able to increase or decrease their foreign assets as they wish, while the bank of Lebanon might influence their decisions by intervening in the foreign exchange market. Such an action is not always possible, because in some cases it would be unadvisable to change the exchange rate thus influencing the Lebanese Balance of Payments. There are times when an intervention in the exchange market might reduce exports and increase imports or vice versa.

---

9 This holds for the period 1972-1975 where the Lebanese pound appreciated vis-a-vis the dollar about 22%.  
10 During the 1970's foreign assets were about 20% - 25% of total deposits, this might be due to the lack of alternatives for investment such as the bond market.
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<tbody>
<tr>
<td>Reserves</td>
<td>108</td>
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<td>149</td>
<td>287</td>
<td>297</td>
<td>345</td>
<td>542</td>
<td>577</td>
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<td>Foreign Assets</td>
<td>1848</td>
<td>1584</td>
<td>1317</td>
<td>1574</td>
<td>1641</td>
<td>2038</td>
<td>2607</td>
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<tr>
<td>Claims on Government</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>69</td>
<td>118</td>
<td>101</td>
<td>60</td>
<td>78</td>
<td>60</td>
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<tr>
<td>Claims on the private sector</td>
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<td>2336</td>
<td>2285</td>
<td>2028</td>
<td>2132</td>
<td>2145</td>
<td>2672</td>
<td>3272</td>
<td>4671</td>
<td>575</td>
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<tr>
<td>Total</td>
<td>4266</td>
<td>4208</td>
<td>3791</td>
<td>3958</td>
<td>4188</td>
<td>4629</td>
<td>5881</td>
<td>7105</td>
<td>8987</td>
<td>1141</td>
</tr>
</tbody>
</table>

Table 1

Source: International Financial Statistics - I.M.F.
The commercial banking system in the Lebanon is affected by the lack of rediscouting facilities. The Bank of Lebanon tends to discourage access to rediscouting except in emergencies, by setting fairly low quotas for individual banks. The data available shows banks with total assets of around 300 million L.L. and have only 15 million LL quotas. The Lebanese market really has a big shortage of bills which are eligible for refinancing.

Tables 2 and 3 use the period 1967-1974 and show the banks assets in West Germany and Italy. Both West Germany and Italy are open economies and their banks have a fair amount of Foreign Assets. Table 4 is derived from Tables 1, 2 and 3 and is divided into two sections or parts. The first section represents the Foreign Assets as a percentage of Banks Total Assets [Lebanon, West Germany and Italy], while the second or lower section represents Foreign Assets as a percentage of total bank loans for the same countries. According to table 4 the Lebanese Commercial banks hold a very high proportion of their assets in the form of Foreign Assets; in 1972 foreign assets were about 44.7% of banks total assets the lowest is 34.7% for 1967 and 34.9% for 1974. If we consider the lower part of Table 4 we find that Foreign Assets of the banks in the Lebanon in 1971 were 95.4% of total bank loans: (the lowest value is 56.6% - 1967).

The West German and the Italian cases are different, the highest value for West German Foreign Assets when taken as a percentage of total bank assets is 13.8% - 1970, and the lowest is 5.6%. For Italy the highest is 15.7% - 1972, and the lowest is 6.8% in 1967. In the case of foreign assets taken as a percentage of total bank loans, the highest for West German banks is 10.7% 1969 and the lowest is 6% - 1973; for Italy the highest is 21.9% for 1973 and the lowest is 8% for 1967.

11 Figures produced by the Bank of Lebanon
<table>
<thead>
<tr>
<th>Year</th>
<th>West Germany Assets</th>
<th>Foreign Assets</th>
<th>Claims on Government</th>
<th>Claims on private sector</th>
<th>Total</th>
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<tr>
<td>1968</td>
<td>18.8</td>
<td>21.5</td>
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<tr>
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<td>52.8</td>
<td>82.5</td>
<td>490.6</td>
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<td>1972</td>
<td>53.5</td>
<td>52.4</td>
<td>92.6</td>
<td>569.3</td>
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<td>50.6</td>
<td>102.9</td>
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<td>1974</td>
<td>55.5</td>
<td>72.9</td>
<td>132.4</td>
<td>672.1</td>
<td>931.4</td>
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Source: International Financial Statistics - I.M.F.
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<td>3245</td>
<td>3877</td>
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<td>5221</td>
<td>5196</td>
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<td>9918</td>
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<td>12654</td>
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<td>Claims on Business and Individuals</td>
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<td>22887</td>
<td>26410</td>
<td>29758</td>
<td>33508</td>
<td>39775</td>
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<td>5771</td>
<td>6871</td>
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<td>35875</td>
<td>39800</td>
<td>49254</td>
<td>59609</td>
<td>73349</td>
<td>92046</td>
<td>102371</td>
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Table 3: Source: International Financial Statistics I.M.F.
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<td>Lebanon</td>
<td>34.7%</td>
<td>39.4%</td>
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<td>44%</td>
<td>44.3%</td>
<td>44.7%</td>
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<tr>
<td>as a % of total</td>
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<td>Bank Assets</td>
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<tr>
<td>West Germany</td>
<td>5.6%</td>
<td>7.3%</td>
<td>9.3%</td>
<td>13.8%</td>
<td>7.7%</td>
<td>6.5%</td>
<td>6.7%</td>
<td>7.8%</td>
</tr>
<tr>
<td>Italy</td>
<td>6.8%</td>
<td>9.0%</td>
<td>11.3%</td>
<td>12.8%</td>
<td>12.9%</td>
<td>15.7%</td>
<td>16.7%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Lebanon</td>
<td>56.6%</td>
<td>75.0%</td>
<td>72.9%</td>
<td>90.7%</td>
<td>95.4%</td>
<td>94.8%</td>
<td>76.6%</td>
<td>68.9%</td>
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<td>Foreign Assets</td>
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<tr>
<td>as a % of total</td>
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<tr>
<td>West Germany</td>
<td>8.2%</td>
<td>9.8%</td>
<td>10.7%</td>
<td>10.3%</td>
<td>9.0%</td>
<td>7.5%</td>
<td>6.0%</td>
<td>9.1%</td>
</tr>
<tr>
<td>Italy</td>
<td>8.0%</td>
<td>10.1%</td>
<td>12.6%</td>
<td>15.8%</td>
<td>16.5%</td>
<td>20.4%</td>
<td>21.9%</td>
<td>11.9%</td>
</tr>
</tbody>
</table>

*Table 4*
From Table 4 we can draw two main conclusions:

(a) The commercial banks in the Lebanon hold a high proportion of their total assets in the form of liquid assets. The bulk of these consists of foreign assets as the domestic money market does not offer enough or sufficiently diversified investment opportunities.

(b) Commercial banks in the Lebanon have been able to treat their foreign assets as equivalent to cash, as the Bank of Lebanon is always prepared to exchange these against cash and/or central bank deposits.
Graph 1 shows two curves for the period 1965-1974, it is based on quarterly data in millions of Lebanese pounds, the upper curve represents the commercial banks' total deposits and the lower curve represents the commercial banks' loans or claims on the private sector. It seems that over the period 1965-1974 both total deposits and bank loans moved almost in identical paths. Both curves show a minor peak in the third quarter of 1966, after that they show a drop up till the end of 1967. The curves have another minor peak in 1968 III and a fall or sudden drop in the end of 1968, but they grow steadily over 1969 and 1970, and from 1971 till 1974 we observe a rather high increase in both total deposits and bank loans.

Table 5 is divided into two sections, the upper section represents banks' total loans, for Lebanon, West Germany and Italy, while the lower section gives us the percentage of total loans with respect to total bank assets for the same countries. The three countries are open-economies and are subject to capital inflows and outflows, the main purpose of the comparison is only to show the contributions of bank loans to the banks' assets. The lowest percentage for the Lebanon is 46.5% in 1971, and the highest is 61.3% during 1967. The lowest for West Germany is 86% in 1970 and the highest is 89.4% in 1967. The highest for Italy is 88.5% for 1968, and the lowest is 76.3% for 1973. The Lebanese banks as argued before have placed a great proportion of their assets in the form of foreign assets, thus are left with a relatively low proportion of assets to lend.

---

15 The drop in bank deposits and banks' claims on the private sector is due to the Intra-bank crisis

16 The three mentioned countries have different economies, this makes comparisons almost unrealistic, but we are only interested in the Banks' assets and their total claims.
<table>
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</thead>
<tbody>
<tr>
<td>Lebanon</td>
<td>2325</td>
<td>2097</td>
<td>2246</td>
<td>2732</td>
<td>3350</td>
<td>4731</td>
<td>5769</td>
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<tr>
<td>West Germany Banks' Total Loans in L.L. millions</td>
<td>342.2</td>
<td>409</td>
<td>461.6</td>
<td>513</td>
<td>583.2</td>
<td>672.2</td>
<td>743.1</td>
<td>804.5</td>
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<tr>
<td>Lebanon Banks' Total Loans in Millions of Deutsche Mark</td>
<td>31774</td>
<td>40053</td>
<td>46892</td>
<td>56564</td>
<td>70284</td>
<td>84448</td>
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<td>Italy Banks' Total Loans in Millions of Lira</td>
<td>27967</td>
<td>36030</td>
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<tr>
<td>Total Loans as a % of total Assets</td>
<td>61.3%</td>
<td>53.7%</td>
<td>48.5%</td>
<td>46.5%</td>
<td>47.1%</td>
<td>52.6%</td>
<td>50.5%</td>
<td>50.5%</td>
</tr>
</tbody>
</table>

| West Germany | 89.4% | 88.6% | 86.6% | 86.0% | 86.6% | 88.6% | 88.5% | 86.5% |
| Italy        | 85.5% | 88.5% | 86.5% | 81.0% | 78.6% | 77.1% | 76.3% | 73.5% |

Table 5
### Commercial Banks' Claims on Private Sector in The Lebanon
**millions of L.L.**

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>115</td>
<td>5</td>
<td>119</td>
<td>5</td>
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<tr>
<td>Industry</td>
<td>385</td>
<td>17</td>
<td>461</td>
<td>18</td>
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<tr>
<td>Construction</td>
<td>265</td>
<td>12</td>
<td>313</td>
<td>12</td>
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<tr>
<td><strong>Trade and Services</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>of which:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Foreign Trade</td>
<td>1215</td>
<td>54</td>
<td>1401</td>
<td>53</td>
</tr>
<tr>
<td>b) Domestic trade</td>
<td>499</td>
<td>22</td>
<td>587</td>
<td>22</td>
</tr>
<tr>
<td>c) Other services</td>
<td>167</td>
<td>7</td>
<td>205</td>
<td>8</td>
</tr>
<tr>
<td>d) Consumer credit</td>
<td>111</td>
<td>5</td>
<td>143</td>
<td>5</td>
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<tr>
<td><strong>Financial Institutions</strong></td>
<td>70</td>
<td>3</td>
<td>4</td>
<td>4</td>
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<tr>
<td><strong>Others</strong></td>
<td>200</td>
<td>9</td>
<td>9</td>
<td>9</td>
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</tbody>
</table>

**Table 6:** Source: Bank of Lebanon
Some bankers in the Lebanon argue that commercial banks in the Lebanon have more deposits than they can absorb i.e. the Lebanese economy is not sophisticated enough to absorb these deposits. Banks in the Lebanon are investing in the Euro-dollar market for the rate of return in that market is higher than it is in the Lebanese market, and therefore have less resources to lend in the Lebanon. West Germany and Italy have heavy industries and relatively bigger capacities to absorb capital than the Lebanese economy, perhaps this explains partly the higher percentages shown in Table 5 by West Germany and Italy.

The commercial banks' overall lending must be well spread. The banker usually advances to various kinds of customers. The banker is aware of the following points 1 - the current level of interest rates, 2 - the risk involved in investment and 3 - the speed with which the invested capital can be withdrawn. Table 6 uses the period 1970-1973 and presents the commercial banks' claims on the private sector in the Lebanon. Loans are divided among Trade and services, Agricultural industry, construction and loans to other financial institutions. Trade and services had the lion's share of bank loans around 53.5% for the period 1970-73, while industry has around 17% of total loans, and agriculture has only about 4.8% of total bank loans. Such allocation of credit is really expected in an economy which is highly dependent on trade and services.

Table 7 shows the distribution of assets of commercial banks by credit instrument in the Lebanon. The most striking observation is the limited importance of various types of bonds and bills. Bills and bonds when taken as a percentage of The assets vary between 9% and 12% for the period 1969-1972, while bank cash for 1971 and 1972 was about 22% of The assets. Securities have been even less important, they average 3% of The assets for 1969-72, and shares are virtually negligible.

---

17 The higher the risk is the higher the rate of return should be.

* Foreign Assets not included.
### Assets of Commercial Banks by Credit Instrument in the Lebanon in millions of L.L.

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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
<td>Amount</td>
<td>%</td>
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<tr>
<td>Cash</td>
<td>947</td>
<td>19</td>
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<td>22</td>
<td>2034</td>
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<td>Bills and Bonds</td>
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<td>665</td>
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<td>725</td>
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<td>Advances</td>
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<td>3490</td>
<td>58</td>
<td>4414</td>
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<td>178</td>
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<td>Shares</td>
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<td>1</td>
<td>52</td>
<td>1</td>
<td>39</td>
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<tr>
<td>Others</td>
<td>315</td>
<td>6</td>
<td>369</td>
<td>6</td>
<td>458</td>
<td>6</td>
<td>504</td>
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<tr>
<td>Total</td>
<td>5061</td>
<td>100</td>
<td>5981</td>
<td>100</td>
<td>7438</td>
<td>100</td>
<td>9162</td>
<td>100</td>
</tr>
</tbody>
</table>

*Table 7: SOURCE: Bank of Lebanon*

Foreign Assets not included.
Advances are the most important form of assets, 59% of the assets for 1972, this is mainly due to two reasons. The first reason is the unpopularity of bonds in the Lebanon. Bills and bonds are not popular, because banks must pay about 0.2% stamp tax on each bill, and since tax is maturity-sensitive means that short-term paper is highly discouraged. If 30 day paper were rolled over ten times, the stamp tax would add up to 2% in extra cost. The second reason is really the absence of a solid Treasury Bill market in the Lebanon.

The end result lead banks to lend mainly in the form of advances and overdrafts. The prime lending rates have been low, due to the high degree of competition in the Lebanon caused by the great number of banks operating in Beirut. The rest of the assets are held in the forms of foreign assets and reserves.

The commercial banks have certain rates which will be changed on loans and they are related to the rates obtainable on other alternative assets that banks could hold and to the liquidity of their existing portfolio in order to obtain preferred combinations of return and risk in the management of banks portfolio. If the money market can provide bonds in the Lebanon then the commercial banks will be furnished with alternatives which are earning assets with very low risk, and so the banks will want to charge higher rates on loans.

---

Another reason given by the banks is the customers' unwillingness to utilise bills for they wish to avoid detailed records of their credit operations.
In the Lebanon there are two semi-public financial institutions, the Agricultural Industrial and Real Estate Credit Bank - AIRECB - and the National Bank for Industrial and Touristic Development - NBITD

(a) **The Agricultural Industrial and Real Estate Credit Bank**

The AIRECB's capital is 40% owned by the government, and 60% by the private sector. It has a paid up capital of 50 million LL and derives its resources in three ways:

i. Deposits of banks

ii. Funds arising from refinancing with the Bank of Lebanon

iii. Funds provided by government

The AIRECB was established in order to provide loans to "socially desirable projects" in the agricultural and industrial sectors of the Lebanese economy. The law provides for the bank to lend for periods up to 12 years, but in practice most of its long-term credits cover periods from 5 to 8 years. Its rates of interest charged are regulated by the authorities i.e. the lending rate to agriculture is not allowed to exceed AIRECB's special discount rate with the Bank of Lebanon by more than 3.5%.

Agricultural loans were originally limited by law to 60,000 LL per person or per project, but the demand for such loans has been so high that the limit was reduced to 30,000 LL. AIRECB is entitled, within certain limits, to create a large number of cheap loans to encourage industrial and agricultural output.

AIRECB, like any other commercial bank, is capable of causing changes in the money supply by expanding its volume of lending.
(b) The National Bank for Industrial and Touristic Development

The National Bank for Industrial and Touristic Development was originally thought of in the 1960s as a result of apparent unwillingness of the banking system to provide medium and long-term financing for domestic investment.

The original concepts of establishing a finance company under state control received so much criticism from the private sector that eventually a compromise was reached according to which the 49% of the share capital of NBITD is held by the private sector and 51% by the government. The NBITD is explicitly forbidden to engage in refinancing activities, and is not allowed to receive time deposits from any source for less than two-years.

The role of the National Bank for Industrial and Touristic Development is to generate new projects and help new ventures. Unfortunately the NBITD's activities can be vetoed by the Council of Ministers, thus hampering the NBITD's role in the financial market. In fact the NBITD's rates of rejection for new projects has been very high.

The NBITD is allowed to issue bonds, receive time deposits for periods of not less than two years (as mentioned above) and to grant loans to commercial banks. If the statutes of the NBITD remain unchanged, with the Council of Ministers retaining the power to veto its activities, then it does not have a very promising future, and a rather high proportion of the demand for loans to start new industrial and touristic projects will remain unsatisfied.

The effect of the NBITD's activities on the money supply does not appear to be very clear. However, since the NBITD did not play any important role in the financial market until 1975 it appears that the NBITD's contribution to changes in the Lebanese money supply has in any case been rather negligible.
3 - Other private Financial Institutions

Before 1972 there were no financial institutions providing medium and long-term loans wholly owned by the private sector operating in the Lebanon, although the law authorising and regulating such institutions has been in existence since 1967. The 1967 law was enacted principally in response to the collapse of Intra Bank and with the aim of encouraging the specialisation of long-term financial operations within different sets of financial institutions. The authorities decided to issue licences for the establishment of up to four credit banks specialising in the provision of medium and long-term loans, but only two institutions in this category started their operations in 1972. One is the long-term credit bank which is owned by foreign financial institutions, with a 35% share held by a local bank; this financial institution issues certificates of deposits to be placed principally with Arab institutional and individual investors, and it conducts project financing and Euro-currency lending on both the regional and international level. The second of the long-term credit banks operating so far is the Bank of the Near East which is organised by a group of domestic and foreign insurance companies, and is mainly concerned with the provision of mortgage finance to individual home-buyers and with conducting limited amounts of long-term domestic lending. Unfortunately there are no other financial institutions dealing with mortgages to finance individual home buyers.

It is the task of the credit banks specialising in longer term loans to expand the flow of medium and long-term funds to Lebanese corporations and enterprises. The demand for long-term funds by Lebanese corporations is not high, and existing demand for explicitly fixed-term loans is currently being adequately provided for by the commercial banks. The relatively limited development of a market for long-term domestic securities and for certificates of deposit of maturities longer than one year can entail an average interest cost of between 6% and 7.5% for borrowings by long-term credit banks from the public. This in turn implies an average
loan cost for term loans taken up by non-banks of about 10%. This compared to a current prime rate (1973) of about 8% would make it difficult to induce term borrowings by Lebanese investors who for the reason mentioned above may not be prepared to pay a higher rate for the advantages of a longer term loan. Up till 1975 the credit banks operating in the longer term loan market have not been able to influence to any marked degree the volume of medium and long-term borrowing. The medium and long-term credit banks are a new phenomena in the Lebanese financial market and the monetary authorities have not encouraged a more rapid growth in the number and size of these institutions.

Apart from these institutions there are about 90 small Financial Companies whose main function is lending to small businessmen and to consumers. These financial companies are not under the direct control of the Central Bank and they are not required to hold any legal reserves with the Bank of Lebanon; they rediscount their bills with commercial banks, and their share of the loan market is rather small.

Apart from the commercial banks there are six prominent foreign exchange dealers in the Lebanon who sit at the top of a pyramid structure composed largely of lesser dealers, and finally street dealers who are part of the foreign exchange organisation. The rates charged by these dealers for small sums are more competitive than those charged by the commercial banks.

The insurance sector in the Lebanon, other than life insurance and pension schemes, is well developed. There are 87 companies operating in the Lebanon, 15 of which are Lebanese, and 72 of which are branches or agencies of international insurance groups.
The Bank of Lebanon started its operations on the first of April 1964. The charter of the Bank of the Lebanon was drawn up under the Law issued on 1 August 1963, which promulgated what is known as the Code of Money and Credit.

Article 12 of the Code of Money and Credit stated that a Central Bank should be established in the Lebanon under the name of the Bank of Lebanon. Its capital is LL 15 million entirely subscribed by the Lebanese state. The Bank has a governor, three deputy governors and a central council.¹

The Bank of Lebanon is owned by the state, but is free from political interference and has an independent Board. The Governor of the Bank of Lebanon is proposed by the Minister of Finance and appointed by the Government for six years. The Deputy Governors are chosen by the Government for five years on the proposal of the Governor of the Bank and the Minister of Finance. All terms of office are renewable.

The Central Council is composed of the Governor, two deputy governors and the directors-general of the Ministry of Finance and the Ministry of National Economy. Article 33 of the Code of Money and Credit states that the general policy of the Bank of Lebanon is decided upon by the Central Council. In all its decisions, the Central Council will be helped by a consultative committee of six members which will report to the Governor of the Bank of Lebanon.

The Consultative Committee of six is made up of one member from each of the following sectors: the Commercial Banking sector, the Industrial sector, the Agricultural sector and the commercial sector, the fifth member is from the Planning Council and the sixth member is a Professor of Economics. The term of office is two years and is renewable. The Consultative Committee of six has advisory power only and can give advice when asked by the Governor of the Bank or when it deems it necessary.

¹ The Code of Money and Credit, published in Beirut, August 1963, and with some amendments in October 1969.
The main role of the Bank of Lebanon according to article 70 of the Code of Money and Credit is to safeguard the value of the Lebanese currency in order to further the economic and social progress of the country. Article 75 gives the Bank of Lebanon the power to use all the monetary tools which are necessary to stabilise the Lebanese pound. And article 76 states that the Bank of Lebanon is able to use legal reserve requirements up to 25% on demand deposits, and up to 15% on time deposits, and is able to use discount rate changes and open market operations as stated in articles 106, 107 and 108. Article 105 states that if government bonds are available the Bank of Lebanon can buy and sell such bonds whose date of maturity must not exceed 90 days. The Bank of Lebanon is not able to sell government bonds to the public, only to commercial banks which have deposits with the Bank of Lebanon (article 109 Code of Money and Credit).

The matters relating to note issuing is decided upon by the Central Council. This activity is regulated by articles 47-69 of the Code of Money and Credit. In particular a minimum gold cover of 50% is required for the Lebanese currency. The Central Council decides also on matters relating to transactions in the gold market, dealings in foreign exchange and co-operation with other central banks. The Bank of Lebanon is not allowed to carry out any ordinary commercial transactions with the private sector, its banking business can be performed with the commercial banking sector, and governmental bodies only (article 82). The Bank of Lebanon is authorised to grant the Government overdraft facilities repayable after four months with amounts not exceeding 10% of the average fiscal receipts over the previous three years and in "exceptionally grave circumstances" the Bank of Lebanon after having studied all other alternatives, is allowed to grant a loan to the Government (article 88). The Bank of Lebanon is also allowed to grant loans to other public agencies but in all cases they have to be repaid within ten years, and the rates charged will be the market rates (articles 91,92,93).
The Bank of Lebanon will also help the state in issuing bonds and bills and will manage the public debt (article 97).

The Bank of Lebanon will act as the Bankers' bank allowing the commercial banks to keep accounts with it (article 98). The Bank of Lebanon rediscounts the banks' commercial paper on the understanding that the commercial banks will buy it back within a month (article 101). The Bank of Lebanon may grant the commercial banks credits not exceeding twelve months and against the security of first class commercial paper, gold, foreign currencies or shares (article 102).

The control of the activities of the Bank of Lebanon is undertaken by a Commissariat du Gouvernement Auprès de la Banque Centrale which is part of the Ministry of Finance (article 41). The functions of the Commissariat are to make sure that the law is obeyed and to check the Bank of Lebanon's accounts and to report to the Minister of Finance (articles 42, 44, 45). Article 43 states that the Commissariat must be kept informed of all of the Bank of Lebanon's decisions and it has the right to stop their implementation within two days, if they are contrary to the law.

Up till the end of 1975 the Bank of Lebanon used two monetary tools the discount rate, and changes in legal reserve requirements. There is an obvious absence of open market operations from the activities of the Bank of Lebanon. Table 1 shows us that the discount rate remained the same between 1964 and November 1973, at 3%, it then increased up to 5% in November 1973 till June 1974, and then up to 7% during July of 1974, and to 8% in August 1974. Legal reserve requirements reached 10% of demand deposits at the end of 1974. Table 2 shows the interest paid on Treasury Bonds for the period 1967-1973. The Treasury issued bonds whose value is 284 million LL for the period 1967-1973 almost one third of the amount. The Treasury was authorised by Parliament to issue. The issuing of bonds was discontinued after 1973.
<table>
<thead>
<tr>
<th>PERIOD</th>
<th>BANK OF LEBANON DISCOUNT RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>I 3%</td>
</tr>
<tr>
<td></td>
<td>II 3%</td>
</tr>
<tr>
<td></td>
<td>III 3%</td>
</tr>
<tr>
<td></td>
<td>IV 3%</td>
</tr>
<tr>
<td>1966</td>
<td>I 3%</td>
</tr>
<tr>
<td></td>
<td>II 3%</td>
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<tr>
<td></td>
<td>III 3%</td>
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<tr>
<td></td>
<td>IV 3%</td>
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<tr>
<td>1967</td>
<td>I 3%</td>
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<tr>
<td></td>
<td>II 3%</td>
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<tr>
<td></td>
<td>III 3%</td>
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<tr>
<td></td>
<td>IV 3%</td>
</tr>
<tr>
<td>1968</td>
<td>I 3%</td>
</tr>
<tr>
<td></td>
<td>II 3%</td>
</tr>
<tr>
<td></td>
<td>III 3%</td>
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<tr>
<td></td>
<td>IV 3%</td>
</tr>
<tr>
<td>1969</td>
<td>I 3%</td>
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<tr>
<td></td>
<td>II 3%</td>
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<td></td>
<td>III 3%</td>
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<td></td>
<td>IV 3%</td>
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<tr>
<td>1970</td>
<td>I 3%</td>
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<td>II 3%</td>
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<td>III 3%</td>
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<td></td>
<td>IV 3%</td>
</tr>
<tr>
<td>Year</td>
<td>Period</td>
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<td>------</td>
<td>--------</td>
</tr>
<tr>
<td>1971</td>
<td>I</td>
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<tr>
<td></td>
<td>II</td>
</tr>
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<td>III</td>
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<td>IV</td>
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<tr>
<td>1972</td>
<td>I</td>
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<td>II</td>
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<td>III</td>
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<td>1973</td>
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<td>III</td>
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<td>1974</td>
<td>I</td>
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<td></td>
<td>II</td>
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<tr>
<td></td>
<td>July</td>
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<tr>
<td></td>
<td>August</td>
</tr>
<tr>
<td></td>
<td>IV</td>
</tr>
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</table>

**TABLE I**
<table>
<thead>
<tr>
<th>PERIOD</th>
<th>INTEREST ON TREASURY BONDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>3.5%</td>
</tr>
<tr>
<td>1968</td>
<td>3.5% $\leq$ Interest $\leq$ 6%</td>
</tr>
<tr>
<td>1969</td>
<td>6%</td>
</tr>
<tr>
<td>1970</td>
<td>6%</td>
</tr>
<tr>
<td>1971</td>
<td>6%</td>
</tr>
<tr>
<td>1972</td>
<td>4%</td>
</tr>
<tr>
<td>1973</td>
<td>4%</td>
</tr>
</tbody>
</table>

Table 2: For the period 1967–1973 parliament authorised the issue of Treasury bonds up to 700 million LL. The Treasury issued bonds whose value is 284 million LL for the period 1967–1973.
The establishment of the Bank of Lebanon has certain impacts on the money market and different monetary tools have different effects on the behaviour of commercial banks.

Let us consider the liquid assets of the commercial banks where we have the following:

Legal Reserves plus other reserves with the BL = LR,

Cash = \( C_p \), Banks Net Foreign assets = BNFA, and call loans plus Treasury Bills = \( L/Treasury \) bills were sold only once to some commercial banks, so in real terms

\[ L = \frac{call \ loans}{7} \]

The regulatory base of commercial banks (A) is

\[ A = LR + BNFA + L \]  \( \ldots \)  \( (1) \)

we can include BNFA because they constitute an important part of commercial banks assets, specially for foreign banks whose balances abroad are easily interchangeable with their Lebanese assets, i.e. they can increase their cash holdings by bringing in some of their foreign assets from abroad, and so can some of the big Lebanese owned banks.

\[ BNFA = \text{Foreign Assets} - \text{Foreign Liabilities}, \] and

\[ C = C_p + C_b, \] where \( C_p \) is currency in the hands of non-bank
public, and \( c_b \) is the notes in hand of the commercial banks, and is treated as a part of LR.

The Bank of Lebanon Assets consist of Foreign Assets (FA), which represent the foreign exchange reserves held by the Bank, plus claims on the government, the private sector, and on commercial banks (DA), these claims are the domestic assets.

\[
BLA = DA + FA \quad \ldots \quad (2)
\]

\( BLA = \) Bank of Lebanon Assets

The Bank of Lebanon Liabilities (BLL) are reserve money \( R_m \) government deposits GD, and other net items u.

\[
BLL = R_m + GD + u \quad \ldots \quad (3)
\]

\( R_m = c_p + LR; \quad c_p = R_m - LR \) by substitution we get

\[
BLL = (c_p + LR) + GD + u \quad \ldots \quad (4)
\]

\( BLA = BLL \) (Assets = Liabilities)

so \( BLA = c_p + LR + GD + u \quad \ldots \quad (5) \)

and \( c_p + LR + GD + u = DA + FA \quad \ldots \quad (6) \)

\[
\therefore \Delta c_p + \Delta LR + \Delta GD + \Delta u = \Delta DA + \Delta FA \quad \ldots \quad (7)
\]

and \( \Delta LR = \Delta DA + \Delta FA - \Delta c_p - \Delta GD - \Delta u \quad \ldots \quad (7) \)

we can see from equation (7) that changes in the commercial bank reserves are dependent on DA, FA, \( c_p \), GD and u. We have from equation (1) the liquid assets of commercial banks

\[
A = LR + BNFA + L
\]

\[
\Delta A = \Delta LR + \Delta BNFA + \Delta L
\]

So \( \Delta LR = \Delta A - \Delta BNFA - \Delta L \quad \ldots \quad (8) \)
we can also have the following equation if we substitute equation (7) for \( \Delta LR \) in equation (8).

\[
\Delta DA + \Delta FA - \Delta C_p - \Delta GD - \Delta u = \Delta A - \Delta BNFA - \Delta L
\]

or

\[
\Delta A = \Delta DA + \Delta FA - \Delta C_p - \Delta GD - \Delta u + \Delta BNFA + \Delta L
\]  \( \text{(9)} \)

\[
FA + BNFA = NFA \quad \text{(Net Foreign Assets)}
\]

\[
\Delta A = \Delta DA + \Delta NFA - \Delta GD - \Delta u + \Delta L - \Delta C_p \quad \ldots \quad \text{(10)}
\]

Using equation (10) we then can argue that the changes in the liquid assets of the commercial banks depend mainly on changes in the net foreign assets, government deposits with the Bank of Lebanon, Commercial banks borrowings from the Bank of Lebanon, and changes in bank loans.

If we wish to look at the same problem from another angle, we can do so by using the liabilities of the commercial banks which are demand deposits (D), time deposits (T), credit from Bank of Lebanon (CBL), capital accounts K, and other net items (w). So we have the following:

\[
\text{Liabilities} = D + T + CBL + K + w
\]

since liabilities are equal to assets then

\[
D + T + CBL + K + w = LR + BNFA + L
\]

\[
(D + T + CBL + K + w) = DA + NFA - GD - u + L - C_p
\]  \( \text{(11)} \)

\[
CBL = DA \quad \text{given}; \quad \text{(CBL is credit from the BL, and DA is the claims on commercial banks by the BL)}
\]

\[
\Rightarrow \quad D + T = NFA - GD + L - K - u - w - C_p
\]

\[
\Rightarrow \quad \Delta(D + T) = \Delta NFA - \Delta GD + \Delta L - \Delta K - \Delta u - \Delta w - \Delta C_p
\]  \( \text{(12)} \)

or

\[
\Delta(D + T) + \Delta C_p = \Delta NFA - \Delta GD + \Delta L - \Delta K - \Delta u - \Delta w
\]  \( \text{(13)} \)
the values of $K$, $u$, $w$ and $C_b$ are relatively small, $L$ is divided into two parts, claims on government for April, May and June 1975 are only 0.005% of the claims on the private sector for the corresponding months, in fact the claims on government if taken as a proposition of the claims on the private sector for the period 1967-1975 vary between 0.06% and 0.005% of the claims on the private sector by commercial banks.

Therefore it seems to be possible to treat changes in $L$ as being dependent only on changes in the supply of loans by the banks and on the private sector's demand for loans, unless the government increases its demand for loans from the commercial banks.

Equations (11) and (13) both show that the NFA and GD (government deposits with the BL) have opposite signs, so if there is a change in the balance of payments the BL can try to offset it by changing GD, i.e. an increase in NFA can be met by an increase in GD thus balancing the effect caused by the increase in NFA. According to equation (7) the changes in the legal reserves depend on changes in the BL's foreign assets, banks borrowing from the BL and government deposits with the Bank of Lebanon.

The three main monetary tools which can be used by the Bank of Lebanon are changes in the legal reserve requirements, open market operations, and the discount rate. In order to analyse the first tool legal reserves, it would be rather helpful to reproduce equation (7)

$$\Delta LR = \Delta DA + \Delta FA - \Delta C_p - \Delta GD - \Delta u$$

The bank of Lebanon has the ability to increase the legal reserves on demand deposits up to 25%, on the other hand equation (7) tells us that there are other ways to produce changes in the level of legal reserves.
a) Changes in DA (commercial banks' borrowings from the Bank of Lebanon)

Such a method is not very strong, for it works only in one direction. The Bank of Lebanon can only reduce its lendings to the banks, but is not able to increase the lendings unless the banks are willing to respond. The Bank of Lebanon if it wishes to increase LR through changes in DA must reduce the discount rate, such an action does not necessarily lead to an increase in DA, because DA is a derived demand and dependent on the public's demand for loans. The Bank of Lebanon might be able to use the foreign exchange reserves (FA), say by selling foreign reserves such as the dollar and create an artificial demand for the Lebanese pound. I do not think that using the FA as a tool to change LR is a convenient alternative in the long-run. FA is dependent on the changes in the balance of payments, and therefore is not under the direct control of the Bank of Lebanon, except in one case. The Bank of Lebanon can expect for example a change in capital flows when it changes the discount rate, thus effecting FA. I would like to note that each central bank has its own demand for international monetary reserves, and thus can influence FA (to a certain extent) accordingly.

b) Changes in government deposits with the Bank of Lebanon could cause some changes in LR (from equation (7)). GD has a negative sign and so has \( C_p \) and \( u \), which means that LR and GD move in opposite directions.

If the government wishes to reduce (or change) LR it can do so by increasing GD given that DA, FA, \( C_p \) and \( u \) are constant. The government can also offset changes in foreign reserves (FA) by either increasing or decreasing GD, because FA and GD have opposite signs. \( C_p \) is dependent on changes in the level of income and on the interest rate. We are mainly interested in

---

3The topic of international reserves or the demand for such reserves has been treated in different ways, but the main theme of the argument is based on the idea that every central bank must have a certain demand function for international reserves, and this function has some influence on FA.
changes in the money supply and the relation between $C_p$ and $M_1$, and $C_p$ and LR. An increase in LR would lead to a decrease in the money supply, according to equation (7) a fall in the changes in $C_p$ could increase LR given that DA, FA, GD and $u$ are constant.

<table>
<thead>
<tr>
<th>Year</th>
<th>$C_p$ in Millions of LL</th>
<th>$M_1$ in LL</th>
<th>$C_p/M_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>547</td>
<td>1510</td>
<td>0.35</td>
</tr>
<tr>
<td>1966</td>
<td>645</td>
<td>1555</td>
<td>0.41</td>
</tr>
<tr>
<td>1967</td>
<td>786</td>
<td>1584</td>
<td>0.49</td>
</tr>
<tr>
<td>1968</td>
<td>838</td>
<td>1763</td>
<td>0.48</td>
</tr>
<tr>
<td>1969</td>
<td>868</td>
<td>1667</td>
<td>0.52</td>
</tr>
<tr>
<td>1970</td>
<td>845</td>
<td>1672</td>
<td>0.52</td>
</tr>
<tr>
<td>1971</td>
<td>919</td>
<td>1987</td>
<td>0.46</td>
</tr>
<tr>
<td>1972</td>
<td>1033</td>
<td>2255</td>
<td>0.45</td>
</tr>
<tr>
<td>1973</td>
<td>1226</td>
<td>2593</td>
<td>0.47</td>
</tr>
<tr>
<td>1974</td>
<td>1353</td>
<td>2965</td>
<td>0.45</td>
</tr>
</tbody>
</table>

Using the data for ten years 1965-74 of $C_p$ and $M_1$ we find for the Lebanon that the ratio $C_p/M_1$ varies from 0.35 to 0.52, while the mean of the ratio is 0.46 and the deviation from the mean is 0.11 only for 1965 for the other years the highest deviation from the mean is 0.06 for 1969 and 1970. This ratio tells us that it can be to a certain extent treated almost as a constant. The above analysis does not in any way prove that $\Delta C_p$ is a constant, but in order to simplify the argument, let us treat $\Delta C_p$ of equation (7) as a constant.

The main body of the argument rests on the idea that if the Bank of Lebanon cannot for one reason or another change the level of legal reserves, it can produce similar effects on the money supply (like those produced by changes in LR) by changing FA, DA and GD. The changes in FA, DA and GD will change LR without using the traditional monetary tool. The government can also offset changes in the foreign reserves by altering GD.
The government security market or government bond market does not exist in Lebanon in practice yet, but in theory it can exist. Article 105 states that the B.L. can buy and sell government bonds if they are available. It seems to me that the use of open market operations in the Lebanese money market could offer some help to the other two main monetary tools to control the changes in money supply. If we study the Lebanese experience in this sphere of monetary economics up to 1975 in order to understand what possible alternatives to open market operations could have or has been used to control the money supply we have to concentrate our attention on equation (13).

\[ \Delta (D + T) + \Delta C_p = \Delta NFA - \Delta GD + \Delta L - \Delta K - \Delta u - \Delta w \]

Let us use \( M_2 = D + T + C_p \) as money supply so we have the following equation:

\[ \Delta M_2 = \Delta NFA + \Delta L - \Delta GD - \Delta K - \Delta u - \Delta w \]

\( K, u \) and \( w \) can be replaced by \( s \) (\( s = k+u+w \)) whose value is relatively small

\[ \Delta M_2 = \Delta NFA + \Delta L - \Delta GD - \Delta S \] \hspace{1cm} (14)

If we wish to use the narrow definition of money \( M_1 \) where \( M_2 = M_1^\text{MD} \) or \( M_1 = M_2 - T \), we get the equation:

\[ \Delta M_1 = \Delta NFA + \Delta L - \Delta GD - \Delta T - \Delta S \] \hspace{1cm} (15)

The negative sign given to time deposits in equation (15) simply means that an increase in \( T \) will cause a fall in the value of demand deposits or is due to a shift of deposits from demand deposits to time deposits. The argument does not hold if there is an injection or an outside increase in the money supply i.e. new deposits in the banks. If the new deposits all take the form \( T \) then according to equation (15) there has been a drop in the level of money supply \( M_1 \), but this is not true. For this reason it would be more realistic to use \( M_2 \) and equation (14), because equation (14) is able to show more truly the increase in both demand and time deposits.

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4 The importance of open market operations is related to the argument that treats base money as a controllable variable where \( M = mB \), \( m \) being the money multiplier \( B \), base and \( M \) money.
Equation (15) holds only in the case where the change in a time deposit has been caused by movements between time deposits and demand deposits. In the absence of open market operations a change in the money supply can be to a certain extent influenced by changing government deposits with the Bank of Lebanon and by changing the level of banks' call loans.

Assume there has been an increase in the level of money supply due to an increase in net foreign assets. Equations (14) and (15) tell us that in order to offset such an increase in the level of money supply the government has to increase its deposits with the Bank of Lebanon. If the increase in the money supply is due to an increase in bank lending then the Bank of Lebanon has to increase the discount rate in order to make borrowing more expensive thus reducing the demand for loans. In an open economy with free capital mobility the increase in the rate of interest would lead to an increase in capital flows and a reduction in capital outflows. So if the Bank of Lebanon increases the discount rate, according to equation (14) there will be a fall in the value of NFA. The increase in capital inflows will eventually increase the level of NFA, and the Banks in the Lebanon are able to bring into the country at any time any amount of foreign assets to lend in the money market if the rate of interest is increased thus increasing the level of NFA. Therefore the central bank must ask the government to increase its deposits again in order to offset the increase in NFA. The conclusion is that an increase in the discount rate might not lead to the expected results if not accompanied by an increase in government deposits with the Bank of Lebanon.

The Bank of Lebanon has not used or been able to use all the traditional monetary tools, chief among them open-market operations. The potentials of the BL are much greater than the actual present and past activities show it to be. The Code of money and credit has furnished the Bank of Lebanon with considerable power over the commercial banks and other financial institutions, but the actual Lebanese experience paints
an unsatisfactory picture of the Bank of Lebanon. Open market operations have been hardly used, and the legal reserve requirements on foreign deposits are virtually non-existent, and have been increased to 10% on domestic demand deposits during 1974.
Chapter III

A Macro-Economic Model For The Lebanon

"The word model indicates that the assumptions made about the nature of an economy's behaviour are explicitly stated and that they are in many respects a simplified picture of reality. These assumptions are partly of a natural character, partly of a technical or legal, and partly of a psychological character. Together they specify the foundation and structure of the economy considered. Such specification has always to be a simplification because of the very complicated nature of economic life. As a rule, only a few of the most relevant characteristics of society are implied ... and reality may widely differ from one situation to the other, it follows that there will have to be made many different models, each of them meant to focus on certain aspects of economic life."¹

1 - The Money Multiplier in The Lebanon

The object or the idea behind the money multiplier is to derive some implications concerning the degree of controllable ability of money supply in the Lebanon.² The model utilises four different economic agents, the public, the banking system, the Bank of Lebanon, and the Foreign Sector.

a - The public or the money holding public, its demand for cash is taken as a function of wealth and money supply. This demand is responsive to changes in the money supply and to changes in interest rates, the responsiveness to changes in interest rates is due to changes in the yields of certain entities which are defined as wealth.


2 The model and its empirical findings are based on the economic conditions which prevailed in the Lebanon prior to the civil war - up till the end of 1974.
b - The banking system, we are only interested in commercial banks, the non-bank financial intermediaries have been excluded, because (up till 1974) of their minimal importance in the Lebanese financial market. The most important banks are branches of foreign banks and they dominate the lion's share in the Lebanese financial market.

c - The bank of Lebanon which in the model represents the monetary authorities.

d - The foreign sector which represents the outer world, or other countries and are extra-economic variables.

I would like to present an hypothesis of the money supply process which will distinguish the role played by each of the four agents in their contribution to changes in the money supply of the Lebanon.

The money multiplier is based on a set of equations where money \( M \) is defined as currency demanded by the public \( C \), plus demand deposits \( D \).

\[
M = C + D \tag{1}
\]

with \( B = C + R \) \tag{2}

\( B \) is base money, and \( R \) represents the reserves demanded by the banking system. Let us assume that the banking system holds some of their debts to the public as reserves consisting of a fraction of demand and time deposits so that;

\[
R = K (D + T) \tag{3}
\]

\( K \) is bank reserve ratio

assume also that currency demanded by the public is a fraction of total money holdings thus we have;

\[
C = cM \tag{4}
\]

\( c \) = currency ratio

and Time deposits \( T \) are assumed to be a fraction of total money holdings with;

\[
T = tM \tag{5}
\]

\( t \) = time deposits ratio
by using adequate substitutions we can derive a money supply equation which has a money multiplier such as

\[ M = m_1 B \]  

(6)

with \( m_1 \) as the multiplier and \( B \) as the monetary base.

The Bank of Lebanon sets the price of the discounts CL, to the commercial banks and fixes it at a certain price or discount rate. But the monetary authorities in the form of the bank of Lebanon cannot by law make it obligatory for the commercial banks to borrow money from it. The Bank of Lebanon can only refuse to lend money to the commercial banks. According to this argument the initiative is divided between the Bank of Lebanon and the commercial banks, where the Bank of Lebanon can influence the volume of discounts by changing the discount rate, but the commercial banks have the option of not borrowing from the central bank. CL or discounts and advances to commercial banks by the Bank of Lebanon represent the indirect supply of base money, because it comes into circulation only when the banks ask for it. In other words at a given certain discount rate

\[ D = \frac{R - KtM}{K} \quad \text{and} \quad R = B - C \]

\[ D = B - CM - KtM \quad \text{and} \]

\[ M = \frac{B - CM - KtM}{K} + CM \quad \text{and} \]

\[ B = kM + CM + KtM - KCM \]

with \( B = M \sqrt{K(1-c+t)} + c^7 \)

\[ M = B \sqrt{K(1-c+t) + c^7}^{-1} \]

Let \( m_1 = \sqrt{K(1-c+t) + c^7}^{-1} \)
part of the monetary base $B$ is determined by the commercial bank's behaviour with respect to borrowing from the Bank of Lebanon.

Therefore we must use a more representative base rather than base $B$. We are able to derive a new monetary adjusted base $B^a$ by subtracting CL from base $B$;

$$\begin{align*}
B^a &= B - CL \\
(7)
\end{align*}$$

The adjusted base $B^a$ leads to the derivation of a new money supply equation with a new money multiplier, in order to derive such an equation we need another set of equations with

$$\begin{align*}
B &= G + TL + CL \\
(8)
\end{align*}$$

$G$ being Bank of Lebanon stock of gold and foreign currency and TL is Treasury Liabilities.

Let $CL = b(D + T)$

$$\begin{align*}
(9)
\end{align*}$$

where $b$ is the commercial banks' borrowing ratio. The Treasury Liabilities, TL, in the Lebanon are divided between the Bank of Lebanon and the Commercial banks. TL in the Lebanon is usually a small amount almost equally distributed between the Bank of Lebanon and the Banks. In our hypothesis only the Treasury Liabilities given to the Bank of Lebanon are accounted for or included.

Using equations 6, 7 and 9 we get the following

$$\begin{align*}
B^a &= M/K(1 - c + t) + \hat{c} \sqrt{7} - b(D + T) \\
\text{and } b_d &= \frac{bB - bcm - bktM}{K} \\
B^a &= M/k (k - b) (1 - c + t) + \hat{c} \sqrt{7} \\
\therefore M &= B^a / (k - b) (1 - c + t) + \hat{c} \sqrt{7}^{-1} \\
\text{OR } M &= m_2 B^a \\
(10)
\end{align*}$$
where \( m_2 \) the money multiplier with the adjusted base \( B^n \) is equal to

\[
m_2 = \left[ \frac{(k-b)(1-c+t) + c}{7} \right]^{-1}
\]

and equation 10 is another form of the money supply equation.

The Lebanon has an open-economy, and in an open economy the monetary base is partly determined by the domestic activities of the commercial banks with respect to the bank of Lebanon lending policies. The outer world or other countries must be allowed to show their influence on the changes in the money supply equation for the Lebanon. The outer world provides the commercial banks of the Lebanon with the choice of borrowing money from various financial markets, thus providing the banking sector in the Lebanon with an alternative to the Bank of Lebanon for discounts. The Bank of Lebanon could not interfere with the commercial banks by imposing regulations on international capital movements, because the raison d'être of the Lebanese banking system is based on the freedom of capital mobility. We must also add that foreign banks are located in Beirut mainly to attract capital from the rich Arab oil producing countries, using part of it in the Lebanon, and the other part in the Euro-dollar market. There are no figures to indicate or show the amounts of foreign capital which is invested domestically or used for investment in the Euro-dollar market.

The Lebanese economy operates on a relatively fixed exchange rate where the bank of Lebanon participates in the foreign exchange market by buying and selling foreign currency. The bank of Lebanon has to sell or buy whatever amount of foreign currency demanded or supplied by the commercial banks. The commercial banks of the Lebanon have the right to borrow money from various financial markets. Some if not all of the big banks of the Lebanon are branches of American and French banks; such banks are able to borrow from either the bank of Lebanon or from Euro-dollar market (so can Lebanese owned banks). The presence of the outer-world as an alternative financial market for lending to commercial
banks operating in the Lebanon adds another dimension to our money supply equation in the form of foreign assets. Thus the Balance of payments must be included in the model in the form of:

\[ G^1 = G + \text{IMF} + \text{NFA} \] (11)

\( G^1 \) is the national stock of monetary reserves and is equal to the sum of the bank of Lebanon's stock of gold and foreign currency, and the Lebanese I.M.F. position, and the banking system's net foreign assets NFA which according to the figures are greater than both \( G \) and I.M.F.\(^4\) The borrowing of commercial banks from the outer-world to changes in their net foreign assets NFA, and a change in NFA would result in changes in the values of both \( G \) and then in \( B^a \), because

\[ B^a = G + \text{TL} \] from equations 7 and 8

Since changes in the monetary base \( B^a \) are influenced by changes in the banks net foreign assets then we must adjust base \( B^a \) in order to include the new dimension (NFA). In order to do so we must add to base \( B^a \) the changes in the banks net foreign assets \( \frac{\partial}{\partial t} \text{NFA} \) or subtract banks net foreign liabilities \( \frac{\partial}{\partial t} \text{NFA} \) thus arriving at another new adjusted base for an open-economy.

Let us assume that:

\[ \text{NFA} = a (D + T) \] (12)

where \( a \) is the net foreign assets ratio.

Equation 11 makes it possible for us to present the adjusted monetary base \( B^a \) in an alternative form to \( B^a = G + \text{TL} \), we have

\[ G = G^1 - \text{IMF} - \text{NFA} \] from equation 11

\[ B^a = G^1 - \text{IMF} - \text{NFA} + \text{TL} \] (13)

by substituting equation 12 into equation 13 we could obtain

\[ B^a = G^1 - \text{IMF} - a (D + T) + \text{TL} \] (14)

\( \text{For the period 1965-1974 end of the value of NFA is about three times that of (G + IMF).} \)
Since our money supply equation can be written as

\[ M = m_2 B^a \]

where \( m_2 = \int (k-b) (1-c+t) + c \gamma \)

and \( M = m_2 \int B^1 \text{IMF} - a(D + T) + TL \gamma \)

with \[-aD = \frac{-aB + acM + akTM}{K}\]

The main idea is to derive another money supply equation with a re-adjusted base \( B^L \) including the influence of the outer-world on the money supply of an open economy such as that of the Lebanon. The new money supply equation will take the form of;

\[ M = mB^L \quad (15) \]

with the multiplier \( m = \int (k-b+a)(1-c+t) + c \gamma \)

and the monetary base \( B^L = B^a + NFA \)

\[ \therefore B^L = G^1 + TL - IMF \quad (16) \]

Let \( TL^1 = TL - IMF \) thus having \( B^L = G^1 + TL^1 \quad (17) \)

The \( TL^1 \) is the result of the argument that an increase in the IMF position of the Lebanon is associated with a decrease in the Bank of Lebanon stock of gold and foreign currency (the opposite is true). When the Lebanese government has or wants to finance an increase in the IMF position of the Lebanon it is able to do so by providing the Bank of Lebanon with government liabilities which are represented by TL.

The final picture is painted in such a way in order to let us know that any changes in the Lebanese IMF position are accompanied by changes in the Bank of Lebanon's claims on government. Up till 1974 the IMF position of the Lebanon did not show any dramatic changes, this does not in any way undermine the theoretical possibility which allows the model to accommodate any degree of change in the Lebanese IMF position. In fact allowing for such changes makes the model theoretically and empirically rather flexible with respect to the Lebanese IMF position.
The main money supply equation is \( M = mB^L \) and it is based on a monetarist model. The idea behind the money supply equation is to help us in devising a way for analysing the money supply process in the Lebanon, or any other small country which has an open-economy and free capital mobility.\(^5\) The model can be used to study and evaluate the role of our four economic agents; the public, the banking sector, the Bank of Lebanon and the foreign sector. In order to be able to undertake an evaluation the multiplier has to be analysed with more care and attention. We have two sorts of multipliers; the dynamic multiplier and the static multiplier. The money supply equation \( M = mB^L \) has \( m \) in the form of a static multiplier which is a short-run multiplier.

\[
m = \left( k + a - b \right) \left( 1 - c + t \right) + c \, \frac{1}{\gamma} \text{ with base } B^L
\]
\[
m_2 = \left( k - b \right) \left( 1 - c + t \right) + c \, \frac{1}{\gamma} \text{ with base } B^a
\]
\[
m_1 = \left( 1 - c + t \right) + c \, \frac{1}{\gamma} \text{ with base } B
\]

these three multipliers are static or short-run multipliers. We are mainly interested in \( m \) and not in \( m_1 \) and \( m_2 \) simply because \( m \) links the monetary base \( B^L \) with the money supply taking into consideration changes in banks foreign assets which represent changes in the Lebanese money supply that are imported or exported from / to the outer world.

The dynamic multiplier or the long-run multiplier can be obtained from the money supply equation as follows; using partial differentiation of the equation \( M = mB^L \) gives us:

\[
\frac{\partial}{\partial B^L} M = \frac{\partial}{\partial B^L} m B^L + B^L \frac{\partial}{\partial m} m
\]

knowing that \( m = \left( k + a - b \right) \left( 1 - c + t \right) + c \, \frac{1}{\gamma} \) then

\(^5\)The model is suitable for studying the Lebanese experience in changes in money supply for the fifties, sixties and early seventies (1974). Keeping in mind that the economic philosophy in the Lebanon has been one that believes in minimum government intervention and with absolute international capital mobility.
The money supply equation \( M = mB^L \) can be put in logarithmic form and then differentiated with respect to time \( t \) in order to show us the contributions of each of the four economic agents to changes in the money supply of the Lebanon. The four economic agents are individually represented each by a different combination of the relevant ratios. The public is taken to be equal to:

\[
- U_c \Delta C + U_t \Delta T
\]

where

\[
U_c = \frac{M}{B^L} \sqrt{1 - (k + a - b)^2} \quad -1
\]

and

\[
U_t = \left[ \frac{M}{B^L} (k + a - b) \right] \quad -1
\]

---

\[ \begin{align*}
1 - \frac{M}{B^L} &= \frac{1}{B^L} \cdot \frac{bB^L}{B^L} = \frac{M}{B^L} \sqrt{1 - (k + a - b)^2} \frac{\partial c}{\partial t} \\
- \frac{M}{B^L} \sqrt{(k + a - b)^2} \frac{\partial t}{\partial t} - \frac{M}{B^L} \sqrt{1 - c + t^2} \frac{\partial k}{\partial t} \\
- \frac{M}{B^L} \sqrt{1 - c + t^7} \frac{\partial a}{\partial t} + \frac{M}{B^L} \sqrt{1 - c + t^7} \frac{\partial b}{\partial t}
\end{align*} \]
$U_c$ and $U_t$, their values are taken from the result of differentiating
the logarithmic form of $M = mB^L$, (look footnote 6). The public is
presented in such a form, because we are interested in calculating
its contributions to the changes in money supply, and this can be obtained
by finding the values for $k, a, b, c$ and $t$ and then doing the relevant
calculations.

The commercial banks are the representatives of the banking system
in the form of

$$U_k = U_a = U_b = \left[ \frac{M}{B^L} (1 - c + t) \right]_{-1}$$

The values of $U_k, U_a$ and $U_b$ are obtained in the same way as we obtain
those of $U_c$ and $U_t$. In order to be able to regard $-U_k \Delta K + U_a \Delta a + U_b \Delta b$
as one variable representing the contributions of the banking system to
changes in the money supply of the Lebanon $U_k, U_a$ and $U_b$ must be equal,
(this condition is true or holds).

The foreign sector and the Bank of Lebanon are both represented in
the monetary base $B^L$, because

$$B^L = G^1 + TL^1$$

$G^1$ in our model takes care of the foreign sector, while $TL^1$ represents
the Bank of Lebanon. The foreign sector is in fact equal to the current
accounts on the balance of payments $A$, plus net capital imports $NKI$, plus
the not recorded transactions $^7$ on the balance of payment $NR$, plus an error
term, therefore we have:

$$G^1 = A + NKI + NR$$

---

$^7$The not recorded transactions on the B/p of the Lebanon according to
some figures (when available) are rather high. In recent years it has
become rather fashionable to exaggerate the importance of $NR$ for the
Lebanon for reasons which are not part of my research.
It is possible to combine the activities of the four economic agents in one equation for empirical estimations, but still the foreign sector G and the Bank of Lebanon TL have to be represented by one variable. In my empirical work on the money supply equation I will use quarterly data (1965-1974) in order to observe the long-run behaviour of the dynamic multiplier, and the long-run importance and contributions of each economic variable (the four agents) to changes in the Lebanese money supply. We can change the form of the variables to allow for percentage changes per-quarter in the following way; let 
\[ \Delta M \] be per quarter of a year where:

\[
100 \frac{\Delta M}{\Delta T} \quad \text{so as} \quad \frac{\Delta M}{M_{-1}} = \Delta M \text{ per cent per quarter of a year.}
\]

This method makes it possible to present the dynamic version of the money supply equation which contains a dynamic multiplier, we have:

\[
\dot{M} = \ddot{B}^L m
\]

where
\[
\dot{m} = m^2 \frac{\partial}{\partial t} (k + a - b) + m^2 \frac{\partial}{\partial t} (k + a - b) + m^2 \frac{\partial}{\partial t} (k + a - b)
\]

we are able to have the following approximation to be used for empirical estimations and testings

\[
\dot{M} = \ddot{B}^L - U_c \Delta c - U_t \Delta t - U_a \Delta a + U_b \Delta b + \text{error}
\]

\( U_c, U_t, U_a, U_b \) have been defined in the previous pages.

Our task after equation 20 is to divide \( B^L \) into its two components the foreign sector in the form of \( G \) and the Bank of Lebanon in the form of \( TL \). Since we are treating the monetary base \( B^L \) as \( B^L \), so must \( G \) be treated as \( G \) and \( TL \) and \( TL \), this is done by simply having

\[
\frac{\Delta G}{G_{-1}} = G \text{ per cent per-quarter and } \frac{\Delta TL}{TL_{-1}} = TL \text{ per cent per-quarter.}
\]
equation 21 shows us the two parts of the monetary base where each can be evaluated alone to provide information on the sector which contributes most to changes in the monetary base. If the monetary base $B^L$ is not re-adjusted to $B^L$ then we will be ignoring the contributions of $G^1$ or current accounts, net capital imports, and not recorded transactions of the balance of payments to changes in the Lebanese money supply.

$$G^1 = A + NKI + NR \quad (22)$$

Let per cent per quarter $\dot{A} = \frac{\Delta A}{A-1}$ and $\frac{\Delta NKI}{NKI-1} = NKI$ percent per quarter

and $\frac{\Delta NR}{NR-1} = NR$ percent per quarter

where

$$U_A = \left[ \begin{array}{c} A \\ G^1 \end{array} \right]_{-1}$$

$$U_L = \left[ \begin{array}{c} NKI \\ G^1 \end{array} \right]_{-1}$$

$$U_R = \left[ \begin{array}{c} NR \\ G^1 \end{array} \right]_{-1}$$

Then we obtain

$$\dot{G}^1 = U_A \dot{A} + U_L \dot{NKI} + U_R \dot{NR} + \text{error} \quad (23)$$

or

$$\dot{G}^1 = \left[ \begin{array}{c} A \\ G^1 \end{array} \right]_{-1} \dot{A} + \left[ \begin{array}{c} NKI \\ G^1 \end{array} \right]_{-1} \dot{NKI} + \left[ \begin{array}{c} NR \\ G^1 \end{array} \right]_{-1} \dot{NR} + \text{error}$$
Equation 23 is derived in order to furnish us with more information about the contributions of the current accounts on the balance of payments, net capital imports, and the not recorded transactions to changes in the national stock of monetary reserves. Each of the mentioned variables has its own behaviour and is responsive to various economic factors, such as changes in interest rates in the Lebanese money market, and in the Euro-dollar market, and to changes in the exchange rates of the Lebanese pound vis a vis the dollar, and to the stability of the Lebanese economy. The method or the analysis used to understand the changes in the Lebanese national stock of monetary reserves can be undertaken by studying the changes in:

a - The current accounts on the Lebanese Balance of Payments which are presented as \( U_A \) where

\[
U_A = \left[ \frac{A}{G} \right]^{-1}
\]

b - the capital imports of the Lebanese non-bank sectors that are presented in the form of \( U_{NKI} \) where

\[
U_{NKI} = \left[ \frac{NKI}{G} \right]^{-1}
\]

c - the not recorded transactions on the Lebanese Balance of payments, \( U_{NR} \) where

\[
U_{NR} = \left[ \frac{NR}{G} \right]^{-1}
\]

I would like to mention that equation 23 will not be tested empirically, because of the lack of continuous data on changes in the current accounts of the Lebanese balance of payments\(^8\) mainly for the period 1965-747. Nevertheless the model has not been theoretically confined to the areas of the Lebanese economy that can be tested empirically.

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\(^8\) In fact there is not enough information about the various parts of the Lebanese balance of payments. My empirical work is based on quarterly and monthly data for the period 1965-1974, and I have not been able to obtain all the data I need to test equation 23 empirically. Before I started my research on the Lebanese economy I expected to face some problems concerning the availability of data which puts some restrictions on the empirical estimations.
The Lebanon as we said before is an open-economy, and has a rather large banking sector that is dominated by non-Lebanese banks. The activities of these banks can be divided into two parts, domestic and international. The domestic activities deal mainly with the credit market of the Lebanon, while international activities are mainly the changes in the banks net foreign assets NFA.

I would like to analyse the international activities first and then move to the domestic activities of the banks. The banking system in the Lebanon enjoys free capital mobility, and the banks are capitalising on this freedom by attracting capital flows from the Arab oil producing countries and investing part of it in Euro-dollar market and in speculations in the foreign exchange market, and the rest is used for domestic investment.

The study of the banks' international activities can be presented in the form of equations that include Euro-dollar interest rates, Lebanese interest rates, the Lebanese exchange rate with respect of the dollar, and the stability of the Lebanese economy.

The Euro-dollar interest rates is represented by \( r_e \), and net foreign assets are responsive to changes in \( r_e \) i.e. if \( r_e \) increases say from 5% to 8% then we expect to have an outflow of capital from the Lebanon to be invested in the Euro-dollar market. Therefore there is a negative relationship between the banks' holdings of NFA and \( r_e \).

\[ NFA = f(r_e) \]

\[ NFA_1, NFA_2 \]

\[ 0 \quad \ quad
The curve d-d represents the banks' demand for NFA (or their holdings of NFA) with respect to \( r_e \). At 5% of Euro dollar rate \( r_e \) the commercial banks in the Lebanon would hold NFA\(_1\) if the Euro-dollar rate changes or increases to 8% then there will be a fall in the amount of NFA held by the commercial banks in the Lebanon to NFA\(_2\). The net result of a 2% increase in the Euro-dollar rate would lead to a fall in NFA equal to NFA\(_1\) - NFA\(_2\). In order for this to be true we must assume that the domestic rates of interest remain constant, the exchange rate of the Lebanese pound vis à vis the dollar is constant, and the confidence in the Lebanese balance of payments is also constant.

The holdings of NFA by banks are also dependent on the rates of interest in the Lebanon. We have three different domestic rates of interest which are capable of influencing the decisions of the banks' about their holdings of NFA. The three interest rates are 1 - The Bank of Lebanon discount rate \( r_d \) which is fixed by the monetary authorities, 2 - the return on government bonds \( r_b \) which are not popular in the Lebanon, and are hardly issued by the Lebanese Treasury. Theoretically \( r_b \) should be included, because when the Lebanese monetary authorities decide to make more use of government bonds then the effects of \( r_b \) could be accounted for in the model. 3 - The commercial interest rate, or the short-term interest rate charged by banks on short-term bank loans \( r_L \). Most of the loans in the Lebanon are short-term loans, the long-term loans are virtually non-existent with the exception of some medium-term loans provided by the Industrial Bank. 10 Banks' holdings of NFA are

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10 One of the problems of the Lebanese credit market is the absence of long-term loans. This leads to the establishment of the Industrial Bank to provide industry with long-term or at least medium-term loans, but the commercial banks are still dominating the show.
positively related to changes in \( r^d \), \( r_b \) and \( r_L \), an increase in the domestic interest rates would lead to an increase in capital inflows and the inflows and the banks would hold more NFA. We are assuming that the Euro-dollar rate is constant, the exchange rate of the Lebanese pound vis à vis the dollar is constant, and the confidence in the Lebanese balance of payments is given.

In figure two, we can observe that an increase in the domestic rate of interest from 4% to 7% (by 3%) would lead to an increase in the commercial banks holdings of NFA from \( NFA_1 \) to \( NFA_2 \) as shown by the movement upward along curve DD.

One of the main reasons which have caused capital inflows into the Lebanon from Arab oil producing countries during the 1960s and early 1970s is the relative stability of the Lebanese economy and the Lebanese pound on the foreign exchange market (up till the end of 1974). Another reason is the complete freedom of capital mobility from the Arab oil producers into and out of Beirut. The commercial banks are able to hold their foreign assets either in Lebanese pounds or any other currency which is acceptable on the free exchange market. The end result is speculation by banks in the foreign exchange market, mainly in the dollar market, and some major European currencies. When the value of the dollar falls with respect to the Lebanese pound L.L., then the commercial banks would want to hold more of their assets in Lebanese pounds and less in dollars and vice versa.
Let us assume that $r_e$ and $r_d$, $r_b$ and $r_L$ are constant, thus making it possible for us to analyse the relationship between NFA and the exchange rate or with the value of the dollar in Lebanese pounds.

In figure three the curve EE represents the relationship between NFA and the price of the dollar in Lebanese pounds, which in turn represents the confidence in the Lebanese balance of payments. If the dollar is worth two Lebanese pounds then the amount of NFA is equal to $NFA_1$. When the dollar can buy more Lebanese pounds say 3 LL per $ then we have a downward movement along curve EE from point S to point L, and the net result is a fall from $NFA_1$ to $NFA_2$. The movement from S to L along curve EE is caused by, a) the fall in the value of the Lebanese pounds leads to some loss of confidence by holders of foreign assets in the Lebanese currency thus motivating capital outflows from the Lebanon and reducing capital inflows. This argument assumes that the original fall in the Lebanese pound was not due to either an increase in capital outflows or a decrease in capital inflows. In other words the volume of capital flows is given and changes in the exchange rate are due to increase in the deficit on the balance of trade, or due to the improvement of the dollar on the world market. b) When the value of the dollar improves commercial banks located in the Lebanon would want to increase their holdings of the dollar and start moving some assets out of the Lebanon.
to be invested in the Euro-dollar market. On the other hand an improvement in the value of the Lebanese pound with respect to the dollar would make the banks more willing to increase their holdings of Lebanese pounds, thus moving some assets from the Euro-dollar market into Lebanon. Their motive is to make profit by speculating on the Lebanese exchange market.

The same analysis can be conducted using the national stock of monetary reserves $G^1$ where

$$G^1 = G + \text{IMF} + \text{NFA} \quad \text{equation 11}$$

or

$$G^1 = A + \text{NKI} + \text{NR} \quad \text{equation 22}$$

$G^1$ is capable of being a proxy for the stability of the Lebanese balance of payments and the stability of the Lebanese pound. A fall in the value of $G^1$ creates a situation which might be characterised by loss of confidence in the position of the Lebanese balance of payments and the Lebanese pound. For this argument to be true we must assume that all capital flows are constant; i.e. the changes in $G^1$ are not due to changes in capital flows which remain constant.\(^1\)

We have treated NFA as a function of Euro-dollar interest rates $r_e$, the domestic interest rates $r_d$, $r_b$, $r_L$ and a function of the stability, and confidence by the outer-world in the Lebanese balance of payments. Using either the exchange rate (dollars in Lebanese pounds) or the national stock of monetary reserves $G^1$ as a proxy for the above mentioned stability and confidence. These hypotheses are subject to empirical testings and in order to do so they are given the following forms:

$$\text{NFA} = f (r_e, r_d, r_b, r_L, E) \quad E = \text{Exchange rate or dollars in Lebanese pounds}$$

and

$$\text{NFA} = f (r_e, r_d, r_b, r_L, G^1)$$

\(^1\)The assumption of constant capital flows is unrealistic, but we have to make such an assumption if we wish to present the argument for using $G^1$ as a proxy for the stability of the Lebanese B/P, and its influence on changes in NFA.
both functions will be tested to help us understand the empirical significance in the movements of NFA with respect to changes in the different interest rates, and in the position of the Lebanese balance of payments.

2 - Free Reserves in the Lebanon

Before developing the hypothesis about Free Reserves in the Lebanon it would be rather helpful to look at the commercial banks credit market, because free reserves play an important role in determining the volume of bank credit.

\[ VC = f(FR, r_i, r_d) \]  

VC being volume of bank credit, FR face reserves, \( r_d \) discount rate, and \( r_i \) index of interest rates on the bank credit market. In the Lebanon as we mentioned before most of bank credit is of short term nature, thus we can use \( r_i^L \) instead of \( r_i \) with

\[ VC = f(FR, r_d, r_i^L) \]

On the other side of the credit market we have the credit demanding public whose demand for bank credit can be treated as a function of the volume of bank credit market interest rates \( r_L \), \( r_i^L \) is the rate banks expect to get on bank credit, while \( r_L \) is the market rate on bank credit, income \( Y \), and expected return of equities \( W \).

\[ PDC = f(VC, r_L, W, Y) \]  
PDC is public's demand for bank credit.

The banking sector in the Lebanon lends money to three parties, the government, the commercial sector \( F \), and the consumers or householders \( H \). Lending to the private sector by commercial banks is much more significant (greater) in the Lebanon than lending to the government;
\( P_D = F^d + H^d \) \hspace{1cm} (3)

\( F^d \) is the firm's demand for bank loans, and \( H^d \) is the household demand function for bank loans.

Free reserves enter the picture in the form;
\[ FR = ER - CL \] \hspace{1cm} (4)

\( ER \) being excess reserves of banks. We know from the money multiplier model that;
\[ B^a = B - CL ; \quad B = C + R ; \quad B^a = C + R - CL \]

and \( C = cM, \quad R = K(D+T), \quad \text{and} \quad CL = b(D+T) \)

\[ \therefore B^a = cM + K(D+T) - b(D+T) \]

\[-b(D+T) = B^a - cM - K(D+T) \]

or \[-CL = B^a - \sqrt{cM + K(D+T)} \] \hspace{1cm} (5)

Substituting equation 5 into equation 4 we obtain
\[ FR = ER + B^a - \sqrt{cM + K(D+T)} \] \hspace{1cm} (6)

In the case of an open economy like the Lebanon the NFA influences the monetary base \( B^a \) (look under the money multiplier) with;
\[ B^L = B^a + NFA \quad \text{and} \quad NFA = a(D+T) \]

If there is a net capital inflow into the Lebanon (as the case has been between 1965-1974), then we have
\[ FR = ER + B^L - \sqrt{cM + K(D+T) + a(D+T)} \] \hspace{1cm} (7)

or \[ FR = ER + B^L - \sqrt{cM + K(D+T)} \] (7)

If there is a net capital outflow from the Lebanon then we have \(-NFA\) with
\[ FR = ER + B^a - \sqrt{cM + K(D+T) + a(D+T)} \] \hspace{1cm} (8)

From equation 7 we have
\[ B^L = FR - ER + \sqrt{cM + K(D+T)} \] \hspace{1cm} (9)

or \[ B^a + NFA = FR - ER + \sqrt{cM + K(D+T)} \]
Free reserves for the whole banking system are defined by equation 4, $FR = ER - CL$. Commercial banks hold certain ratios between free reserves and total deposits, the free reserve ratio being $FR/TD$. At any point of time the free reserve ratio is dependent on two main factors; (a) the commercial banks' demand for free reserves, and (b) the rate at which monetary policy of the Bank of Lebanon adds or withdraws unborrowed reserves UR.

The hypothesis about free-reserve ratio desired by commercial banks is taken to be a function of the market interest rate $r_L$, discount rate $r_d$, euro-dollar rate $r_e$, exchange rate of the Lebanese pound with respect to the dollar $r_e$, and unborrowed reserves UR.

$$\left( \frac{FR}{TD} \right) = f(r_L, r_d, r_e, r_e, UR) \quad (10)$$

The market interest rate $r_L$ could be used to represent the net yield or marginal return on bank earning assets. $r_L$ could then be considered as a measure of the cost of holding excess reserves due to opportunity cost, and a measure of the gain to be expected from borrowing extra reserves in order to buy more earning assets.

The discount rate $r_d$ could be used as a measure of the extra cost the commercial banks have to pay in order to increase the borrowings from the Bank of Lebanon. We have $r_L$ in the form of $MR$ (extra return on assets) and $r_d$ as $MC$ (extra cost) if the banks have their $MR > MC$ then they would increase their borrowings from the Bank of Lebanon in order to invest more in earning assets, up to the point where $MR = MC$, or $r_L = r_d$. If $MR < MC$ then banks would reduce their borrowings from the Bank of Lebanon because their lending rate is lower than their borrowing rate, $r_L < r_d$.

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12 Free reserves of one bank are defined as excess reserves at the Bank of Lebanon, and loans to other commercial banks, minus borrowings from the Bank of Lebanon and commercial banks. When the free reserves of all commercial banks are aggregated the inter-bank loans cancel out, thus making free reserves equal to total excess reserves minus total bank borrowings from the Bank of Lebanon.
The presence of euro-dollar rate \( r_e \) in the function is due to the fact that Lebanon has an open economy, and there is complete free capital mobility between Beirut and Europe, and between Beirut and the Arab oil producing countries.\(^{13}\) The commercial banks operating in the Lebanon can use some of their assets in the euro-dollar market, and the extra return obtained from investing their assets in the euro-dollar market is measured by \( r_e \). Let us assume that in both the Lebanon and the euro-dollar market the availability of investment and the risk involved with it are given and equal. Then we may argue that if \( r_e > r_L \) there might be an outflow of funds from the Lebanon to the euro-dollar market; and if \( r_e < r_L \) there might be an inflow of funds from the Euro-dollar market to Beirut.\(^{14}\) So we could consider \( r_e \) to be the measure of the cost of holding excess reserves. Any amount of assets held in the form of excess reserves is losing the opportunity cost of both rates \( r_L \) and \( r_e \); in case the banks have not invested any of their Excess Reserves in the Euro-dollar market then their losses are equal to the amount of return that could have been gained by investing in the Euro-dollar market. But if the banks invest some of their excess reserves in the Euro-dollar market, their loss would be equal to the return that could have been earned on the uninvested excess reserves. This holds if \( r_e > r_L \), otherwise the excess reserves would be invested in the Lebanon, the exception or the \( r_e > r_L \) assumption does not hold when the Lebanese money market cannot absorb any extra bank credit.

The exchange rate \( E \) is included in the function, because there is a relationship between free-reserve ratios and the exchange rates in the case of the Lebanon. Let us look at this issue from an angle which allows us to make use of commercial banks foreign assets. In the Lebanon during the period 1965-1974 the commercial banks were at any time able to sell

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\(^{13}\) Excluding Iraq, and Libya

\(^{14}\) We are assuming that \( r_e > r_d \) and \( r_L > r_d \). If we have \( r_e > r_d \) and \( r_L < r_d \) then \( r_e < r_L \), thus the banks will borrow from the Bank of Lebanon to invest in the Euro-dollar market.
and buy as much foreign currencies as they wished (mainly dollars) from
the Bank of Lebanon. The willingness of the Bank of Lebanon to buy
foreign currencies from commercial banks without any limit makes it possible
for banks to use their foreign assets as reserves and excess reserves. If
and when the Bank of Lebanon increases the legal reserve requirements on
bank deposits; say from 5% to 10% on demand deposits and from 7% to 5%
on time deposits, the commercial banks can satisfy these requirements by
simply converting part of their assets held in dollars or other foreign
currencies into Lebanese pounds.

According to the figures the commercial banks in the Lebanon hold
a rather high percentage of their assets in the form of foreign assets:

<table>
<thead>
<tr>
<th>Year</th>
<th>% of Total Bank Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td>34.7%</td>
</tr>
<tr>
<td>1968</td>
<td>39.4%</td>
</tr>
<tr>
<td>1969</td>
<td>39.2%</td>
</tr>
<tr>
<td>1970</td>
<td>44%</td>
</tr>
<tr>
<td>1971</td>
<td>44.3%</td>
</tr>
<tr>
<td>1972</td>
<td>44.7%</td>
</tr>
<tr>
<td>1973</td>
<td>40.3%</td>
</tr>
<tr>
<td>1974</td>
<td>34.5%</td>
</tr>
</tbody>
</table>

These foreign assets due to the ease of convertability of currencies in
the Lebanon can be considered as excess reserves. From equation 4 we have
FR = ER - CL, thus showing the dependence of free reserves on excess reserves
and bank foreign assets.

The level of unborrowed reserves UR is dependent on the activities
of the monetary authorities in open market operations. The Bank of
Lebanon can use open market operations to decrease the rate at which
unborrowed reserves are provided to the banks, or decrease the supply
of reserves, thus causing the free reserve ratio to fall. In other
words, the Bank of Lebanon can reduce the level of free reserves by selling
government bonds to the commercial banks. Open market operations can also
be used to increase the rate at which unborrowed reserves are provided
to the commercial banks, thus increasing the level of free reserves
(and free reserve-ratio) by an outflow of government bonds from the
commercial banks to the Bank of Lebanon. The unborrowed reserves UR,

15 The use of government bonds and open-market operations are not popular
in the Lebanon yet, and has not been used regularly by the Bank of Lebanon.
and the discount rate $r_d$ represent monetary policy or the tools which can be used by the Bank of Lebanon to influence changes in the free-reserve ratio.

We can use certain graphs in order to illustrate the process by which commercial banks adjust their free-reserve ratio in response to changes in market interest rates $r_L$, Euro-dollar rate, and in the exchange rates of the Lebanese pound with respect to the dollar.

\[
\frac{FR}{TD} = f(r_L, r_d, r_e, E, UR)
\]

Let us assume that $r_d$, $E$, $UR$, and the legal reserve requirements are all constant, then we can draw the following graph:

![Graph](image)

**Fig. 1**

In figure 1, the market interest rates and the Euro-dollar rates are measured along the horizontal axis, and the free reserve ratio is measured along the vertical axis. The curve $HR$ is the commercial banks' demand curve for free reserves $\frac{FR}{TD}$ being expressed as a ratio of bank total deposits $TD$. Let us start from the initial situation where the market interest rate (and the Euro-dollar rate) is equal to $UC$. At that interest rate the commercial banks wish to hold a ratio of free reserves to deposits equal to $OD$ corresponding to point $L$ on the demand schedule $HR$. If there is a change in the market rate of interest $r_L$ say an increase from $UC$ to $UE$, then the commercial banks would not want to hold a free reserve ratio of $OD$,
But would like to hold a free reserve ratio of \( UF \) corresponding to point \( N \) on \( RR \). Thus an increase in \( r_L \) equal to \( CE \) \((OE - UC)\) created a fall in the free reserve ratio equal to \( FD \) \((UD - UF)\) and a movement downward along curve \( RR \) from point \( L \) to point \( N \).

The commercial banks move from \( uD \) to \( uF \) by reducing excess reserves and increasing their borrowings from the Bank of Lebanon until there is no incentive to do so. And since

\[
FR = ER - CL
\]

a reduction in \( ER \) and an increase in \( CL \) would lead to a fall in \( FR \).

The process of reducing excess reserves and increasing bank borrowings affects reserve positions of other commercial banks making those banks change their portfolios until all the commercial banks in portfolio adjustment are satisfied. A fall in the market rate of interest has the opposite effect, causing banks to increase their excess reserves and reducing their borrowings thus increasing their free reserves \(^{16}\). The curve \( RR \) is downward sloping, because of the opportunity costs of holding excess reserves, and because of the cost of borrowing from the Bank of Lebanon.

Banks have to pay the rate \( r_d \) for borrowing from the Bank of Lebanon and they pay the opportunity cost \( r_L \) and \( r_e \) for holding idle reserves (excess reserves). As \( r_L \) (and/or \( r_e \)) rises in relation to \( r_d \) with \( r_L - r_d, r_e - r_d \) increasing then it would be more profitable for the banks to increase their borrowings from the Bank of Lebanon, and increase their loans. The increase in \( r_L \) and \( r_e \) increase the opportunity cost of \( ER \), thus inducing banks to divert some of their idle balances into loans.

The end result of an increase in \( r_L \) and \( r_e \) in relation to \( r_d \) causes the commercial banks to reduce their ratio of free reserves \( FR \) to total deposits \( TD \). \(^{17}\)

\(^{16}\) The arguments used to explain free reserve adjustments due to changes in \( r_L \) are similar to those needed to explain changes in \( r_e \). An increase in \( r \) makes banks want to reduce \( ER \), increase \( CL \) thus reducing \( FR \) and the opposite is true for a fall in \( r \).

\(^{17}\) As the market interest rate \( r \) and Euro dollar rate \( r \) increase it would become more difficult for the banks to reduce the free-reserve ratio. Because as borrowing increases the banks approach the limits of borrowing set by the Bank of Lebanon.
According to the argument about changes in the free reserve ratio, due to changes in the market rate of interest and the Euro-dollar rate, the interest rates have to be determined autonomously. We might argue that the level of free-reserve ratio influences changes in the market rate of interest $r_L$. But the level of $r_L$ is the result of the interaction between the supply of and demand for money (bank credit), and loanable funds. The Euro-dollar rate $r_e$ is determined autonomously, and the level of the free-reserve ratio of the banks in the Lebanon has no influence on $r_e$. In case there is an increase in legal reserve requirements then commercial banks have to hold less excess reserves, if they accept this new level of excess reserves and free reserves then there is no reason for the market interest rate to change. But if the commercial banks wish to maintain the same level of free reserves, then they have to sell some of their bonds and reduce their loans, thus increasing the market rate of interest. As the interest rate $r_L$ increases the banks would want to reduce their free reserve ratio as shown by the movement from $L$ to $N$ on curve RR in figure one. After the adjustment process by the commercial banks we have a new level of free reserve ratio which is lower than the initial level, and this has been caused by the increase in legal reserve requirements.
Two money supply equations which include a short run multiplier that links the monetary base with the money supply were tested empirically. The two equations are:

\[ M_1 = m_2 B^a \]

and

\[ M_1 = mB^L \]

money supply is defined as \( M_1 \) equal to cash with public (non-bank) and demand deposits with the banks. \( B^a \) is the adjusted monetary base, and \( B^L \) is the readjusted monetary base. The money supply equation with the short-run multiplier \( m_2 \) and base \( B^a \) is for a closed economy, it does not include the changes in money supply that are due to changes in the balance of payments.

\[ m_2 = \left( \frac{k-b(1-c+t)}{c} \right)^{-1} \]

The empirical test on \( M_1 = m_2 B^a \) makes use of three different combinations of observations. Test number one uses eight observations for the period 1969 I - 1970 IV, with quarterly data; we have the following results:

\[ M_1 = 2.893.526 - 179.94 m_2 - 0.51966 B^a \]

(1.709) (4.195)

\[ R^2 = 0.78 \]

\[ D.W. = 1.92 \]

\[ \log M_1 = 9.86163 - 0.4386 \log m_2 - 0.26654 \log B^a \]

(1.85) (4.62)

\[ R^2 = 0.811 \]

\[ D.W. = 1.96 \]

The same test was performed using quarterly data for the period 1965 I - 1968 IV - 16 observations and the results are:

\[ M_1 = 739.0817 + 52.64 m_2 + 0.8324 B^a \]

(1.703) (6.94)

\[ R^2 = 0.823 \]

\[ D.W. = 1.13 \]
\[
\log M_1 = 4.556 + 0.1411 \log m_2 + 0.5947 \log B^a
\]
\[(1.737) \quad (7.279)\]

\[R^2 = 0.835\]
\[D.W. = 1.1\]

A third test for the money supply equation \( M_1 = m_2 B^a \) for the period 1966 I - 1970 IV using quarterly data - with 20 observations, the results are:

\[
M_1 = 1837.5086 - 75.3413 m_2 + 0.1639 B^a
\]
\[(1.53) \quad (0.93)\]

\[R^2 = 0.384\]
\[D.W. = 0.53\]

\[
\log M_1 = 6.92675 - 0.16392 \log m_2 + 0.10718 \log B^a
\]
\[(1.27) \quad (1.26)\]

\[R^2 = 0.4\]
\[D.W. = 0.51\]

The Elasticities of the short-run money multiplier \( m_2 \) are:

- 8 observations : elasticity = 0.45
- 16 observations : elasticity = 0.14
- 20 observations : elasticity = 0.16

Similar tests were used to study the money supply equation

\( M_1 = m B^L \), where the short-run money multiplier \( m \) is equal to

\[
m = \left( \frac{k + a - b}{1 - c + t} \right) + \theta^{-1}
\]

The values of the ratios \( a, b, c, k \) and \( t_2 \) and \( t_1 \) are presented in table one where \( t_2 = \frac{T}{M^2} \), \( m_2 \) being the wide definition of money and equal to \( M_1 \) plus time deposits with the commercial banks, and \( t_1 = \frac{T}{M^1} \).

In the empirical tests performed on \( M_1 = m B^a \) and \( M_1 = m B^L \), I used the values of \( t_1 \) because the test is only for the money supply equation that is based on a narrow definition of money \( M_1 \).
<table>
<thead>
<tr>
<th>Year</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>k</th>
<th>( \frac{T_{N_2}}{t_2} )</th>
<th>( \frac{T_{N_1}}{t_1} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.546</td>
<td>0.005</td>
<td>0.176</td>
<td>0.052</td>
<td>0.495</td>
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<tr>
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<td>0.534</td>
<td>0.006</td>
<td>0.178</td>
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<tr>
<td>III</td>
<td>0.524</td>
<td>0.011</td>
<td>0.177</td>
<td>0.035</td>
<td>0.513</td>
<td>1.056</td>
</tr>
<tr>
<td>IV</td>
<td>0.550</td>
<td>0.009</td>
<td>0.167</td>
<td>0.040</td>
<td>0.530</td>
<td>1.129</td>
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<tr>
<td>I</td>
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<td>0.539</td>
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<tr>
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<td>0.151</td>
<td>0.039</td>
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<td>III</td>
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<tr>
<td>I</td>
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<td>0.070</td>
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<td>0.237</td>
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<td>1.136</td>
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<tr>
<td>I</td>
<td>0.614</td>
<td>0.070</td>
<td>0.217</td>
<td>0.092</td>
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<td>1.163</td>
</tr>
<tr>
<td>II</td>
<td>0.636</td>
<td>0.070</td>
<td>0.222</td>
<td>0.095</td>
<td>0.538</td>
<td>1.164</td>
</tr>
<tr>
<td>III</td>
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<td>0.068</td>
<td>0.218</td>
<td>0.080</td>
<td>0.540</td>
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<tr>
<td>IV</td>
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<td>0.242</td>
<td>0.109</td>
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<td>0.983</td>
</tr>
<tr>
<td>Year</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>k</td>
<td>( \frac{T}{M_2} = t_2 )</td>
<td>( \frac{T}{M_1} = t_1 )</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>1969</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.639</td>
<td>0.095</td>
<td>0.236</td>
<td>0.108</td>
<td>0.510</td>
<td>1.047</td>
</tr>
<tr>
<td>II</td>
<td>0.650</td>
<td>0.096</td>
<td>0.228</td>
<td>0.100</td>
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<td>1.090</td>
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<tr>
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<td>0.099</td>
<td>0.237</td>
<td>0.108</td>
<td>0.567</td>
<td>1.158</td>
</tr>
<tr>
<td>IV</td>
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<td>0.109</td>
<td>0.233</td>
<td>0.114</td>
<td>0.554</td>
<td>1.244</td>
</tr>
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<td></td>
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<td></td>
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<tr>
<td>I</td>
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<td>0.072</td>
<td>0.233</td>
<td>0.095</td>
<td>0.568</td>
<td>1.315</td>
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<tr>
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<td>0.207</td>
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<tr>
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<td>0.192</td>
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<td>0.097</td>
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<td>1.613</td>
</tr>
<tr>
<td>III</td>
<td>0.712</td>
<td>0.024</td>
<td>0.194</td>
<td>0.088</td>
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<td>1.652</td>
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<tr>
<td>IV</td>
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<td>0.174</td>
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<td>1.617</td>
</tr>
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<td>1972</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>I</td>
<td>0.759</td>
<td>0.021</td>
<td>0.168</td>
<td>0.115</td>
<td>0.631</td>
<td>1.694</td>
</tr>
<tr>
<td>II</td>
<td>0.759</td>
<td>0.021</td>
<td>0.167</td>
<td>0.119</td>
<td>0.637</td>
<td>1.761</td>
</tr>
<tr>
<td>III</td>
<td>0.766</td>
<td>0.025</td>
<td>0.166</td>
<td>0.111</td>
<td>0.643</td>
<td>1.807</td>
</tr>
<tr>
<td>IV</td>
<td>0.757</td>
<td>0.018</td>
<td>0.162</td>
<td>0.107</td>
<td>0.642</td>
<td>1.804</td>
</tr>
</tbody>
</table>
Table 1 showing the values of $a$, $b$, $c$, $k$, $\frac{T}{N_2} = t_2$, and $\frac{T}{N_1} = t_1$ for the period 1965 I - 1974 II, using quarterly data,

<table>
<thead>
<tr>
<th>Year</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>k</th>
<th>$\frac{T}{N_2} = t_2$</th>
<th>$\frac{T}{N_1} = t_1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1973</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.710</td>
<td>0.015</td>
<td>0.168</td>
<td>0.108</td>
<td>0.657</td>
<td>1.917</td>
</tr>
<tr>
<td>II</td>
<td>0.678</td>
<td>0.015</td>
<td>0.167</td>
<td>0.129</td>
<td>0.648</td>
<td>1.848</td>
</tr>
<tr>
<td>III</td>
<td>0.707</td>
<td>0.016</td>
<td>0.166</td>
<td>0.104</td>
<td>0.649</td>
<td>1.864</td>
</tr>
<tr>
<td>IV</td>
<td>0.656</td>
<td>0.026</td>
<td>0.162</td>
<td>0.096</td>
<td>0.661</td>
<td>1.951</td>
</tr>
<tr>
<td>1974</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.630</td>
<td>0.028</td>
<td>0.146</td>
<td>0.097</td>
<td>0.676</td>
<td>2.093</td>
</tr>
<tr>
<td>II</td>
<td>0.631</td>
<td>0.015</td>
<td>0.147</td>
<td>0.121</td>
<td>0.680</td>
<td>2.130</td>
</tr>
</tbody>
</table>
The short run multiplier \( m \) is distinguished from \( m_2 \) mainly by linking \( B^L \) with \( M_1 \), thus including the values of the ratio \( a \) where \( a = \frac{NFA}{(D+T)} \). In other words the monetary base \( B^L \) includes the influences of changes on the balance of payments which are represented by NFA, and the changes are linked with changes in the money supply by the help of \( m \). I think base \( B^L \) and the short run money multiplier \( m \) are more representative of the Lebanese economy than base \( B^L \) and the short-run multiplier \( m_2 \), because Lebanon has an open economy which is subject to capital inflows and outflows.

Test number one for the period 1969 I - 1970 IV - quarterly data, (eight observations)

\[
M_1 = -61920.48 + 64136.44 m - 0.19726 B^L
\]

\[
R^2 = 0.42
\]

\[
D.W. = 1.6
\]

\[
\log M_1 = 10.5156 + 40.4 \log m - 0.3904 \log B^L
\]

\[
R^2 = 0.47
\]

\[
D.W. = 1.76
\]

Test number two uses 16 observations for the period 1965 I - 1968 IV - quarterly data, the results are:

\[
M_1 = 385.6 + 286.79 m + 0.3553 B^L
\]

\[
R^2 = 0.85
\]

\[
D.W. = 1.1
\]

\[
\log M_1 = 3.035 + 0.174 \log m + 0.552 \log B^L
\]

\[
R^2 = 0.85
\]

\[
D.W. = 1.07
\]
Test number three is based on 20 observations and uses quarterly data for the period 1966 I - 1970 IV, the results are:

\[
M_1 = 2765.963 - 1301.997 m + 0.0694 B^L \\
(1.817) \quad (1.303)
\]

\[R^2 = 0.4 \quad \text{D.W.} = 0.64\]

\[
\log M_1 = 6.28756 - 0.7596 m + 0.1417 \log B^L \\
(1.7) \quad (1.5)
\]

\[R^2 = 0.42 \quad \text{D.W.} = 0.65\]

The Elasticities of the short-run money multiplier \(m\) are:

<table>
<thead>
<tr>
<th>Period</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969 I - 1970 IV</td>
<td>40.4</td>
</tr>
<tr>
<td>1965 I - 1968 IV</td>
<td>0.174</td>
</tr>
<tr>
<td>1966 I - 1970 IV</td>
<td>0.759</td>
</tr>
</tbody>
</table>

The tests for both money supply equations using three different sets of observations, indicate to us that the domestic short-run money multiplier \(m_2\) and the money supply equation \(M_1 = m_2 B^a\), are more relevant (statistically) than the money supply equation \(M_1 = mB^L\), and the \(m\) multiplier \(m_1\). In the case of eight observations, the equation \(M_1 = mB^L\) does not really hold, and it has a low \(R^2\) of 0.42 and 0.47 for the logarithmic function. \(M_1 = mB^L\) failed the test for the period 1969 I - 1970 IV and the elasticity for \(m\) of 40.4 does not hold.

On the other side for the same period \(M_1 = m_2 B^a\) has an \(R^2\) of 0.78, and the logarithmic function has an \(R^2\) of 0.811, and the t-statistics for \(M_1 = m_2 B^L\) are much better for the above mentioned period. For the period 1965 I - 1968 IV (16 observations), again \(M_1 = m_2 B^a\) gives better results than \(M_1 = mB^L\). Both equations have similar \(R^2\) around 0.81 to 0.85, but according to t - statistics the short-run money multiplier \(m\) is not significant. For the third period 1966 I - 1970 IV both money supply equations fail the test, and the short-run multiplier \(m_2\), and \(m\) and both

---

\(m_2\) can be defined as the domestic money multiplier, because it is related to the base \(B^a\) which does not include the foreign sector like base \(B^L\) that has \(m\) as the money multiplier.
monetary bases $B^a$ and $B^L$ are shown by $t$ - statistics as not significant and the values of $R^2$ range between 0.38 and 0.42. Finally the results tell us that the domestic money multiplier $m_2$ is rather inelastic we cannot say the same for $m$ because it is not significant in the equation $M_1 = mB^L$. 
The dynamic money multiplier provides better results and is more relative for periods which vary between 8 and 16 quarters and with 20 observations it becomes rather insignificant. The money multiplier \( m \) failed the three tests and the \( B^L \) came out to be not significant according to the t-statistics for two periods, 1969 I - 1970 IV and 1966 I - 1970 IV while it is significant for the period 1965 I-1968 IV. I think that the short-run dynamic multiplier should be compared with the long run multiplier in order to be able to draw some conclusions about the money multiplier and its relationship with the monetary base \( B^L \) and money supply.

The dynamic money multiplier as derived in the model is equal to:

\[
\begin{align*}
\dot{m} &= m^2 \frac{\partial}{\partial t} \left( I - (k+a-b) \right) \delta c - m^2 \left( k+a-b \right) \delta t \\
&\quad - m^2 \frac{\partial}{\partial k} \left( I - c + t \right) \delta k - m^2 \left( I - c + t \right) \delta a + m^2 \left( I - c + t \right) \delta b
\end{align*}
\]

The dynamic multiplier has been empirically estimated and tested using 38 observations, and quarterly data for the period 1965 I - 1974 II, the results are:

\[
\begin{align*}
\dot{M}_1 &= 0.29719 m + 0.44454 B^L \\
(0.052) &\quad (5.882) \\
R^2 &= 0.5 \\
D.W. &= 1.32
\end{align*}
\]

\( m \) being in these two equations the dynamic multiplier and;

\[
\begin{align*}
\frac{\partial M}{\partial B^L} > 0 \\
\log \dot{M}_1 &= 0.06568 \log m + 0.5587 \log B^L \\
(1.18) &\quad (4.324) \\
R^2 &= 0.4 \\
D.W. &= 1.36
\end{align*}
\]
The dynamic multiplier as such has produced some weak results with $R^2 = 0.5$ and 0.4 for the logarithmic function and Durbin-Watson statistics of 1.32 and 1.56 for the logarithmic function, indicating the presence of autocorrelation in the equation. The equation $M_t = mBL$ can be represented in another form in which the dynamic multiplier is divided into two main sections or parts; the first part represents the cash demanding public, and the second part represents the commercial banks operating in the Lebanon.

\[ F = -U_c \Delta C - U_t \Delta t \] represents the cash demanding public's contributions to changes in the money supply.

\[ CB = -U_k \Delta K - U_a \Delta a + U_b \Delta b \] sums up the commercial banks contributions to changes in money supply.

Thus we are able to write the money supply equation in the following way:

\[ \dot{M} = \dot{B}L - U_c \Delta C - U_t \Delta t - U_k \Delta K - U_a \Delta a + U_b \Delta b + \epsilon; \quad \epsilon = \text{error} \]

The above money supply equation was tested empirically for both definitions of money $M_1$, the narrow definition and $M_2$, the wide definition.

The results of the empirical estimations which are based on 38 observations for the period 1965 I - 1974 II are:

\[ \dot{M}_1 = 0.5583 \dot{B}L + 172.048 r - 14.669 CB \]

\[ R^2 = 0.66 \]

\[ \text{D.W.} = 1.7 \]

\[ \log \dot{M}_1 = 0.61705 \log \dot{B}L - 0.04758 \log r + 0.08154 \log CB \]

\[ R^2 = 0.507 \]

\[ \text{D.W.} = 1.54 \]

---

19 For the various forms of the money supply equation look in part one of this chapter (the money multiplier in the Lebanon).

20 The public's contributions to changes in $M$ can be seen in both $\Delta C$ and $\Delta t$, and the banks contributions to changes in $M$ can be observed in $\Delta b$, $\Delta a$ and $\Delta k$. 
\[ M_2 = 0.75516 B^L - 15.25218 r - 27.286 CB \]
\[ (7.723) \quad (3.016) \quad (0.4) \]

\[ R^2 = 0.68 \quad D.W. = 2.3 \]

\[ \log M_2 = 0.7858 \log B^L - 0.0956 \log r + 0.0529 \log CB \]
\[ (6.00) \quad (2.28) \quad (0.83) \]

\[ R^2 = 0.67 \quad D.W. = 1.5 \]

The same form of the money supply equation was tested again, with the monetary base \( B^L \) being lagged \( B^L_{t-4} \) (one year). The reason for lagging the base \( B^L \) one year is dependent on the argument that changes in the monetary base affect changes in money supply after a certain period of time (which I have taken to be one year) and not immediately i.e. there is a lag between the changes in the monetary base \( B^L \) and the money supply; this hypothesis has been tested and the results are:

\[ M_1 = 0.4724 B^L + 0.194 B^L_{t-4} + 195.7 P - 8.1 CB \]
\[ (5.78) \quad (2.347) \quad (3.66) \quad (0.912) \]

\[ R^2 = 0.68 \quad D.W. = 1.6 \]

According to t-statistics the lagged variable \( B^L_{t-4} \) is significant and so is \( B^L \).

\[ \log M_1 = 0.373 \log B^L + 0.288 \log B^L_{t-4} - 0.0202 \log P + 0.07 \log CB \]
\[ (2.33) \quad (2.2) \quad (0.67) \quad (1.26) \]

\[ R^2 = 0.5 \quad D.W. = 1.25 \]

Again in logarithmic form of the equation both monetary bases \( B^L \) and the lagged base \( B^L_{t-4} \) are significant.
The empirical estimations have dealt with changes in the base and the money supply, another form of the money supply equation was tested and it does not deal with changes in either the base $B^L$ or the money supply, where:

$$M = B^L - u_c - u_t - u_k - u_a - u_b + E$$

The results of the empirical work are as follows:

Using 38 observations, quarterly data for the period 1965 I - 1974 II

$$M_1 = 949.147 + 0.22174B^L + 56.884P_1 + 12.76 CB_1$$

$$R^2 = 0.95$$

$$D.W. = 0.6$$

$$\log M_1 = 3.849 + 0.4874 \log B^L - 0.00327 \log P_1 + 0.00088 \log CB_1$$

$$R^2 = 0.93$$

$$D.W. = 0.23$$

Testing the same money supply equation with the wider definition of money $M_2 = C + D + T$, gave the following results:

$$M_2 = 397.339 + 0.9379B^L - 1567.9P_1 + 1918.273 CB_1$$

$$R^2 = 0.98$$

$$D.W. = 0.81$$

$$\log M_2 = 1.7736 + 0.77119 \log B^L - 0.3897 \log P_1 + 0.70413 \log CB_1$$

$$R^2 = 0.99$$

$$D.W. = 1.1$$

The empirical estimations were conducted on the money supply equation in its different forms using both definitions of money supply $M_1$ and $M_2$. In some cases the money supply $M_1$ gave better results than $M_2$ in other cases $M_2$ gave better results than $M_1$. The most obvious case is the test on the equation in the form:
where $\mathcal{M}_2$ gave significantly better results than $\mathcal{M}_1$, this is shown by the values of $R^2$, D.W. and t-statistics. When using $\mathcal{M}_1$ we have only the base and the public as significant, but with high autocorrelation, and in the logarithmic form only the monetary base is significant (with very high autocorrelation). By using $\mathcal{M}_2$ the situation improves the three variables $B^L$, $P$, and CB became significant in both forms (functional form and logarithmic) of the money supply equation, but we still have autocorrelation.

Graphs one and two show the changes in $\mathcal{M}_1$, $\mathcal{M}_2$, $B$, $B^a$ and $B^L$ for the period 1965 I - 1974 II on quarterly basis. The values of $M$ and the base are in millions of Lebanese pounds. It is almost in the same direction as $\mathcal{M}_1$ and the re-adjusted base $B^L$ has almost an identical path to that of $\mathcal{M}_2$. It was mentioned before that it is more realistic to use a lagged base in the money supply equation, because it takes a certain amount of time for the monetary base to affect the money supply; so it would be more beneficial if we keep this idea in mind while looking at graphs one and two. In graph two in 1968 IV $B^a$ has a peak and in 1969 II $\mathcal{M}_1$ has a similar peak (almost of the same magnitude). In 1973 II $B^a$ has a peak while $\mathcal{M}_1$ has a similar peak in 1974 I.

Graph two also tells us that base $B^a$ after 1968 has a path different from that of $\mathcal{M}_2$ while $B^L$ has a path similar to $\mathcal{M}_2$, so it is hardly surprising to find out that $\mathcal{M}_2$ has given more realistic results than $\mathcal{M}_1$ in the last equation. The sudden increase in the base $B^L$ and in $\mathcal{M}_2$ after 1970 IV is explained by the increase of capital inflows into the Lebanon from two sources; a) the Arab oil producing countries b) repatriation of some Lebanese capital from certain African countries mainly in 1972 and 1973.
Ronald S. Koot employs a methodological and statistical approach which involves a two-stage procedure in order to define money empirically. In the first stage, Koot uses a set of financial assets which is considered simultaneously to determine relationships among the assets within the set. The dimension of the set of assets is then reduced by the statistical technique of factor analysis. In the second stage, Koot applies the Friedman-Meiselman dual criteria to the factor analytic results to determine an empirical definition of money. The empirical results of Koot for the first stage indicate that the most important determinants of an empirical definition of money are currency and demand deposits. But time deposits and savings bonds show some degree of moneyness; they are near-moneys. The results of the factor analytic definition under the Friedman-Meiselman criteria have given a satisfactory performance.

The empirical tests of various forms of the money supply equation (with $M_1$ and $M_2$) have generally given results which show or indicate that there is autocorrelation. The values of $R^2$ range from 0.68 to 0.97 for $M_1$ and $M_2$, and from 0.93 to 0.99 for $M_1$ and $M_2$. When a lagged variable was used $E_{t-4}$, the results did not show any improvements though the lagged variable came out to be rather significant according to t-statistics.

The most common sources of autocorrelation are 1) omission of some important variable, 2) error in the mathematical form of the equation, 3) errors in the macrovariables, 4) mis-specification of the true random term.

---

23 D.W. for $M_1$ is 1.7 for lag $M_1$ is 1.34, lag $M_2$ D.W. = 1.5, and for $M_1$ D.W. = 0.6 and 0.23 for log $M_1$ and $M_2$ and log $M_2$ consecutively.
When the values of the random variable \( u \) in any particular period are correlated with its own preceding values then there is serial correlation of the random variable (autocorrelation). In certain practical cases or when we undertake applied econometric research the assumption of temporal independence of the values of the random variable can be easily violated.\(^{25}\)

When we build an economic model we do not include all the explanatory variables, only the most important variables are included explicitly in the function, so it is natural to expect that omitted variables are a frequent cause of quasi-autocorrelation. The money supply model used the following variables, the monetary base; the public's demand for cash, and the commercial banks demand for reserves. The values of the monetary base in any particular period are partly determined by its own value in the preceding period. The base \( B^L \) includes net foreign assets, and the level of net foreign assets in period \( t \) depends on the level of net foreign assets in period \( t - 1 \). An inflow of foreign assets at period \( t - 1 \) would improve the position of the Lebanese balance of payments, such an improvement leads to an increase in the Lebanese stock of monetary reserves and increases the value of the Lebanese pound on the foreign exchange market; thus causing a new inflow of foreign assets into the Lebanon in period \( t \). "One can hardly think of any significant economic magnitude which is not somehow determined by the values which the same magnitude assumed in the past. Furthermore, in actual life, autocorrelation tends to be positive."\(^{27}\)

The two traditional tests for the incidence of autocorrelation are the Von Neumann ratio and the Durbin-Watson test. The Von Neumann ratio is applicable for directly observed series and for variables which are random. When the values of the random variable \( u \) are not directly observable but are estimated from the OLS residuals (\( \hat{e} \)'s); one might think that the

\(^{25}\) A. Koutsoyiannis, op. cit. p. 198-199
\(^{26}\) ibid. p. 198
\(^{27}\) ibid. p. 199
Von-Neumann ratio could be applied approximately\(^{(28)}\) (n \(\geq 30\), and \(\bar{e} = 0\) by definition). The Von Neumann ratio may be used to test a large sample for positive autocorrelation "by constructing the empirical value obtained for the V.N. ratio with a pre-selected critical region from the normal distribution with the appropriate mean and variance, but it is important to emphasise that even the formulae for the mean and variance are only true if the \(e\) values are independently distributed and this, in fact, is not true of least squares residuals, even when the true disturbance terms are independently distributed."\(^{(29)}\)

The Durbin-watson test is applicable to small samples, and the \(e\) values are both positive and negative with mean zero. The D.W. tends to be small for positively autocorrelated series, and large for negatively autocorrelated series, and somewhere in between for random series."\(^{(30)}\) The Durbin-watson test has some shortcomings, the D.W. statistic is not an appropriate measure of autocorrelation if among the explanatory variables there are lagged values of the endogenous variable. The D.W. is inappropriate for testing for higher order serial correlation or for other forms of autocorrelation."\(^{(31)}\)

There is an alternative test for autocorrelation, which has the advantage of being applicable to any form of autocorrelation and provides estimates of the coefficients of the autocorrelation relationship. We take the regression residuals and use them instead of the dependent variable of the original regression and run another regression with the same independent variables. I have taken the residuals of the regression.

\[
M_1 = 0.5583L + 172.048r - 14.669CB
\]

and substituted them for \(M\), and another regression gave the following results:

\(^{(28)}\) ibid. p. 206
\(^{(29)}\) J. Johnston, op. cit. p. 250
\(^{(30)}\) ibid. 251-254
\(^{(31)}\) For more information on this point look A. Koutsoyiannis, op. cit p. 207-210 and p. 326 - 334.
The correlation coefficients are:

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>P</th>
<th>CB</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>1.000</td>
<td>0.324</td>
<td>0.331</td>
<td>-0.1352</td>
</tr>
<tr>
<td>P</td>
<td>-0.324</td>
<td>1.000</td>
<td>0.0914</td>
<td>0.0481</td>
</tr>
<tr>
<td>CB</td>
<td>0.331</td>
<td>0.0914</td>
<td>1.000</td>
<td>-0.0114</td>
</tr>
<tr>
<td>D</td>
<td>-0.135</td>
<td>0.0481</td>
<td>-0.0114</td>
<td>1.000</td>
</tr>
</tbody>
</table>

Table 2

D = the residual series of the estimated model.

Table 2 shows that the correlation coefficients are not high, in fact they are low. The $R^2$ for the first variable, or the monetary base is 0.01829 rather low. The F-statistic is 0.67088 also low. $R^2$ for variable P is 0.0023 very low, and F-statistic is also very low 0.08376. And variable CB has $R^2 = 0.00013$ very low, and F-statistic of 0.00473 extremely low. B, P and CB are the independent variables while D is the dependent variable. The conclusion which can be drawn from such results states that the values of the random variable are not autocorrelated. This is so, because the test has given low values of $R^2$ and F-statistics thus making P's insignificant where P's are from:

$$e_t = P_{e_{t-1}} + V_t$$

or

$$e_t = P_1 e_{t-1} + P_2 e_{t-2}$$

and so on.

Since P's are not significant then the random variable has successive independent values.

The same test was applied using the residuals of the regression.

$$M_2 = 0.755 B - 15.25 P - 27.28 CB$$

as the dependent variable D. The correlation coefficients are:
Table 3

Again for $M_2$ the correlation coefficients are not high, the independent variable $B^L$ has an $R^2$ of 0.0397 not high, and F-statistic 1.49.

The independent variable $P$ has an $R^2 = 0.0013$ very low and F-statistic 0.0495. The independent variable $CB$ has an $R^2$ of 0.00000 and an F-statistic of 0.00014. Thus we conclude that $P$'s are not significant, and each of the variables has successive independent values. In both equation $CB$ has produced excellent results thus proving empirically that its values at period $t$ are not related to its values at period $t-1$; so did the other independent variables, but not as strongly as $CB$. 

<table>
<thead>
<tr>
<th></th>
<th>$B^L$</th>
<th>$P$</th>
<th>$CB$</th>
<th>$D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$B^L$</td>
<td>1.000</td>
<td>-0.338</td>
<td>0.318</td>
<td>-0.199</td>
</tr>
<tr>
<td>$P$</td>
<td>-0.338</td>
<td>1.000</td>
<td>-0.130</td>
<td>0.037</td>
</tr>
<tr>
<td>$CB$</td>
<td>0.318</td>
<td>0.130</td>
<td>1.000</td>
<td>-0.0019</td>
</tr>
<tr>
<td>$D$</td>
<td>-0.199</td>
<td>0.037</td>
<td>-0.0019</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Before presenting the empirical results of this section I would like to note that in the function

$$\text{NFA} = f \left( r_e, r_d, G' \right)$$

$G'$ is the national stock of reserves, and I am aware that the net foreign assets influence $G'$. The reason for using $G'$ in the function is simply to compare it empirically, being a proxy for the stability of the Lebanese balance of payments. With the influence of the Exchange rate $E$ and NFA, when the function resumes a more realistic form

$$\text{NFA} = f \left( r_e, r_d, E \right)$$

in fact the results tell us that $E$ is a better proxy for the stability of the Lebanese B/P than $G'$. 
c - Net Foreign Assets

The monetary base $B^L$ according to the model and the empirical estimations plays an important role in determining changes in the money supply of the Lebanon. As mentioned before the Lebanon has an open-economy, and the balance of payments is subject to changes in capital flows. The way the monetary base $B^L$ is derived (as in the first part of this chapter) makes it possible for us to trace the influence of net foreign assets on $B^L$ and on the money supply in the Lebanon. We have:

\[ B^L = B^a + NFA \]

and

\[ M = mB^L \]

where $NFA = a(D+T)$, and represents the foreign sector in the monetary base $B^L$.

The object of this section is to test empirically the relationship between $NFA$, and a set of independent variables, $r_e$, $r_d$, $G^1$, $TL^1$ and $E$.

The hypothesis about $NFA$ states that there is a negative relationship between the level of $NFA$ and $r_e$, a positive relationship between the level of $NFA$ and $r_d$, and a negative relationship between $NFA$ and the exchange rate (dollars in Lebanese pounds), thus having:

\[ NFA = f (r_e, r_d, E) \]

We can have another hypothesis which includes the national stock of monetary reserves $G^1$ as a proxy for the stability of the Lebanese balance-of-payments; with

\[ NFA = f (r_e, r_d, G^1) \]

Both functions have been tested\(^{32}\) using quarterly data, and 22 observations for the period 1969I - 1974 II. I think that a great part of the funds that are deposited in the Lebanon from Arab oil producing countries are these, because of the relative stability of the Lebanese \(^{32}\)\(^{2}r_L\) and \(V_b\) have been omitted from the empirical test, because it has not been possible to obtain any data on $r_L$ (the market interest rates), and values for $V_b$ are not continuous - they are only available for a short period of time.
pound (or balance of payments); while the other part of the funds enter Lebanon to be invested in the Euro-dollar market, via the commercial banks in Beirut.

The NFA are responsive to changes in \( r_e \) and \( r_d \) in two opposite directions i.e. an increase in \( r_e \) leads to an outflow of capital from Lebanon to the Euro-dollar market, while an increase in \( r_d \) causes capital inflows to Lebanon. I have treated the differences between \( r_e \) and \( r_d \) by using two alternative methods in conducting empirical tests. The first method is based on the idea that NFA are responsive to \( (r_e - r_d) \); the net result of capital mobility due to changes in \( r_e \) and \( r_d \) is dependent on the net difference in changes of \( r_e \) and \( r_d \), \( (r_e - r_d) \). If the value of \( (r_e - r_d) \) increases it means that \( r_e \) has a higher rate of increase than that of \( r_d \), the opposite is true. So we have the following function:

\[
NFA = f(r_e - r_d)
\]

The other method treats one of the interest rates as the denominator; in my tests I use \( r_d \) as the denominator having the ratio \( \frac{r_e}{r_d} \), for the period 1971-1971IV for example

\[
\frac{r_e}{r_d} = 1.84, 2.24, 2.57, 2.11
\]

an increase in the ratio from say 1.84 to 2.24 means that the rate of increase in \( r_e \) has been greater than the rate of increase in \( r_d \); or the rate of decrease in \( r_e \) has been less than the rate of decrease in \( r_d \).

When there is an increase in the ratio then there will be an outflow of capital from Beirut to the Euro-dollar market, the function has the following form:

\[
NFA = f \left( \frac{r_e}{r_d} \right)
\]
The first set of regressions includes G and TL, the reason for including TL = TL - IMF is just to incorporate the changes in the Lebanese IMF position and its influence on changes in NFA. We have

\[
NFA = 95.433 - 20.665(r_e - r_d) + 0.657G - 0.5173TL
\]

\[
(1.6124) \quad (43.14) \quad (0.773)
\]

\[
R^2 = 0.99 \\
D.W. = 1.75
\]

\[
\log NFA = -0.47976 - 0.5337\log(r_e - r_d) + 1.0125\log G - 0.00106 \log TL
\]

\[
(1.53) \quad (47.9) \quad (0.345)
\]

\[
R^2 = 0.99 \\
D.W. = 1.42
\]

The previous two regressions have the right signs for both independent variables \((r_e - r_d)\) and G, with \(r_e, r_d\); TL is insignificant, so it has been dropped out and we have:

\[
NFA = 127.71 - 23.72(r_e - r_d) + 0.6506G
\]

\[
(1.96) \quad (51.8)
\]

\[
R^2 = 0.99 \\
D.W. = 1.75
\]

By dropping out TL the results improved; thus making \((r_e - r_d)\) significant with t-statistic 1.96

\[
\log NFA = 0.46833 - 0.0354 \log (r_e - r_d) + 1.01117 \log G
\]

\[
(1.74) \quad (49.9)
\]

\[
R^2 = 0.99 \\
D.W. = 1.4
\]

Elasticities of NFA with respect to \((r_e - r_d)\) are \(-0.3337\) and \(-0.035\)

Another set of regression was run with \(\frac{r_e}{r_d}\) rather than \((r_e - r_d)\) as on the independent variables, the other independent variables are G and TL.
\[
NFA = 143.59 - 53.61 \frac{r_e}{r_d} + 0.656G^1 - 0.678TL^1
\]

\[
(1.2) \quad (33.6) \quad (1.45)
\]

\[\begin{align*}
R^2 &= 0.99 \\
D.W. &= 1.6
\end{align*}\]

\[
\log NFA = -0.592 - 0.0187 \log \frac{r_e}{r_d} + 1.023 \log G^1 - 0.0029 \log TL^1
\]

\[
(0.44) \quad (30.08) \quad (0.877)
\]

\[\begin{align*}
R^2 &= 0.99 \\
D.W. &= 1.15
\end{align*}\]

Both independent variables \(G^1\) and \(\frac{r_e}{r_d}\) have the right sign, but according to t-statistic \(\frac{r_e}{r_d}\) is not significant. \(TL^1\) was dropped out and the results did not improve, they are:

\[
NFA = 122.23817 - 44.475 \frac{r_e}{r_d} + 0.65144 G^1
\]

\[
(0.98) \quad (33.6)
\]

\[\begin{align*}
R^2 &= 0.99 \\
D.W. &= 1.4
\end{align*}\]

\[
\log NFA = -0.69324 - 0.00567 \log \frac{r_e}{r_d} + 1.03 \log G^1
\]

\[
(0.16) \quad (32.61)
\]

\[\begin{align*}
R^2 &= 0.99 \\
D.W. &= 0.946
\end{align*}\]

It seems from the results that \((r_e - r_d)\) is relatively less insignificant than \(\frac{r_e}{r_d}\), and in the function;

\[
NFA = f (r_e - r_d, G^1)
\]

\((r_e - r_d)\) is significant and so is \(G^1\); (according to t-statistic).

The exchange rate \(E\) was substituted for \(G^1\), and another set of regression were run for the same period with quarterly data; The results are:
\[ \text{NFA} = 13411.6 - 208.024 (\text{r}_e - \text{r}_d) - 2991.4E - 12.69\text{TL}^{1} \]

\[ (3.98) \quad (7.6) \quad (3.4) \]

\[ R^2 = 0.91 \]
\[ \text{D.W.} = 1.3 \]

\[ \log \text{NFA} = 11.04 - 0.347 \log (\text{r}_e - \text{r}_d) - 2.17 \log E - 0.069 \log \text{TL}^{1} \]

\[ (3.231) \quad (7.09) \quad (3.146) \]

\[ R^2 = 0.88 \]
\[ \text{D.W.} = 1.25 \]

TL\(^1\) was dropped out, and the results did not show any significant changes, except that \((\text{r}_e - \text{r}_d)\) increased in significance; we have:

\[ \text{NFA} = 9914.503 - 275.318 (\text{r}_e - \text{r}_d) - 1662.19E \]

\[ (4.509) \quad (7.04) \]

\[ R^2 = 0.86 \]
\[ \text{D.W.} = 1.1 \]

\[ \log \text{NFA} = 10.463 - 0.516 \log (\text{r}_e - \text{r}_d) - 1.58 \log E \]

\[ (4.571) \quad (5.38) \]

\[ R^2 = 0.817 \]
\[ \text{D.W.} = 1.05 \]

The results show that the exchange rate (empirically) is a better proxy for the stability of the Lebanese balance of payments than the stock of monetary reserves.

\[ \text{NFA} = f (\text{r}_e - \text{r}_d, E) \]

The above function has shown empirically that, both independent variables are significant, and have the right sign.

Let us study the responsiveness of NFA to the various independent variables, \((\text{r}_e - \text{r}_d)\), \(G^1\) and \(E\); \(\frac{\text{r}_e}{\text{r}_d}\) has been dropped out, because it is not significant; TL\(^1\) is included only in the function that has \(E\) as one of its independent variables.
The Elasticities of NFA with respect to

<table>
<thead>
<tr>
<th>(r_e - r_d)</th>
<th>G^1</th>
<th>E</th>
<th>TL^1</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.333</td>
<td>47.98</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-0.035</td>
<td>1.011</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-0.347</td>
<td>-</td>
<td>-2.17</td>
<td>-0.0695</td>
</tr>
<tr>
<td>-0.516</td>
<td>-</td>
<td>-1.585</td>
<td></td>
</tr>
</tbody>
</table>

The main conclusion that could be drawn from the elasticities supports the hypothesis which states that a great part of the Arab funds are deposited in the Lebanon, because of the relative stability of the Lebanese pound (and balance of payments). It seems that NFA is interest inelastic - in the case of the Lebanon. The results also support the hypothesis which states that commercial banks increase their holdings of foreign assets when the Lebanese pound improves its position with respect to the dollar.35

The regressions have shown some positive auto-correlation, this is expected in equations which include variables like E, and G^1. The value of E at period t is dependent on its value in period t-1, because if there is an improvement in the Lebanese pound on the foreign exchange market this could lead to an increase in capital inflows into the Lebanon thus improving or increasing the value of the Lebanese pound with respect to other currencies. In order to minimize positive autocorrelation the same regressions were run using first differences, the results are:

$$NFA = 7.63 (r_e - r_d) + 0.594 G^1 - 0.497 TL^1$$

\( (0.467) \quad (10.55) \quad (1.66) \)

$$R^2 = 0.87$$

The implications of the results with respect to monetary policy and the controlability of money supply in the Lebanon will be discussed in the next chapter.
\[
\log NFA = 0.0149 \log (r_e - r_d) + 0.94 \log G - 0.401 \log TL
\]
\[
(0.373) \quad (38.1) \quad (0.76)
\]
\[R^2 = 0.98\]

\[
NFA = 31.2 \frac{r_e}{r_d} + 0.59 \log G - 0.46 \log TL
\]
\[
(0.69) \quad (10.4) \quad (1.56)
\]
\[R^2 = 0.87\]

\[
\log NFA = -0.129 \log \frac{r_e}{r_d} + 0.921 \log G - 0.064 \log TL
\]
\[
(1.562) \quad (39.3) \quad (1.4)
\]
\[R^2 = 0.99\]

\[
NFA = 9.98 (r_e - r_d) - 378.08 E - 1.772 \log TL
\]
\[
(0.251) \quad (0.78) \quad (1.75)
\]
\[R^2 = 0.14\]

\[
\log NFA = -1.4117 \log (r_e - r_d) - 1.336 \log E - 0.155 \log TL
\]
\[
(1.308) \quad (2.512) \quad (0.367)
\]
\[R^2 = 0.5\]

\[
NFA = 10.16 (r_e - r_d) + 174.13 E
\]
\[
(0.243) \quad (0.456)
\]
\[R^2 = 0.114\]

\[
\log NFA = -1.226 \log (r_e - r_d) - 1.336 \log E
\]
\[
(1.311) \quad (2.54)
\]
\[R^2 = 0.5\]

The results show that when we use first differences the stock of monetary reserves functions much better than E does. The empirical estimations with first differences are generally not significant according to t-statistic with the exception of \(G\).
d - The Free-Reserve Ratio

The Free-reserve ratio \( \frac{FR}{TD} \) is taken to be a function of interest, rates, the exchange rate, and unborrowed reserves;

\[
\frac{FR}{TD} = f(r_L, r_d, r_e, \varepsilon, UR)
\]

Since it is not possible to obtain figures for \( r_L \) then it has to be dropped out of the empirical estimations, the equations that has been tested is in the following form:

\[
\frac{FR}{TD} = f(r_e - r_d, \varepsilon, U)
\]

\[
U = UR - \frac{TD}{UR} \frac{RR}{TD}
\]

\[
\frac{FR}{TD} = 0.04918 - 0.00132 (r_e - r_d) - 0.01527 \varepsilon + 0.00026 U
\]

\[
(0.96) \quad (2.51) \quad (7.39)
\]

\[ R^2 = 0.626 \]

\[ D.W. = 2.3 \]

48 monthly observations were used for the period 1971 Jan.-1974 Dec.

The commercial banks in the Lebanon are able to use their foreign assets as excess reserves, because the Bank of Lebanon is willing to buy any given amount of foreign currency that the banks are supplying. 34

The same equation for the Free-reserve ratio is treated with lagged variables, because the influence of the explanatory variable on the dependent variable is distributed over a number of past values of the explanatory variable. The general form of a distributed-lag model is:

\[
Y_t = a + b_0 X_t + b_1 X_{t-1} + b_2 X_{t-2} + \ldots + b_L X_{t-L} + \ldots + U_t
\]

The main reason for using lagged variables is because the level of free reserves, and the changes in free reserves are dependent on the present and past pattern of interest rates and the exchange rate; so if we lag \((r_e - r_d)\) one month we get:

34 This point has been put forward in the theoretical part of this chapter.
\[
\begin{align*}
\text{FR} \quad & = 0.05712 + 0.000015(r_e - r_d)_t - 0.0019(r_e - r_d)_{t-1} - 0.017 E_t \\
& + 0.00027 U_t  \\
(0.016) & \quad (0.916) \quad (2.66)
\end{align*}
\]

\[
R^2 = 0.64 \\
D.w. = 2.35
\]

\[(r_e - r_d)_t \text{ has the wrong sign, and is insignificant, so is } (r_e - r_d)_{t-1}.\]

Since the data is based on monthly data a lag of four months, three months and two months would give us a more clear idea about the relationship between Free Reserves and the interest rates, the estimations are as follows:

\[
\begin{align*}
\text{FR} \quad & = 0.0542 + 0.00018(r_e - r_d)_t - 0.00242 (r_e - r_d)_{t-1} \\
& + 0.00055(r_e - r_d)_{t-2} - 0.01653 U_t + 0.00026 U_t  \\
& (0.09) \quad (0.82) \quad (0.25) \quad (7.124)
\end{align*}
\]

\[
R^2 = 0.63 \\
D.w. = 2.3
\]

Again the variable \((r_e - r_d)_t\) is not significant and both \((r_e - r_d)_t\) and \((r_e - r_d)_{t-2}\) have the wrong sign.

\[
\begin{align*}
\text{FR} \quad & = 0.05186 - 0.00069 (r_e - r_d)_t - 0.00038(r_e - r_d)_{t-1} \\
& - 0.00308(r_e - r_d)_{t-2} + 0.00405 (r_e - r_d)_{t-3}  \\
& - 0.0108 E_t + 0.00026 U_t  \\
& (0.332) \quad (0.1208) \quad (0.9949) \quad (1.73) \quad (1.4) \quad (6.98)
\end{align*}
\]

\[
R^2 = 0.66 \\
D.w. = 2.2
\]

\[(r_e - r_d)_{t-3} \text{ has the wrong sign but is much less insignificant than } (r_e - r_d)_t, (r_e - r_d)_{t-1} \text{ and } (r_e - r_d)_{t-2}\]

\(E\) the variable in this regression seems to be not significant.
\( \frac{\text{PR}}{\text{TD}}_t = 0.0597 - 0.00267 (r_{e-d})_t + 0.0024 (r_{e-d})_{t-1} \)

\[ (1.144) \quad (0.72) \]

\[-0.0064 (r_{e-d})_{t-2} + 0.00912 (r_{e-d})_{t-3} \]

\[ (1.85) \quad (2.598) \]

\[-0.00481 (r_{e-d})_{t-4} - 0.01748E_t \]

\[ (1.897) \quad (2.097) \]

\[+ 0.00023 U_t \]

\[ (6.34) \]

\[ R^2 = 0.69 \]

\[ \text{D.W.} = 2.1 \]

\((r_{e-d})_{t-1}\) and \((r_{e-d})_{t-3}\) both have the wrong sign, but \((r_{e-d})_{t-3}\) is significant. \((r_{e-d})_{t-2}\) and \((r_{e-d})_{t-4}\) are almost significant.

Generally the results are not strong according to t-statistic specially for \((r_{e-d})_t\) and \((r_{e-d})_{t-1}\); may be free reserves are responsive to past changes in interest rates rather than present changes; i.e. two, three and four months before changes in interest rates took place and are related to the present behaviour of free reserves.

Another lagged variable has been tested, but only for period \(t-1\); the reason being that \(E_{t-1}\) (one month) might have an influence on the present level of Free-Reserves, \(E_{t-2}\), \(E_{t-3}\) (two and three months) is a rather long period (relatively), and responses of foreign assets and changes in excess reserves\(^{35}\) to changes in \(E\) are almost spontaneous or very short-run oriented, (short-run in this case being less than 30 days).

We have:

\[ \frac{\text{PR}}{\text{TD}}_t = 0.01586 + 0.00087 (r_{e-d})_t - 0.0149E_t \]

\[ (1.24) \quad (0.911) \]

\[+0.01569 E_{t-1} + 0.00014 U_t \]

\[ (1.146) \quad (18.9) \]

\[ R^2 = 0.91 \]

\[ \text{D.W.} = 2.4 \]

\(^{35}\) For the relationship between \(E\) and excess reserves look up under Free-Reserves in part one of this chapter.
According to the above regression there is no justification for lagging E, in fact without $E_{t-1}$ the results are much better and E becomes significant with t-statistic of 2.51. The variable $U_t$ is significant in all the previous regressions.

Some empirical estimations were undertaken to study the relationship between total bank deposits and the interest rates, free-reserve ratio, and $U_t$; and the results are:

$$TD = -1.50844 + 9.0917(r_e-r_d) + 709.6 \frac{FR}{TD} - 0.0089U$$

$$R^2 = 0.037$$
$$D.W. = 2.1$$

using 48 monthly observations for the period 1971-1974 end of. The results are insignificant, so another regression was run using 40 monthly observations 1971-1974 April.

$$TD = 250.16 + 11.0616(r_e-r_d) - 2538.9 \frac{FR}{TD} + 0.238 U$$

$$R^2 = 0.1$$
$$D.W. = 2.6$$

With no improvement on the previous regression, I attempted or introduced lagged variables, and the results are:

$$TD_t = -9.0738 + 1.588 (r_e-r_d)_t + 9.115 (r_e-r_d)_{t-1} + 718.1 \frac{FR}{TD}$$

$$R^2 = 0.43$$
$$D.W. = 2.18$$

There is no improvement in the results, the $(r_e-r_d)$ is still not significant showing according to the above regression that changes in total deposits are not related to interest rates; or to be more realistic the equation has failed to show that there is a relationship between changes in total bank deposits and interest rates. The same variable then was lagged over
two, three and four months, and the results did not in any way improve.

\[ TD_t = -16.73 + 10.4(r_e - r_d)_t - 32.5(r_e - r_d)_{t-1} + 40.3(r_e - r_d)_{t-2} \]

(0.51) (1.11) (1.91)

\[ + 476.4 \frac{FR}{TD} t - 0.15467 U_t \]

(0.721) (0.43)

\[ R^2 = 0.13 \]

\[ D.W. = 2.5 \]

\[ TD_t = -6.20075 + 5.41(r_e - r_d)_t - 24.9(r_e - r_d)_{t-1} + 23.5(r_e - r_d)_{t-2} \]

(0.251) (0.784) (0.74)

\[ + 16.9(r_e - r_d)_{t-3} + 261.39 \frac{FR}{TD} t - 0.16533 U_t \]

(0.71) (0.361) (0.447)

\[ R^2 = 0.14 \]

\[ D.W. = 2.5 \]

\[ TD_t = -10.7084 + 10.867(r_e - r_d)_t - 34.719(r_e - r_d)_{t-1} \]

(0.469) (0.984)

\[ + 33.533(r_e - r_d)_{t-2} - 51523(r_e - r_d)_{t-3} \]

(0.958) (0.0412)

\[ + 15.761(r_e - r_d)_{t-4} + 157.677 \frac{FR}{TD} t - 0.077 U_t \]

(0.648) (0.2098) (0.19)

\[ R^2 = 0.15 \]

\[ D.W. = 2.5 \]

Another variable was introduced into the equation, E the exchange rate, Lebanon is an open economy and an improvement in the exchange rate and discount rate might lead to capital inflows, thus increasing total bank deposits. 48 monthly observations were used for the period 1971-1974 end of.
The results are very poor, but this does not mean that there is no relationship between total bank deposits and interest rates. The equation has failed empirically to show that there is a relationship between TD and \((r_e - r_d)\), and between TD and \(E\). The way the relationship has been presented is one conception among many alternative possibilities. The evidence considered in this section indicates that the free-reserve ratio of the commercial banks operating in the Lebanon is related to the exchange rate and to a lesser extent to the difference between the Euro-dollar rates and the Bank of Lebanon discount rates. The free-reserve ratio according to the results shows that it has some relationship with changes in the differences between commercial banks unborrowed reserves and the required reserves ratio.
e - Forecasting Abilities of the model

The purpose of this section is to test the forecasting performance of the model, and the measure of the accuracy of the forecasts is based on Theil's inequality coefficient which is defined as the positive square root of

\[ u^2 = \frac{\sum (P_i - A_i)^2}{\sum A_i^2/n} \]

Pi being the forecast change in the dependent variable, and Ai is the realised change in the dependent variable. The seriousness of a given forecast error can be measured by

\[ \sum (P_i - A_i)^2/n \]

which is the mean square prediction error for the set of all n observations. And the square root is usually taken in order to obtain a measure which has the same dimension as the predictions and realisations themselves. The denominator \(\sum A_i^2/n\) is simply a device to obtain an appropriate unit of measurement.

Theil decomposes the numerator into a number of terms:

\[ \frac{1}{n} \sum (P_i - A_i)^2 = (P - A)^2 + (S_p - S_A)^2 + 2(1 - r) S_p S_A, \]

where \(\bar{P}, \bar{A}, S_p, S_A\) are the means and standard deviations of the series \(P_i, A_i\) respectively, and \(r\) is the correlation coefficient.

\[ r = \frac{\sum (P_i - \bar{P})(A_i - \bar{A})}{S_p S_A} \]

---

37 *ibid.* p. 27-29
with $U_m, U_s, U_c$ as the partial coefficients of inequality $^{39}$ and $U_m + U_s + U_c = 1$

The values of the inequality coefficient lie between zero and infinity

$$0 \leq U \leq \infty$$

when $u = 0$, we have the case of perfect forecasts, and when $U = 1$, the model forecasts no changes in the value of the variable $P_i$, and if $U > 1$ the predictive power of the model is more than the zero change prediction i.e. in this case it is preferable to assume that there will be no change in the value of the dependent variable between the periods $t$ and $t+1$. The conclusion is that the smaller the value of the inequality coefficient $U$ the better is the forecasting performance of the model.

The equations which have been used for forecasting are:

$$M = B_L - U_c \Delta C - U_t \Delta t - U_k \Delta k - U_a \Delta a + U_{b} \Delta b + \xi$$

$M$ being the dependent variable of the money supply equation. $^{40}$

The Free-Reserve ratio,

$$\Delta \left( \frac{FR}{TD} \right) = a - b_o \left( r_e - r_d \right) - b_1 E + b_2 U + \xi$$

Both equations were tested in the previous parts of this chapter, similar tests were performed again for $M$ leaving out the last eight periods.

The money supply equation with $M_1$ has been estimated with 30 observations for the period 1965 I - 1972 II, and then $M_1^*$ (forecast) is calculated for eight periods 1972 III-1974 II. Table 4 presents the values of $M_1$ obtained from the calculations which are reached by multiplying the value of the coefficient of each independent variable with the relevant actual value, of that variable for the eight periods. The calculations are available on the next page.

$^{39}$ ibid p. 35-37

$^{40}$ The money supply equation was derived in the first part of this chapter.
Theil's inequality coefficient \( u \) has been calculated for \( M_1 \) with the help of Table 4 where:

\[
U = \sqrt{\frac{26.714}{94.8}}
\]

For periods III and IV 1972 the predicted values of \( M_1 \)'s are:

\[
\begin{align*}
M_1^* &= a + 0.53597(5.847) + 169.318(-0.0025) - 1.32623(-0.005) = 2.7505 \\
M_1^* &= a + 0.53597(5.170) + 169.318(0.0004) - 1.32623(0.0051) = 2.835
\end{align*}
\]

For periods I, II, III and IV 1973 the predicted \( M_1 \)’s are:

\[
\begin{align*}
M_1^* &= a + 0.53597(-0.195) + 169.318(-0.0007) - 1.32623(-0.239) = 0.08 \\
M_1^* &= a + 0.53597(1.524) + 169.318(0.005) - 1.32623(0.0057) = 1.67 \\
M_1^* &= a + 0.53597(7.053) + 169.318(-0.0025) - 1.32623(0.0060) = 3.83 \\
M_1^* &= a + 0.53597(-1.176) + 169.318(0.002) - 1.32623(-0.0396) = -0.243
\end{align*}
\]

For periods I and II 1974 the predicted \( M_1 \)’s are:

\[
\begin{align*}
M_1^* &= a + 0.53597(2.270) + 169.318(0.0071) - 1.32623(-0.0162) = 2.43 \\
M_1^* &= a + 0.53597(6.519) + 169.318(-0.0003) - 1.32623(0.0220) = 3.42
\end{align*}
\]

\( a \) is equal to zero, and the coefficient of \( B^L = 0.53597 \)

\( p = 169.318 \)

\( CB = -1.32623 \)
<table>
<thead>
<tr>
<th>Period</th>
<th>( \dot{M}_1 )</th>
<th>( \ddot{M}_1 )</th>
<th>( \dddot{M}_1 )</th>
<th>( (\dot{M}_1 - \dddot{M}_1)^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>2.7505</td>
<td>3.316</td>
<td>10.9</td>
<td>0.320</td>
</tr>
<tr>
<td>IV</td>
<td>2.835</td>
<td>4.571</td>
<td>20.8</td>
<td>3.03</td>
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<tr>
<td>1973</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.08</td>
<td>0.655</td>
<td>0.429</td>
<td>0.330</td>
</tr>
<tr>
<td>II</td>
<td>1.67</td>
<td>4.424</td>
<td>19.5</td>
<td>7.56</td>
</tr>
<tr>
<td>III</td>
<td>3.83</td>
<td>5.818</td>
<td>33.6</td>
<td>3.92</td>
</tr>
<tr>
<td>IV</td>
<td>-0.243</td>
<td>2.864</td>
<td>8.18</td>
<td>9.61</td>
</tr>
<tr>
<td>1974</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>2.45</td>
<td>0.760</td>
<td>0.577</td>
<td>2.78</td>
</tr>
<tr>
<td>II</td>
<td>3.42</td>
<td>0.378</td>
<td>0.142</td>
<td>9.24</td>
</tr>
</tbody>
</table>

\[
\sum \dot{M}_1 = 22.8, \quad \sum \dddot{M}_1 = 94, \quad \sum (\dot{M}_1 - \dddot{M}_1)^2 = 36.71
\]

Table 4

\[
\frac{\sum \dddot{M}_1}{n} = \frac{94}{8} = 11.75
\]

\[
\frac{\sum (\dot{M}_1 - \dddot{M}_1)^2}{n} = \frac{36.71}{8} = 4.588
\]
\[ U = \sqrt{0.3904} \]

\[ U = 0.6248 \text{ and therefore } U < 1 \text{ for } M_1 \text{ and the money supply equation has shown a good forecasting performance.} \]

The same money supply equation was used again to forecast \( M_2 \) for the period 1972 III - 1974 II, and the same method was followed in order to calculate Theil's inequality coefficient \( u \). Table 5 shows the eight different values of \( M_2 \) (forecast), and the actual values of \( M_2 \) for the same period or quarters.

\[
U = \sqrt[2]{\frac{(M_2^* - M_2)^2}{n}}
\]

From Table 5 we have \( \sum (M_2^* - M_2)^2 = 70.13 \) and \( \sum M_2^2 = 172.4 \) \( n = 8 \)

Therefore

\[
U = \sqrt{\frac{8.76625}{21.55}}
\]

\[ U = 0.657797 \text{ and } U < 1 \]

The predicted values of \( M_2 \)'s for periods III and IV, 1972 are:

\[ M_2^* = 5.646 + 0.270 - 0.119 = 3.996 \]

\[ M_2^* = 3.400 - 0.131 + 0.131 = 3.400 \]

The predicted values of \( M_2 \)'s for periods I, II, III and IV 1973 are:

\[ M_2^* = -0.132 + 0.077 + 0.836 = 0.781 \]

\[ M_2^* = 1.003 - 0.540 + 0.129 = 0.592 \]

\[ M_2^* = 4.64 + 0.270 - 0.202 = 4.572 \]

\[ M_2^* = -0.772 - 0.233 + 1.43 = 0.425 \]

The predicted values of \( M_2 \)'s for periods I, II 1974

\[ M_2^* = 1.493 - 0.855 + 0.597 = 1.232 \]

\[ M_2^* = 4.292 + 0.0389 - 0.785 = 3.546 \]
The regression which gives us the relative coefficients is based on 50 Quarterly observations 1965 I - 1972 II and is:

\[ M_2 = 0.65784 \ M^L - 38.638P - 11.933 \ CB \]
<table>
<thead>
<tr>
<th>Period</th>
<th>( \dot{H}^2 )</th>
<th>( \dot{M}_2 )</th>
<th>( \dot{M}_2^2 )</th>
<th>( (\dot{M}_2^2 - M_2^2)^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1972</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>3.996</td>
<td>4.888</td>
<td>23.89</td>
<td>0.7956</td>
</tr>
<tr>
<td>IV</td>
<td>3.400</td>
<td>4.481</td>
<td>20.08</td>
<td>1.1685</td>
</tr>
<tr>
<td>1973</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>0.781</td>
<td>4.503</td>
<td>20.28</td>
<td>13.853</td>
</tr>
<tr>
<td>II</td>
<td>0.592</td>
<td>2.109</td>
<td>4.45</td>
<td>2.301</td>
</tr>
<tr>
<td>III</td>
<td>4.572</td>
<td>6.338</td>
<td>40.17</td>
<td>3.118</td>
</tr>
<tr>
<td>IV</td>
<td>0.425</td>
<td>5.741</td>
<td>32.95</td>
<td>28.19</td>
</tr>
<tr>
<td>1974</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>1.232</td>
<td>5.314</td>
<td>28.24</td>
<td>16.64</td>
</tr>
<tr>
<td>II</td>
<td>3.546</td>
<td>1.531</td>
<td>2.34</td>
<td>4.060</td>
</tr>
</tbody>
</table>

\[ \sum \dot{M}_2^2 = 172.4 \]

\[ \sum (\dot{M}_2^2 - M_2^2)^2 = 70.13 \]

\[ \frac{\sum \dot{M}_2^2}{n} = \frac{172.4}{8} = 21.55 \]

\[ \frac{\sum (\dot{M}_2^2 - M_2^2)^2}{n} = \frac{70.13}{8} = 8.76625 \]
According to the empirical estimations the values of Theil's inequality coefficient $U$ varies from 0.6248 for $M_1^*$ and 0.637797 for $M_2^*$. The conclusion which is based on these figures supports the forecasting performance of the model for both definitions of money $M_1$ and $M_2$ for the period 1972 III - 1974 II.

The same method was applied to test the forecasting performance of the Free-Reserve ratio equation. Table 6 shows the actual and predicted values of changes in the Free-Reserves ratio for the last eight months of 1974.

$$U = \sqrt{\frac{\sum (\Pi - A_i)^2}{\sum A_i^2}}$$

$n = 8$

$\sum (\Pi - A_i)^2 = 0.00587$, and $\sum A_i^2 = 0.011097$ From Table 6

$$U = \sqrt{\frac{0.000073375}{0.001387125}}$$

$$U = \sqrt{0.052897179}$$

$U = 0.229993$  

Therefore the Free-Reserves Ratio equation has shown good forecasting performance, in fact better than the money supply equation, because it has a lower value for $U$.

The predicted values of changes in the Free-Reserve ratio for the last eight months of 1974 are: Let $\Delta \left(\frac{PR}{TD}\right)^*$

$\Pi_1 = 0.00065 - 0.00236 - 0.000255 - 0.0103 = -0.01223$

$\Pi_2 = 0.00065 - 0.001788 - 0.000249 - 0.00238 = -0.00376$

$\Pi_3 = 0.00065 - 0.00224 - 0.0002508 - 0.00154 = -0.00338$

$\Pi_4 = 0.00065 - 0.00264 - 0.000249 - 0.01022 = -0.01245$

$\Pi_5 = 0.00065 - 0.001533 - 0.000246 - 0.0005628 = -0.00169$

$\Pi_6 = 0.00065 - 0.001015 - 0.0002519 + 0.54867 = 0.05415$

$\Pi_7 = 0.00065 - 0.000745 - 0.000255 + 0.09868 = 0.09833$

$\Pi_8 = 0.00065 - 0.0008085 - 0.000253 - 0.0110698 = -0.0115$
The coefficient of

\((r_e - r_d) = -0.00035\)

E = -0.00011

U = 0.00014

and the constant a = 0.00065
<table>
<thead>
<tr>
<th>Period</th>
<th>Predicted Values $\pi_i$</th>
<th>Actual Values $a_i$</th>
<th>$a_i^2$</th>
<th>$(\pi_i-a_i)^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>-0.01223</td>
<td>-0.0072</td>
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<td>0.0000253</td>
</tr>
<tr>
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<td>-0.00376</td>
<td>-0.0013</td>
<td>0.000012</td>
<td>0.00000605</td>
</tr>
<tr>
<td>July</td>
<td>-0.00538</td>
<td>-0.0037</td>
<td>0.000014</td>
<td>0.00000102</td>
</tr>
<tr>
<td>Aug.</td>
<td>-0.01245</td>
<td>-0.0112</td>
<td>0.00013</td>
<td>0.0000156</td>
</tr>
<tr>
<td>Sep.</td>
<td>-0.00169</td>
<td>0.0006</td>
<td>0.000056</td>
<td>0.000052</td>
</tr>
<tr>
<td>Oct.</td>
<td>-0.05415</td>
<td>0.0376</td>
<td>0.00141</td>
<td>0.000274</td>
</tr>
<tr>
<td>Nov.</td>
<td>0.09833</td>
<td>0.0935</td>
<td>0.00874</td>
<td>0.000023</td>
</tr>
<tr>
<td>Dec.</td>
<td>-0.0115</td>
<td>0.0274</td>
<td>0.00075</td>
<td>0.000253</td>
</tr>
</tbody>
</table>

$$\sum a_i^2 = 0.001387125$$

$$\sum (\pi_i-a_i)^2 = 0.00007375$$

Table 6

$$\frac{\sum a_i^2}{n} = 0.001387125$$

$$\sum (\pi_i - a_i)^2 = 0.00007375$$
The empirical estimations show that the monetary base $B^L$ plays a major role in determining the values of the dependent variable $M$ ($M_1$ and $M_2$). The monetary base itself is dependent on NFA, so NFA were tested and the results support the hypothesis that capital inflows to the Lebanon are sensitive to changes in the values of the Lebanese pound rather than the changes in interest rates. Changes in the Free-Reserve ratio are empirically related to the exchange rates in the Lebanon, but are more related to changes in unborrowed reserves and required reserves.
List of Variables used in the Model for the Lebanon

A = current accounts on the balance of payments
B = monetary base
B^a = Adjusted monetary base
B^L = Re-adjusted monetary base
C = Currency demanded by the public
CL = Banks borrowings from the Bank of Lebanon
D = Demand deposits
E = The exchange rate of the Lebanese pound with respect to the dollar
ER = Excess reserves of the commercial banks
FR = Free-Reserves
F^d = Firms' demand for bank loans
G = The Bank of Lebanon stock of gold and foreign currency
G^1 = The national stock of monetary reserves
H^d = Household demand for bank loans
M_1 = Money supply, equal to D + C
M_2 = Money supply equal to T + D + C
NKI = Net capital imports
NR = Not recorded transactions on the Lebanese balance of payments
NFA = Bank net foreign assets
rDC = public's demand for bank credit where rDC = F^d + H^d
T = Time Deposits
TD = Total deposits with the banks; TD = D + T
TL = Treasury liabilities
TL^1 = TL - IMF where IMF is the Lebanese position with the International Monetary Fund
R = Reserves demanded by the banking system
UR = Unborrowed reserves
Vc = Volume of bank credit in the Lebanon
Y = Income
a = net foreign assets ratio; \( a = \frac{NFA}{(D+T)} \)

b = The commercial banks borrowing ratio; \( b = \frac{CL}{(D+T)} \)

c = Currency ratio; \( c = \frac{C}{M} \)

k = Bank reserve ratio; \( k = \frac{R}{(D+T)} \)

m_1 = The money multiplier with base B;

\[ m_1 = \frac{1}{k(1-c+t) + c} \]

m_2 = The money multiplier with base B^a;

\[ m_2 = \frac{1}{(k-b+1-c+t) + c} \]

m = The money multiplier with base B^L;

\[ m = \frac{1}{(k+a-b+1-c+t) + c} \]

m = The dynamic multiplier;

\[ m = m_2^{\sum (k+a-b+1-c+t)} - m_2^{\sum (k+1-c+1)} \quad t \]

\[ - m_2^{\sum (1-c+t)} \times (k+a-b+1-c+t+a) + m_2^{\sum (1-c+t)} b \]

t = Time deposits ratio; \( t = \frac{T}{M} \)

r_b = Return on government bonds in the Lebanon

r_d = The discount rate of the Bank of Lebanon

r_e = Euro-dollar rate of return

r_i = Index of interest rates on the bank credit market in the Lebanon

r_l = The Lebanese market rate of interest of bank loans

r^r = The expected rate of interest on Bank loans in the Lebanon

w = Expected return of equities

U_a = \( \frac{H}{B^L} (1-c+t) \) ; \( U_A = \frac{A}{G} \)

U_a = U_b = U_k
\[ U_c = \frac{M}{B^L} (1-(k+a-b)) \]
\[ U_g = \frac{G^1}{B^L} \]
\[ U_L = \frac{T_L}{B^L} \]
\[ U_I = \frac{NKH}{G^1} \]
\[ U_R = \frac{NR}{G^1} \]
\[ U_t = \frac{M}{B^L} (k=a-b) \]

\[ \frac{FR}{TD} = \text{Free reserve ratio} \]
APPENDIX II

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Chapter IV

1 - The purpose and effectiveness of monetary policy in the Lebanon

The examination of monetary policy can be divided into three parts: the information problem, the interpretation of the information, and the determination of the targets by policy makers. The Bank of Lebanon is supposed to be continuously assessing the general movement of the economy, the pace of economic activity, the pressures on the price level and the trend in the balance of payments. The choice among competing interpretations involves a selection of a suitable scale guiding the central banker in identifying the relevant indicators which could be utilised to interpret monetary policy. Due to the absence of perfect information the policy maker has to make use of the available partial knowledge thus producing an interpretation which might not be the most reliable one.¹

The policy makers or central bankers adjust their instruments according to the movement of the selected target magnitude.

The purpose of monetary policy in the Lebanon should be to control the monetary base $B^L$, which has not been under the control of the Bank of Lebanon during the period 1965-1974. The monetary base $B^L$ contains the adjusted domestic base $B^a$ and net foreign assets. The Bank of Lebanon should create new means and tools in order to separate between the domestic base $B^a$ and the influence of the foreign assets on the monetary base and the Lebanese money supply.

¹Perhaps the interpretation of imperfect information could be considered as the second best choice.
I think the Bank of Lebanon should;

1. Ask for the creation of special deposits. Calls for special deposits should be made by the Bank of Lebanon rather regularly. The calls should be expressed in terms of the percentage of the deposits of the commercial banks which is to be placed on special deposit with the Bank of Lebanon and specify the data or dates by which the deposits are to be completed.

The introduction of this new monetary tool or weapon means that as soon as a call has been announced, letters must be despatched to the commercial banks informing them of the precise amount that each bank is required to deposit and of the date by which the deposits are to be made.

The calls on the commercial banks operating in the Lebanon should be divided between domestic deposits and foreign or non-domestic deposits, and a much higher percentage should be imposed on non-domestic deposits in order to absorb any increase in bank deposits caused by the external world. In other words the amount of special deposits to be placed with the Bank of Lebanon should be calculated by reference to two particular bank liabilities, and the rate of call should be different for domestic deposits and non-domestic deposits.

The reason for distinguishing between domestic and non domestic deposits in calls for special deposits is to isolate the influence of the foreign deposits on the Lebanese monetary base and the money supply.
One of the main problems would be the definition of domestic and non-domestic deposits. Such bank liabilities would have to be divided into two parts, the deposits belonging to residents are the domestic deposits, and the deposits belonging to non-residents are the non-domestic deposits. The liabilities to which transit items relate are impossible to identify. I suggest that the Bank of Lebanon should in this particular case adopt the method used by the Bank of England and allocate all transit items to domestic deposits.

2 - The Bank of Lebanon should make more use of legal reserve requirements on both forms of deposits; demand deposits and time deposits.

3 - Have a more realistic discount rate policy.

4 - The Lebanese economy must have a much larger bond market with greater use of long-term and short-term bonds by the Bank of Lebanon so as to be able to use open-market operations for controlling the monetary base $B^L$ and the money supply as much as possible.

5 - The bond market might help in the establishment of long-term loans in the Lebanon, which are essential to the development of the Lebanese industry and agriculture. This will also help to absorb a great part of the banks' idle assets.

The effectiveness of monetary policy can be considered from two angles:

a) the long-term effect on inflation, employment and the balance of payments, and

b) the immediate or short-term effect on rates of interest.
The effect of monetary policy on inflation is based on the philosophy which argues that there is a causal relationship between the supply of money and prices, \(^2\) in order to change the price level the monetary authorities have to change the supply of money\(^7\). The major variable in monetary policy is the money supply, and the main factors which will contribute to the changes in this variable are the Bank of Lebanon, the commercial banks, and the public. The process of monetary control is based on the manipulation of the monetary base by the Bank of Lebanon.

Monetary policy in the Lebanon has not been effective, and has not been used efficiently in order to control the expansion in the money supply. It is not possible to level the traditional arguments against monetary policy in the Lebanon, because:

a) there is not sufficient evidence and data to test the stability of the demand for money in the Lebanon

b) the Bank of Lebanon has not been using open market operations as a monetary tool thus leaving the monetary base outside its control

c) the Bank of Lebanon has shown no indication to separate the influence of the foreign sector on the monetary base from the influence of the domestic sector. Such as the use of differential special deposits in order to absorb some of the foreign deposits with banks operating in the Lebanon.

\(^2\)See M. Friedman "The Supply of Money and Changes in Prices and Output", in Mr. Friedman The Optimum Quantity of Money, pp 171-187.
a - The monetary base

Chapter III has been utilised to derive various equations concerning the money supply process in the Lebanon, and some of those equations dealt directly with the monetary base in the Lebanon. I would like to reproduce the relevant equations in order to make the picture more clear;

\[ B = C + R \] (1)

\( B \) being base money, and \( R \) is the reserves demanded by the banking system and \( C \) is currency demanded by the public.

\[ B^a = B - CL \] (2)

\( B^a \) is the adjusted base, \( CL \) is advances to commercial banks by the Bank of Lebanon.

\[ B^L = B^a + NFA \] (3)

\( B^L \) is the re-adjusted base, it includes the influence of the capital flows on the money supply of the Lebanon.\(^3\)

The values of \( B, B^a \) and \( B^L \) for the Lebanon during the period 1965I - 1974II are shown in Table 1, and graphs one and two show the movements of \( B, B^a, B^L \) and \( M_1 \) and \( M_2 \) during that period. From graph one we notice that \( B \) and \( M_1 \) have almost identical paths, both have a minor peak at 1967 II and from 1970IV both graphs start to increase steadily. In graph two \( B^a \) and \( M_1 \) also move in similar paths, but \( B^L \) moves in similar path to \( M_2 \) and not \( M_1 \).

According to my empirical results \( B^L \) is rather significant and changes in \( B^L \) contribute between 60% to 70% to the changes in the money supply, while the remaining 40% to 30% are distributed among the banking sector and the public.

\(^3\)For more information on the derivation of \( B^a \) and \( B^L \) for the Lebanon see Chapter III, part I.
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Table 1

Source: International Financial Statistics - I.M.F.
b - Open Market Operations.

Under uncertainty an investor can only be sure of the nominal yield on a marketable fixed-interest bond when he wishes to hold that bond till maturity, even then he will face uncertainty over the prospective real yield. Investors have to allocate their funds on the basis of their expectations of the real yield obtainable on the different available investments. 14

In the Lebanon the issuance of private and government bonds and bills should be encouraged. The present stamp taxes 15 increase the cost of bond issues and is not maturity sensitive, thus discriminating in particular against shorter-term paper. It seems that in the Lebanon there has not been any governmental measures to provide liquidity to the small bond market. Such liquidity may be provided by financial institutions either directly through the agents of the Bank of Lebanon or through the establishment of special funds that will stand ready to stabilise the market. The Bank of Lebanon by standing ready to refinance a larger quantity of shorter-term private bills, could play an important role in stimulating and developing the money market, and producing perhaps a stronger bond market. More care must be taken by the Bank of Lebanon to ensure the reliability of bonds and bills, considerably improved auditing and disclosure requirements are needed before expecting the Lebanese banking system to move heavily into such paper.

The Bank of Lebanon in the early seventies levied some criticisms against international bond issues denominated in Lebanese pounds. I think the issuing of international bonds would make it possible to have some development of intermediary under-writing mechanisms that might help to retain at least part of the underwriting and placement profits within Lebanon.

15 For the period 1965-1974.
The Bank of Lebanon must have a certain strategy for controlling the money supply, one of the methods that could be used is open-market operations and it should be aimed at controlling the monetary base. According to J.M. Guttentag\textsuperscript{16} a strategy of open market operations may include several targets having control periods of different length for example, "one possible strategy would include a non-borrowed reserve target on a weekly basis, total reserves on a monthly basis, and total commercial bank credit on a quarterly basis. The ordering is in terms of the extent to which the targets are under open market control."\textsuperscript{17}

The principle aim of open market operations in a country like the Lebanon should be to control the monetary base; by monetary base is meant bank's reserves and bank's net foreign assets.\textsuperscript{18} The reserves of the commercial banks include required reserves, and reserves which are in excess of the required reserves, they are known as excess reserves (ER) and are an indicator of surplus primary liquidity in the commercial banking system. When commercial banks are obtaining a relatively large proportion of their reserves by borrowing from the Bank of Lebanon to meet temporary reserve needs, a given volume of excess reserves does not have the same significance in terms of reserve availability and credit expansion potential, as when the commercial banks have no need for small need\textsuperscript{17} for borrowing from the Bank of Lebanon. Even though commercial bank borrowing from the Bank of Lebanon is a source of reserves and is certainly a potential backing for bank deposits, it can be used only temporarily by an individual bank. The individual bank is in debt to the Bank of Lebanon.

\textsuperscript{17} ibid p. 195
\textsuperscript{18} \( B = B^a + NFA \); \( B^a = C + R - CL \)
and is always under pressure, because it has to pay back the loan.  

Graphs three and four show the fluctuations in excess reserves, free reserves, unborrowed reserves and commercial banks' borrowings from the Bank of Lebanon, for the period 1971-1974. According to graph three Excess Reserves and Free Reserves move in identical paths; this means that commercial banks' borrowing from the Bank of Lebanon had a rather stable path as shown by graph four (1971-1974). For the period 1971-1973 the curve CL is almost horizontal and hardly showing any changes. There is an argument which claims that sometimes it is satisfactory to use commercial banks' borrowings rather than Free Reserves as a measure of greater or less credit restraint. "At times, however there will be sizeable movements in excess reserves that are automatically picked up by the free reserves - net borrowed reserves concept, but that might be lost from sight if borrowings were the sole criterion."  

The volume of free reserves in the commercial banking system of the Lebanon is affected by more than one factor. a) there are what may be called the operating factors which influence mainly the reserve base, and includes the amount of currency in circulation and various international transactions. b) Free reserves are influenced and affected by the amount of required reserves as determined by the volume of commercial banks' deposits. c) The volume of free reserves is affected by Bank of Lebanon operations either in the form of changes in legal reserve requirements which are usually made at infrequent intervals to effect massive changes in reserve availability; or by using open market operations that could be conducted flexibly from day to day and could be directed also to bring about major shifts in the availability of bank reserves.  

19 Look D. Sternlicht and R. Lindsay, "The Significance and Limitations of Free Reserves" in Money and Economic Activity ed. L.S. Ritter, p. 169-175  
20 ibid. p. 170  
21 Open market operations have not been used on day to day basis by the Bank of Lebanon,
Graph four shows the fluctuations in the unborrowed reserves for the period 1971-1974, with a sharp increase during the months of August and September 1974, and a smaller increase during the earlier months of 1974. Generally we can argue that if the Bank of Lebanon uses open-market operations to increase the rate at which unborrowed reserves are provided to the commercial banks (assuming that market interest rates remain constant, and the exchange rate does not change), the free-reserve ratio FR/TD and the rate of change of deposits will rise.

\[ \frac{FR}{TD} = f(r_L, r_d, r_e, E, UR) \]

The variable $E$ is included to explain the importance of bank net foreign assets in the Lebanon that can be held either in Lebanese pounds or any other currency (mainly in dollars) and can be changed into Lebanese pounds very easily, thus making it possible for the commercial banks to use their foreign assets as reserves and excess reserves (see chapter III part 2). According to my empirical results banks net foreign assets in the Lebanon are very responsive to changes in the variable $E$, where

\[ NFA = f(r_e - r_d, E, T_L) \]

and the elasticities of NFA with respect to $E$, are 2.17 and 1.585. The variable $E$ in FR/TD function has been tested empirically and came out to be significant according to t-statistics, but became insignificant when lagged one month.

The rate of increase in unborrowed reserves (due to open market operations) will usually rise more rapidly than the rate of increase in total deposits, because some of the additional reserves will be used by the commercial banks to increase the free-reserve ratio.

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22 The changes are not due to open market operations, perhaps they are due to the increase in bank reserves, (excess reserves) during that period as shown by graph 3.

23 Look Chapter III part 2.

24 Look Chapter III part 3 section d.
In case the Bank of Lebanon uses open-market operations in order to reduce the rate at which unborrowed reserves are provided to the commercial banks (contract the supply of reserves) the free-reserve ratio FR/TD and the rate of change of deposits will fall. The contraction in the rate of deposits will lag behind the contraction in the rate of unborrowed reserves as the commercial banks increase their borrowings and reduce their excess reserves.

\[ UR = RR + ER - CL \]

In a situation where there is a money market strategy changes in required reserves are accommodated by the Central Bank, such accommodation is implied by use of a free reserve target. This aspect of the money market strategy has certain important implications.

(a) It implies short-run stabilisation of free reserves and the money market but destabilisation of the flow of money and credit. This is so because accommodation of changes in required reserves is similar to accommodation of changes in the demand for deposits. For example if the free reserve target is given and the demand for deposits increases, then there will be enough unborrowed reserves to increase the supply of deposits.26

(b) Since under a money market strategy the Central Bank is able automatically to accommodate changes in the demand for deposits, and the system feeds in reserves as the banks demonstrate that they are willing to use them, an association is generated between actual changes in deposits and in unborrowed reserves. The result would be a high statistical correlation between money supply and various reserve base measures.27

25 A purely hypothetical case.
27 ibid.
Open-market operations could be used by the Bank of Lebanon to add or withdraw reserves in order to induce the commercial banks to expand or contract deposits at some desired rate. According to the empirical results (Chapter II) the free reserve ratio is not influenced by movements of interest rates. And the results also tell us that changes in the free reserve ratio are dependent on changes in unborrowed reserves; thus making it clear that if the Bank of Lebanon uses open-market operations to influence changes in unborrowed reserves then it would also influence changes in the free reserve ratio. Perhaps if the empirical estimations were used to study another period, we then might find out that movements in interest rates influence the free-reserve ratio. In other words we should not rule out the possibility that changes in interest rates could influence the changes in Free Reserves in the Lebanon.

The main idea behind open-market operations if to be used in the Lebanon would be to control commercial banks' total reserves, and changes in unborrowed reserves represent open-market operations. There is a tendency to argue that short-run changes in unborrowed reserves could produce offsetting changes in the volume of commercial banks' borrowing. In the case of Lebanon, banks' borrowing from the Bank of Lebanon would not play an important role in offsetting changes in unborrowed reserves, because their volume is rather small, in certain cases it is only 12 million L.L. For the whole commercial banking sector and also because the banks in the Lebanon have a rather high liquidity position with a high percentage of idle balances.

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28 Look Chapter II, section 2 equations 6, 7, 8 and 9 for the link between Free Reserves and the monetary base.
29 Look graph 4, Chapter II for commercial banks' borrowings from the Bank of Lebanon.
30 Look Chapter II,
If the Bank of Lebanon wishes to keep the free reserves of the Commercial Banks at a specific level, one possibility would be to create different rates if change of un-borrowed reserves at different times. For example let us say the Bank of Lebanon wishes to maintain a level of 300 million L.L. of free reserves, it can try to do so only by changing the discount rate to influence commercial banks' borrowings, and not by using open-market operations, because there are no government bonds with the commercial banks in the Lebanon. As mentioned before, according to my empirical results the changes in the free-reserve ratio are related to un-borrowed reserves rather than to interest rates. And my conclusion is that the Bank of Lebanon with its monetary tools for 1970-1974 could not have been able to control the changes in the free-reserves of the commercial banks.

Let us assume that the Bank of Lebanon is able to use open-market operations, and if it uses this tool to maintain a fixed free reserve level, then the rate of change of un-borrowed reserves and the rate of total deposit change would both be determined by the commercial banks' demand for borrowings and excess reserves. If the commercial banks want to reduce their free reserves and the Bank of Lebanon frustrates their attempts by injecting additional reserves, then total deposits will expand. And in case the commercial banks want to increase their free reserves and the Bank of Lebanon frustrates their attempt by withdrawing reserves thus reducing the rate of expansion in total deposits.

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31 Such an assumption can become an actual fact if the Bank of Lebanon uses all the powers that were given to it by the Lebanese parliament.

32 The empirical estimations for analysing the relationship between total bank deposits and interest rates, free-reserve ratio and un-borrowed reserves gave poor results: chapter II, part 3, section d.
"For all its limitations, the free reserves concept remains a useful guide to the interpretation of credit policy. It cannot stand alone, as a single, all-purpose indicator of liquidity or credit availability, but for that matter neither can other measures... However, viewed together with other factors, such as the banking system's ratio of loans to deposits, the size and turnover rate of the money supply, the volume and growth of bank credit, and trends in various market interest rates ..., the amount of free or net borrowed reserves can give a useful lead in the interpretation of changing credit conditions. Clearly, it is more meaningful than either excess reserves, or total borrowings, taken alone and represents another in the continually unfolding series of aids that can be used in analyzing monetary developments and Federal Reserve Policy."

Open-market operations and debt management are different names for the same monetary tool, wielded in the one case by the Central Bank, in the other, by the Treasury.\textsuperscript{34} The sale of government bonds by a Central Bank makes the amount of base money available for use as bank reserves less than it would otherwise be and thus tends to reduce the stock of money. The sale of similar bonds of the same total amount by the Treasury with the proceeds added to its balance with the Central Bank has the identical effects. \textit{The opposite is true.}

The differences between open-market operations of the Central Bank and debt management operations of the Treasury are, a) the Central Bank conducts open-market operations through the use of the monetary base, while the Treasury keeps accounts at commercial banks and conducts its operations...

\textsuperscript{33}P.D. Sternlight and R. Lindsay, "The significance and Limitations of Free Reserves" op. cit. p. 174-175 and look pages 172-173 for arguments against the concept of Free-reserves.

\textsuperscript{34}M. Friedman, A Program for Monetary Stability, Fordham University Press, New York, 1959, p.52.
at times in deposit money. A transfer of funds by the Treasury from Commercial banks to the Central Bank is like a decision by the public to convert deposits into currency and so exerting downward pressure on the money supply. The power to make such transfers can be used as a monetary tool to alter the stock of money. 35 b) The other difference is that the Central Bank creates and destroys high-powered money by using open-market operations, while the Treasury generally uses existing cash balances to redeem bonds and adds proceeds of sales to its balances.

Such a difference is mostly in words. "In terms of its effect on the public's cash balances, increasing or reducing Treasury balances of high-powered money is the economic equivalent of destroying or creating such money." 36

The main conclusion is to have co-ordination between open-market operations and debt management, and giving full responsibility for debt management to the Central Bank. 37

In the case of the Lebanon I think the Treasury should expand the size (and frequency) of their bonds and bills concentrating on longer-term ones in order to activate a bond market. There are some autonomous agencies of the Government in the Lebanon [the Electricity Office and others] which could be given the authority to issue bonds to the public. Bond issuing by such agencies would lead to some appropriate internal financial planning for the concerned parties, and would introduce a larger volume of longer-term debt securities into the market. Since the bond market in the Lebanon is rather small and has not been developed yet, this offers the Lebanese monetary authorities a chance to start a bond market which is based on co-ordination between debt management and open-market operations in the future.

35 ibid p. 55
36 ibid p. 56
37 ibid p. 59
"The burden of controlling the pace of monetary expansion falls mainly on the authorities' open-market operations. In some circumstances this burden can seem insupportable. In particular, the authorities can rarely foretell with any confidence how the market will respond to their operations. Investor's demand for bonds is not just a simple function of current bond prices, but also depends on the expectations generated in an uncertain world ... Uncertainty about the market's response and fear of large, erratic and unpredictable variations in interest rates make the authorities tentative in such operations."\textsuperscript{38}

Discount policy in the Lebanon

The theory of discount policy in the 1920s was known as the Riefler thesis; the hypothesis stated that "borrowings occurred primarily when banks, for brief and unexpected reasons, found themselves short of reserves ..., banks were not motivated basically by relative profit considerations but rather reluctantly resorted to the discount window to meet adverse clearing balances and unanticipated seasonal loan demands ...". The monetary policy of the Riefler thesis suggested that the way to initiate a credit tightening action would be through the use of open-market sales in order to decrease the reserve base, and force banks to the discount window.

Discount policy is one of the monetary policy tools which have been used by the Bank of Lebanon during the period 1965-1974 since it was established. The discount rates between 1964 and 1974 are as follows:
- From 1964 to 1.11.1973 the discount rate was 5%
- From 1.11.73 to 1.6.74 the discount rate was 5%
- From 1.6.74 to 1.7.74 the discount rate was 7%
- From 1.7.74 and up till 1975 the discount rate was 0%, the figures were obtained from the Bank of Lebanon.

According to the money supply equation used in chapter III, the extension of advances by the Bank of Lebanon expands the monetary base B, and the repayment of these advances contracts it. The Bank of Lebanon establishes the line of credit available to the commercial banks, sets the conditions for advances and posts the interest rates at which central bank advances will be made. The Bank of Lebanon has the ability of making its terms for advances rather favourable or not favourable by lowering the discount rate, but it does not have the ability to make the commercial

39ibid. for the development of the discount policy theory, such as the profitability thesis of the 1930s.
banks willing to borrow from it, and so cannot influence the monetary base in this case.\footnote{Look chapter 11, section 1, for the adjusted monetary base $B^a$ and $B^L$.} On the other hand the Bank of Lebanon could increase the discount rate and reduce Commercial Banks' borrowings from it.

The Commercial Banker's borrowings from the Bank of Lebanon is one method of adjusting to a deficiency in his cash reserve position. The other methods are, a) call outstanding call loans, b) sell short-term liquid assets in the money market, c) borrowing from other commercial banks and d) borrowing from foreign money markets. The basic consideration would be the relative cost of the alternative adjustment methods. Table 2 shows the commercial banks' borrowings from the Bank of Lebanon, and table 3 shows CL as a percentage of total bank loans to the private sector in the Lebanon. Table 4 shows CL as a percentage of $L$ for Italy, France and West Germany\footnote{For more details on this issue look M. Friedman, "Rediscounting" in Reading in Money and Banking ed. L.S. Ritter, p. 211-217.}, for the period 1965-1974. The values of CL as a percentage of $L$ in the Lebanon varies between 14.58% and 0.582%, Italy and West Germany show low percentages, but not less than 1.774%. France has rather high values for CL as a percentage of $L$, up to 25.24% in 1969.

The main idea behind tables 2, 3 and 4 is to compare the CL as a percentage of $L$ of the Lebanon with those of other open economies that have bond markets (where open-market operations are being used by the Central Banks.)

The main feature of the Discount rate policy is that the initiative is in the hands of the commercial banks.\footnote{Look chapter 11, section 1, for the adjusted monetary base $B^a$ and $B^L$.} The Bank of Lebanon can affect the amount of discounting by exercising discretion with respect to the commercial banks that borrow from it, or by changing the discount rate to influence the incentive on the part of the commercial banks to discount. "The exercise of discretion is an undesirable kind of
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<thead>
<tr>
<th>Year</th>
<th>Banks' Total Deposits</th>
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<td>CL</td>
<td>Private Sector</td>
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Table 2
In millions of L.L.

Source - International Financial Statistics - I.M.F.
<table>
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<tr>
<th>Year</th>
<th>CL as a % of Bank Loans To Private Sector</th>
<th>Year</th>
<th>CL as a % of Bank Loans To Private Sector</th>
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Table 3 - For the Lebanon
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<th>Year</th>
<th>Italy, in Billions of Lire</th>
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<th>W. Germany in Billions of D.M.</th>
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<td>CL as % of L</td>
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<td>1974</td>
<td>3187</td>
<td>57121</td>
<td>5.579</td>
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Table 4
CL = Central Bank Claims on Banks
L = Banks' Claims on the Private Sector

Source: International Financial Statistics - I. M. F.
specific credit control that involves detailed intervention into the affairs of individual banks and arbitrary decisions by governmental officials. Moreover, it is incapable of being applied in a sufficiently sensitive way to produce predictable results over short periods."\textsuperscript{43}

Another defect of the discount rate is the difficulty of predicting the effect of a change in the rate on the amount of discounting and on the stock of money.\textsuperscript{44} The effect on the willingness of commercial banks to borrow from the Bank of Lebanon is rather different under different circumstances, depending on various factors such as the level of other interest rates, the demand for commercial bank loans, the supply of funds from other sources (foreign money markets) and the opportunities available for investment.

\textsuperscript{43}ibid p. 213

\textsuperscript{44}ibid p. 214
d - Reserve Requirements in the Lebanon

According to Article 76 of the Code of money and credit, the Bank of Lebanon has the power to vary reserve requirements up to 25% on demand deposits, and up to 15% on time deposits. Article 76 of the Code of money and credit was amended on the 5 October 1973 to read as follows:

The Bank of Lebanon may, if it deems it appropriate, consider banks' investments in government stocks or in stocks issued with government guarantee as part of the reserves up to a specific ratio to be assessed by the Bank of Lebanon.

The Bank of Lebanon shall enforce varying ratios on the different categories of bank liabilities within the limits set in the preceding subsection, 25% on demand deposits and 15% in time deposits.

In exceptional cases, it may impose special limitations on what exceeds in these liabilities or some of their categories a fixed limit or on the excess occurring, in these liabilities or some of their categories, after a fixed date.

The other two amendments of article 76 are:

(a) The Bank of Lebanon has the power to compel banks to deposit with its assets (special minima reserves) amounting to a specific ratio of assets as may be fixed by the Bank of Lebanon.

(b) Accept, in the light of the general monetary situation, deposits bearing interests as may be fixed by the Bank of Lebanon.

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45 This point has been discussed in chapter II.

46 For information on the arguments about 100% reserve requirements and zero required reserves see, "100 per cent reserves" by Irving Fisher, and "Is the Federal Reserve system Really Necessary?" by D. Carson in Readings in Money and Banking ed. L.S. Ritter, p.232-245
The idea behind using reserve ratio variations is to create particular changes in the size of the money supply in the Lebanon. Such a monetary tool has been rather ineffective in the Lebanon for the period 1965-1974 for two main reasons.

(a) Legal reserve requirements were increased only to 10% during 1973-1974 on demand deposits; and were never above 10%.

(b) As mentioned in chapter IX, commercial banks in the Lebanon have been able to treat their foreign assets as equivalent to cash, because the Bank of Lebanon has been willing to accumulate foreign exchange. If the Bank of Lebanon wishes to increase the legal reserve requirements or even cash reserve ratio this will not produce any serious changes in the supply of money, because the commercial banks can simply use their foreign assets as cash. This argument as long as the Bank of Lebanon is willing to accumulate foreign exchange.

Some economists such as Friedman argue that "the elimination of discounting and of variable reserve requirements would leave open market operations as the instrument of monetary policy proper. This is by all odds the most efficient instrument and has few of the defects of the others. It can be used continuously, from day to day, and in amounts varying by fine gradations. It need involve no public announcement, and thus there are neither announcement effects nor any obstacles to reversal of policy within a brief compass of time ... It is highly impersonal and its effects are diffused over the banking community." The opposite view is held by other economists who argue that the rapid impact of reserve ratio changes is a positive attribute where all commercial banks are affected simultaneously and immediately, and the errors of magnitude can be adjusted through appropriate open-market operations. Since the Bank of Lebanon has not used open-market operations up till the end of 1974, and the legal reserve requirements have been rather low, therefore the monetary base in the Lebanon is not effectively (practically) under the control of the Bank of Lebanon, and neither is the money supply.

Commercial Banks in the Lebanon can also use their foreign assets as excess reserves, see chapter III part 2.

e - Other Activities of the Bank of Lebanon

The Bank of Lebanon has the option to use certain direct regulations in order to control the activities of the commercial banks, or use an alternative form of control known as moral suasion.49 Article 79 of the Code of Money and Credit was amended on the 5 October, 1973 so as to read as follows:

The Bank of Lebanon may also exercise an influence over the general credit situation by limiting the volume of credit in specific categories or granted for specific purposes or to specific sectors, and lay down conditions to govern such credit.50

Article 175 of the Code of Money and Credit was amended on the 5 October, 1973 so as to read as follows:

In order to safeguard sound banking activity, it shall be the duty of the Bank of Lebanon to occasionally specify, either generally or pertinently to individual banks, the ratio that it is essential to maintain between assets and liabilities or between some items of the assets and liabilities.

Direct credit control in the Lebanon could be successful in achieving proximate objectives, such as the control over certain big loans by some commercial banks, but such a method will not necessarily be effective in achieving the ultimate objective, changes in the money supply (reduction in the money supply). "Selective controls attack the symptoms of the economic ailment, not the causes".

49 In general moral suasion is designed and used to restrain commercial banks and other financial institutions from activities they would normally undertake or to induce them to undertake activities they would not do voluntarily.

50 The amendments of articles 105, 106, 108 and 109 all deal with the activities of the Bank of Lebanon with respect to government bonds, thus giving the Bank of Lebanon the legal power to use open-market operations.
on the 8th October, 1973 the law promulgated by Decree No. 6104 ratifying the measures adopted for the approval of the new price of gold in relation to the U.S. dollar and the approval of the real parities of foreign exchange in relation to the Lebanese pound required from the Minister of Finance, following agreement with the Bank of Lebanon, to lay down appropriate rules and take such steps as may be necessary for the ratification of the following:

Approving the new price of gold in relation to the U.S. dollar and approving the real parities of foreign exchange in relation to the Lebanese pound for the purpose of collecting taxes and dues levied on sums drawn up in foreign exchange, and adapting the last two prices of the U.S. dollar in relation to gold for the settlement of the Bank of Lebanon's accounts in accordance with the period of validity of these two prices.

According to article 70 of the Code of Money and Credit, the overall duty of the Bank of Lebanon shall be to safeguard the Lebanese currency as a fundamental guarantee for permanent economic and social development. In the early months of 1974 (also 1972, 1973) the value of the Lebanese pound increased with respect to the dollar and other currencies thus making the prices of Lebanese agricultural and industrial exports go up. On the other hand the prices of imported goods did not fall. In fact from 1973-1974 the Lebanese pound increased by 23% with respect to the dollar, thus increasing the prices of Lebanese exports, where the volume of some industrial products in the export market fell almost to zero. The

51 a) Safeguarding a sound Lebanese currency, b) Safeguarding economic stability, and c) Safeguarding the basic structure of the banking system, are the duties of the Bank of Lebanon Article 70, Code of Money and Credit.
Bank of Lebanon found it rather necessary to reduce the value of the Lebanese pound on the foreign exchange market in order to safeguard the Lebanese economy (reduce the price of the Lebanese exports).

The Bank of Lebanon's policy in the early 1970's (1972, 1973 and 1974) was to help the economy (exports) by buying dollars and selling Lebanese pounds, and hoping to stabilise the price of the dollar at 2.40 L.L. (1974). The main idea was to reduce the price of the Lebanese pound, and not to help the dollar, but in doing so the Bank of Lebanon had to help the dollar.

On the 8th of November 1974 the Bank of Lebanon bought 15 million dollars in order to stabilise the dollar at 2.40 L.L., but the dollar remained at 2.19 L.L. On the second day the Bank of Lebanon bought 60 million dollars and the dollar reached the figure of 2.40 L.L. In fact in a period of 12 days the Bank of Lebanon bought 500 million dollars just to stabilise the dollar at 2.40 L.L. Such actions left a big question mark on the ability of the Bank of Lebanon for stabilising the value of the dollar at 2.40, because the Bank of Lebanon's capacity (November 1974) allows it to buy 350 million dollars more, and would buying 350 million dollars stabilise the dollar at 2.40 L.L.?

The Bank of Lebanon was buying dollars in order to stabilise the price of the dollar with respect to the Lebanese pound, but such an action would lead to a fall in the volume of net foreign assets. According to my empirical estimations in chapter 6, I found that the commercial banks' net foreign assets are sensitive to changes in the price of the Lebanese pound with respect to the dollar.

\[ NFA = f (r_e, r_d, r_n, r_L, E) \]

The domestic purchasing power of the Lebanese pound fell very dramatically during 1973-74.

It is interesting to note that most of the Lebanese importers during 1974 were basing the prices of imported goods on 1970 prices of the dollar around 3 L.L. while they were buying each dollar for 2.20 L.L. in 1974.

During November 1974 the bank of Lebanon kept buying dollars and was able to push the price of the dollar to about 2.31 L.L.
showing an inverse relationship between NFA and E, and the empirical results support this idea. If the volume of NFA falls then the monetary base $B^L$ will fall because

$$B^L = B^a + NFA$$

thus reducing the money supply in the Lebanon according to the equation

$$M = mB^L$$

the main conclusion would be that the Bank of Lebanon used a certain method to stabilise the dollar which also could have some influence on the volume NFA and the money supply in the short-run.
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Price Developments in The Lebanon

"Monetary expansion will have a stimulating effect upon the economy, even though the exact transmission mechanism may be obscure and the process of uncertain strength and timing. Depending upon the existing availability of spare capacity, and current expectations a general stimulus to money incomes will lead in part to a rise in real output and in part to a rise in prices." 1

The only general indication of price development in the Lebanon is either the consumer price index or the wholesale price index. 2 Table 1 shows the wholesale price with 1965 as base year, and consumer prices with 1970 as base year. Graph one represents the movement of the wholesale prices from 1965 till the end of 1971, with a continuous increase, showing a drop during 1968. Graph two represents the consumer price index from 1971 to 1974, an increase of 21% from the third quarter of 1971 to the first quarter 1974, with a very sharp increase during 1972 and 1973. The figures in Table 1 must be treated with considerable caution because (a) the wholesale price index has been discontinued since the end of 1971 and (b) the consumer price index is based upon the consumption pattern of lower income groups, L6000 L.L. per annum in 1966 or about 2000 dollars. 3 The lower income group represents about 7% of total expenditure, 4 thus it would not be realistic to place great reliance upon this price index. Table 2 shows the official Index of prices of foodstuffs, and housing, again such indexes are not really reliable because rent control in the Lebanon applies only to lower

2 There is not a GDP price deflator in the Lebanon
3 Ministry of Planning, (Lebanon), Bulletin Statistique Mensuel
<table>
<thead>
<tr>
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<td>1973</td>
<td>116</td>
<td>1977</td>
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<td>1974</td>
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<td>1975</td>
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<td>1976</td>
<td>121</td>
<td>1980</td>
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<tr>
<td>1977</td>
<td>122</td>
<td>1981</td>
<td>123</td>
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Table 1: International Financial Statistics, I.M.F.

<table>
<thead>
<tr>
<th>Year</th>
<th>Price Index/ Lebanon</th>
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<tbody>
<tr>
<td>1965</td>
<td>110</td>
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<tr>
<td>1966</td>
<td>111</td>
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<td>1967</td>
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<td>1972</td>
<td>114</td>
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<td>1974</td>
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<td>1975</td>
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<td>1978</td>
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<td>1979</td>
<td>124</td>
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<tr>
<td>1980</td>
<td>125</td>
</tr>
<tr>
<td>1981</td>
<td>126</td>
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</table>

Note: The table includes data for the years 1965 to 1981, with specific values for each year.
whole sale price
Index to L.L.

Index No. L.L. = 100
whole sale price; Lebanon 1965-1971

Graph
rent housing (lower income about 7%). Table 3 shows export price
dindices of Lebanon's trading partners, which have some dramatic
increase in the year 1973.

The Lebanon has imported some of the increase in prices from the
outer-world (see Table 3), but the appreciation of the Lebanese pound
should have helped to offset much of the rise in import prices. This
did not happen, perhaps because of the rigidities among importers who in
1974 were buying the dollar for 2.40 L.L. and charging for the prices of
their imported goods 3.00 L.L. for the dollar. Other reasons for
the increase in prices is due to the increase in government spending in
1971, 1972, 1973. The main contributor to increases in the prices in
the Lebanon is the increase in the money supply. The increases in bank
reserves and bank net foreign assets lead to an increase in the monetary
base, and the monetary base through the multiplier leads to increases
in the money supply (see chapter III), and increases in the money supply
cause increases in the price level.

5 This took place only during 1972-1974, but before that from 1965-1971
the dollar had a steady price around 3.10 to 3.20 L.L.

6 According to the Bank of Lebanon, "Rapport sur l'Annee 1972"
there is no evidence that government expenditures have exceeded
government revenues.
### Table 2: Direction of Lebanese Imports from Country concerned divided by Total Imports in 1972

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<tr>
<td>Switzerland</td>
<td>6.6</td>
<td>36.3</td>
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<td>Italy</td>
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<td>Japan</td>
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<tr>
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<td>W. Germany</td>
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<td>U.S.A.</td>
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</table>

Export Price Indices of Lebanon's Trading Partners: Expressed in U.S. dollars; 1963=100

Import Price Movements in the Lebanon
Table 2: Direction Centrale de la Statistique, Liban

<table>
<thead>
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<td>120.0</td>
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<td>Others</td>
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<td>104.7</td>
<td>103.4</td>
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<td>Housing</td>
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<td>104.8</td>
<td>104.6</td>
<td>104.8</td>
<td>104.6</td>
<td>104.8</td>
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<tr>
<td>Clothing</td>
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<td>141.2</td>
<td>142.3</td>
<td>141.2</td>
<td>142.3</td>
<td>141.2</td>
<td>142.3</td>
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<td>111.6</td>
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<td>113.7</td>
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Details of the Official Index 1972-1973, 1966=100
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