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An Empirical Study of Demand for Money in Bangladesh

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AN EMPIRICAL STUDY OF DEMAND FOR MONEY IN BANGLADESH

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By

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Declaration

I hereby declare that the whole of the work now submitted as dissertation entitled, **"An Empirical Study of Demand for Money in Bangladesh"** for the degree of Doctor of Philosophy in the Department of Economics, Rajshahi University is the result of my original research work and it has not been submitted in part or full for any diploma or degree in any university. My indebtedness to other works/publications has been duly acknowledged at the relevant places.

Sultana Fatima Tariq

Sultana Fatima Tariq

Certificate

This is to certify that the dissertation, **"An Empirical Study of Demand for Money in Bangladesh"** is an original research work done by Sultana Fatima Tariq for the degree of Doctor of Philosophy in the Department of Economics, Rajshahi University under my supervision. The thesis has not been submitted elsewhere for any other degree. The references cited in it have been duly acknowledged.

Prof :ubur   Rahman

Supervisor

Dedication

To

My Parents

and

My uncle Late Alauddin Ahmed

Acknowledgement

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Abstract

This is an empirical study of demand for money in Bangladesh. It covers the period from 1976 to 2006. The main objective of this thesis was to estimate the demand function of money for the whole period of 1976 to 2006 as well as for the two sub periods of 1976 to 1990, which was the pre liberalization period chracterised by regimented interest rate policy and 1991 to 2006, which was the post liberalization period, which had a more flexible policy of interest. This study also examined the stability property of the money demand function. The empirical results showed that income was the statistically significant determinant while the rate of interest was found insignificant. In a separate estimate of a model that allowed for the short and the long run estimates, the long run estimates of income and interest elasticity were found to be higher than the short run, which were in line with earlier studies. In this study, the stability of demand for money was studied using time series econometric techniques. It was found that although money demand function in Bangladesh was unstable in the short run, there was stability in the long run. Besides these empirical estimates, this study also provided a thorough discussion of monetary background in Bangladesh and an extensive survey of literature on money demand function.

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Chapter 1

INTRODUCTION

This study empirically examines various aspects of demand for money in Bangladesh. Empirical research on demand for money has two parts. One pali deals with estimation of money demand function while the other part contains a study of stability of the money demand function. Both these aspects are dealt with in this thesis.

This study covers the period 1976 to 2006. It is divided into two-palis-the pre-liberalization period (1976-1990) and the post-liberalization period (1991-2006). The first period is characterized by highly regimented interest rate policy while the second period is marked by greater interest rate flexibility.

1.1 Rationale

It is necessary to know, especially for the implementation of monetary policy, the relative importance of determinants of money demand function. Also, stability of the money demand function is regarded as very important for financial targeting. Hence, there is need for a fresh look at both these aspects of money demand in Bangladesh.

1.2 Objectives

The main objective of this study is to examine various aspects of demand for money in Bangladesh using long and latest time series data. To attain this, the following objectives are specified:

1. Estimation of various money demand functions using the standard determinants of income and interest rate as well as some *ad hoc* determinants like inflation and exchange rate.

2. Estimation of the money demand functions for the pre- and the post-liberalization period separately.

3. Estimation of a money demand function that can generate both short and long-run estimates of money demand function.

4. Examination of short-run stability of demand for money using the technique of time series econometrics such as the unit root test and the test of cointegration.

5. Examination of the long-run stability of demand for money using various tests such as the Augmented Dicky-Fuller test and the test of cointegration.

1.3 Methodology

The main method of studying demand for money consists in estimating demand functions of various types using time series data and

testing the stability of the money demand function using appropriate techniques. These are briefly stated below.

1.3.1 The standard money demand function

The standard money demand function shows money as a function of income and interest rate and can be generally written as

$$M^d = f(y, i) \qquad (1.1)$$

where M^d refers to real money demand, y refers to real income (GDP), and i refers to the rate of interest. More specifically, (1.1) can be written in linear form as

$$M^d = a + by + ci \qquad (1.2)$$

For empirical work, (1.2) is usually written in logarithmic form

$$\log M^d = b \log y + c \log i \qquad (1.3)$$

If empirical estimates show that both y and i are significant, then that means that we have the Keynesian situation and both transaction and speculative demand for money are important. If, however, only income is found to be significant, then that will imply that a classical situation prevails and only transaction demand for money is important. These observations have policy implications that have important bearing on the relevance of monetary and fiscal policy. These will be explained when the empirical results are reported and discussed.

1.3.2 The broad and the narrow money demand function

In this study, money demand function has been separately estimated for narrow and broad money. Such estimations are of interest for monetary policy targeting by the central bank, as these estimates will enable them to use the right definition of money for policy use.

It is worthwhile to mention here that the central bank of Bangladesh, the Bangladesh Bank has used broad money (M2) for policy targeting. It will be interesting to see whether this study supports this or not.

1.3.3 The money demand function with some *ad hoc* variables

Besides income and interest rate, researchers have also included other variables in their studies. These cannot shed light on the two most important aspects of money demand - that of income and interest elasticity, but are regarded as useful as they can shed some additional light on the factors that can affect money demand.

In this thesis, estimates of money demand function using some of these variables have been obtained, presented, and discussed. The variables that have been considered are exchange rate and inflation.

1.3.4 The short-run and the long-run demand for money

In this study, a model will be used that will generate both short- and long-run estimates of demand for money. The long-run values of elasticity of demand for money with respect to income and interest are usually found to be lower than the short-run values. The estimates from this model will show by how much the long-run value is lower than the short-run ones.

1.3.5 The stability of the money demand function

Monetary policy is an important policy instrument that is used by the central bank in Bangladesh. An important assumption behind monetary targeting is the existence of stable money demand functions.

Before 1970, the stability of money demand function was taken for granted. It was in the mid 1970s that stability of money demand function began to be questioned. An effective method for studying stability became available with the development of time series econometrics. Methods taken from this development have been used to formally study stability of money demand function in Bangladesh.

The monetary authority in Bangladesh assumes a stable money demand function in using monetary policy. As mentioned above, the Bangladesh Bank usually uses broad money rather than narrow money for policy targeting (Rahim and Sohrabuddin, 1988; Hossain, 1992). Through empirical investigation, the present study may be able to shed light on these issues

In this study, stability of the money demand functions is studied using the methodology of the time series econometrics. Such methods include the following stages:

(a) To study the stationarity property of each of the relevant variables. If a variable is not found to be stationary, then that indicates short-run instability.

(b) If a variable is non-stationary, the first difference of the variable is taken to see if it has become stationary. If stationarity is not achieved after first difference then higher differences are taken. If a variable becomes stationary after first difference, then it is said to be integrated of order one. If it is found to be stationary after two differences, then it is integrated of order two, and so on. Both (a) and (b) are examined by using the Dicky-Fuller (DF) or the augmented Dicky-Fuller (ADF) test.

(c) The test of cointegration is done to see if the dependent variable, here M1 and M2, and the independent variables are integrated of the same order. If integration of the same order is found to exist, then a test of cointegration is done, presence of which implies existence of long-run stability.

The main idea behind this detailed exercise is to show that although there may be short-run instability, stability may he achieved in the long-run.

1.4 Data

The variables that are needed for estimating the demand functions for money are:

M1: narrow money, which equals currency and demand deposits;

M2: M1 plus time (fixed) deposit;

y: real income (GDP)

i : nominal interest rate on time deposits

Other variables that have been used are

er = exchange rate

inf= rate of inflation

Data on these variables have been collected from the *Bangladesh Economic Review, Statistical Yearbook of Bangladesh, Economic Trends,* and *World Tables.*

1.5 Estimation

In this study demand functions of various types are estimated using the ordinary least squares technique. The estimations can be done using well-known econometric softwares like SHAZAM, EViews and Microfit.

The tests of stability of money demand are done by methods available in time series econometrics. These include, among others, the augmented Dicky-Fuller (ADF) test and the test of cointegration. Since econometric estimates of money demand functions can be obtained and tests of stability can be done by using EViews, this software has been used primarily because of its familiarity and availability.

1.6 Organisation of the study

This study is divided into seven chapters.

This is chapter 1 and it provides an introduction to the study. It states the topic of research, the time covered, methodology, data used and their sources.

The demand for money is linked with the monetary sector of the economy. A description of various aspects of the monetary sector of the economy of Bangladesh is presented in chapter 2.

There is a huge literature on demand for money. A selected review of these works is given in chapter 3. The review is divided into two parts. These are the general works on money demand and the works on money demand on Bangladesh.

The theoretical models, empirical specification and estimation techniques used in this study are explained in Chapter 4.

Chapter 5 contains necessary data that have been used as inputs for econometric estimation. Among other variables, these include long time series on narrow money (M1), broad money (M2), income, interest rate, inflation, and exchange rate.

The empirical results of this work based on econometric estimates are presented and analysed in Chapter 6. The estimates presented are on narrow and broad money demand, for pre- and post liberalization period, short- and long-run money demand, and for stability of money demand using the time series econometric methodology.

The summary, conclusion, and policy implications of this study are given in Chapter 7.

At the end of the thesis, a comprehensive bibliography on money demand research is given.

Chapter 2

BACKGROUND

The monetary sector and the prevailing macroeconomic situation form the background to the study of demand for money. In this chapter, macroeconomic conditions and various aspects of the monetary sector of the economy of Bangladesh in recent years are described and discussed.

An important source of description and analysis of the economy of Bangladesh is contained in *the Bangladesh Economic Review,* an annual publication of the Ministry of Finance, Government of Bangladesh. This chapter is based on the materials mainly drawn from this publication.

This study covers the period of 1976 to 2006. The description provided here covers the situation prevailing in the last few years of the period although there are references to various events and reforms carried out before. Since this study covers the period 1976 to 2006, the discussion here is not carried beyond 2006.

2.1 Macroeconomic situation

The Bangladesh economy emerged stronger than expected despite the combined adverse effects of confrontational politics, unexpected price hike of oil and essential imported commodities, stiff global price competition for exports and dwindling foreign aid. The government was able to achieve macroeconomic stability and to maintain the trend of development over the last couple of years.

The growth in actual GDP for 2004-05 exceeded the projected growth of 5.38 percent to 6 percent due to higher growth in agriculture, industry and service sectors. The GDP growth in 2005-06 was projected at 6.71 percent, which was one of the highest growths in the last three decades.

Sustained GDP growth coupled with growth in exports and remittance led to marked improvement in balance of payments position that resulted in commendable improvement of the economic fundamentals necessary for macroeconomic stability. The rise in the inflation rate and widening income inequality, however, tempered the direct impact of growth on the quality of life.

In terms of social indicators, Bangladesh's success surpassed the achievements of many low-income countries. In reduction of infant and child mortality rate, higher contraceptive prevalence rate and declining birth and death rate, the success of Bangladesh surpassed the achievements of the countries having the same level of income. The World Bank identified Bangladesh as one of the most rapidly growing economy among 31 large developing countries in recent times.

2.1.1 Growth

The growth performance of Bangladesh economy was relatively strong during the 1990's showing considerable improvement over the previous two decades. During the 1990's growth performance was around 5.3 percent per year with an impressive 3.3 percent growth of per capita GDP. GDP growth further accelerated and reached to 5.7 percent per year over the last year with 4.2 percent growth of per capita GDP.

The impressive growth in the industrial sector, the significant growth in the agricultural sector and the continuous trend of growth in the service sector raised the GDP growth rate to 6.71 percent in 2005-06. The industrial sector, particularly in the large and medium scale-manufacturing sector, registered the highest growth. The overall growth rate of the agriculture sector for 2005-06 was 4.67 percent. This was 2.21

consistently increasing. The share of private investment in total investment accounted for 75 percent in 2005-06.

Bangladesh was increasingly becoming an attractive and competitive destination of foreign direct investment (FDI) due to introduction and implementation of pro-industrialization and investment friendly economic policies and strategies by the government.

Along with the significant growth in local investment, foreign and joint venture investment has also been registering growth. In 2005-06, the growth in the registration of private investment project in the Board of Investment (BOI) reached 164 percent. In the calendar year of 2005, there was an inflow more than US$ 845 million worth FDI in the country recording 84 percent growth. Besides, the trend of significant growth was observed for importation of capital machineries and industrial raw materials. During the last two consecutive years, Bangladesh occupied second position among the South Asian countries in terms of FDI growth.

2.1.3 Inflation

The economy experienced an upward trend in inflation due mainly to the abnormal price hike of oil and other essential imported commodities in international market. In 2004-05, the average rate of

inflation at national level was 6.48, which reached 7.17 percent in 2005-06. However, the rate of inflation that stood at 7.68 percent in July, 2005 decreased to 7.54 percent in June, 2006.

2.2 Money, credit, and capital market

During 2005-06, broad money (M2) growth rose to 19.51 percent compared to 16.81 percent growth during the previous fiscal year. On the other hand, in 2005-06 net credits to government from the banking system registered a growth of 21.95 percent. Credit to private sector grew by 18.27 percent.

Government encouraged banks and financial institutions to increase credit flows to productive sectors by fixing rational interest rate. The power for fixing interest rate was given to the bank's authority except interest rate of credit on export.

2.3 Banking sector reforms

With the aim to prepare and implement a sound monetary policy, to enhance the supervising capability of financial institutions with more responsibilities, to introduce international banking rules and regulations and to enhance the operational capability of the Bangladesh Bank by

introducing computerisation, a project titled 'Central Bank Strengthening' was implemented.

Under the above project, a programme titled 'Partnership for Excellence in Research and Policy Analysis at Bangladesh Bank' was undertaken with the joint effort of the Bangladesh Bank and the World Bank Institute to enhance the capability of research and policy analysis and to prepare analytical policy and recommendations. A Policy Analysis Unit (PAU) was set up at the Bangladesh Bank to conduct high-level research in all areas of macroeconomics including monetary policy and central banking.

A Memorandum of Understanding (MoU) was signed between the 4 NCBs and Bangladesh Bank to monitor the overall activities of the banks. Four audit firms, having international affiliation, were appointed, which duly completed their assignments.

An informative memorandum and the conditions for 'fit and proper test' of eligible investors were finalised by the assistance of the financial consulting firm engaged in the process of privatising Rupali Bank. As part of this process, the Privatisation Commission published a notice inviting Expression of Interest (EOI) from prospective investors.

As part of the process of restructuring and modernizing the other three nationalized banks (Sonali, Janata and Agrani), a management team with a Chief Executive was appointed to improve overall management and financial condition of the Agrani Bank.

To bring dynamism to bank management and to establish efficiency in the Sonali and the Janata bank, a management facilitator team was appointed in these two banks.

2.4 Money and financial market reforms

To fulfill the objective of monetary policy, Cash Reserve Requirement (CRR) of the scheduled banks was enhanced from 4.5 percent to 5 percent of their total demand and term liabilities. Statutory Liquidity Requirement (SLR) was refixed at 18 percent from 16 percent effective from October 2005.

From 14 February 2006, the borrowers whose credit facility had been rescheduled were to get new loan facility subject to the fulfillment of certain conditions. The decision was taken considering the issue of restricting new loan facilities to the borrowers within one year after their loans had been rescheduled or the entire loan was repaid (whichever occurs earlier).

In order to protect the interest of the clients, ensure security in IT setup as well as in IT operation for protection of transformation, disclosure and destruction of information, Bangladesh Bank issued IT guideline of 'minimum' security standards for scheduled banks.

To strengthen discipline in providing loans and to improve loan classification guidelines to international standards, Bangladesh Bank introduced Special Mention Account (SMA) and decided to make a provision of 5 percent of the outstanding interest on those loans kept under Special Mention Account.

With the aim to fully implement a Risk Grading System, an Integrated Credit Risk Grading Manual was developed and forwarded to the banks. Banks were advised to implement Credit Risk Grading as described in the manual and also under Risk Grading Matrix provided in the Manual. Banks might adopt and adapt more sophisticated risk grades in line with the size and complexity of their business.

To make the existing Money Laundering Prevention Act 2002 more effective and time befitting, the draft Money Laundering Prevention Act 2006 was prepared.

2.5 Non-bank financial institutions

Bangladesh Bank had taken up a project giving emphasis on effective risk management system for the non-bank financial institutions. Steps were taken to segregate the risks of the financial institutions into 4 major categories viz. credit risk, wealth and liabilities/balance sheet risks, internal control and compliance risk, and information technology security risk.

2.6 Capital market

Several efforts were made to improve the capital market. These are described below.

2.6.1 Issuance of IPO

The financial institutions having capital and reserve of Tk.25 crore on December 31, 2005 but not yet issued IPO (Initial Public Offering) were asked to issue IPO of at least Tk.5 crore by June 30, 2006.

2.6.2 Issuance of corporate governance guidelines

A Corporate Governance Guidelines was issued primarily to establish institutional good governance of the companies. The guidelines

incorporate various issues including formation of audit committee and provision for appointing independent director.

2.6.3 Establishment of financial reporting council

Initiative was taken to establish a regulatory institution namely Financial Reporting Council with the assistance from the World Bank to ensure appropriate reflection of the wealth and liabilities in the audited financial reports of issuer companies. Necessary laws were formulated to establish this body.

2.7 Preparation of Poverty Reduction Strategy Paper (PRSP)

As part of the UN Millennium Development Goals adopted with an aim to ensure economic growth and to reduce the scale of poverty, the government finalised the full draft PRSP titled "Unlocking the Potential: National Strategy for Accelerated Poverty Reduction" in January 2005 through broad-based consultative process. The government in October 2005 approved the Strategy Paper. Four strategic blocks and four supporting strategies were identified in the full-blown PRSP document to translate the vision into reality. Four strategic blocks were:

(a) Macroeconomic environment for pro-poor economic growth;

(b) Critical sectors for pro-poor economic growth;

(c) Effective social safety nets and targeted programmes; and

(d) Human development.

The following four supporting strategies were implemented in support of the four strategic blocks:

(a) Ensuring participation, social inclusion and empowerment;

(b) Promoting good governance;

(c) Service delivery; and

(d) Caring for the environment and sustainable development.

2.8 The Medium Term Macroeconomic Framework (MTMF)

A Medium term macroeconomic framework (MTMF) included in the PRSP set out a coherent macro framework which brought consistency among savings, investment, external and monetary balances to promote economic growth and employment.

2.9 Monetary management and financial market

Financial sector is one of the key sectors of the economy and it encompasses monetary policy, monetary management and financial

market management. Ensuring effective monetary management and developing an efficient and reliable financial market are regarded as the prerequisites for achieving the goals of macroeconomic stability and economic growth.

The Bangladesh economy has been facing a range of challenges since 2004-05 resulting from escalating price hike of petroleum and petroleum products including several other important commodities in international market and phasing out of MFA quotas. To maintain macroeconomic stability against these odds, emphasis was laid on enhancing economy's absorptive capacity. By restraining the robust growth rate of private sector credit and to bring back balance of payment account at a sustainable level, accommodative monetary policy was pursued since 2004-05. Various instruments like repo, reverse-repo, higher rate of treasury bills/bonds and higher rate of cash reserve requirement (CRR) and higher rate of statutory liquidity ratio (SLR) were used to fulfill the objectives of monetary policy.

2.10 Money and credit situation

In 2005-06, broad money (M2) increased by Tk. 29568 crore (19.51 percent) from that of the previous year. Broad money (M2) increased during the same period of the previous year by Tk. 21815 crore

(16.81 percent). During 2005-06, currency in circulation increased by 23.46 percent, while demand deposit and time deposit showed an increase of 19.05 and 18.94 percent respectively.

The usage of broad money indicates that credit to the government sector (net), other public sector and private sector increased by 23.57, 34.91 and 18.27 percent respectively. Consequently, total domestic credit showed a growth of 20.45 percent in FY 2005- 06.

2.11 Reserve money

Reserve money was used as an operating target in line with overall monetary projection, which is a part of accommodative monetary policy and liquidity management. Along with this, the auction of weekly T-bills/T-bonds was used to control reserve money.

2.12 Rationalising the interest rate

The government encouraged banks and non-bank financial institutions to disburse more credit to the productive sectors of the economy for accelerated economic growth and poverty reduction by rationalising interest rates on loans.

2.13 Floating exchange rate

Bangladesh adopted floating exchange rate regime since 31 May 2003. Under this arrangement, the government does not interfere in the determination of exchange rate, but operates the monetary policy prudently for minimising extreme swings in exchange rate to avoid the adverse repercussion on the domestic economy.

2.14 Financial market management

Financial market of an economy comprises the banking sector, other financial institutions and capital market. At present, there are 4 NCBs, 5 nationalised specialised Banks, 30 private commercial banks, 9 foreign commercial banks and 28 non-bank financial institutions, Investment Corporation of Bangladesh (ICB), House Building Finance Corporation (HBFC), Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE) are working in the financial market of Bangladesh. Banks and other financial institutions (OFis) have been playing a key role in activating the financial sector that in turn infuses dynamism to the economy.

Banks are engaged in upgrading the socio-economic status of the country by helping investment in productive sectors. However, in the

context of globalisation, emphasis has been laid on to the development of the financial market through banking sector. In order to uphold the role of banking sector in financial market development, the government has taken a range of measures, which include further deployment of bank branches and evaluation of their performance, classification of loans following international standards assessment of capital adequacy, determination of quality of assets and earning of impressive profit.

2.15 The banking sector

The banking sector of Bangladesh comprises four categories of scheduled banks (NCBs, SBs, local PCBs and FCBs). In addition, one national co-operative bank, one Ansar-VDP Bank, one Karmasangsthan Bank and one Grameen Bank and some non-scheduled banks are also in operation. Up to June 2006, 3773 branches of NCBs were operating in rural areas.

In order to enhance the overall efficiency of NCBs, decisions were taken to rationalise bank branches, and up to June 2006, 109 new branches were established and 2 existing branches were closed under the 'branch rationalisation programme'.

2.16 Deployment of bank branches

Although foreign banks and private banks show better performance according to different criteria such as capital adequacy, quality of assets and expenditure-income ratio, the common people throughout the country have far better access to NCBs and SBs because of their locations. Foreign banks do not have a single branch in any rural area of Bangladesh.

Though PCBs have branches outside the urban area, it is only 26.15 percent of their total number of branches. On the contrary, 63.44 percent and 88.76 percent of the total branches of NCBs and SBs are located in different sub-urban and rural areas of Bangladesh respectively.

2.17 Non-bank financial institutions

In the financial sector of Bangladesh, some non-bank financial institutions (NBFis) were also making significant contribution towards financing various sectors like industry, commerce, house- building, ICT and others. By June 2006, there were 28 licensed non-financial institutions operating in Bangladesh.

The paid-up capital and reserve of these NBFis as of June 2006, totaled up to Tk. 13.86 billion and the investment of these institutions in different sectors of the economy amounted to Tk. 61.57 billion. Since December 2000, lending and leases extended by these NBFis, like other scheduled banks, are subject to the classification and regulations.

The goal of the above-mentioned initiatives was to strengthen and revitalise these institutions through regular reviewing of the loan position as well as improving the recovery process. Up to December 2005, the ratio of classified loan of financial institutions stood at 6.07 percent and classified loan stood at 1.13 percent excluding net suspended interest and prov1s10nimg.

2.18 Financing agriculture, industry and commerce by banks and other financial institutions

To ensure adequate credit flow to agriculture and other rural economic activities, the government had a target of disbursing Tk. 5542.21 crore in FY 2005-06 through BKB, RAKUB, four NCBs, BRDB and Bangladesh Cooperative Bank Limited. Against this target, Tk. 5789.71 crore was disbursed up to June 2006, which is 16.80 percent higher than the amount disbursed in the same period of the previous year.

The government encouraged small and medium enterprises (SMEs) along with the large ones. Banks and other Fls supported this effort of the government by extending industrial credit and other necessary assistance to this sector. In FY2005-06, term loan disbursement in the industrial sector stood at Tk. 9419.03 crore, which is 8.21 percent higher than that of the same period of the previous year. In addition to extending credit to agriculture, industry and trade, banks and other financial institutions were also providing credit, though at a limited scale, for undertaking poverty reduction programmes.

2.19 Banking, monetary and credit policy reforms

Several banking, monetary, and credit policy reforms were made to improve the state of affairs in this area. These are briefly described below.

2.19.1 Legal reforms

To expedite the settlement of disputes regarding loan recovery of financial institutions, the "Money Loan Court", 2003 (Artha Rin Adalat, 2003) was made effective, and to strengthen the process of recovering defaulted loans, banks, under this Act, were now empowered to sell the collaterals without prior approval of the court. Effective application of

this Act started yielding encouraging results. As of December 2005, 94897 cases were filed, of which 49116 cases were settled accruing the recovery of Tk. 2380.72 crore against the claim of Tk. 21756.84 crore.

2.19.2 Reforms in the Bangladesh Bank

Implementation of "Central Bank Strengthening Project" was underway which was tasked to formulate and implement a prudent monetary policy, enhance the regulatory capability of Bangladesh Bank to supervise financial institutions, establish banking policies and regulations that conform to international standards and increase operational efficiency of Bangladesh Bank through computerisation.

2.19.3 Reforms in NCBs

With a view to monitoring overall performance of banks including capacity enhancing, bringing financial solvency, and increasing performance of NCBs as part of financial sector reform programmes, the following steps were taken:

(i) NCBs signed a Memorandum of Understanding (MOU) with the Bangladesh Bank to monitor overall performance, and four internationally reputed local auditing farms audited the NCBs;

(ii) As part of privatisation in the banking sector, Rupali Bank Ltd. was at the final stage of privatisation process;

(iii) As part of the restructuring and modernising programme of the other three NCBs (Sonali, Janata and Agrani), a management team along with a Chief Executive was appointed in the Agrani Bank in order to improve overall management capacity and financial condition. And a management support team was appointed both at Sonali and Janata Bank to bring dynamism in the management and to enhance efficiency.

2.20 Money and financial market reforms

Measures were taken to build the existing banking system to an international standard and to strengthen overall banking system of the country. Important among the initiatives taken in FY 2005-06 were as follows:

Measures were taken to provide new loan for rescheduling borrowers from February 16, 2006 considering payment of loan within one year or the full payment (whichever occurs earlier) under the following conditions:

a) Defaulter borrowers, benefited by remission of interest payment, have to pay 15 percent according to the present rule. It will be calculated except rescheduled payment as agreed upon to get further loan facility;

b) To take loan from another bank, borrowers have to submit NOC from the previous bank; and

c) Exporter borrowers (those who are not intentionally defaulter) will be qualified to receive further loan facility after paying at least 7.5 percent of agreed amount.

Banks were advised to take effective measures against unauthorised transformation, publication and destruction of system to protect the interest of depositors by introducing IT and ensuring security in operating IT. To do this, BB has issued IT guidelines with minimumsecurity standard for its schedule banks.

To strengthen discipline in providing loans and to improve loan classification guidelines at international standards, BB introduced Special Mention Account (SMA) and decided to introduce provision of 5 percent of the outstanding interest on those loans to be kept under SMA.

With a view to implementing risk-grading system, an integrated credit risk-grading manual prepared by BB was forwarded to all schedule

banks. In the light of this risk matrix, a high standard risk-grading system was introduced based on the bank's business size and its nature.

In order to apply fair value accounting on government securities and to encourage secondary trade, section 38 (4) of the Bank Company Act of 1991 was amended as: securities, which are kept by bank companies in SLR form to be considered 'held to maturity'. By doing so, revaluation gain/loss would be added/deducted in the capital account. To fulfill SLR, excess securities would be considered as held for trading.

An order was issued to schedule banks for maintaining general provislon such as (a) 2 percent for unclassified consumers' credit, housing credit and unclassified professional credit; and (b) 5 percent for all other unclassified consumers' credit.

Decision was taken to allow mmlmum 6-monthly deposit for institutional deposit from July 19, 2005, considering traditional deposit system, which does not allow making deposit for less than one year.

In order to maintain discipline in human resources and its utilisation, some parts of Article 18(g) of Financial Institution Act 1993 (such as money grabbing, corruption, fraudulent activities, employees

who were terminated from their service on moral hazard ground etc. will not be considered to employ in any other Fls/banks) were amended.

Importance had been given to improve the risk management especially of NBFis to maintain minimum standard in separation/classification of duties and responsibilities. In order to assist on-going development of Fls, the risks of Fls were classified/categorised in 4 main parts' such as (1) credit risk (2) asset liabilities/balance sheet risk (3) internal control and (4) maintenance.

Financial Ordinance 53F of 1984 was amended through Financial Act 2005. According to this Act, 10 percent income tax deduction at source from the interest or profit earned from banks, NBFis, leasing companies, and housing financing companies was introduced from July 1, 2005 and onward. All banks took initiative to introduce identity card for existing and newly opened account holders.

With a view to averting money laundering, banks were advised to be sure about the nature of the respondent banks before providing correspondent banking service.

To make the Money Laundering Prevention Act 2002 more effective, a revised draft of Money Laundering Prevention Act 2006 was submitted for its approval.

Banks were instructed to report BB about excess cash transaction in order to limit cash transaction and identify the cash transaction involved in criminal activities.

In order to create opportunity for reinvesting autonomously in savings deposit, Savings Deposit Rules 1977 was amended (amendment up to June 30, 2002) as one can buy any kind of savings certificate up to Tk. 25 lakh and 50 lakh gradually in a single name. In joint names certificates Tk. 50 lakh and Tk. 1 crore could be bought.

To simplify pension savings scheme, 'Pensioner Savings Deposit Policy 2004' was amended. According to this policy, employees on LPR can buy savings certificates valued at best Tk. 30 lakh, which should comprise GPF and gratuity payment in a single name.

BB was given authority to direct (i) deducting tax at source in advance on the given interest of approved securities or discount, and (ii) at the same time submitting bids in auction of treasury bills/bonds.

2.21 The capital market

The level of development of the capital market is an indicator of the state of development of an economy. Private sector development has been given priority in Bangladesh. To achieve private sector-led growth objectives, it was necessary to make capital market more efficient.

The Securities and Exchange Commission (SEC) of Bangladesh was formed on June 8, 1993 under the 'Securities and Exchange Commission Act, 1993'. The principal responsibilities of the SEC include ensuring proper issuance of securities, safeguarding the interest of investors in the stock exchange, controlling the stock market and development of the capital market. Two stock exchanges were operating in Bangladesh: Dhaka Stock Exchange (DSE) and Chittagong Stock Exchange (CSE). Both the stock exchanges are autonomous non-profit organisations.

2.21.1 The Dhaka Stock Exchange

The number of securities (including mutual fund and debentures) listed with the DSE increased to 303 by June 2006 from that of June 2005. By the end of June 2006, the issued capital of listed securities stood

at Tk. 8572.30 crore, which is 29.12 percent higher than what stood in June 2005.

Up to June 2006, market capitalisation of securities stood at Tk. 22530.00 crore. General share price index of the DSE stood at 1040.47 in June 2006, which was 1310.62 in June 2005.

2.21.2 The Chittagong Stock Exchange

The number of securities listed with the CSE reached 213 as of June 2006 from 198 as of June 2005. By the end of June 2006, the issued capital of listed securities stood at Tk. 6253.13 crore, which is 25.09 percent higher compared to that at the end of June 2005.

As of June 2006, market capitalisation of securities reached Tk. 19634.10 crore. General share price index of the CSE reached 2879.19 as on June 2006, which were 3347.09 on June 30, 2005.

2.22 Reform initiatives in the capital market

The Government was making efforts to develop the reliability and efficiency of stock exchanges as investment market. The Securities and Exchange Commission (SEC) continued to carry out its regulatory reform

activities in a bid to develop and protect investors' interest by establishing fairness and transparency in the capital market.

2.23 Chapter summary

a) The government was able to achieve macroeconomic stability and to maintain the trend of development over the last couple of years.

b) Sustained GDP growth coupled with growth in exports and remittance led to marked improvement in balance of payments position that resulted in commendable improvement of the economic fundamentals necessary for macroeconomic stability.

c) The World Bank identified Bangladesh as one of the most rapidly growing economy among 31 large developing countries in the recent times.

d) The growth performance of Bangladesh economy was relatively strong during the 1990's showing considerable improvement over the previous two decades.

e) The impressive growth in industry sector, the significant growth in agriculture sector and the continuous trend of growth in service sector raised the GDP growth rate to 6.71 percent in 2005-06.

f) Due to higher growth rate in the industry sector, the share of the industry sector in GDP increased and reached at 29.01 percent.

g) Savings and investment registered a gradual rise along with the economic growth. According to provisional estimates, the rates of domestic and national savings will stand at 20.26 and 26.61 percent of GDP in 2005-06.

h) Bangladesh was increasingly becoming an attractive and competitive destination of Foreign Direct Investment (FDI) due to introduction and implementation of pro-industrialization and investment friendly economic policies.

i) The economy experienced an upward trend in inflation mainly due to the abnormal price hike of oil and other essential imported commodities in international market. In 2004-05, the average rate of inflation at national level was 6.48, which reached 7.17 percent in 2005-06.

j) During 2005-06, broad money (M2) growth rose to 19.51 percent compared to 16.81 percent growth during the previous fiscal year. On the other hand, in 2005-06 net credits to government from the banking system registered a growth of 21.95 percent. Credit to private sector grew by 18.27 percent.

k) To fulfill the objective of monetary policy, Cash Reserve Requirement (CRR) of the scheduled banks was enhanced from 4.5 percent to 5 percent of their total demand and term liabilities.

l) To make the existing Money Laundering Prevention Act 2002 more effective and time befitting, the draft Money Laundering Prevention Act 2006 was prepared.

m) A Medium term macroeconomic framework (MTMF) included in the PRSP set out a coherent macro framework which brought consistency among savings, investment, external and monetary balances to promote economic growth and employment.

n) The government encouraged banks and non-bank financial institutions to disburse more credit to the productive sectors of the economy for

accelerated economic growth and poverty reduction by rationalising interest rates on loans.

o) Bangladesh adopted floating exchange rate regime since 31 May 2003. Under this arrangement, the government does not interfere in the determination of exchange rate, but operates the monetary policy prudently for minimising extreme swings in exchange rate to avoid the adverse repercussion on the domestic economy.

p) In order to enhance the overall efficiency of NCBs, decisions were taken to rationalise bank branches, and up to June 2006, 109 new branches were established and 2 existing branches were closed under the 'branch rationalisation programme'.

q) Implementation of 'Central Bank Strengthening Project' was underway which was tasked to formulate and implement a prudent monetary policy,

r) With a view to monitoring overall performance of banks including capacity enhancing, bringing financial solvency, and increasing performance of NCBs as part of financial sector reform programmes, several steps were taken.

s) Financial Ordinance 53F of 1984 was amended through Financial Act 2005. According to this Act, 10 percent income tax deduction at source from the interest or profit earned from banks, NBFis, leasing companies, and housing financing companies from July 1, 2005 and onward.

t) The Securities and Exchange Commission (SEC) of Bangladesh was formed on June 8, 1993 under the 'Securities and Exchange Commission Act, 1993 '.

It appears from the above discussion that the Bangladesh economy was improving and the monetary sector was reformed. It is in this background that the present study on demand for money was carried out.

Chapter 3

LITERATURE SURVEY

There is considerable literature on money demand functions. This chapter contains a survey of these works. The discussion is divided into two parts. The first part contains a general survey of works on money demand functions, while the second part consists of the few works that have been done on Bangladesh.

3.1 Introduction

Baumol (1952) was the first to formally study the demand for money using an inventory theoretic approach. Friedman (1966) advanced this study of money demand both theoretically and empirically. He thought his results supported monetary policy. Goldfeld (1976) studied demand for money using adjustment mechanism which became quite well known. Chow (1966), and later Laidler (1982) advanced the money demand function further.

There are some works on Bangladesh. Ahmed (1977) wanted to identify major determinant of money demand. Taslim (1984) tested the statistical significance of both interest rate and foreign aid in the money

demand function. Hossain (1992) estimated money demand function using the then up-to-date data. Wadud (2004) used a cointegration approach to study money demand function and effectiveness of monetary policy in Bangladesh. Quayum and Keya (2005) studied various determinants of money demand. They included the foreign sector where the crucial variables were foreign remittance, foreign aid and loan, and exchange rate.

3.2 Studies on demand of money in some countries other than Bangladesh

The UK demand for the narrow money aggregate, M1, was estimated by Hendry (1979). Hend$_{ry}$'s model was estimated using data for 1961 to 1977, but there was little change in coefficient values when the data for 1978-82 were used. According to this model, the long run demand for real balances was independent of the price level.

The International Monetary Fund (IMF) conducted a study (1982) on narrow money (M1) demand in Fiji. Annual data were used in this study. The explanatory variables were income and the interest rate. The study was based on the partial adjustment mechanism and it found that the income elasticity was positive and close to unity but the coefficient of the interest rate elasticity was statistically insignificant for narrow money.

Baba, Hendry and Starr (1992) estimated the demand for money function for USA using M1. Their findings showed that short-term interest rate has a positive sigh. Moreover, the long tern income elasticity and long-run price elasticity were respectively 0.5 and unity.

Luckett (1987) estimated the narrow money demand function for Fiji for the period 1978-1985. The income elasticity according to his estimate was 0.132 while the interest elasticity was -0.128. Both income and interest rate elasticity were significant. It is seen that his estimated income elasticity was far below unity.

Fair (1987) examined the adjustment of actual to desired money holdings in nominal and real terms. He used a simple method to test the nominal against the real hypothesis. He used data for 27 countries in his study to see the structural stability. His results strongly favoured the nominal adjustment hypothesis. But there was some evidence of moderate structural instability before and after 1973.

Arize (1989) studied the demand for money in four Asian Countries. These were Pakistan, The Philippines, South Korea and Thailand. According to his study, foreign interest rate, exchange rate

depreciation and technological change were found to be important determinants of the Asian money demand functions.

Yoshida and Rasche (1990) studied the Japanese money demand function using quarterly data for the period 1956/1-1989/II. They used a vector error correction model and found that the equilibrium real income elasticity was about 1.2 for the period 1956/1-1985/11. They investigated whether the equilibrium income elasticities had changed after the deregulation of interest rate that started in the middle of 1985. For this, they added a time dummy variable that took on the value of one after 1985/III and zero before 1985/III. The result showed that time dummy absorbed all the effect of deregulation of interest rates. So the rest of the parameters of the function were unchanged from the parameters estimated from the data for the period of 1956/1 - 1985/II. This implied that income elasticity was stable even after deregulation of interest rates in the Japanese money market.

Boughton (1991) examined the nature of long-run demand for money in five large industrial countries. The countries were USA, UK, Japan, Germany, and France. He used price, income and interest rate as the dependent variables. Boughton found that price elasticity was less than unity and income elasticities exceeded unity for USA for narrow and

UK for broad money. The estimated price elasticities were contrary to the theory but no evidence of instability was found in the UK money model. He also found that short term interest variable had a positive coefficient, indicating that it acted as the own rate of interest on money.

Bahmani-Oskooee and Malixi (1991) examined the demand for money for thirteen developing countries. They used inflation, real income and real effective exchange rate as the explanatory variables. They found that, decrease in real effective exchange rate also decreased the demand for money.

Lim and Martin (1991) also studied the relationship between real M3 with the real GDP, nominal 90-day bill rate, 2-year bond yield and 10-year bond yield and annual percentage change in the GDP deflator. They used quarterly data of period 1970:4 to 1990:2. Variables apart from interest rate were seasonally adjusted. In their study, all variables apart from interest and inflation rates were in natural logarithms. They used Park's (1988) estimation method. According to their results, there was long run relationship between real M3, real GDP and 10-year bond yield. They also estimated the ECM that included short-term interest rate.

Lim (1991) estimated the long-run relationship between money and income in Australia where the explanatory variables were real GDP, real Broad money, 90-day bank bill rate, 2-year bond yield, 10-year bond yield and annual percentage change in the GDP deflator. They used quarterly data in their study and their study was done for the period of 1976:3 to 1991:2 and monthly 1976:08 to 1990:06. Except interest rate, all the variables were seasonally adjusted. All the variables apart from inflation and interest rate were in natural logarithms. He used the Phillips-Hensen (1990) technique for estimation. A structural change dummy was included for the 1982-83 recession and for the effects of deregulation and rapid depreciation 1985. He found long-run relationships on both data sets for all variables except the bill rate.

Lim and Dixon (1991) estimated the long-run relationship between money and income in Australia using real currency (GNE deflator) as a dependent variable and real GNE and three-month average of 90-day bill rate as the explanatory variable. Quarterly data for the period of 1977: 1 to 1989:2 were used in their study. Because the variables were seasonally adjusted, seasonal dummy were included in their analysis. They used the OLS technique followed by the Engle-Granger procedure. The results showed that long-run relationship between real currency and real GNE existed.

de Haan and Zelhorst (1991) found the long-run relationship between money and income in Australia using both real M3 and M1 (deflated by the CPI) as dependent variable. The explanatory variables included real GDP (deflated by the CPI) and 3-year Treasury bond yield. They estimated the function for the period 1960:1 to 1989:2 using quarterly data. Variables apart from the bond yield were seasonally adjusted and were in natural logarithms. They used the Engle-Granger (1987) estimation procedure. They found long-run relationship between GDP velocity of M3 and 3-year bond yield only for the period of 1960:1 to 1983:4.

Hargreaves (1991) estimated the long-run relationship between money and income in Australia. He used real money base and real M1 (alternatively deflated by GDP and GNE deflator) as the dependent variable in his study. He used quarterly data for the period of 1973:3 to 1989:4 where all variables were in natural logarithms. Variables used were seasonally unadjusted. He used the Engle-Granger (1987) method and found long-run relationship between real money base M1 with GDP or GNE and with tax-adjusted 90-day bill rate or 2-year bond yield.

Juselius (1991) also studied the long-run relationship between money and income in Australia where he used the nominal M1 and M3 as

the dependent variable. Alternatively real GDP and real GNE, alternatively GDP and GNE implicit price deflator, nominal 90- day bill rate and nominal 10-year bond yield were used as the explanatory variables in his study. Quarterly data from 1975:3 to 1991:1 were used. All the variables were seasonally unadjusted and, apart from interest rate, were in natural logarithms. Seasonal dummies were included. He used the Johansen (1988) procedure and found two cointegrating vectors money and real activity, prices, short and long-run interest rates and a time trend for each definition of money and each definition of activity.

Simmons (1992) used the error-correction model to estimate the demand for money in five African countries. He gave special emphasis on the role of opportunity cost variable. Such as the domestic interest rate and expected exchange rate depreciation. He found that the domestic interest rate was an important determinant of the demand for money function. For three of the five countries, external opportunity cost variable was found significant. He also found that inflation played an important role in four countries of his study.

Brouwer, Ng and Subbaraman (1993) estimated the long-run relationship between the money stock, activity and interest rate for Australia using the technique of cointegration. Firstly, they reviewed

some basics of money demand theory. Then they summarized the results of earlier papers on cointegrating relationships. Finally, they tested for the existence of cointegration between a number of definitions of money aggregates, activity and interest rates.

Orden and Fisher (1993) tested the long run relationship between income and money demand in Australia using nominal M3 as dependent variable. They used real GDP, nominal 13-week Treasury note rate and GDP deflator as the independent variable. They studied the money demand using quarterly data for the period 1965:2 to 1989:3. They defined variables alternatively in seasonally adjusted terms and seasonally unadjusted term, with seasonal dummies included in the latter case. Except interest rate, all variables were taken in natural logarithms. The Johansen procedure of cointegration was used in their study. They found one cointegrating vector between M3, real GDP and prices only in the pre-deregulation sub period 1965:2 to 1982:4. Their findings were for seasonal adjustment approach.

Klacek and Smidkova (1995) conducted research for the period 1992-1995 using the error-correction model measured the money demand function in the long run for the Czech Economy. The real narrow (M1) and broad money (M2) were used as the real demand money indicators.

They found that in this period the demand for money mostly depended on the economic activity (proxied by the level of consumption) and the inflation rate.

Agenor and Khan (1996) used a dynamic currency substitution model that incorporated forward-looking relation expectations to study the demand for money for a group of ten developing countries. They also referred to the view that foreign rate of interest at the expected rate of depreciation of the parallel market exchange rate were crucial determinants of the demand for money.

Fujiki and Mulligan (1996) estimated the parameters of a money demand function for Japan. The cross-sectional estimates of the elasticity of the income were in range of 1.2 to 1.4 and they were found stable over time.

Ewing and Payne (1999) investigated the role of the exchange rate on the demand for narrow money in several developed countries. They employed a standard cointegration technique to examine the relevance of the inclusion of the effective exchange rate in the money demand function. According to their findings, income and interest rate were sufficient for the formulation of a long run stable demand for money in

Australia, Austria, Finland, Italy, UK, and USA. However, for Canada, Germany and Switzerland, the effective exchange rate should be incorporated.

Hayo (2000) estimated the demand for money in Austria for the period 1965 to 1996. Here the demand for money was defined as demand for real money M1, M2, and M3. He constructed two-equation error-correction models to estimate the demand for money. The model contained the short-run dynamics and the long-run economic equilibrium. The results suggested that a stable money demand existed for all monetary aggregates. The results also showed long-run equilibrium of M1, after accounting for a structural break in 1979, and can be characterised as a classical type of money demand, with no interest rate effects and an elasticity of one for real GDP. The estimates of M2 and M3 showed a unit coefficient on income and a significantly negative influence of a long-term interest rate.

Jayaraman and Ward (2000) estimated the broad money demand function for the economy of Fiji using quarterly data for the period 1979(Q1) to 1996(Q4). They used income and real interest rate as the explanatory variables and found that the elasticity of income was 0.987. However, the income elasticity was found to be insignificant. The

elasticity of real interest rate, measuring the return on time deposits, was also found to be positive with the value 0.022 and it was found to be significant. They found positive relationship of demand for money with both income and interest rate.

Katafono (2001) applied time series econometric techniques and estimated the demand functions for both narrow and broad money in Fiji for the period 1975 to 1999 using annual data. The explanatory variables in the study included price level, nominal rate of interest on saving deposits, nominal treasury bill rate and real effective exchange rate. All the variables were found to be positively related with the money demand. In her study, the demand for narrow money (M1), received relatively more attention. She used unit root, cointegration and causality tests in her study.

Andoh and Chappell (2002) estimated the demand for money (M2) in Ghana for the period 1960 to 1996. They studied whether privatization, removal of foreign exchange controls policies had altered the demand for money function. The results of the study showed a structural break in the demand for money function in 1983.

Bahmani-Oskooee and Ng (2002) examined the long run demand for money of Hong Kong using quarterly data over the period 1985 Q1-1999 Q4. They used the auto regressive distributed lag (ARDL) cointegration procedure in their study. They found that broad money demand in Hong Kong was cointegrated with its explanatory variables. Moreover, they used the CUSUM and CUSUMSQ tests that also confirmed the stability of the money demand function.

Golinelli and Rovelli (2002) analyzed the effect of interest rate used as the transmission mechanism tool on the inflation and money demand in three countries. These were the Czech Republic, Poland and Hungary. They measured the effect of interest rates in the real money demand and prices in the domestic market for the period 1991-2000. They also studied the effect of exchange rate on inflation that appeared to be most significant in the Czech Republic. The effects of both interest rates and the exchange rate were found to be significant for policies aimed at controlling and suppressing inflation, with the exception of the Czech Republic where the effect of interest rates on money demand was significant only after a larger number of lags had been included in the model. Using stability test, it was found that the early stage of transition had been marked by the instable money demand while stability was achieved at a later stage.

Miyao (2002) analyzed the stability of an equilibrium money demand relationship in Japan in an attempted to see whether Japanese economy really trapped at the zero interest rate bound. He performed a formal analysis on the presence and stability and cointegration in narrow money demand in Japan and found that the answer was in the negative. He used double-log specifications. The results suggested existence of a cointegrating relationship and no break in the interest elasticity. This meant that even after nominal rates were lowered to virtually zero percent, the money demand was still stable.

Valadkhan and Alauddin (2003) examined the major determinants of the demand for real money balances in eight developing countries for which consistent annual time series data were available. Pooling cross-country and time series data for the 1979-1999 period and employing the seemingly unrelated regression (SUR) estimation technique, this paper modeled a standard money demand function. Various country-specific coefficients were allowed to capture inter-country heterogeneities. Consistent with theoretical postulates, this paper found that the demand for money positively responded to an increase in real income and negatively to a rise in the interest rate spread, the rate of inflation and the US long-term interest rate. This study supports the hypothesis that

disequilibrium in the money market could exacerbate inflation and widen the output gap.

Meghyereh (2003) looked into various aspects of financial liberalization and stability of demand for money in Jordan. He tests empirically whether there existed a stable function of demand for broad money in Jordan over the period 1976-2000. Despite the substantial financial market liberalization in the late of 1988, the co integration and error correction methodology showed that the quarterly time-series data confirmed that the broad demand for money in Jordan was stable during the period under investigation. The results also showed that the inflation rate was the most important variable that explained the demand for money in the Jordanian economy.

Nell (2003) empirically tested whether stable long-run demand for money function existed over the period 1965-1997. The empirical result suggested that their existed stable long run demand for money function for M3 in South Africa, which meant that the M3 money stock could serve as an indicator for monetary policy.

Lazea and Cozmanca (2003) empirically estimated the demand for money in Romania for the period June 1997 - March 2003. They showed

that the main money demand determinants had been the industrial output index used in the analysis as the GDP approximation, rate of inflation, and the national currency depreciation rate. The long run model coefficient attached to the industrial output index was found to be statistically significant and considerably above the level of one, which spoke in favour of this indicator as the best approximation of economic activity.

Serletis and Shahmoradi (2004) used the sampling theoretic as well as Bayesian inference to study the demand for money in the United States. They did their study in the context of the basic translog flexible functional form. In their study, they imposed local curvature, and argued that a breakthrough from the current state of using locally flexible specification that violate theoretical regularity to the use of such specifications that are more consistent with the theory will be through the use of Bayesian inference. They also showed that the basic translog did not perform well describing USA money demand in a manner that satisfied the restrictions imposed by microeconomic theory and gave rise to stable elasticity estimates.

Choi and Oxley (2004) estimated long and short run demand for money function for New Zealand for the period 1990-2000 using

cointegration and error-correction based models. They used quarterly data in their study. The independent variables in this study were price, real income and interest rate. Using Phillips and Hansen fully modified estimation method, they found existence of a long-run relationship among price, real income and interest rate.

Rao and Singh (2004) estimated demand for narrow money in Fiji and evaluated its stability for the period 1971 to 2002 using the co-integration and error-correction models. Income and interest rate elasticities were found to be significant by them.

The dynamic demand for money (M2) for Pakistan is estimated by Qayyum (2005). He employed co-integration analysis and error correction mechanism. The analysis revealed that the rates of interest, market rate, and bond yield were important for the long-run money demand behavior. It was also found that the rate of inflation was also an important determinant of money demand in Pakistan.

Stability of the money demand function was analysed by Maravic and Palic (2005) for Serbia to see the factors that influenced narrow money demand in both short and long run for the period January 1996 - March 2005. They found instability of money demand for the period

under study. Empirical results showed that the money demand was unstable throughout the observed period. The cointegration analysis showed strong cointegration between the real money, overall economic activity, inflation, and interest rates. The long-term earning elasticity was found to be close to one and the opportunity cost variables had the expected designations. The short-term ECM model showed that the money demand was mostly affected by the expected inflation while the interest rate payable on short-term highly liquid transaction deposits did not play a very significant role. The instability of the demand for money function showed that Serbia's economy was sensitive to external shocks. The unstable demand for money function also meant that it may not be used for the monetary aggregate targeting.

Carstensen (2006) examined the stability of money demand in Europe. He analyzed whether money demand in the Euro area had undergone a structural change in recent time when M3 money growth had considerably grown more than the reference value set by the European Central Bank (ECB). He found that conventional specifications of money demand had become unstable but specifications that were augmented with real stock prices and volatility remain stable. He used an augmented specification to examine the claim that the excessive M3 growth rates were due to adverse stock market developments. He found that this

growth rate to revert in the near future was unexpected unless one was willing to assume a quick recovery of the European stock markets.

Hussain, Awan, Hussain, Farhan and Haq (2006) estimated the demand for money in Pakistan using a time series data for 33 years. Because the time series are subjected to various shortcomings such as nonstationary, autocorrelation, and host of other problems; they first tested the data for cointegration and unit root. The results of these tests showed no cointegration and unit root. So, they did not apply the ECM technique. Then they applied OLSQ technique with real money balances as dependent variables and real GDP as scale variable, interest rate on time deposit, inflation and financial innovations as independent variables. Results showed that all coefficients were statistically significant and had the expected signs. Long run income elasticity varied from 0.74 to 0.78 and interest elasticity was found to be -0.464. They concluded that the money demand function was stable. The financial innovation was highly significant showing batter management of the monetary policy in the country. The real balance (M2) provided batter fit than the narrow money for the demand function for money.

Bahmani-Oskooee and Wang (2007) applied the CUSUM and CUSUMSQ tests in conjunction with cointegration analysis to see

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whether the narrow and broad money were cointegrated with their determinants. According to the results of stability tests, they found that narrow money demand in China was stable, but there was some doubt about stability of broad money demand.

3.3 Studies on demand for money in Bangladesh

Bhattacharya (1974) studied demand for money in Bangladesh. He used income and the interest rate as the independent variables. He found the coefficient of income to be insignificant which implied that there was no relationship between demand for money and income for this period in Bangladesh. But the coefficient of interest rate was found to be negative and insignificant. This meant that demand for money was inversely related to interest rate.

Ahmed (1977) studied the demand for money in Bangladesh for the period 1960 to 1976. He estimated the demand for money function with a gap of two years, 1971 and 1972. In this study, he used price, rate of interest and income as the independent variables. The results indicate that the rate of change of price was insignificant which meant that price change did not affect the demand for money. It was also found that the rate of interest was statistically significant and negatively related to the demand for money. Here, the elasticity of interest rate was found to be

less than one. Regarding the relationship between income and money demand, it was seen that the income elasticity of demand for money was positive and greater than one. But the study did not take into consideration the problem of non-stationarity.

Rahim and Uddin (1978) also estimated the demand for money in Bangladesh. They used only eight annual observations. Moreover, years 1970 and 1971 were included which were the years of liberation war. The dependent variables in the study were rate of interest and income. Results showed that both the regression coefficients of income and interest rate were statistically significant. It was found that the rate of interest was negatively related to the demand for money while the income elasticity of demand for money was positively related with the demand for money. Though authors did not conduct any test for stability, they concluded that there was stable money demand relationship.

The money demand function for Bangladesh for the period 1961 to 1976 was estimated by Murty and Murty (1978). They used a generalized money demand function (GMDF) based on Box-Cox parametric transformation. Annual data were used for this study. They also used income and interest rate as the independent variables. The authors incorporated different transformations and considered both equilibrium

and disequilibrium vers10ns. The estimates of GMDF were compared with those obtained from restrictive models. To choose the appropriate functional form, likelihood ratio test was carried out. They found that the linear model was found appropriate for an equilibrium version while none of the restrictive models was appropriate for a disequilibrium version. Moreover, when behavioural properties of alternative models were examined, GMDF model was found to be superior to other models. Their findings were also similar to the previous works of Ahmed (1977) and Rahim and Uddin (1978), that is, the coefficient of the rate of interest was negative while that of income was positive.

The money demand function for Bangladesh was estimated by Taslim (1984). In this model, the explanatory variables, among others, also included foreign aid. He argued that Bangladesh maintained perpetual trade deficit. So the development programmes of the country relied on economic forces to restore external balance. Foreign aid played a very important role to meet the deficit. In such a situation, there was an excess of goods and reserves in the market for which there was no corresponding income. In this way, foreign aid increased the volume of transactions in the economy and increased the demand for real balances. Other explanatory variables in the demand function he used were income and inflation rate. He used a partial adjustment model for the period of

1960 to 1982. Annual data were used in this study. He found that the sign of the rate of interest was not only wrong but also insignificant. He used a variety of regression models involving different combinations of variables to find the variables that were important in determining the demand for money in Bangladesh and the way they affect it. When rate of interest was dropped, a better fit was found. According to the study, the public's desired cash holdings were found to be positively related to the level of income and foreign aid while it was negatively related to the inflation rate. He also suggested that the actual real balances adjusted to their desired level through a partial adjustment process.

Hossain (1996) also studied the money demand function for Bangladesh. The same independent variables were used in his study. According to this study, the rate of interest was negatively related to demand for money while income was positively related with the money demand. The results also showed that elasticity is less than one for the interest rate while it is greater than one for income.

Siddiki (2000) estimated the demand for real broad money (M2) from 1975 to 1995 for Bangladesh using cointegration analyses. The results show that there was a stable long-run relationship among real per capita broad money demand, real per capita income, domestic interest

rates and unofficial exchange rate (U.M.) premiums, which acted as a surrogate for foreign interest rates. It was found that income and interest elasticities were positive while the U.M. premium elasticity was negative. These results suggested that the demand for money in Bangladesh was stable despite financial and exchange rate policy changes during the period.

Ahmed (2001) investigated the existence of a long-run money demand function for Bangladesh during the period 1975-1997. He used the cointegration and error-correction modelling approach and examined the parameter stability of the money demand function. He found that there exists a unique long-run relationship between real broad money balance, real GDP, and the real exchange rate. By estimating an error-correction model, the short- term dynamic behaviour of money demand had been investigated. He found real GDP and the real exchange rate as important determinants of the demand for money in Bangladesh.

Wadud (2004) used a cointegration approach to study money demand function and effectiveness of monetary policy in Bangladesh. He not only studied the determinants of money but also the stability of the money demand function.

Quayum and Keya (2005) studied various determinants of money demand. They included the foreign sector where the crucial variables were foreign remittance, foreign aid and loan, and exchange rate. They analysed the analysed the determinants of demand for money in Bangladesh for the period 1976 to 2003. Apart from normal variables, other independent variables were foreign remittance, foreign aid and loan, and exchange rate. They also included a dummy variable representing the financial liberalization programme to see its impact on Bangladesh economy. They found that real GDP had significant positive effect on both M1 and M2 but interest rate had significant negative impact on M2 only. Their findings appeared to indicate that Keynesian view was pertinent in Bangladesh.

Hossain and Younus (2006) examined the sensitivity of money demand to interest rates on treasury bills in Bangladesh for the period 1997 to 2006. They used quarterly data for the period and specified a standard demand for money function with real output and a representative interest rate on treasury bills as key determinants. They used the ADF and the KPSS tests to see stationarity problem and found that real money balances (narrow or broad) and real output appear to have a unit root while the interest rates on treasury bills are stationary. They then estimated the long-run demand for money relationship sequentially with a

representative interest rate on treasury bills of a particular maturity by using both the Ordinary Least Squares and Dynamic Ordinary Least Squares methods. The results show that there was a well-behaved and stable money demand function. They also found that the demand for money was related to interest rate. For the long run, income elasticity of the demand for narrow money was about 1.15 while the corresponding value for broad money was about 1.7. It was also found that the long-run interest elasticity of the demand for money was about (-) 0.2. They also incorporated the term-structure of interest rates in the money demand function. The empirical results were not very satisfactory because the coefficients on the pre-estimated parameters of a quadratic yield curve were insignificant and not consistent with a priori theoretical expectations.

Hossain (2006) recently estimated demand for narrow and broad money for Bangladesh using a partial adjustment method (PAM) for the period 1973- 2003. The study provides some new results and since it is a very recent one, it may have substantial impact on the works that will done in the future.

Rao and Kumar (2007) estimated the stability of demand for money for Bangladesh. They allowed for endogenous structural breaks in

the cointegration equation and then investigated the stability of money demand. They used the Gregory and Hansen framework and found that there was an intercept shift and a well-determined and stable demand for money exists in Bangladesh.

Ahmed and Islam (2007) examined the long-run equilibrium money demand relationship as well as short-run dynamics in the context of Bangladesh. They had done it for both the broad money (M2) and the narrow money (M1 and M0) categories. They used both Johansen (1988) and Johansen and Juselius (1990) multivariate cointegration techniques. They used the quarterly data in their study. The results showed that a single cointegrating vector described the long-run equilibrium money demand relationship for both the broad money and narrow money categories for Bangladesh. Moreover, there existed a statistically significant long-run equilibrium demand relationship among real money balances of various types, real income and respective nominal interest rates. The study showed that the long-run demands for broad money, narrow money (M1), and narrow money (M0) depend positively on real income and negatively on Treasury bill (28-day), fixed deposit, and short-term deposit rates, respectively. Another important thing that was found in their study was that the demand for real balances in the economy was strongly dominated by the transactions motive for holding money. The

results on short-run dynamics suggested stability of the short-run money demand function for all categories of monetary aggregates was quite reasonable. The same thing was found for the case of speed of adjustment to the respective long-run equilibrium path.

3.4 Chapter summary

This chapter contains a survey of works on the demand for money. The general works, that is, works other than on Bangladesh, shed light on large number of issues, and reported a large number of results. These works represent the fascinating development of research on the demand fort money. The growing number of works, though still few in number, also shed important light on various aspects of money demand function in Bangladesh.

Chapter 4

THEORY AND RESEARCH METHODOLOGY

This chapter is divided into two parts. The first part contains a discussion of conceptual and theoretical issues related to demand for money. The second part describes the methodology and modeling that have been used to conduct an empirical study of different aspects of demand for money.

4.1 Definition of money

Generally money is known as the means of payment or medium of exchange. It can be said that whatever is generally accepted in exchange is called money. In earlier years, money was known as the means of payment that is generally accepted. Moreover, it also had the feature of not taking interest. So, in that period, money was known as the sum of currency and demand deposits that did not earn any interest. This definition of money is now known as the narrow money (M1).

In the 1980s, many interest bearing assets became checkable. When these assets were included in the definition of money, this came to be known as the broad money (M2).

4.2 Demand for money

Both theoretically and practically, the demand for money has been studied very intensively. From these studies, it is generally agreed that two things affect the demand for money, that is, the demand for real cash balances. These are income and the interest rate. It is found that there is a positive relationship between real income and demand for money whereas a negative relationship between nominal interest rate and demand for money.

4.3 Stable and unstable demand for money

Empirical works on the demand for money till 1973 showed a very stable money demand function. In those studies, it was seen that demand for real balance increased with increase in real income and decrease in nominal interest rate. From about 1974, the demand for money function became unstable as it shifted several times. This can be due to the changes in the financial system. Explaining this instability in the money demand function has been an important area of research.

4.4 Components of money stock

There are various definitions of money. These are M1 (narrow money), M2 (broad money) and M3.

M1 is most closely related to the traditional definition money. It includes those claims that are liquid. An asset is liquid if it can be used immediately, conveniently and cheaply for making payments. So, M1 comprises things that can be used directly, instantly and without restrictions to make payments.

M2 includes the components of M1 and also claims that are not instantly liquid. M2 includes time deposits in addition to the narrow money. Time deposits are not instantly liquid in the sense that withdrawal of time deposits may require notice to the depository institution.

M3, another definition of money, includes items such as large negotiable deposits and repurchase agreements. Generally these are held by corporations and sometimes by very wealthy people. Although most people never see these items, these are also included in the very broader definition of money as these can also be used as means of payment. In Bangladesh, as in many other developing countries, data on M3 are not yet reported nor have we found any research work that dealt with M3.

4.5 The functions of money

There are four functions of money. These are medium or exchange, store of value, unit of account and standard of deferred payment. These are described below.

Medium of exchange is the first function of money. In a barter economy where there is no money, every transaction needed a double coincidence of wants, which means the wants of two individuals would have to be identically same for the exchange to take place. But this function of money makes it unnecessary for there to be a double coincidence of wants.

Store of value is an asset that maintains value over time. An asset will not be used for money if it were not a store of value. For this function of value, a person can use it as a means of payment at a future date. There are many stores of value other than money like bonds, stocks and houses.

The third function is the unit of account. This is the unit in which prices are quoted. Although it is generally seen that the money unit of a country is the unit of account, it is not a necessary condition. In countries

where there is high-inflation. U.S. dollar is used as the unit of account and the money unit of that country is used as the medium of exchange.

The last function of money is that it is a standard of deferred payment, for this function, money can be used in long-term transactions like loans. Like the third function, it is not necessary that the money unit of a country be the standard of deferred payment. For example, the final payment of a loan may be related with the behavior of the price level, known as indexed loan.

Of the above four functions, the last two functions of money are functions that it usually performs but not function that it necessarily performs. Many assets perform the second function. It should be noted that whatever is generally accepted in exchange is money. Various things have been used as money because they are believed to be accepted in payment by others later on.

4.6 The theory of demand for money

In explaining why people demand money, macroeconomics texts have mentioned three major motives of demand for money and focused on effects of changes in income and interest rate on demand for money.

The demand for money, the texts explain, is a demand for real balances. Dornbusch and Fischer (1995: 375) say, "...people hold money for its purchasing power, for the amount of goods they can buy with it. They are not concerned with their *nominal* money holdings, that is, the number of dollar bills they hold." This means that the individuals do not suffer from money illusion.

Keynes (1936) mentioned three motives for holding money. Dornbusch and Fischer (1995) described them in the following way:

(a) The transaction motive, which is the demand for money for making regular payments;

(b) The precautionary motive, which is the money required for meeting unforeseen contingencies; and

(c) The speculative motive, which arises from uncertainties of the money value of other asset, which an individual can hold.

In terms of the components of money that we discussed above, the transactions and the precautionary motives refer to M1 whereas the speculative motive refers more to M2 or M3.

4.7 Empirical study of demand for money

Estimation of elasticity of money demand with respect to income and interest rate is a key objective in empirical study of demand for money. The income elasticity demand can be written as:

$$\frac{\frac{\partial(M/P)}{M/P}}{\frac{\partial Y}{Y}} \tag{4.1}$$

where M refers to nominal money, P refers to price level and Y refers to income.

Similarly, interest elasticity of money call be written as

$$\frac{\frac{\partial(M/P)}{M/P}}{\frac{\partial i}{i}} \tag{4.2}$$

where M refers to nominal money, P refers to price level and i refers to interest.

For empirical estimation, when demand for money is written as a function of income and interest rate, the double-log form is used. This means that log of dependent and independent variables are taken so that the coefficient of income and interest rate now show elasticity of money

demand with respect to these variables. If the money demand function is written thus:

$$\log M = a + b \log Y - c \log i \qquad (4.3)$$

Now if logM is differentiated with respect to Y, we have

$$\frac{dlogM}{dlogY} = \frac{\dfrac{(MI\ P)}{M/p}}{\dfrac{y}{Y}} = b \qquad (4.4)$$

Similar expression can be obtained for elasticity of money demand with respect to other variables. This justifies application of the double-log from used by many researchers as well as in this thesis.

4.8 The short and the long-run demand for money

Here, a model that can generate both the short-run and the long-run money demand function are presented. The key feature of this type of model is the presence of a term in the money demand function that takes care of the adjustment from the short to the long-run. The model has been used, among others, by Chow (1966) and Gujarati (1995). This enables us to study both short- and long-run demand for money:

$$M_1^\bullet = /J_{0^11} \cdot PlyP2_1 \ e^{\mathbf{I}} \qquad (4.5)$$

where   M/ = desired or long-run demand for money;

i_t = long-term interest rate, %;

Y_t = aggregate real national income;

For econometric estimation, (4.5) may be written as

$$\ln M_t^* = \ln\beta_0 + \beta_1 \ln i_t + \beta_2 \ln Y_t + u_t \qquad (4.6)$$

The desired demand variable cannot be directly observed. Hence, the stock adjustment hypothesis can be stated as

$$M_t / M_{t-1} = (M_t^* / M_{t-1})^\delta \qquad 0 < \delta < 1 \qquad (4.7)$$

the meaning of (4.7) is that a constant percentage of the discrepancy between the actual and desired real cash balances is eliminated within a single period (say, a year). In log form, equation (4.7) may be expressed as

$$\ln M_t - \ln M_{t-1} = \delta(\ln M_t^* - \ln M_{t-1}) \qquad (4.8)$$

Substituting ln M/ from (4.6) into (4.8) and rearranging, we have

$$\ln M_t = \delta\ln\beta_0 + \beta_1\delta\ln i_t + \beta_2\delta\ln Y_t + (1-\delta)\ln M_{t-1} + \delta u_t \qquad (4.9)$$

which is a short-run demand function for money. If it is divided by 8, the long-run estimate can be obtained. Gujarati provided estimates of this

function usmg Canadian data. This model is agam briefly stated m Chapter 6 where empirical results based on it are presented.

4.9 Monetary and fiscal policy and money demand

Dornbusch and Fischer (1995) and other textbook writers have asserted that the demand for money plays an important role in determining the effectiveness of monetary and fiscal policies. They have explained the theoretical reasons for which the demand for real balances should depend on the rate of interest and why this relationship should be negative.

According to the theory of money demand, the demand for money should also depend on the level of income. This can be measured by estimating the income elasticity of money demand. In this thesis, both interest and income elasticities are carefully estimated and analyzed.

4. 10 Properties of money demand

In an early work, Goldfeld (1973) advanced four essential properties of money demand that have been confirmed in subsequent studies. The properties can be summarized thus:

(a) The demand for real money depends negatively on the rate of interest.

(b) The demand for money is positively influenced by real income.

(c) The long-run responsiveness of money demand to changes in interest rate and income is greater than the short run response.

(d) There is no money illusion, that is, the demand for nominal money is proportional to the price level.

In this thesis, these properties will be empirically examined.

4.11 The time series econometrics and tests of stationarity

If a variable whose values are given for a long time series is found to be nonstationary then this reflects instability in the short run. To test stationarity of a variable, the Dickey-Fuller (DF) test is widely applied. However, this test assumes that error terms are uncorrelated. If the error terms are correlated, as quite frequently is the case, then the DF test is not appropriate. Another test, also advanced by Dicky and Fuller, is known as the Augmented Dickey-Fuller (ADF) test. This test takes into consideration the problem of autocorrelation, that is, possible relation between the error terms. The ADF test requires estimation of an equation like the following:

$$Y_t = \beta_1 + \beta_2 t + \alpha Y_{t-1} + \sum_{i=1}^{m} Y_{t-1} + \varepsilon_t \qquad (4.10)$$

where ε_t is the error term and where $Y_{t-1} = (Y_{t-1} - Y_{t-2})$. The ADF test has the same critical values as the DF test. Inclusion of the lagged difference term and their number is empirically determined. The main objective is to have enough terms so that the error term is serially uncorrelated,

4.12 Test of cointegration

A test of cointegration between variables of the same order of integration can be made. Cointegration can be between any two variables or between the dependent variable and all other independent variables. The latter is known as multiple cointegration. The foremost among the cointegration tests is the Johansen test, which is used for empirical testing in this thesis using the econometric software Microfit.

4.13 Chapter summary

In this chapter, conceptual issues and empirical methodology related to the study of demand for money have been described. These include theoretical issues of demand for money, modeling money demand function for empirical study, short- and long-run money demand function and the methodology of the study of stability of money demand.

Together, these will enable us to undertake a fairly comprehensive study of money demand in Bangladesh.

Chapter 5

DATA FOR THE STUDY

A description of data that are needed for econometric estimation of the money demand functions of various types and for the analysis of stability of money demand function is provided in this chapter. Along with a description of the data, an analysis of these data as well as a comparison between them are made. This will give a clear picture of the demand for money in Bangladesh, whose econometric analysis is conducted in the following chapter.

5.1 Narrow money and its components in current term

The trend of narrow money demand and its components are described in the following pages with the help of both table and figure. Data of these variables have been collected from various issues of the *Bangladesh Economic Review.*

Money outside bank in current term has gone through a steady growth during the period of 1976 to 2006. It was 3.30 billion taka in 1976, then gradually increased to 19.50 billion taka in 1986. In 1996, its growth was rather fast and it increased to 71.20. Finally, it became 228.60 billion taka in 2006.

Current currency deposits had almost a similar pattern of increase during the period of study. It was 5.50 billion taka in 1976, increased to 29.80 in 1986. The trend continued even after the post-liberalisation period. In 1996, the current currency deposit rose to 73.40 billion taka. The growth was continuous and by the year 2006, the amount reached 202.70 billion taka.

The current narrow money (Ml) is the combination of the above two components. So it followed a quite similar path for this period. Of the two components, currency deposit was bigger in the early part of this study but money outside bank increased at a faster rate and gradually became the bigger component of current M1 from the year 1998. Current narrow money demand was 8.80 billion taka in 1976, increased to 49.30 in 1986. The trend continued even after the post-liberalisation period. In 1996, the current currency deposit rose to 144.60 billion taka. The growth was continuous and by the year 2006, the amount reached 431.30 billion taka.

Table 5.1: Money outside bank, current deposit and narrow money (Ml) for the period 1976 to 2006 in current billion taka

<div align="right">(in current billion taka)</div>

Year	Money outside bank	Current deposit	Narrow money (Ml)
1976	3.3	5.5	8.8
1977	3.6	6.2	9.7
1978	5.0	7.2	12.2
1979	6.1	9.1	15.2
1980	6.9	10.4	17.3
1981	9.2	10.7	19.9
1982	8.8	11.4	20.1
1983	11.4	15.0	26.3
1984	15.6	19.9	35.5
1985	17.2	25.1	42.3
1986	19.5	29.8	49.3
1987	20.8	31.9	52.6
1988	24.2	26.3	50.5
1989	26.2	28.5	54.6
1990	31.9	31.8	63.7
1991	36.1	35.9	72.0
1992	40.7	41.9	82.6
1993	44.8	45.8	90.6
1994	54.2	57.5	111.7
1995	65.7	66.1	131.8
1996	71.2	73.4	144.6
1997	75.8	75.9	151.7
1998	81.5	77.4	158.9
1999	86.9	85.6	172.5
2000	101.8	97.1	198.8
2001	114.8	108.7	223.5
2002	125.3	116.3	241.6
2003	139.0	128.4	267.4
2004	158.1	146.9	305.0
2005	185.2	170.3	355.5
2006	228.6	202.7	431.3

Sources: Government of Bangladesh, *Bangladesh Economic Review,* various issues.

The trend of these variables during the period of 1976 to 2006 can be seen more clearly in Figure 5.1.

Figure 5.1: Money outside bank, current deposit and narrow money for the period 1976 to 2006 in current billion taka
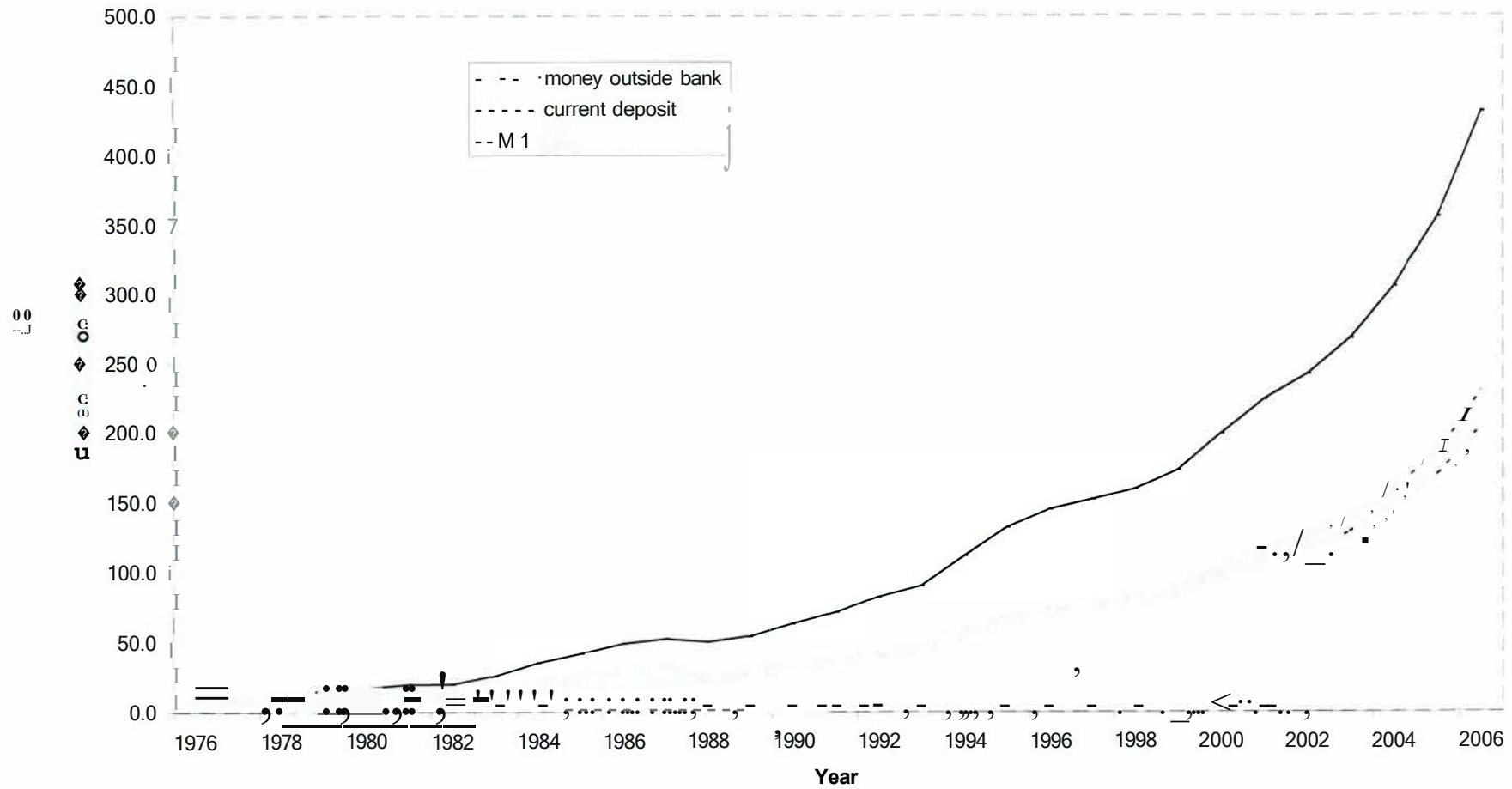
5.2 Narrow money, time deposit and broad money in current term

The trend of broad money demand and its components are described in the following pages with the help of both table and figure. In the following table and figure, the data of narrow money, time deposit and broad money are given for the period 1976 to 2006. Data of these variables have been collected from various issues of *Bangladesh Economic Review.*

As the trend of narrow money discussed above, only the trends of time deposit and broad money in current terms are discussed below. Current time deposits continuously increased during the period of study but the growth was very fast during the second half of the period. It was 5.20 billion taka in 1976, increased to 74.10 in 1986. The increase continued at a greater amount and reached 312.30 in the year 1996. By 2006, the amount reached a mammoth 1380.20 billion taka.

The current broad money (M2) is the sum of the above two components. The trend followed the pattern of time deposit because it formed the larger part of broad money. Current broad money demand was 14.00 billion taka in 1976, increased to 123.40 in 1986. In 1996, the current currency deposit rose to 457.60 billion taka. The growth was continuous and in 2006, the amount reached 1811.60 billion taka.

Table 5.2: Narrow money (Ml), time deposit and broad money (M2) for the period 1976 to 2006

(in current billion taka)

Year	Narrow money (Ml)	Time deposit	Broad money (M2)
1976	8.8	5.2	14.0
1977	9.7	7.7	17.4
1978	12.2	9.2	21.4
1979	15.2	12.4	27.6
1980	17.3	15.1	32.4
1981	19.9	21.5	41.4
1982	20.1	25.4	45.5
1983	26.3	32.6	59.0
1984	35.5	48.4	83.9
1985	42.3	63.0	105.3
1986	49.3	74.1	123.4
1987	52.6	90.9	143.5
1988	50.5	113.6	164.1
1989	54.6	136.2	190.8
1990	63.7	159.3	223.0
1991	72.0	178.0	250.1
1992	82.6	202.7	285.3
1993	90.6	224.7	315.4
1994	111.7	252.4	364.0
1995	131.8	290.3	422.7
1996	144.6	312.3	457.6
1997	151.7	354.6	507.1
1998	158.9	399.8	558.7
1999	172.5	457.8	630.3
2000	198.8	548.8	747.6
2001	223.5	648.3	871.7
2002	241.6	744.5	986.2
2003	267.4	872.5	1140.0
2004	305.0	992.7	1297.7
2005	355.5	1160.4	1515.9
2006	431.3	1380.2	1811.6

Sources: Government of Bangladesh, *Bangladesh Economic Review,* various issues.

Figure 5.2: Narrow money, time deposit and broad money for the period 1976 to 2006
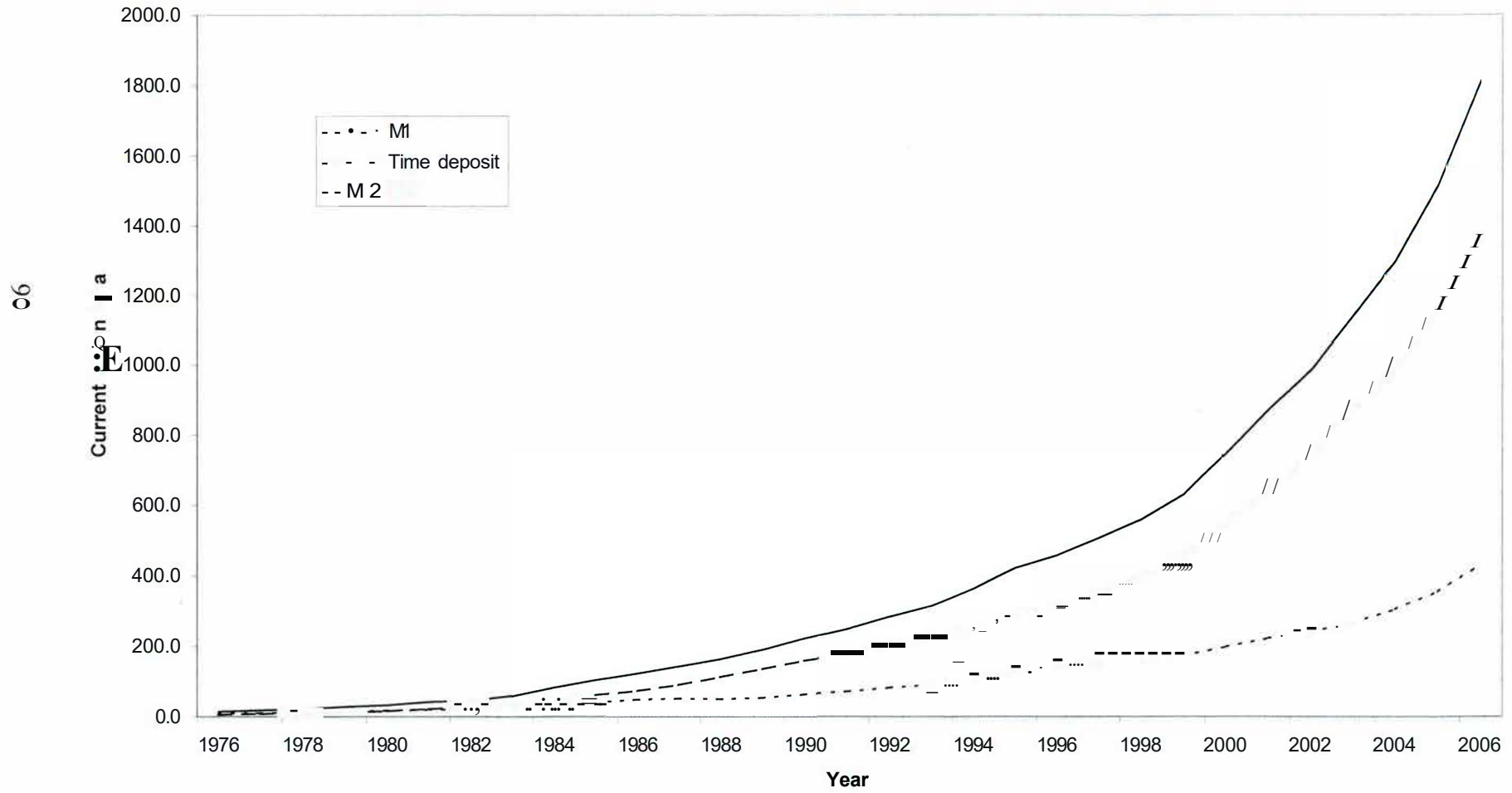
5.3 GDP deflator series

When M1 and M2 are stated in nominal term, these refer to supply of money. Since demand for money refer to demand for real balance, it has to be stated in real terms. Practically, this means that when M1 and M2 are divided by P, demand for money is obtained, which can be written as M1/P and M2/P.

The basic data of the GDP deflator series has been obtained from various issues of *World Development Indicators*. The remaining part of the series has been constructed on the basis of the series with the help of inflation data. The base year for the study is 1990. Choosing 1990 as the base year has the following two advantages. Firstly, it falls almost in the middle part of our study. Secondly, from this time the liberalization process started.

From the GDP deflator series, it can be seen that it is 100.0 in 1990 because this is the base year. It was 27.9 at the starting year of the study, that is 1976. In 1986, it became 74.1. After another ten years, it was 127.1 in the year 1996. After another ten years in 2006 which is the end year of our study, it reached 197.6.

Table 5.3: GDP deflator series

Year	GDP deflator
1976	27.9
1977	27.4
1978	34.4
1979	38.1
1980	43.2
1981	45.8
1982	49.2
1983	53.0
1984	60.7
1985	67.5
1986	74.1
1987	82.2
1988	88.5
1989	95.4
1990	100.0
1991	106.8
1992	110.3
1993	110.9
1994	114.7
1995	122.4
1996	127.1
1997	133.2
1998	140.1
1999	146.7
2000	149.4
2001	151.8
2002	156.7
2003	163.6
2004	173.1
2005	184.3
2006	197.6

Sources: Bangladesh Bureau of Statistics, *Statistical Yearbook of Bangladesh,* various issues.
Government of Bangladesh, *Bangladesh Economic Review,* various issues.
World Bank, *World Development Indicators,* various issues.

5.4 Narrow money and its components in real term

The trend of narrow money demand and its components are described in the following pages with the help of both table and figure. The demand for narrow money can be defined as the narrow money demand in real terms. This is derived by deflating the current narrow money demand by the GDP deflator. The same thing is done for the components of narrow money demand, which are money outside banks and current deposits. These are described in the following pages with the help of both table and figure.

Data of these variables in nominal term have been collected from various issues of *Bangladesh Economic Review.* Then they were deflated by the GDP deflator series to have these series in real term.

Money outside bank in real term has gone through a steady growth during the period of 1976 to 2006. It was 11.83 billion taka in 1976, then gradually increased to 26.32 billion taka in 1986. In 1996, its growth was quite similar and it increased to 56.20. Finally, it became 115.69 billion taka in 2006.

Real currency deposits increased during the period of study with some fluctuations in some years. It was 19.71 billion taka in 1976,

increased to 40.22 in 1986. The trend continued even after the post-liberalisation period. In 1996, the real currency deposit rose to 57.75 billion taka. The growth gained speed and by the year 2006, the amount reached 102.58 billion taka. Although the growth was steady from decade to decade, it decreased in some years within the decades.

The real narrow money (M1) is the combination of the above two components. So in this period, it had characteristics of both the components, it had quite a steady growth as well as it also experienced some decrease in some years. Of the two components, currency deposit was bigger in the early part of this study but money outside bank increased at a faster rate and gradually became the bigger component of real M1 from the year 1998. Real narrow money demand was 31.54 billion taka in 1976, increased to 66.53 in 1986. The trend continued even after the post-liberalisation period. In 1996, the real currency deposit rose to 113.77 billion taka. The growth experienced marginal decrease in 1998 but otherwise its increase was continuous and by the year 2006, the amount reached 218.27 billion taka.

The trend of these variables during the period of 1976 to 2006 can be seen more clearly in Figure 5.3.

Table 5.4: Money outside bank, currency deposit and narrow money (M 1) for the period 1976 to 2006 in real billion taka

(in real billion taka)

Year	Money outside bank	Real deposit	Narrow money (M 1)
1976	11.83	19.71	31.54
1977	13.14	22.63	35.77
1978	14.53	20.93	35.47
1979	16.01	23.88	39.90
1980	15.97	24.07	40.05
1981	20.09	23.36	43.45
1982	17.89	23.17	41.06
1983	21.51	28.30	49.81
1984	25.70	32.78	58.48
1985	25.48	37.19	62.67
1986	26.32	40.22	66.53
1987	25.30	38.81	64.11
1988	27.34	29.72	57.06
1989	27.46	29.87	57.34
1990	31.90	31.80	63.70
1991	33.80	33.61	67.42
1992	36.90	37.99	74.89
1993	40.40	41.30	81.70
1994	47.25	50.13	97.38
1995	53.68	54.00	107.68
1996	56.02	57.75	113.77
1997	56.91	56.98	113.89
1998	58.17	55.25	113.42
1999	59.24	58.35	117.59
2000	68.14	64.99	133.13
2001	75.63	71.61	147.23
2002	79.96	74.22	154.18
2003	84.96	78.48	163.45
2004	91.34	84.86	176.20
2005	100.48	92.40	192.89
2006	115.69	102.58	218.27

Sources: Government of Bangladesh, *Bangladesh Economic Review,* various issues.

Figure 5.3: Money outside bank, currency deposit and narrow money for 1976 to 2006 in real billion taka
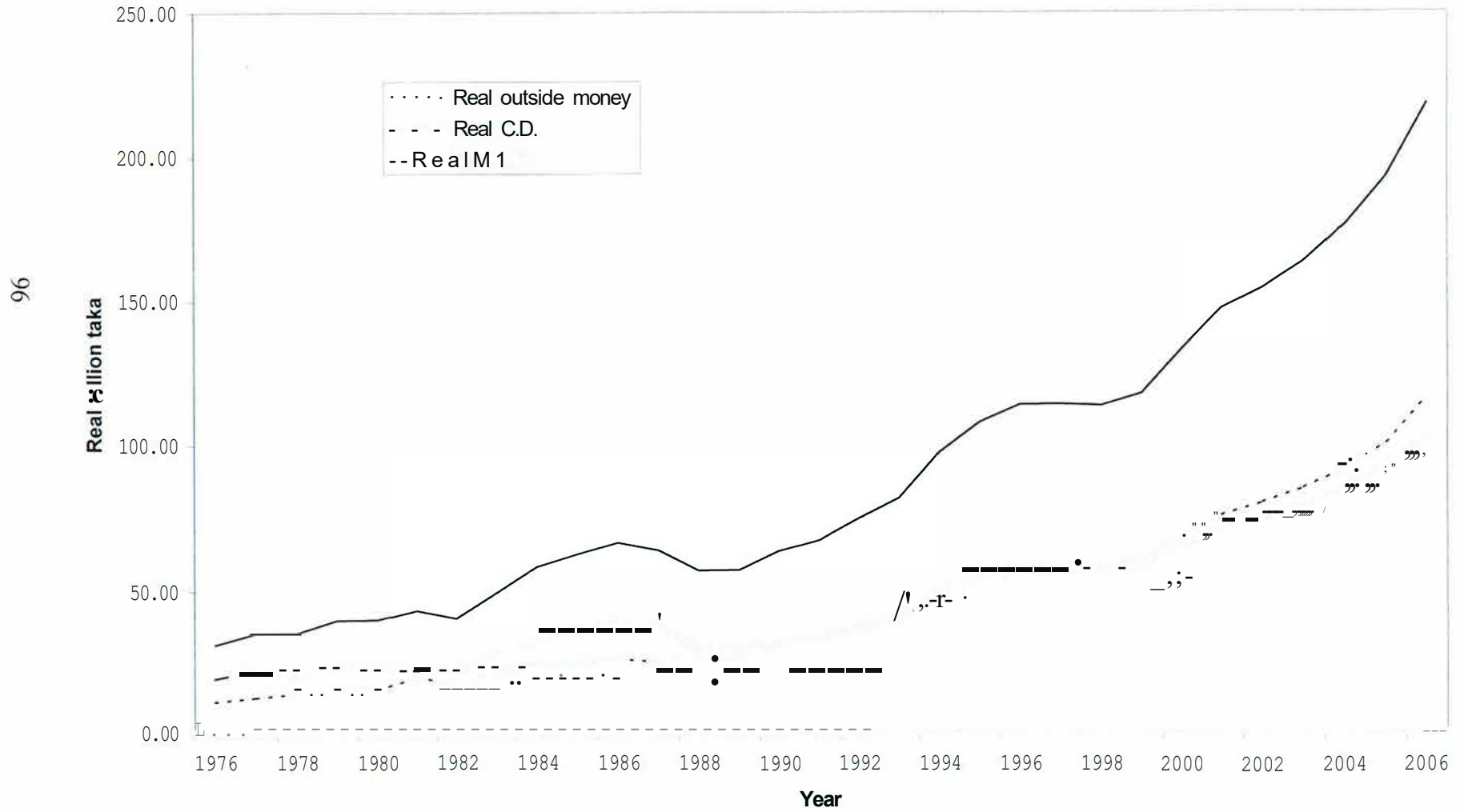
5.5 Narrow money, time deposit, and broad money in real term

The demand for broad money can be defined as the broad money demand in real terms. This is derived by deflating the real narrow money demand by the GDP deflator. The same thing is done for the components of broad money demand, which are narrow money and time deposits. These are described below with the help of table and figure. Data of these variables in nominal term have been collected from various issues of *Bangladesh Economic Review.* Then they were deflated by the GDP deflator series to have these series in real term.

Trend of real narrow money have been discussed earlier. So this discussion stat s with trend of real time deposits. Real time deposit followed a quite steady increase with some early fluctuations. It was 18.64 billion taka in 1976, then gradually increased to 100.00 billion taka in 1986. In 1996, its growth was quite similar and it increased to 245.71. Finally, it became 698.48 billion taka in 2006.

The real broad money (M2) increased during this period with the exception of 1978. Real broad money demand was 50.18 billion taka in 1976, increased to 166.53 in 1986. In 1996, it rose to 360.03 billion taka. The growth gained speed and reached 916.80 billion taka in 2006. These trends can be seen more clearly with the following figure.

Table 5.5: Narrow money (Ml), time deposit and broad money (M2) for the period 1976 to 2006 in real billion taka

(in real billion taka)

Year	Narrow money (M l)	Time deposit	Broad money (M2)
1976	31.54	18.64	50.18
1977	35.77	28.10	63.87
1978	35.47	26.74	62.21
1979	39.90	32.55	72.44
1980	40.05	34.95	75.00
1981	43.45	46.94	90.39
1982	41.06	51.63	92.68
1983	49.81	61.51	111.32
1984	58.48	79.74	138.22
1985	62.67	93.33	156.00
1986	66.53	100.00	166.53
1987	64.11	110.58	174.70
1988	57.06	128.36	185.42
1989	57.34	142.77	200.10
1990	63.70	159.30	223.00
1991	67.42	166.67	234.08
1992	74.89	183.77	258.66
1993	81.70	202.61	284.31
1994	97.38	220.05	317.44
1995	107.68	237.17	344.85
1996	113.77	245.71	359.48
1997	113.89	266.22	380.11
1998	113.42	285.37	398.79
1999	117.59	312.07	429.65
2000	133.13	367.34	500.47
2001	147.23	427.08	574.31
2002	154.18	475.11	629.29
2003	163.45	533.31	696.76
2004	176.20	573.48	749.68
2005	192.89	629.63	822.52
2006	218.27	698.48	916.80

Sources: Government of Bangladesh, *Bangladesh Economic Review,* various issues.

Figure 5.4: Narrow money, time deposit and broad money for the period 1976 to 2006 in real billion taka
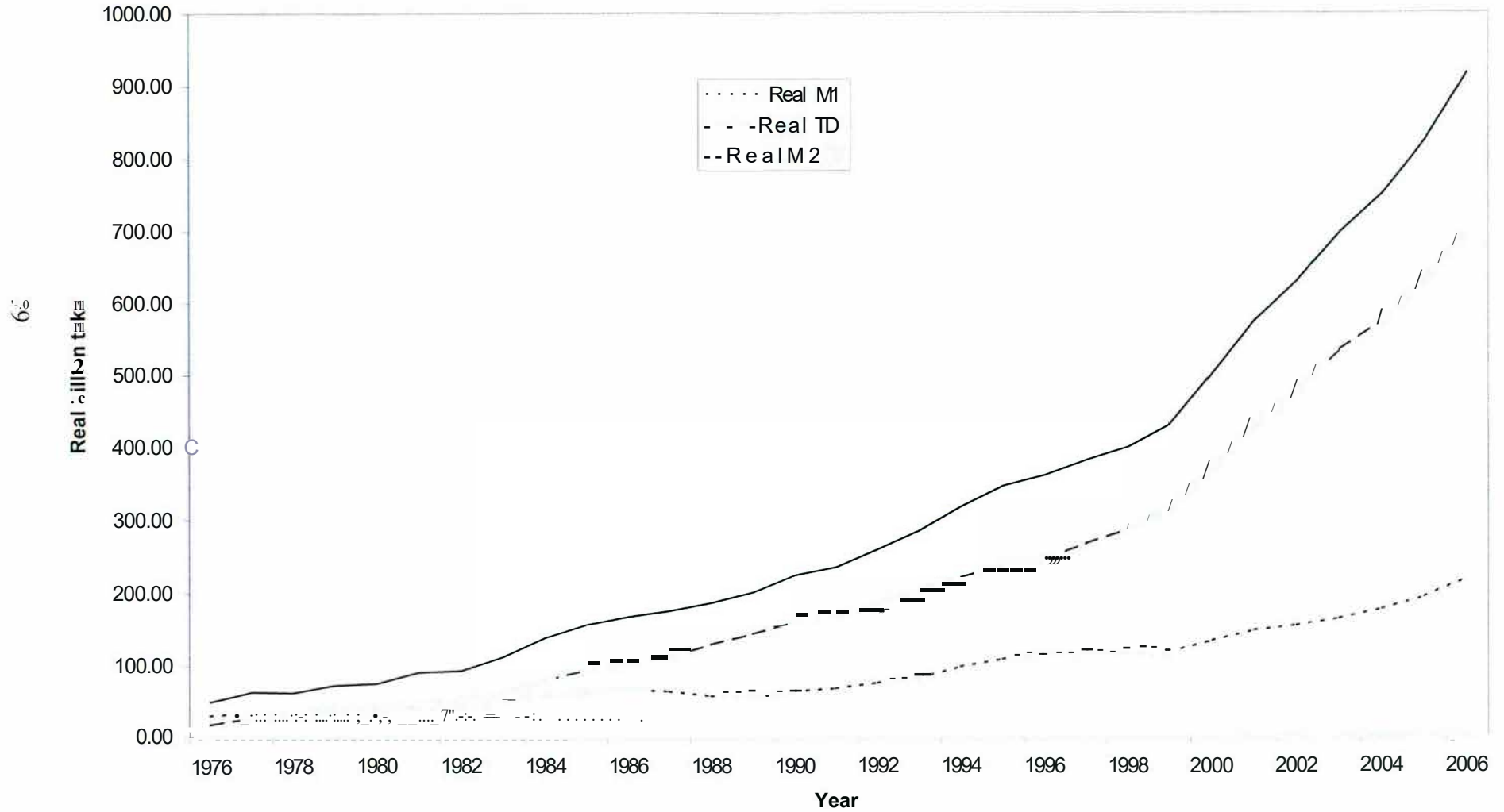
5.6 Percentage share of money outside bank, current deposit and time deposit in broad money in real term

The percentage shares of the three components of broad money real term are discussed below. Data for these shares are calculated using the real value of the three components.

In the early part of our study, the shares of these components were quite close although the share of money outside bank was a bit behind. Later on, shares of both money outside banks and currency deposit decreased even though their amount in both nominal and real terms increased. On the other hand, the share of time deposit in real term more than doubled during this period.

The above trends indicate the changes in the saving pattern of the people of Bangladesh. This may also indicate the improvement in the economic condition of the country. These trends are now individually described below.

The trend of percentage share of money outside bank in real term has gone through a steady decline during the period of 1976 to 2006. Its share was 23.57 percent in 1976, then gradually decreased to 15.80

percent in 1986. In the next ten years it hovered around 15 percent and stood at 15.58 percent in 1996. After that, it continuously decreased again except the last couple of years and the share was 12.62 percent in 2006.

The trend of percentage share of current deposit in real term has also gone through a steady decline during the period of 1976 to 2006. Its share was 39.29 percent in 1976, and then gradually decreased to 24.15 percent in 1986. This trend continued and stood at 16.06 percent in 1996. It continuously decreased again for the last ten years except 2004 and the share became 11.19 percent in 2006.

The trend of percentage share of time deposit followed a completely different pattern. Although its share experienced some fluctuations in some individual years as well as in the early part of 1990s, the share increased. Its share was 37.14 percent in 1976, and then gradually increased to 60.05 percent in 1986. In the next two years it increased dramatically to almost 70 percent but then it hovered around it and stood at 68.35 percent in 1996. After that, it continuously increased again except the year 2004 and the share reached a staggering 76.19 percent in 2006. The trend of these variables during the period of 1976 to 2006 can be seen more clearly with the following figure.

Table 5.6: Percentage share of money outside bank, current deposit and time deposit in broad money (M2) for the period 1976 to 2006

(in real term)

Year	Share of money outside bank in M2 (%)	Share of current deposit in M2 (%)	Share of time deposit in M2 (%)
1976	23.57	39.29	37.14
1977	20.57	35.43	44.00
1978	23.36	33.64	42.99
1979	22.10	32.97	44.93
1980	21.30	32.10	46.60
1981	22.22	25.85	51.93
1982	19.30	25.00	55.70
1983	19.32	25.42	55.25
1984	18.59	23.72	57.69
1985	16.33	23.84	59.83
1986	15.80	24.15	60.05
1987	14.48	22.21	63.30
1988	14.75	16.03	69.23
1989	13.72	14.93	71.35
1990	14.30	14.26	71.43
1991	14.44	14.36	71.20
1992	14.27	14.69	71.05
1993	14.21	14.53	71.27
1994	14.89	15.79	69.32
1995	15.57	15.66	68.78
1996	15.58	16.06	68.35
1997	14.97	14.99	70.04
1998	14.59	13.85	71.56
1999	13.79	13.58	72.63
2000	13.62	12.99	73.40
2001	13.17	12.47	74.36
2002	12.71	11.79	75.50
2003	12.19	11.26	76.54
2004	12.18	11.32	76.50
2005	12.22	11.23	76.55
2006	12.62	11.19	76.19

Sources: Bangladesh Bureau of Statistics, *Statistical Yearbook of Bangladesh,* various issues.
Government of Bangladesh, *Bangladesh Economic Review,* various issues.
World Bank, *World Development Indicators,* various issues.

Figure 5.5: Percentage share of money outside bank, current deposit and time deposit in broad money for the period 1976 to 2006
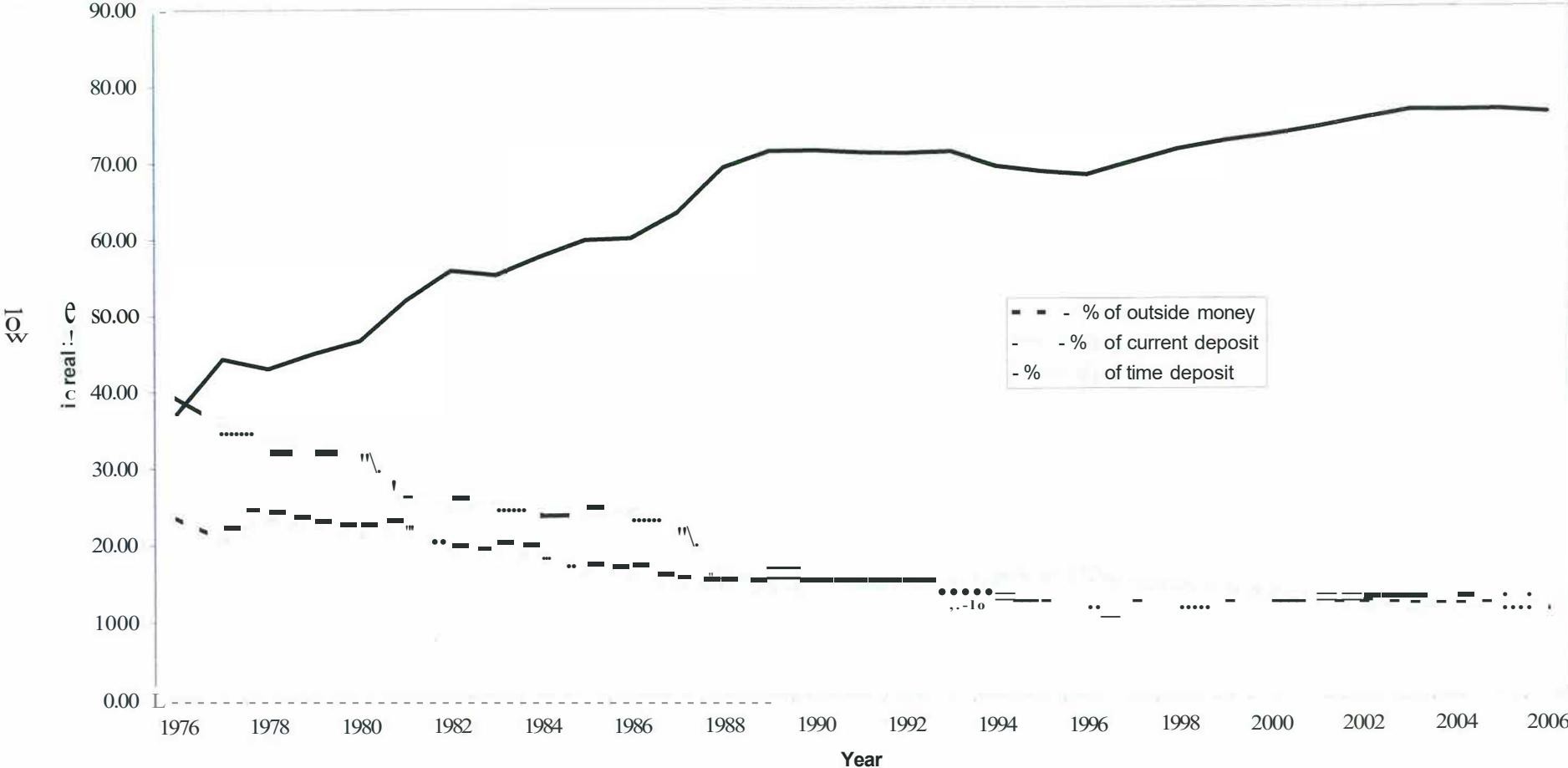
5.7 Real GDP, interest and exchange rate

The trend of nominal GDP, real GDP, nominal interest rate and exchange rate are described in the following pages with the help of table. The relationship of demand for both narrow and broad money with income is seen with the income in real terms. But the GDP series is given below in both nominal and real terms. The nominal interest rate and the inflation rate are also described in the following pages with the help of both table and figure.

As data of these variables are different in nature, data have been collected from various sources. These include various issues of *Bangladesh Economic Review, Statistical Yearbook of Bangladesh, Economic Trends,* and *World Development Indicators.*

Nominal GDP of Bangladesh has gone through a steady increase during 1976 to 2006 except the year 1977. Nominal GDP was 148.90 billion taka in 1976, and then gradually increased to 628.40 billion taka in 1986. In 1996, its growth was quite similar and it increased to 1648.40. Finally, it became 4161.60 billion taka in 2006.

Real GDP of Bangladesh has also gone through a steady increase during 1976 to 2006 except the year 1977. Real GDP was 533.69 billion

taka in 1976, and then gradually increased to 848.04 billion taka in 1986. In 1996, its growth was quite similar and it increased to 1296.93. Finally, it became 2106.07 billion taka in 2006.

Table 5.7: Data of nominal and real GDP, nominal interest rate and rate of exchange for the Period 1976 to 2006

Year	y (GDP, in current billion Tk)	y (GDP, in real billion Tk)	i (Nominal interest rate,%)	E (Exchange rate)
1976	148.9	533.69	9.25	15.05
1977	148.0	540.15	10.25	15.43
1978	199.0	578.49	10.25	15.12
1979	234.8	616.27	10.25	15.22
1980	270.2	625.46	15.00	15.49
1981	315.5	688.86	15.00	16.26
1982	350.9	713.21	15.00	20.07
1983	395.5	746.23	15.00	23.80
1984	475.2	782.87	15.00	24.94
1985	548.5	812.59	15.00	25.96
1986	628.4	848.04	15.00	29.89
1987	726.8	884.18	14.25	30.63
1988	804.9	909.49	14.25	31.24
1989	889.1	931.97	14.25	32.14
1990	994.2	994.20	14.25	32.92
1991	1097.0	1027.15	9.11	35.67
1992	1188.9	1077.88	8.11	38.15
1993	1249.9	1127.05	6.51	39.14
1994	1342.4	1170.36	5.34	40.00
1995	1512.1	1235.38	4.86	40.20
1996	1648.4	1296.93	6.11	40.84
1997	1807.0	1356.61	6.67	42.70
1998	2001.8	1428.84	7.01	45.46
1999	2197.0	1497.61	7.28	48.06
2000	2370.9	1586.95	7.21	50.31
2001	2535.5	I670.29	7.03	53.95
2002	2732.0	1743.46	7.00	57.43
2003	3005.8	1837.29	8.17	57.90
2004	3329.7	1923.57	5.74	58.93
2005	3707.1	2011.45	9.30	61.39
2006	4I61.6	2106.07	11.10	67.08

Sources: Bangladesh Bank, *Economic Trends,* various issues.
Bangladesh Bureau of Statistics, *Statistical Yearbook of Bangladesh,* various issues.
Government of Bangladesh, *Bangladesh Economic Review,* various issues.
World Bank, *World Development indicators,* various issues.

Nominal interest rate of Bangladesh can be divided into two phases. The first phase is the pre-liberalisation period when the interest rate was kept fixed and changed by the central bank while the second phase is the post-liberalisation period when the interest rate became flexible to some extent and the central bank's influence was limited. The nominal interest rate was 9.25 percent in 1976, it was 10.25 in the following three years, then it was fixed at 15 percent for the period 1980 to 1986. From 1987 to 1990, the rate was 14.25 percent. From 1991, the rate of interest fluctuated as there was no central control over it. It was 9.11 percent in 1991, decreased to 6.11 percent in 1996. It then gradually increased to 11.10 percent in 2006.

Rate of exchange of Bangladeshi taka against US dollar steadily declined for this period. It was 15.05 in 1976. In the next ten years, it increased gradually and stood at 29.89 taka in 1986. In 1996, the exchange rate against US dollar for taka became 40.84 and in 2006 it reached 67.08 taka in 2006.

5.8 Chapter summary

Data on various aspects of demand for money have been described in this chapter. Along with the main data that will be used for econometric estimation, various components of these data have also been

described. This has been done to obtain a clearer picture of the determinants of demand for money in Bangladesh. Below, a summary of growth of narrow and broad money, the two concepts used in this research are stated.

(a) Current narrow money demand was 8.80 billion taka in 1976, increased to 49.30 in 1986. The trend continued even after the post-liberalisation period. In 1996, the current currency deposit rose to 144.60 billion taka. The growth was continuous and by the year 2006, the amount reached 431.30 billion taka.

(b) Current broad money demand was 14.00 billion taka in 1976, increased to 123.40 in 1986. In 1996, the current currency deposit rose to 457.60 billion taka. The growth was continuous and in 2006, the amount reached 1811.60 billion taka.

It is seen from the above summary that the study of money demand function carried out in this thesis was done when both narrow and broad increased substantially. This implies a great deal of dynamism and make the study interesting.

Chapter 6

EMPIRICAL RESULTS

Empirical studies lay great emphasis on impact of income and interest on demand for money. Of these two variables, income is expected to affect money demand positively while a negative relationship is expected between interest rate and money demand.

In this study, both narrow and broad money, that is, M1 and M2, concepts are studied. An important question that is examined is which of these two definitions of money generates better and more sensible result. So, estimates of equations having M1 and M2 as dependent variables are provided.

Since the main interest is to obtain income and interest elasticity estimates, the double log form is used. In this case, coefficients of the variables stand for elasticity of money demand with respect to that variable.

Importance of elasticity of money demand with respect to income and interest rate has been widely discussed in standard texts in

macroeconomics. Relevant parts of such observations made by Dornbusch and Fischer (1994: 383-384) are quoted below:

" .... *interest elasticity* of the demand for money plays an important role in determining the effectiveness of monetary and fiscal policies. The response of the demand for money to the level of income, as measured by the *income elasticity* of money demand, is also important from a policy viewpoint. As we shall see, the income elasticity of money demand provides a guide to the Fed (the central bank) as to how fast to increase the money supply in order to support a given rate of growth of GNP without changing the interest rate."

The demand for money is regarded as a demand for real balance, that is, how much a given quantity of money can buy. Hence, in empirical studies, money is divided by the price level, P, to get the demand for real balance (M/P).

This study covers the period of 1976-2006. The year 1973, which is the First full fiscal year after the emergence of Bangladesh, is an abnormal year and is, hence, excluded from the analysis of this study. So, all estimation begins from 1976. In all, this study covers 31 years, which

Is the full picture of demand for money since the inception of Bangladesh.

6.1 The specific empirical objectives

The main empirical objectives of this study are the following:

a. Analyzing the estimated money demand function for the whole period, that is, for the period 1976 to 2006;

b. Highlighting the difference between M1 and M2 estimated money demand function;

c. Explaining the money demand functions obtained for the sub periods 1976 to 1990, which is the pre-liberalisation period and 1991 to 2006, which is the post-liberalisation period;

d. Finding whether the estimated money demand function for Bangladesh resembles the classical specification where money is regarded as a function of income alone or whether it resembles the Keynesian specification where money is regarded as a function of both income and interest rate;

e. Studying the inclusion of two additional variables - inflation and exchange rate - in the money demand function;

f. Distinguishing between the long-run and the short-run money demand function;

g. Considering stability of demand for money in the short- and the long-run;

h. Carefully considering the statistical significance of the estimated coefficients;

i. Analysing the estimated R^2 and Durbin-Watson values.

Implementation of these objectives, will provide a comprehensive and up-to-date picture of the state of money demand in Bangladesh.

6.2 The narrow money demand function

The estimated narrow money (M1) demand function for the whole period is reported below. Figures in the parentheses denote t-values in all equations:

$$\ln M1 = -3.774 + 1.201 \ln y - 0.085 \ln i \qquad (6.1)$$

$$(-8.316) \quad (24.449) \quad (-1.345)$$

$$R^2 = 0.957$$

$$D\text{-}W = 1.206$$

It is seen from equation (6.1) that the coefficient of income is 1.201, which means that elasticity of narrow money demand with respect

to income is greater than one. Statistically, the estimated coefficient is found to be highly significant, the t-value being 24.449. The coefficient of interest rate has the right sign, that is, negative. The coefficient is found to be very small, which is in line with earlier studies. The estimated coefficient of interest rate is not statistically significant as indicated by the t-value, which is found to be -1.345. The value R^2 is found to be 0.957, which is quite high. This means that income and interest rate together explain 95.7% of the variation in narrow money demand. Economically, it can be observed that of the two explanatory variables, income is more dominant than the rate of interest.

6.3 The broad money demand function

The broad money is denoted by M2 and is defined as narrow money plus long-term deposits. The estimated broad money demand function is given below:

$$\text{Ln } M2 = -7.769 + 1.909 \ln y - 0.016 \ln i \qquad (6.2)$$

$$(-22.799) \ (47.502) \quad (-0.335)$$

$$R^2 \quad = 0.990$$

$$\text{D-W} = 2.116$$

Equation (6.2) shows that coefficient of income is 1.909, which is higher than the narrow money elasticity of demand with respect to income. Statistically, the estimated coefficient is found to be highly

significant, the t-value being 47.502. The coefficient of interest rate has the right sign, that is, negative. However, the interest elasticity of broad money demand is found to be lower than that of the narrow money. The estimated coefficient is not statistically significant as indicated by the t-value, which is found to be -0.335. The value of R^2 is slightly higher at 0.990.

The empirical results or narrow and broad money together show that income is the dominant explanatory variable in the money demand function. The value of income elasticity is higher, and that of interest rate is lower, for broad money. It appears that the use of broader concept of money strengthened the influence of income, and weakened that of interest on money demand.

6.4 The pre- and post-liberalization periods

The period 1976-1990 is regarded as the pre-liberalization period characterized by fixity of interest rate, while the period 1991-2006 is thought of as post-liberalization period when greater reliance was placed on market mechanism that led to variation in the interest rate. This can be seen from the tables of Chapter 2, which provides a background to this

study. In order to look into these two periods, separate estimates of the narrow and broad money demand functions are presented below.

6.4.1 The pre-liberalization narrow money demand function

The narrow money demand function for the pre-liberalization period, that is, for 1976-1990 is presented below:

$$\ln M1 = -2.629 + 1.012 \ln y - 0.044 \ln i \qquad (6.3)$$

$$(-2.032) \quad (3.988) \qquad (-0.206)$$

$$R^2 \quad = 0.723$$

$$D\text{-}W = 1.643$$

The estimates above show that income elasticity of M1 is 1.012, which is lower than the value for the whole period, that is, 1.201. It is significant at the 1% level. The value of interest elasticity is -0.044 whose absolute value is found to be lower than the value of -0.085 found for the whole period. This is an interesting result. It is during this pre liberalization period that interest rate was often deliberately held constant by the monetary authority. As a result, interest rate had a lesser impact on M1 than it had for the whole period. Statistically, the coefficient of interest rate is not significant, the t-value being only -0.206 compared to a much higher value (-1.957) for the whole period.

6.4.2 The post-liberalization narrow money demand function

The narrow money demand function for the post-liberalization period, that is, for 1991-2006 is presented below:

$$\ln M1 = -5.686 + 1.480 \ln y - 0.150 \ln i \qquad (6.4)$$

$$(-11.812) \quad (20.985) \quad (-1.957)$$

$$R^2 = 0.973$$

$$D\text{-}W = 0.844$$

It can be seen from equation (6.4) that income elasticity of M1 is 1.480, which is higher than that for the pre-liberalization period. The coefficient of income is statistically highly significant with t-value of 20.985.

The estimate of interest elasticity of narrow money demand shows that there is nearly a ten-fold increase in the absolute value. The value is -1.50 compared to -0.044 for the pre-liberalization period. This is perhaps due to the fact that there was lesser intervention on the interest rate, which varied to some extent daring this period. As a result, a greater impact of interest rate on M1 was found. The statistical significance of the estimated coefficient is still very low, the t-value being -1.957, which shows significance at the 10% level.

It is necessary to mention here that interest rate still remained under control. At the time of completing this thesis, the central bank of Bangladesh, the Bangladesh Bank, pressed the commercial banks to lower the rate of interest, which the commercial banks reluctantly complied with.

6.4.3 The pre-liberalization broad money demand function

The broad money demand function for the pre-liberalization period, that is for 1976-1990, is presented below:

$$\ln M2 = -9.213 + 2.207 \ln y - 0.218 \ln i \qquad (6.5)$$

$$(-9.191) \quad (11.229) \quad (-1.317)$$

$$R^2 = 0.949$$

$$D\text{-}W = 2.449$$

The estimated equation show that income elasticity of M2 is 2.207 and interest elasticity is -0.218. The coefficient of income, which shows income elasticity, is highly significant but that of interest is not.

6.4.4 The post-liberalization broad money demand function

The broad money demand function for the post-liberalization period, that is estimates for M2, for 1991-2006 is presented below:

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$$\ln M2 = -7.298 + 1.845 \ln y - 0.020 \ln i \qquad (6.6)$$

$$(-20.218) \ (34.884) \quad (-0.347)$$

$$R^2 = 0.991$$

$$D\text{-}W = 0.485$$

The estimated equation shows that income elasticity of M2 is 1.845 and interest elasticity is -0.020. The coefficient of income, which shows income elasticity, is highly significant but that of interest rate is not. The interest elasticity of money demand is found to be lower than that obtained for the pre-liberalization period. This result is somewhat disappointing since in this period the interest rate varied more than the previous period.

A summary of results presented and discussed above is given in Table 6.1 below. This will enable us to compare and analyse the results in a compact manner.

Ta hie 6.1: Income and interest elasticity of narrow (M 1) and broad money (M2)

Period	Narrow money (Ml)		Broad money (M2)	
	Income elasticity	Interest elasticity	Income elasticity	Interest elasticity
1976-2006	1.201 (24.449)	-0.085 (-1.345)	1.909 (47.502)	-0.016 (-0.335)
1976-1990	1.012 (3.988)	-0.044 (-0.206)	2.207 (11.229)	-0.218 (-1.317)
1991-2006	1.480 (20.985)	-0.150 (-1.957)	1.845 (34.884)	-0.020 (-0.347)

Note: figures in the parentheses show t-values.

It can be seen from Table 6.1 that:

(a) Income elasticities of money demand are higher for M2 than for Ml for the whole as well as for the sub-periods;

(b) Interest elasticities are higher for Ml than for M2 for the whole as well as for the sub-periods;

(c) Income is found to be the dominant variable, as it is consistently found to be statistically significant;

(d) Interest rate is not found to be an important explanatory variable of money demand, whether it is M1 or M2 as the variable was always found to be statistically insignificant;

(e) These results indicate that the estimated demand functions for Bangladesh resembles the classical view, which posited demand for money as a function of income only.

6.5 Inclusion of inflation and exchange rate in the money demand function

Although income and interest rate are regarded as the key variables that affect money demand and find their place in macroeconomic texts as the main determinants of money demand, researchers have included other variables in money demand studies. Inflation and exchange rate are two such variables. New estimates, based on an augmented money demand function that includes these two variables are now reported. The estimated demand function for narrow money is reported first and is followed by the demand function for board money. These are given below:

$$\ln M1 = -6.008 + 1.766 \ln y - 0.033 \ln i - 0.580 \ln inf + 0.226 \ln er \quad (6.7)$$

$$(-7.327) \quad (10.243) \quad (-0.615) \quad (-4.364) \quad (1.553)$$

$$R^2 = 0.976$$

$$D\text{-}W = 0.944$$

$$\ln M2 = -7.229 + 1.827 \ln y - 0.039 \ln i - 0.243 \ln \inf + 0.337 \ln er \quad (6.8)$$

$$(-9.882) \quad (11.880) \quad (-0.814) \quad (-2.054) \quad (2.595)$$

$$R^2 = 0.992$$

$$D\text{-}W = 1.717$$

In this study, the list of variables other than income and interest has been kept to a minimum. This is because it has bearing on stability of money demand, an aspect that is dealt with in some detail below. The following quotation of a well-known money demand researcher will make the point clear:

> By "a stable demand for money function, it is normally meant a stable relationship between demand for money and just a few, typically two or three, explanatory variables. If a large number of variables seriously influence money demand than a stable function, in our sense, does not exist." (Thomas, 1993: 346)

6.6 The short- and the long-run demand for money

Estimation of the short-run and the long-run money demand function has been a matter of considerable research interest. Here, estimates based on a model that can generate both the short-run and the long-run money demand functions are presented. The key feature of this

type of model is the presence of a term in the money demand function that takes care of the adjustment from the short to the long term.

Here a model that has been used, among others, by Chow (1966) and Gujarati (1995) and which enables us to study both short-run and long-run demand for money is described and the relevant empirical estimates are presented below:

$$M_t^* = J_{a't} \cdot P_l^{b} y_l^{P2} e^{m} \qquad (6.9)$$

where M_l^* = desired or long-run demand for money;

i_l = long-term interest rate;

Y_l = aggregate real national income;

For econometric estimation, (6.9) may be written as

$$\ln M_t^* = \ln\beta_0 + \beta_1 \ln i_t + \beta_2 \ln Y_t + u_t \qquad (6.10)$$

The desired demand variable cannot be directly observed. Hence, the stock adjustment hypothesis can be stated as

$$M_t / M_{t-1} = (M_t^* / M_{t-1})^\delta \qquad 0 < \delta < 1 \qquad (6.11)$$

The meaning or (6.11) is that a constrain percentage of the discrepancy between the actual and desired real cash balances is

eliminated within a single period (say, a year), In log form, equation (6.11) may be expressed as

$$\ln M_t - \ln M_{t-1} = \delta(\ln M_t^* - \ln M_{t-1}) \qquad (6.12)$$

Substituting ln Mt* from (6. 10) into (6.12) and rearranging we have

$$\ln M_t = \delta \ln \beta_0 + \beta_1 \delta \ln i_t + \beta_2 \delta \ln Y_t + (1-\delta)\ln M_{t-1} + \delta u_t \qquad (6.13)$$

which is a short-run demand function for money. If it is divided by 8, the long-run estimate can be obtained. Gujarati provided estimates of this function using Canadian data.

6.7 Estimate of the short- and long-run demand function for narrow money

The estimates of the short- and the long-run demand for narrow money are given below. The short-run estimate is given first, which is then converted to the long-run estimate using the adjustment coefficient, which is the coefficient of ln Ml $_{t-I}$.

6.7.1 The short-run demand function for narrow money

If it is assumed that Ụ hence $8u_t$ satisfy the usual OLS assumptions, the regression results based on our data on Bangladesh are as follows:

$$\ln M1_1 = -3.307 + 0.962 \ln Y_1 - 0.025 \ln i_1 + 0.244 M1_{\cdot 1} \qquad (6.14)$$

$$(-4.093) \quad (4.719) \qquad (-0.387) \qquad (1.486)$$

$$R^2 = 0.965$$

$$D\text{-}W = 0.867$$

Here, $M1_1$ refers to M1. Contrary to the estimates presented here, Gujarati had found for Canada that file coefficient of interest was significant while that of income was not. The estimated short-run demand function shows that the short-run interest elasticity is statistically insignificant, but the short-run income elasticity is statistically significant.

6.7.2 The long-run demand function for narrow money

To obtain the long-run demand function, the short-run demand function has to be divided through by the value of 8 obtained and drop the $\ln M_{L1}$ term. The resultant estimated money demand function is:

$$\ln M1_t^* = -4.374 + 1.272 \ln Y_t - 0.033 \ln i_t \qquad (6.15)$$

It can be seen here that the long-run income elasticity of demand for money is 1.272 that is greater than the short-run value of 0.962. Also, the

long-run absolute value of interest elasticity of money demand is greater (0.033) than the short-run value (0.025).

The coefficient of adjustment is, $\delta = 1 - 0.244 = 0.756$, implying that 75.6% of the discrepancy between the desired and actual real cash balances is eliminated in a year.

6.8 Stability of money demand function

The general opinion regarding demand for money functions until the early 1970s was that these were stable. Laidler (1971 :99) said, "For the United States, the evidence is overwhelming and for Britain it is at the very least highly suggested." At that time stability was not, studied rigorously, and the conclusions were based mainly on rough comparison of income and interest elasticities estimated for various sub-periods. Such comparisons suggested fairly constant values of elasticities.

More rigorous statistical tests were applied for the study of stability of demand for money functions. Some of the better known of such studies included the works of Kahn (1974), Laumas and Mehra (1976), and Laumas (1978). These seemed to confirm the previous findings of stability of money demand function.

Doubts began to be raised on the stability of money demand functions estimated for both the U.K. and U.S. during the mid 1970s. Such results began a new era of the study of stability in the estimated money demand functions. This was reinforced by the development in the time series econometrics which, through examination of stationarity (or nonstationarity), integration and cointegration could formally and concretely study stability in the short- and in the long-run.

Monetary policy is an important policy instrument that is used by the central bank in Bangladesh. An important assumption behind monetary targeting is the existence of stable money demand functions. To judge this, it is necessary to specify and estimate a money demand function and test for its stability. Also, Bangladesh Bank's practice of targeting broad rather than narrow money needs to be looked afresh. This is done below.

In this study, stability of the money demand functions is studied using the methodology of the time series econometrics. Such studies include the following stages:

(a) To study the stationarity property of each of the relevant variables. If a variable is not found to be stationary, then that indicates short-run instability.

(b) If a variable is non-stationary, the first difference of the variable is taken to see if it has become stationary. If stationarity is not achieved after first difference then higher differences are taken. If a variable becomes stationary after first difference, then it is known to be integrated of order one. If it is found to be stationary after two differences, then it is integrated of order two, and so on.

(c) The cointegration test is made to see if the dependent variable, here M1 and M2, and the independent variables that are integrated of the same order. If cointegration of the same order is found to exist, then that implies long-run stability.

The main idea behind this elaborate exercise is to show that although there may be short-run instability, stability may be achieved in the long-run.

6.8.1 The short-run instability and the ADF test

If it is assumed that the demand for real money is a function of real income, interest rate, and expected rate of inflation, then the following variables are used for unit root testing:

ln M1/P = the natural log of real narrow money (the narrow stock of money M1 deflated by the price index)

ln M2/P = the natural log of real broad money (the broad stock of money M2 deflated by the price index)

ln y = natural log of real income (GDP)

ln i = natural log of nominal interest rate on time deposit

ln inf= natural log of inflation

ln er=natural log of exchange rate.

To examine stability of money demand function, the first step is to check whether the relevant variables - here M 1, M2, income, interest rate, inflation, and exchange rate suffer from non-stationarity or not. It there is non-stationarity, it is said to have the unit root problem.

The stationarity problem is tested by the use of the Dickey-Fuller (DF) and the Augmented Dickey-Fuller (ADF) test. Of these two tests, the first one does not take into consideration the problem of

autocorrelation but the second one does. Since, the problem of autocorrelation was encountered in our empirical study of money demand, the Augmented Dickey-Fuller (ADF) test is used here.

The Augmented Dickey-Fuller (ADF) test is done for all these variables and the results are given in Table 6.2.

Table 6.2: The Augmented Dickey-Fuller (ADF) test on the levels of the Variables

Variable	ADF Value	Result
ln M1	-0.611	Non-stationary
lnM2	-0.8817	Non-stationary
ln y	-0.8762	Non-stationary
ln i	-1.3110	Non-stationary
ln inf	-1.648	Non-stationary
ln er	-2.5431	Non-stationary

Critical Values: -2.9591 (5%)

The results of the ADF test given in Table 6.1 show that M1, M2, income, interest rate, inflation, and exchange rate have all unit roots, that is, they are all non-stationary. This implies that there is short-run instability in the money demand function.

6.8.2 The long-run stability of the money demand function

Presence of short-run instability does not mean that long-run stability cannot be achieved. In fact, present econometric methodology enables us to examine whether long-run stability can be achieved even when there is short-run instability.

The first step in this direction is to take first difference of the variables and then see if these have become stationary. If so, they are said to be integrated of order one.

Table 6.3: The Augmented Dickey-Fuller (ADP) test on the 1st difference of the variables

Variable	ADF Value	Result
ln M1	-4.7911	Stationary
lnM2	-9.7103	Stationary
ln y	-9.3219	Stationary
ln i	-2.7551	Stationary
ln inf	-5.3201	Stationary
lner	-9.3792	Stationary

Critical values for first difference data: -2.9627 (5%)

The results of the ADF test on the first differenced variables, given in Table 6.3, show that all variables except the interest rate became stationary at the 5% level of significance. The interest rate was found to be stationary at the 10% level of significance. So, all the variables can be said to be integrated of order one. Since the variables have been found integrated of the same order, the next step is to find if they are cointegrated, that is, jointly integrated. This is an important step, as it will indicate presence of long-run stability.

6.8.3 Testing for cointegration and stability of narrow money demand function, M1 when only income and interest rate are considered

If the estimated statistic is greater than the critical value then the relevant null hypothesis is rejected and the alternative hypothesis is accepted. Here as in Table 6.4, when the null hypothesis is r= 0 and the alternative is r = 1 estimated statistic is 30.55 which is greater than the critical value of 21.12 at the 5% level of significance.

Table 6.4: Cointegration test for M1, GDP and interest rate

Maximum Eigen Value Test				
Null	Alternative	Statistic	95 % critical value	90% critical value
r= 0	r= 1	30.55	21.12	19.02
r::::;1	r= 2	7.45	14.88	12.98
r::;2	r= 3	0.53	8.07	6.50

This means that the null hypothesis is rejected and the alternative hypothesis (r= l) is accepted. Here, this means that there is unique vector. This result shows that the variables income and interest rate are cointegrated with narrow money demand, M1. This means that the money demand function is stable in the long run.

6.8.4 Testing for cointegration and stability of broad money demand function, M2 when income and interest rate are considered

Here, as in Table 6.5, when the null hypothesis is r= 0 and the alternative is r= 1, the estimated statistic is 29.27 which is greater than the critical value 21.12 W the 5% level of significance. This means that the null

Table 6.5: Cointegration test for M2, GDP and interest rate

Maximum Eigen Value Test				
Null	Alternative	Statistic	95 % critical value	90% critical value
r= 0	r= 1	29.27	21.12	19.02
rsl	r= 2	2.91	14.88	12.98
rs2	r= 3	0.12	8.07	6.50

hypothesis is rejected and the alternative hypothesis (r=l) is accepted. This means that there is unique vector. This result shows that the variables income and interest rate are cointegrated with broad money

demand, M2. This means that the broad money demand function is stable in the long run.

6.8.5 Testing for cointegration and stability of narrow money demand function, M1 when income, interest rate, inflation and exchange rate are considered

If the estimated statistic is greater than the critical value than the relevant null hypothesis is rejected and the alternative hypothesis is accepted. Here, as in Table 6.6, when the null hypothesis is r= O and the alternative is r= l, the estimated statistic is 61.35 which is greater than the critical value 33 .64 at the 5% level of significance. This means that the

Table 6.6: Cointegration test for M1, GDP, interest rate, inflation and exchange rate

Maximum Eigen Value Test				
Null	Alternative	Statistic	95 % critical value	90% critical value
r= O	r= 1	61.35	33.64	31.02
r:::l	r= 2	34.65	27.42	24.99
r:::2	r= 3	14.05	21.12	19.02

null hypothesis is rejected and the alternative hypothesis (r= l) is accepted. Here, this means that there is unique vector. This result shows that the variables income, interest rate, inflation and exchange rate are

cointegrated with narrow money demand, M1. This means that the money

demand function in this extended form is stable in the long run.

6.8.6 Testing for cointegration and stability of broad money demand function, M2 when income, interest rate, inflation and exchange rate are considered

If the estimated statistic is greater than the critical value than the

relevant null hypothesis is rejected and the alternative hypothesis is

accepted. Here, as in Table 6.7, when the null hypothesis is $r= 0$ and the

alternative is $r= 1$, the estimated statistic is 62.26 which is greater than the

critical value of 33.64 at the 5% level of significance.

Table 6.7: Cointegration test for M2, GDP, interest rate, inflation and
exchange rate

Maximum Eigen Value Test				
Null	Alternative	Statistic	95 % critical value	90% critical value
$r= 0$	$r= 1$	62.26	33.64	31.02
r s1	r=2	20.05	27.42	24.99
rs2	$r= 3$	13.56	21.12	19.02

This means that the null hypothesis is rejected and the alternative

hypothesis (r=1) is accepted. Here, this means that there is unique vector.

This result shows that the variables income, interest rate, inflation and

exchange rate are cointegrated with broad money demand, M2. This

means that the broad money demand function in this extended form is stable in the long run.

6.9 Chapter summary

Several empirical results have been obtained with respect to different specification of the money demand function, the short- and the long-run money demand function, and stability of the money demand function. It is worthwhile to present a summary of these results, which are given below.

(a) Analysing the estimated money demand function for the whole period, that is, for the period 1976 to 2006, it is found that income elasticities of money demand are higher for M2 than M1 and interest elasticities are higher for M1 than for M2;

(b) An analysis of sub-period results show that income elasticities of money demand are higher for M2 than M1 and interest elasticities are higher for M1 than for M2;

(c) Examining the estimated money demand function for M1 and M2, it is found that estimated income elasticities of money demand are higher

for M2 than M1 and interest elasticities are lower for M2 than for M1 for the whole and the sub-periods;

(d) The estimated money demand function for Bangladesh resembles the classical sp

(e) The inclusion of two additional variables, inflation and exchange rate, shows that these affect the money demand in Bangladesh;

(t) The estimates of the long-run and the short-run money demand function shows that long-run income and interest elasticities of money demand (in this study, narrow money only) are higher than the short-run values. This is in line with earlier studies;

(g) An analysis of the statistical significance of the estimated coefficients show that income is always found to be significant while interest rate appears as an insignificant variable. This means that contrary to many results obtained particularly for the developed countries where interest rate appeared as a significant variable, in the case of Bangladesh it is not found to be so;

(h) A clarification is in order regarding the observation made in (g) above. Given the state of interest rate, the above results were found.

If, however, the rate of interest was allowed to vary freely, a different result showing interest rate to be an important determinant of money might have been found. Now that greater flexibility in the interest rate is being allowed, future research may come out with such a result.

(i) The estimated R^2 and Durbin-Watson values show that the R^2 values are quite high but the problem of autocorrelation was observed in some cases;

(j) In the study of stability, the ADF test on the levels of the variables showed the existence of the nonstationarity problem, which meant that there was short-run instability in the estimated money demand functions;

(k) Subsequent test of cointegration done by applying the Johansen test, which is an advanced and more general method, showed existence of cointegration, which meant that there was long-run stability in the money demand function.

6.10 Some remarks

The empirical results throw light on several aspects. Interest rate, which is regarded, as a key policy variable, particularly in the advanced countries, does not appear to be a potent weapon in the hand of the monetary authorities in Bangladesh. However, appearance of the interest rate as statistically insignificant is due to repeated intervention by the monetary authorities, which often kept the interest rate fixed, particularly during the pre-liberalization period of 1976 to 1990. So, the empirical position of interest rate was not due to economic but institutional reason. With liberalization that started after 1990, it is hoped that interest rate will play a greater role in future.

The income elasticity of money demand that was consistently found statistically significant and whose value appeared somewhat high is due perhaps to the fact that interest being the subject of intervention by the monetary authority, the burden of adjustment in the money demand fell on income turning the whole thing look more like the classical situation where income was the prime determinant of money demand.

The study of stability of money demand, which is an important aspect of this type of study, showed that although money demand suffered from short-run instability, it was stable in the long-run. As a

result, although the central bank of Bangladesh did not conduct any formal study of stability of money demand function and was unaware of the existence of stability, it did not face much difficulty since stability actually existed. Such a comment was made in an important earlier study (Hossain, 1996) and our study spanning over a longer period confirms it.

Chapter 7

SUMMARY AND CONCLUSION

In this study, various aspects of the money demand function in Bangladesh were studied. Particular focus was given to the two key determinants of money demand, that is, income and the rate of interest. Besides providing results for the whole period of 1976 to 2006, empirical study was separately done for the pre-liberalisation period of 1976 to 1990 and the post-liberalisation period of 1991 to 2006. Estimates of the money demand function that included two other variables; exchange rate and inflation in addition to income and interest rate were also made and reported. Empirical estimates of a model that could provide both short run and long run estimates were also reported.

A key emphasis of this study was the stability of demand for money. This was formally studied and results provided that suggested that although there was short-run instability in money demand function in Bangladesh, log-run stability existed.

A summary of these results, some policy implications, and concluding remarks are given below.

7.1 Summary

Several empirical results have been obtained with respect to different specification of the money demand function, the short- and the long-run money demand function, and stability of the money demand function. It is worthwhile to present a summary of these results, which are given below.

(a) Analyzing the estimated money demand function for the whole period, that is, for the period 1976 to 2006, it is found that income elasticity of money demand is higher for M2 than M1 and interest elasticity is higher for M1 than for M2;

(b) An analysis of sub-period results show that income elasticity of money demand is higher for M2 than M1 and interest elasticity is higher for M1 than for M2;

(c) Examining the estimated money demand function for M1 and M2, it is found that estimated income elasticity of money demand is higher for M2 than for M1 and interest elasticity is lower for M2 than for M1 for the whole and the sub-periods;

(d) Results mentioned in (c) above, reveal an interesting thing. It appears that when income elasticity of money demand is higher then interest elasticity is lower and vice versa. Perhaps it can be said that there is a tradeoff between the two definitions of elasticity;

(e) The estimated money demand function for Bangladesh resembles the classical specialization where money is regarded as a function of income alone rather than the Keynesian specification where money is regarded as a function of both income and interest rate;

(f) The inclusion of two additional variables -inflation and exchange rate shows that they affect the money demand in a significant manner;

(g) The estimates of the long-run and the short-run money demand function shows that long-run income and interest elasticity of money demand (in this study, narrow money only) is higher than the short-run values. This is in line with earlier studies;

(h) An analysis of the statistical significance of the estimated coefficients show that income is always found to be significant while interest rate appears as an insignificant variable. This means that contrary to many results obtained particularly for the developed countries where

interest rate appeared as a significant variable, in the case or Bangladesh it is not and, hence it cannot be used as a policy variable;

(i) The estimated R^2 and Durbin-Watson values show that the R^2 values are quite high but the problem of autocorrelation was observed in some cases;

U) In the study of stability, the ADF test on the levels of the variables showed the existence of the nonstationarity problem, which meant that there was short-run instability in the estimated money demand functions;

(k)Test of cointegration done by applying the Johansen test, which is an advanced and more general method, showed existence of cointegration. This meant that there was long-run stability in the money demand function.

7.2 Policy implications

Associated with money demand function is the monetary sector of the economy. The empirical results of the money demand function can guide the policy makers regarding relative importance of the two key determinants of money demand, that is, income and interest rate. This

will enable the policy makers to frame appropriate income and interest policy.

The results of this study clearly showed that interest rate was not a significant determinant of money demand and hence it could not be recommended as a potent weapon of monetary policy. It is income that was consistently found to be a significant determinant of money demand and appeared to be a preferred choice to the policy makers. It appears that it is income policy, and not interest policy, that should be emphasized for Bangladesh. This observation, however, deserves to be critically looked into, which is done in the paragraph below.

The fact that interest rate did not appear as an important determinant of money demand is because it was held constant for prolonged periods by the monetary authorities. Any econometric work using such data will come out with results that will show interest rate to be ineffective. In reality, however, monetary authorities use interest rate as a policy variable and raise and lower it. At the time of submitting this thesis in June 2009, interest rate was being lowered. So, it can be said that although our results did not suggest interest rate as an effective policy tool, it should not be rejected in an unqualified manner. In fact, with the dawn of flexible interest rate policy that was ushered in by the post

liberalization period, interest rate as a policy weapon is likely to play a more important role in future.

7.3 Limitation of this study and scope for further research

This study kept the analysis simple, focusing on the key variables of income and interest rate. Only two additional variables, exchange rate and inflation were considered as an additional exercise. Future research on Bangladesh may focus on other variables.

Because of the regimented nature of the interest rate, this variable appeared as mostly insignificant in this study. With greater liberalization, future research work may be able to capture the true role of interest rate in monetary policy that the regimented policy on it had so far camouflaged.

7.4 Conclusion

The empirical results of this study threw light on several aspects. Interest rate, which is regarded, as a key policy variable, particularly in the advanced countries, did not appear to be a potent weapon in the hand of the monetary authorities in Bangladesh.

However, appearance of the interest rate as statistically insignificant was due to repeated intervention by the monetary authorities, which often kept the interest rate fixed, particularly during the pre-liberalization period of 1976 to 1990. So, the empirical position of interest rate was not due to economic but institutional reason. With liberalization that started after 1990, it is expected that interest rate will play a greater role in future.

The income elasticity of money demand that was consistently found statistically significant and whose value appeared somewhat high was due perhaps to the fact that interest being the subject of intervention by the monetary authority, the burden of adjustment in the money demand fell on income turning the whole thing look more like the classical situation where income is regarded as the prime determinant of money demand.

The analysis of stability of money demand, which is an important aspect of this type of study, showed that although money demand suffered from short-run instability, it was stable in the long-run. As a result, although the central bank of Bangladesh did not conduct any formal study of stability of money demand function till very recently (Ahmad and Islam, 2007), it did not face much difficulty since stability

actually existed. Such a comment was made in an important earlier study (Hossain, 1996) and our study spanning over a longer period confirms it.

This study covers nearly all the years since the emergence of Bangladesh. As such, the results of this study and other background materials provided in it should be of interest to the academicians, policy makers and those who will undertake research on money demand in future.

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