Testing Endogeneity of Money Supply:
Time Series Analysis

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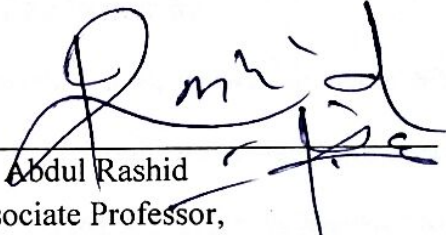**2019**

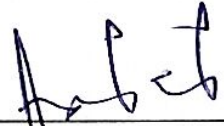# PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS, ISLAMABAD

CERTIFICATE

This is to certify that this thesis entitled **"Testing Endogeneity of Money Supply: Time Series Analysis"** submitted by **Mr. Usman Masood** is accepted in its present form by the Department of Economics and Finance, Pakistan Institute of Development Economics (PIDE) Islamabad as satisfying the requirements for partial fulfillment of the Degree of Master of Philosophy in Economics and Finance.

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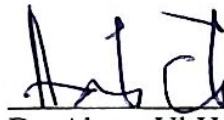
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ABSTRACT

The conventional doctrine of money supply supports exogenous flow of money in an economy. Simultaneously, it is believed that commercial banks create a large amount of money in circulation instead of central banks issuing currency notes. It is interesting to mention here that the testing the endogenous money supply hypothesis is an infant area, despite the fact the literature is recognizing that the money supply is an endogenous phenomena in the developing economies. The current study is aimed to fill this gap and at finding out empirical evidence of endogenous money supply in the case of economy of Pakistan. In this regard, it seeks to find out evidence of endogenous money supply in the economy of Pakistan and to check the robustness of the contemporaneous correlation of bank credit, financial development and money supply. Particularly, this study uses the ARDL estimators for testing the long-term relationships between variables. A specific path to work in this technique has largely been adopted by the researchers in the field of applied econometrics. Thereby, it follows the standard route. The essential steps of the analysis include, first to test unit root test for the purpose of testing its stationary properties. *Secondly,* using the ARDL estimators for testing the long-term relationships among the variables. Thirdly, using statistical testing for finding the long-term and short-run coefficients. Lastly, testing stability through CUSUMSQ and CUSUM tests along with checking robustness of the data. In this regard, time-series data analysis has been carried out on these variables for a period of thirty-seven years. The methodology Autoregressive Distributed Lag has been used after testing the stationarity of data. The findings conclusively indicate the existence of endogenous money supply in the economy of Pakistan. The cointegration has been tested statistically through Autoregressive Distributed Lag technique. The findings of the ARDL estimation indicate significant values of money supply M1, monetary base,

money supply M2, money multiplier of M1, and money multiplier of M2 with regard to Pakistan's bank credit and gross domestic product in the long-term. These significant results of particular variables show the evidence of endogeniety of money supply in long run in case of Pakistan economy.

CHAPTER 1

INTRODUCTION

Money plays a vital role in functioning of an economy. No activity in the economy can take place without it. However; classical were of the belief that money is just a veil and intrinsically it is not of critical importance. Conversely; Keynesian and post Keynesian do not believe in money neutrality. They are of the opinion that smooth working of economy is not possible without money and it do affect the real sector as well. In today's complex economy's organization; money plays several roles as it serves as a store of value. It works as a standard for deferred payments. Money primarily acts as a medium of exchange. Considering the importance of money, this is of critical importance to observe that what are the dynamics behind money supply, and how it is being dictated.

Modern school of thoughts believe that money is of critical importance; however; the controversy is on supply of money prevails. As there are basically two schools of thoughts. The conventional doctrine of money supply has been supportive of exogenous flow of money in an economy. It claimed that monetary authorities, that is, central banks are responsible for determining the money directly. In this respect, the authorities use policy tools to affect the money supply within a society, which in turn, through the transmission channel-consider IS-LM framework for example, affects the real economy. This conventional concept is widely accepted even today; some researchers and practitioners have suggested an escalation of this concept during the Global Financial Crisis of 2007 (Taylor, 2009). It has also been argued by the pro-Monetarists that exogeneity of money supply provides theoretical foundations to the central banks for exercising a direct intervention into the money market. For instance, central banks of most of the countries have been taking on massive monetary easing

policies to directly target the money supply, with the desire of saving the economy with such money supply (Bernanke et al., 2004).

The Post-Keynesians, on the other end, believe in money supply endogeneity. They claim that money supply is dictated under the umbrella of supply of loans by banks and the demand for credit (Lavoie, 1984). Despite growing literature on the endogeneity of money supply in the industrialized countries, money supply in the under-developed countries has yet to be examined. The reason behind it lies in the fact that the monetary policies of the under-developed countries are not controlled by the monetary markets but the governments or the monetary authorities. For this reason, governments understandably support the exogenously dictated supply of money (Dinc, 2005; Wade & Bruton, 1994).

Exogeneity of money supply means that central bank generates and controls the money itself. Further; it is believed that exogenous money supply is dictated in the economy through depositors' preferences against holding cash and the banks preferences against excess reserve. It is also argued that economic variable like interest rate do not affect these options, resultantly the quantity of money supply does not change with rise or decrease in interest rate. The money multiplier remains constant (Bayes & Jansen, 1995). Based on these arguments the aggregate supply curve assumes the shape of a vertical line, which is not affected by economic variables or exogenously dictated. The literature provides two main theories explaining exogeneity of money supply; that is, i) Orthodox monetary theory and ii) Monetarists' model. The Orthodox School indicates the exogeneity of money supply and based on quantity theory of money in this regard (Howells & Bain, 2003).

Monetarists saw money supply as the chief determinant of changes in any economy. Thereby, money supply must be controlled to control inflation rate. It is an

economic formula that multiplies money supply with its velocity and equals it to nominal expenditures in the economy. However, the velocity is considered stable in this case that is up for debate. Friedman (1974) explained that, in the long run, real-income can never significantly be affected by the change in the money supply. Thereby, he elaborated that money is not all that matters (Friedman, 1974). Thus, according to monetarists, the change in the amount of money in an economy only brings short-run changes.

Contrary to above mentioned theories; Structuralist school of thought in this context believes that money supply is endogenous so that desired currency to deposit ratio and desire excess reserve ratio vary with economic conditions and thus, do not remain constant. For example, there is an inverse relationship between currency to deposit ratio, excess reserve ratio and the interest rate. Banks are suggested to rise their interest rate along with a reduction in the excess reserves. It enables them to lending out additional fund at the higher rates. At this point in discussion, it must be kept in mind that the money multiplier not constant but an increasing function of interest rate. This reason predicts a money supply curve is an upward sloping and also endogenous in nature respectively (Bayes & Jansen 1995).

Similarly; Accommodationists School of thought supported endogeneity of money supply. According to them, the overnight rate[1] established by commercial banks and central bank fixed their loan above that rate. It enables the banks to coming across all demands for loans. Further; the Liquidity preference view about endogeniety of money supply is that the monetary aggregates, that is, (M1, M2 and MB) and bank

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[1] Overnight rate is the rate at which generally banks lends or borrow funds with another bank, in overnight market. In most situations, the overnight rate is the interest rate which is lowest and central bank sets to target monetary policy.

credits had a two-way relationship between them. Similarly, there is a feedback mechanism occur among the money multipliers and bank credits.

In the case of Pakistan; the exogeneity and endogeniety of money is also under discussion. However, it is an infant area of research, specifically in the case of Pakistan. Particularly, Ahmad and Ahmad (2006) empirically investigate the long- and short-run money supply endogeneity in the country. Their study concludes that the country's money supply is not exogenously dictated in the short-run. Additionally, the empirical findings of this study supported both Liquidity Preference view and Structuralists' view on money endogeneity. Therefore, the present will be a significant contribution in the empirical literature, specifically in the context of Pakistan.

1.1 Significance of the Study

This study aims at finding out empirical evidence of endogeneity money supply in Pakistan. This is of critical importance to observe whether money supply is exogenous or endogenous as if we consider money supply as exogenous but in actual it is endogenous then the policy intervention of central bank has different implications. There is only one study, according to the best of our knowledge, which has tested the matter in case of Pakistan, that is, Ahmed and Ahmed (2006). But the findings of this particular study is different as its concludes that money supply is exogenous in the short run in the case of Pakistan. The present study considers a time period of 37 years using time series data, from 1980 to 2017, and considering the possibility of structural breaks, it tests the endogeniety of money supply, through conclusive findings.

1.2 Hypothesis of the Study

The present study is an attempt to test the null hypothesis whether the money supply is endogenous or not against the alternative hypothesis in the case of Pakistan. Formally,

H0: The money supply is endogenous in Pakistan

H1: The money supply is not endogenous in Pakistan

1.3 Objectives of the Study

As pointed out earlier, the area of testing the money endogeniety is in infancy specially in developing economies like Pakistan. Therefore, the present study intends to test that if money supply is endogenous or exogenous in the case of Pakistan.

Therefore, the study pursues two main objectives to test the above mentioned hypothesis:

1. To find evidence of endogenous money supply in the case of Pakistan.
2. To investigate the robustness of the contemporaneous relationship of bank credit, financial development, and money supply.

1.4 Organization of the Study

The rest of the study is organized as follows: Chapter 2 present the extensive literature survey to check the evidence that if money supply is endogenous or exogenous. It is further divided into two sections: (I) theoretical literature review and (II) empirical literature review. Chapter 3 encompasses the methodology for testing the money supply endogeneity and required variables to test the objectives. Chapter 4 will present the empirical findings and findings of the study. Chapter 5 will conclude the study.

CHAPTER 02

LITERATURE REVIEW

Keeping the importance of money supply in the modern era, it is well discussed in the literature. However; there is controversy among school of thoughts that whether money supply is dictated exogenously or endogenously in the economy. According to classical, Keynesian and monetarist school of thought; the money is exogenous. On the contrary, post-Keynesian argue that central banks strictly dictate money supply in any economy. It means that it is dictated endogenously within the banking system.

Nowadays, it is believed that commercial banks create a large amount of money in circulation instead of central banks issuing currency notes. McLeay (2014) found a vital role of the private sector in creation of money available in an economy. The bank creates loans by lending the customers or borrowers and this lending of money directly affects the money supply. On the other hand, Badarudin et al. (2011) found money supply and bank stock return exhibit a positive relationship in the presence of endogenous money supply. The debate amongst exogenous and endogenous of money theories revolves around the control being exhibited and exercised by the private banks in an economy.

2.1 Theoretical Literature Review

The debate on exogenous and endogenous nature of money runs through the history of monetary theory. Conventionally, money has been regarded as exogenous. However; the basis of the endogeniety of money explicitly can be traced in the work of

Kaldor in 1970[2]. And still the controversy that whether if money supply is endogenous or exogenous, exists among the economists.

The literature is replete with the studies explaining that money supply is dictated by real output, interest rate, price level and others. They posit that the movement in the stock of money dictates the cluster of these variables. The post Keynesians supported the concept of endogenous money supply. They explain that the monetary authorities cannot control aggregate spending because they do not exhibit control over the supply of the credit. The studies clearly refer that the banks and business borrowers dictate the amount of credit supplied in the short run. Later, the chapter discusses evidence of endogeneity of money supply around the globe with particular focus on the Europe, Asia, and especially Pakistan.

2.1.1: Exogenous Money Supply

Classical, Monetarists and Keynesian believe that central bank itself generates and controls money supply. In response to the supply of money, the private agents set interest rates on it. Several theories developed on this concept. Two of the most prominent money theories supporting exogenous supply are explained in the following two sections: (I) Orthodox monetary theory (II) Monetarists' model.

2.1.2: Orthodox Monetary Theory

Quantitative theory of money of the money supply considers it to be an exogenous variable (Howells & Bain, 2003). It is believed that the monetary policy goals determine the money supply and that the central banks control these goals with

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[2] Kaldor's analysis triggered a lot of studies; see for example: Rousseas (1986); Moore (1988); Arestis (1988); Nell & Semmler (1991); Lavoie (1992); Carvalho (1993); Cottrell (1994); Musella & Panico (1993; 1995); Davidson (1994; 2002); Hewitson (1995); Howells (1995); Deleplace & Nell (1996); Harcourt & Riach (1997); Dow (1997); Rotheim (1998); Wray (1990, 1998, 2002); Rochon (1999; 2003); Fontana (2000; 2003); Smithin (2000); Dalziel (2001); Rochon & Vernengo (2001); Bertocco (2001); Palley (2002).

the instruments of required reserve ratio and open market operations, and thus, manage the monetary base at their discretion (Mishkin, 1995; Burda & Wyplosz, 1997).

Money multiplier remains least stable over time. It is also assumed to be constant. It raises the efficacy of the central banks in managing the money base. It implies that the changes in money supply introduce a non-equilibrium situation in the money market. This situation finds fall of the nominal interest rates as well as changes in the patterns of both investment and consumption. Thus, the aggregate demand changes accordingly. It implies, although indirectly, that the money demand must inelastic while investment and consumption must be highly interest-elastic for the monetary policy to be effective (Howells & Bain, 2003).

2.1.3: Monetarist Model

Monetarists see money supply as the chief determinant of the changes in any economy. Thereby, money supply must be controlled to control inflation rate. It is an economic formula that multiplies money supply with its velocity and equates it to nominal expenditures in the economy. However, the velocity is considered stable in this case that is up for debate. Friedman (1971) explained that the real income on the long-term basis is not much affected by any changes in the money supply. Thereby, he elaborated that money is not all that matters (Friedman, 1971). Thus, according to monetarists, the changes in the quantity of money only bring short-run changes in the economy.

2.1.4: Endogenous Money Supply

Theoretically, Lord Keynes (1930) and Le Bourva (1992) laid the foundation of the concept of endogeniety of money supply. They are the pioneers and thus provided some insights into it. Thereby, their significant contributions cannot be overlooked. Several monetarists contributed towards the evolution of the modern-day Post-

Keynesian School (Moore, 1986, 1988, 1998; Kaldor, 1982; Davidson, 1978; Robinson, 1956). Among most developed and developing countries, money supply is found to be exogenous due to the sole controlling authority of the central banks in drafting and implementing money supply policies.

The Keynesians kept the aggregate demand or consumption at the core of the theory of money supply. They firmly believed in enticing consumers to keep spending and considered it the key to both a healthy economy and mitigating depressions and recessions. The post-Keynesians introduced endogeneity in the discussion. It is attributed to the occurrence of money creation within an economy's monetary system. This discussion led to the development of the later theories and concepts concerning endogenous money supply.

This endogenous nature of money supply, on the other hand, has been expanded by the Post-Keynesian Structuralists. They argued that banks (both commercial central) constrain the demand for credit. In this regard, Pollin (1991) and Palley (1994) presented the view that the accommodation is dependent on the stance of the private initiative of banks and monetary authorities. Central banks can place significant quantity constraint, through open market operations, on reserve ability (Pollin, 1991). The open market operations provide non-borrowed funds which cannot be substituted by discount window borrowing. Post-Keynesians stress that each time this option is used by banks, marginal cost of discount window borrowing rises because the level of borrowed funds is positively related to the discount rate (Palley, 1994).

Furthermore, the approach on endogenous money supply emphasizes on liability management practices. Post-Keynesians stress that adequate amount of reserves to meet demand does not need to be created by liability management (Pollin, 1991). For this reason, the Structuralists' hypothesis is a mixed model which adopts

some of the features of the monetarists and some of them from the accommodationists. The Monetarists' part illustrates causality from the log-level M3 Money Supply and log-level Monetary Base to Bank Credit (at log-level) whereas the Structuralists' part illustrates causality from total bank credit (at log-level) to the log-level Monetary Base.

The liquidity preference theory supports endogenous money supply in the long-term as well. As per the empirical evidence of the hypothesis of liquidity preference theory, causality of log-level M3 Money Supply from Bank Credit (at log-level) is predicted in the case of endogenously dictated money supply. The new deposit holders with independent liquid preferences concerning quantity of money they desire to hold, will need not to willingly hold deposits that result from loans in a situation with independent demand for loans and money. In this context, a constraint will be placed on ability of loans to create demand by the independent demand of money. Causality may also run from log-level M3 Money Supply to Bank Credit (at log-level). The brief summary of theories explaining endogeniety/exogeneity of money supply is as under:
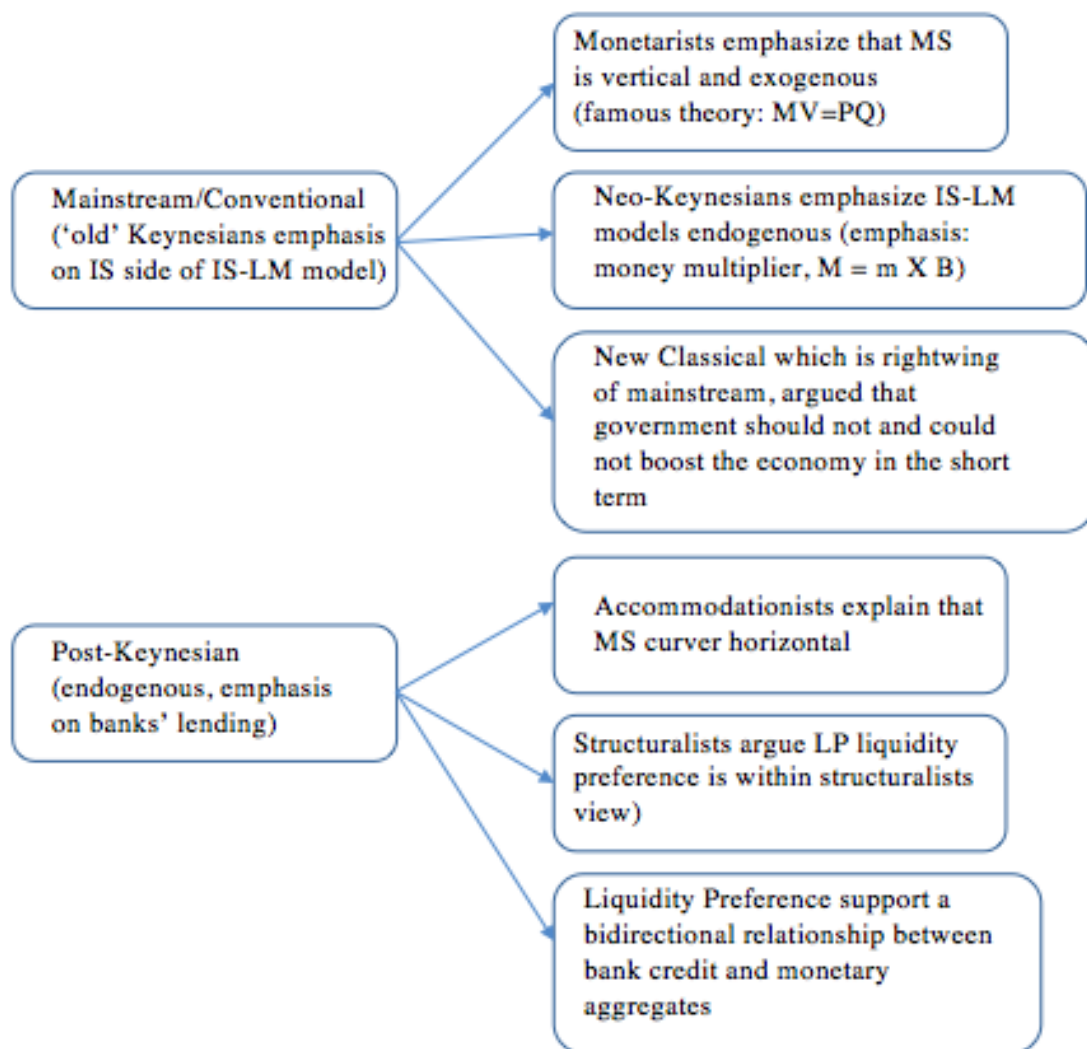
Figure 1: Brief Summary of Money Supply Theories (References: Dylan Matthews (2012); Snowdon & Vane, 2002)

2.1.5: Post Keynesian view of Money Supply

Post-Keynesians believe that the monetary authorities cannot control aggregate spending because they do not exhibit control over the supply of the credit. The study indicates that the banks and business borrowers dictate the amount of credit supplied in the short run. Thus, it creates the demand of the credit at the same time. Furthermore, financing the projects rarely becomes a constraint for the banks and other firms when they decide to take on a new investment given the fact that they understand the

conditions of the market for selling the additional output. Thus, post-Keynesians while extending the Keynesian point of view believe that money supply is generated endogenously. The famous name of Basil Moore is largely associated with bringing this idea at the end of twentieth century. Later, four branches or sub-schools of the same thought developed. They are discussed in the subsequent sections.
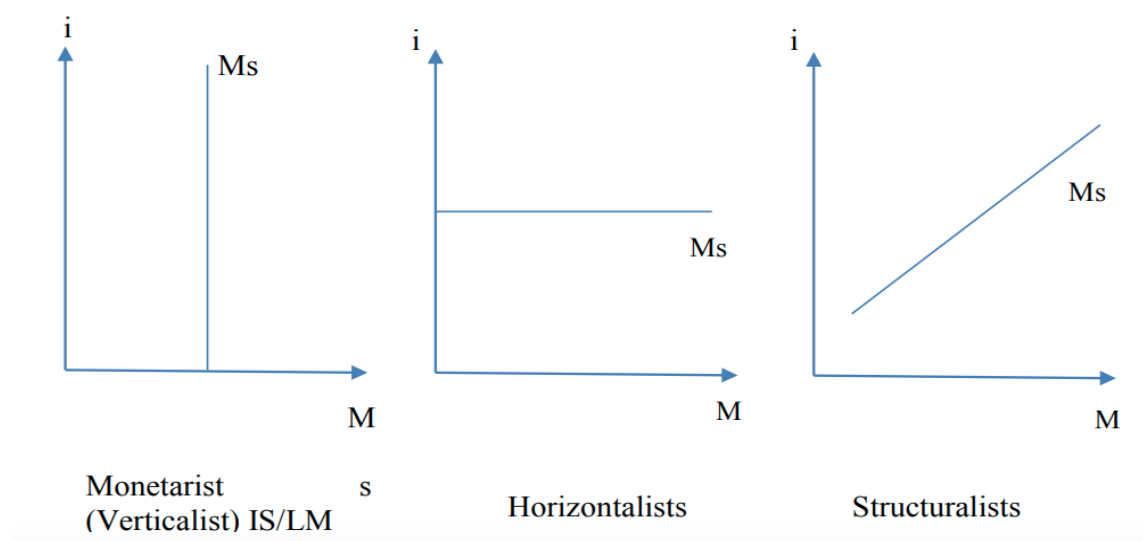
Figure 2: Different Money Supply Curves (References: Desai, 1987; Snowdon & vane, 2002)

2.1.6: Horizontalism/Accommodationist School of Thought

Horizontalism is associated with Kaldor (1982) and Moore (1988). They explained that since loans create deposits and thus, endogenously deposits are dictated. Thereby, the changes in the money supply occur as a result of the corresponding changes in the money income. It varies with respect to both output and prices. According to the Horizontalists, there exists a causal relationship among three pairs of money variables. Firstly, the demand for bank lending causes the money supply (Howells, 1995). Secondly, money income and monetary aggregates share a two-way relationship (Davidson, 1978), and lastly, there should be a unidirectional relationship between monetary base and bank credit (Panagopoulos & Spiliotis, 2008; Nell, 2000).

This view presents the orthodox monetarists' approach with a direct challenge. They believe that some multiple of monetary base, which is explicitly stable and independent in this theory, is responsible for money supply in an economy. Therefore, deposits are made from reserves and those deposits that are formed because of the monetary base dictated exogenously by a country's monetary authorities. Moreover, monetarists believed that a decrease (rise) in monetary multiplier does not affect the expansionary (restrictive) monetary policy (Lavoie, 1984). Accommodationist view, in the direct contrast, argue that monetarists' view is not in contact with the real-world scenario primarily when the quantity is being taken and price is being set by the commercial banks (Moore, 1989).

Central Banks play a critically of critical importance role in the economy if banks are involved with selling credits, they supply the necessary reserves and currency on demand. It is of critical importance for ensuring the liquidity of financial system by fulfilling their role as lender of last resort (Moore, 1989). Moreover, the lending rates are set on some mark-up value from the discount window by the banks on cost of borrowing. For this reason, Accommodationists imply that loans create deposits and thus, support endogenous generation of the resulting deposits. This approach follows that any change in the money supply does not cause any change in money income in any economy but is the result; it varies in its relationship with output and prices (Kaldor & Trevithick, 1981).

2.1.7: Structuralism

According to Structuralism, the central banks are the key players in the presence of firms and economic agents are of significant importance in the economic system. Moreover, the central bank can resist credit expansion because it can deny privilege of reserve needs. It emphasizes on enabling banks in overcoming the Central Bank

induced reserve constraints (Pollin, 1991). The role of multiplier is of critical importance in an economic system and structuralism accepts it. It explains that the a bidirectional causal relationship between gross domestic product and money aggregate by the central bank's fractional ability to control the liabilities of quantity banks, on one end, and money endogeniety generating process on the other side (Nell, 2000).

Structuralism focuses on the liability management practice adopted by the banks for overcoming reserve constraints imposed by the monetary authorities of a country. Due to the fact that liquidity management practice can go too far in its scope, the Structuralists emphasize that an adequate supply of money need not to be generated for meeting its demand in the economy (Pollin, 1991). For this reason, this approach is defined as mixture of the previous two theories, that is, the Monetarists' approach and the Accommodationist view.

2.1.8: Liquidity Preference View

It supports the Horizontalists' point of view in courtesy of an endogenously money supply is dictated. However, it focuses on the role of excess money supply. It criticizes the Horizontalists for their theoretical agreement on the idea that the credit money, in an economy, cannot flow in excess supply. Liquidity preference theory explains the possibility of independent money demand function in an economy (Howells, 1997; Arestis & Howells, 1999; Palley, 1991; Goodhart, 1989). It hypothesizes that the relationship of money aggregate and bank credit exhibits a two-way causation. It assumes that this relationship is based on endogenous money supply. Moreover, it provides a theory of effective amount of deposits for explaining the reverse assumption that money aggregate causes bank credits (Howells, 1997).

Although the liquidity preference view of an economy's endogenous money supply is admitted on a large scale, it holds some limitations. Its primary criticism is

based on the assumption provided by the monetarists, that is, the supply of money can never be in excess in any economy. Therefore, a demand function at practice is not required for this situation (Palley, 1991; Goodhart, 1989; Howells, 1997, Howells, 1995; Arestis & Howells, 1996).

2.1.9: Circuit Theory of Money

This theory begins with the hierarchy of production (Robinson, 1956). Here, banks finance the production process, workers play their role in completing the production process, and money ensures a smooth functioning of the economy (Realfonzo, 1998). It is a theory of endogenous money that has been endorsed by Robinson (Rochon, 2001).

2.2: Empirical Literature Review

This literature review has arguably put forward argument in favor of endogeneity of money supply. However, this theoretical argument is needed to be supported through empirical evidence. In this regard, the literature survey on the empirical evidence has vehemently demonstrated an endogenously dictated money supply for various economies. All of these studies have encompassed the middle-income and developed economies. Pollin (1991), Vera (2001), Shanmugam *et al.* (1996), and Nell (2001) have presented a time-series analysis for testing evidence of endogeneity of money supply primarily in the United States, Spain, Malaysia, and South Africa respectively. The following table, which is a modified version of Nell (2001), presents a quick review of the methodology selection by some of the of critical importance yet selective relevant studies from the past.

2.2.1: Endogeneity of Money Supply in Developed Economies

Yun (1996) investigated the co-movement of inflation with the cyclical component of output as a result of nominal price rigidity shown from the post-war data from the United States. However, this study is not directly related to the money supply endogeneity but has been incorporated in the past studies to explain the ability of nominal price models, in comparison to the flexible price models, to provide a better understanding of the relationship between inflation and output (Yun, 1996). The study found affirmative findings for this ability of nominal price models by using various kinds of criteria. However, the conclusions of the study are subjected to the degree of nominal price rigidity (Yun, 1996).

Dickens (1999) argued that large banks prefer selling securities over the policy of raising interest rates because the income policy of the Administration receives its support from the Federal Reserves. Wolfson (1999), on the other hand, supported the view that securities are forcefully sold by the large banks due to tight monetary policy that issues non-competitive certificates of deposits. Wray (1999) rejected Wolfson's point of view and posited that the Federal Reserves are used for providing the exact amount of reserves that a bank needs to hold. However, this rejection is not assessable because Wray (1999) did not specify the mechanism of transmission for this money supply. Wolfson (1999), in contrast, presented the financial crisis of 1996 as the transmission mechanism for money supply exogeneity in the United States.

The existing literature on endogenous money supply is marked by the assumption that the behavior of note issuer can be monitored publicly. It is the dynamic inconsistency problem. Araujo and Camargo (2006) departed from this approach and investigated the decentralized economies where a single self-interested agent is the only money issuer who embraces a private source of money supply. It is a scenario where

the record keeping is missing and thus, the money supply agents can only use past experiences for learning purposes. They also have heterogeneous choices. Fiat money plays a critical role in such an economy. The study found that money suppliers have an incentive for maintaining their reputation that does not disappear if the memory is imperfect (Araujo & Camargo, 2006).

G7 or Group of Seven is an organization comprises of highly industrialized countries across the globe. The list includes the United States, Germany, Canada, Japan, Italy, France and the United Kingdom. Several studies have found evidence of endogenous money supply in these countries (Howells & Hussein, 1998). Badarudin *et al.*, in 2013, provided new evidence in this respect. They collected quarterly data from over a period of twenty-six years. The researchers refined their research with controls for effects of change in the monetary regime. They employed a series of tests on the obtained data such as causality and co-integration using Toda and Yamamoto, Wald, and Johansen methods (Badarudin *et al.,* 2013).

Badarudin *et al.* (2013) found endogeneity of money supply in the G7 countries other than for the two small periods in the United Kingdom and the United States as well. They further found that the Central Bank and the supporting banking system meet the full money demand in Japan, Canada, and the United States in the short run (Badarudin *et al.,* 2013). These findings indicate that endogeneity of money supply of G7 countries, in the long-term, is interrupted by the Central Bank to their advantage (Badarudin *et al.,* 2013). Howell & Hussein (1998) also studied endogeneity of money supply in G7 economies. In a similar fashion, Panagopoulos & Spiliotis (2008) concluded that despite the fact that all seven economies identify with various types of money supply theories and fitting on monetary theories differently, exhibit a similar

trend of endogenous money supply. Carpenter and Demiralp (2012) also worked in this domain and found similar findings.

On the European side of the globe, Arnold *et al.,* (2000) found that non-activist steady money supply policy is the best in the continent. They explained that the pre-unification data could not evidently be used to prove presence of a stable money demand in the European area. For this reason, they employed the long and variable lags and proposed that the untested relations must be used to base the current monetary policy decisions because a true European monetary policy exists on rapid and uniform transmission of monetary impulses from European Central Bank throughout the euro-system. They overcame the Lucas Critique in this regard by applying the standard foreign exchange rate model due to the raised co-movement in local money aggregates (Arnold *et al.,* 2000).

Switzerland remains an exception despite the overwhelming evidence of endogenous money supply in the developing economies. It exhibits continuous control on its money; the money supply is exogenous in the country, as proven by Fischer (1993). The prime reason is that the Swiss National Bank sticks tight to the monetarists' approach. In a similar fashion, some other small economies are also found to be having exogenous money supply; the list includes countries such as Portugal, Italy, Spain, Netherlands, Ireland, Luxembourg, Germany, Finland, France, Austria and Belgium. (Altunabas *et al*, 2002). New Zealand has also been found to have exogenous money supply (Guender, 1998). Similarly, Badarudin *et al* (2009; 2013) found endogenous money supply across G7 countries and five other emerging economies; Mexico remains an exception in this case.

Some of the researchers have also worked on single countries in other parts of the world. For instance, Vymyatnina (2006) found evidence supporting the monetary

views of the structuralism and Accommodationists for the period from 1995 to 2004. Croatia has been found to be neutral in the short-run (Erjavec & Cota, 2003). As in the case of Malaysia, Tan and Baharumshah (1999) found evidence of endogeneity. Shanmugam *et al* further elaborated these findings in 2003. Both of these studies supported the new Keynesian view and found non-neutral money supply in Malaysia in the short-run. Additionally, Nell (2000) considered the sample of South Africa and found evidence of endogenous money supply in the country whereas Haghighat (2011) found that money is endogenous in case of Iran.

2.2.2: Endogeneity of Money Supply in Developing Economies

The endogenous money supply in the Gulf Cooperation Council (GCC) countries is linked with the correlation of monetary aggregates and bank credits. Onur-Tas and Togay (2012), using IV methodology, significantly indicate presence of endogenous money supply in all GCC countries. However, the study found an exception for Kuwait and Bahrain in this regard. Furthermore, researchers noticed difference in the structure of the contemporaneous relationship between bank credits and monetary aggregates in Saudi Arabia and UAE due to lack of empirical evidence. It happened for the reason that the past literature focused on time series analysis of variables. On the other hand, the researchers found both unidirectional and bidirectional correlation between monetary aggregates and bank credits in Oman and Qatar respectively (Onur-Tas & Togay, 2012).

2.2.3: Empirical Evidence of Endogenous Money Supply in Pakistan

In the case of Pakistan this area of study is infant. However; few of the studies have investigated the exogeneity/endogeneity of money supply. For example, Chaudhary *et al.,* (1995) conducted a study on the topic under discussion on the time periods 1973 – 1992, 1973 – 1982, and 1982 –1992. The researchers developed their

model based on quantity theory and monetarist approach to inflation. By estimating the models, the researchers successfully concluded that rise in money supply and rise in inflation occurs when government budget deficits are financed through domestic sources. These findings are conclusive and support the accommodation hypothesis on a positive relationship between money growth and budget deficit as well as the notion that higher money growth is caused by higher budget deficits. Therefore, the study concludes that the State Bank may dictate the execution of monetary policy, fiscal decisions made by the government highly affect the overall formulation of the policy. The findings of the study suggest that the government must take immediate and concrete steps for installing a private business environment by limiting its size and working on reducing the rate of inflation in the country.

Later, Ahmad and Ahmad (2006) presented evidence on endogenous money supply in the economy of Pakistan. This particular study was based on the time period from 1980 to 2003. The findings of the study are accordant to Structuralists' theory of money supply. The findings of the study conclude that in the short-run, there exists a partial support to accommodative endogeneity. It has also been found that in the short-run Structuralists' view on money endogeneity is consistent with that of liquidity preference theory. Thus, this study concludes that money endogeneity in Pakistan exists in the short-run only. The policy implication of this particular study is that monetary policy has the ability to indeed affect the financial environment of the country in the long-term. Since money supply is endogenous in the country in the short-run, the State Bank of Pakistan must establish market-creating and market-establishing institutions; these institutions must be aimed at facilitating economic growth and development such as consistent monetary policies, stable aggregate price level, enforcement of debt contracts, and transparency. Similarly; Khan (2008) have tested the monetary approach

to the balance of payments by incorporating the currency substitution version of money demand function for Pakistan over the period 1962-2005. The results suggest that real output, real exchange rate and domestic credit play an important role in the determination of foreign reserves in Pakistan in long-run as well in short-run.

2.3: Conclusion

The discussion of previous literature shows that the area of endogeniety of money supply is in well discussion now. However; it is also evident that the findings are inconclusive. As in case of Pakistan; Chaudhary *et al.* (1995), found endogeneity of money supply. However; Ahmad and Ahmad (2006) conclude that money supply is endogenous only in short-run while exogenous in long run. This controversy compels to investigate the matter.

CHAPTER 03:

THEORETICAL FRAMEWORK

This chapter provides the theoretical background of endogeniety of money supply. Earlier it was considered that central bank is autonomous body in determining the level of money supply, that is, money is exogenous. However, now the momentum is almost set which explains that several economic indicators may affect the supply of money.

3.1: Theoretical Background

The theoretical background is constructed on the different perspective of the Post-Keynesian money supply theory. Over the time, monetary growth targeting has been unsuccessful in several developing countries primarily because the governments instead of monetary markets primarily control the monetary policies in under-developed countries. Thus, money supply is dictated exogenously supply of money (Dinc, 2005; Wade & Bruton, 1994). It represents the post-Keynesian view on money supply. Bank borrowers dictate loans that in turn make deposits. In the context, system liquidity is preserved through supply of currency and reserves by central banks fulfilling their role as leaders of the last resort. On the other hand, banks, from the discount window, set their lending rate with markup over the borrowing cost. The Post-Keynesians argue that because loans make deposits which endogenously dictated the deposits. Thus, any change in money income does not cause but result in a change in money supply. These changes vary with respect to output and price (Kaldor & Trevithick, 1981).

Keeping the above discussion in backdrop, we can trace the different theoretical linkages in the discussion of endogenity of money. There are several possibilities,

according to the different school of thoughts, of devising the functional form in the light of different views of Post Keynesians theory on the basis of arguments and explained relationships. Generally, there could be three possibilities, i) the accomodationist view, ii) structuralist view, and iii) liquidity preference view of money endogenity. Now, we shall explain each of them in a bit detail.

The Accommodationist View have mentioned, in the chapter of literature review, in details that it supports the notion that a unidirectional relationship exists between bank credits to the monetary aggregates and the monetary base with the former towards the latter (Pollin, 1991; Palley, 1994). More clearly, the money creation is dependent on the bank credit. Formally, it can be represented as follows:

$$M_t = f(BC_t)$$

In this equation, M_t represents any form of money, that is, M1, M2 or MB and BC represents bank credit.

Similarly, The Structuralist View concurs with the previous view on the connection between monetary aggregate and income (Lavoie, 2006). However, it suggests a bidirectional connection among the two. It can be represented in the functional form as follows:

$$BC_t = f(MM_t)$$

$$MM_t = f(BC_t)$$

In this equation, MM_t is either money multiplier or any form of money, that is, MM1 or MM2. On the other hand, The Liquidity Preference suggests bidirectional view between monetary aggregates and total bank credits (Kregel, 1988). Simultaneously, it concurs a feedback relationship between money aggregates and income. However, the feedback mechanism can be conditional from the liquidity preference:

$$BC_t = f(M_t, MM_t, FD_t)$$

$$\text{GDP}_t = f(\text{M}_t, \text{MM}_t, \text{FD}_t)$$

3.1.1: Econometric Model:

This study follows the liquidity preference view or Post Keynesian School of Thoughts. In this respect, we will discuss the linear relationship of bank credits with monetary aggregates. This study also checks the linear relationship between money aggregates and money income. We shall estimate the different variations with the different monetary aggregates so that we may check the robustness of the estimates. For example, first we shall test with only one monetary aggregate and the log of financial development. The specification would be:

$$LBC_t = \alpha + LMB_t + LFD_t + u_t \quad \text{..3.1}$$

Here LBC is the log of bank credit, LMB is log of monetary base and LFD is log of financial development. The specification is implied the bank credit is dependent on the monetary base. Then we shall change the monetary aggregate to test the robustness of the findings. For example:

$$LBC_t = \alpha + LM1_t + LFD_t + u_t \quad \text{..3.2}$$

Here LM1 is the log of money supply M1

$$LBC_t = \alpha + LM2_t + LFD_t + u_t \quad \text{..3.3}$$

Here LM2 is the log of money supply M1

$$LBC_t = \alpha + LMM1_t + LFD_t + u_t \quad \text{..3.4}$$

Here LMM1 is log of money multiplier of M1

$$LBC_t = \alpha + LMM2_t + LFD_t + u_t \quad \text{..3.5}$$

Here LMM2 is the log of money multiplier of M2

It is important to mention here that this not a general to specific method. But five are the independent models with a different monetary aggregate keeping the importance in view.

The income side specification will be:

The specification would be:

$$LGDP_t = \alpha + LMB_t + LFD_t + u_t \quad \text{..}3.6$$

Here LGP is the log of GDP. Similarly, the other variations of the specification will go on.

3.2 Econometric Technique Map

The econometric technique map for this particular study comprises of a three-step methodology. *Firstly,* time-series unit root tests will be conducted with the purpose of confirming that the data is stationary over time, that is, there are no highs and lows of an extent that might compromise the quality of the results obtained by running this data. Dicky Fuller test has been selected for this study in this regard. *Secondly,* the data will be statistically testing through regression analysis. For this purpose, autoregressive distributed lag model has been selected. *Lastly,* diagnostic tests will be run to confirm that if using this model was the right choice for this particular study.

3.2.1 Unit Root Test for Stationarity

The theoretical econometricians suggest formal tests to determine whether a time series data contains a trend and whether the trend is deterministic or stochastic. In the econometric literature, these are known as unit root tests. There is a plethora of unit root tests available to determine the order of co-integration of the different series. However, we shall use two of the earliest tests that is Phillip Peron test and Augmented Dicky Fuller (ADF) test presented by Dicky and Fuller (1979, 1981).

3.2.2 ADF Test

Dickey-Fuller test (Dickey, Fuller, 1979) is one of the best known and most widely used unit root tests. It is based on the model of the first-order autoregressive process. The Augmented Dickey-Fuller test constructs a parametric correction for higher-order correlation by assuming that the y series follows an AR(p) process, and adds p lagged differences of y to the RHS of the test regression. This raises the problem of choosing the number of lags p. This is done by a variety of tests. In practical terms, you'd like to add enough terms so that the errors are white noise. Augmented Dickey-Fuller test is a parametric test in nature and only predict that series which is normally distributed in data set. While on the other hand the (ADF) statistic used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis that there is a unit root at some level of confidence.

3.2.3 Phillips Peron Test

The Phillips-Perron (PP) test offer an alternative method for correcting for serial correlation in unit root testing. Basically, they use the standard DF or ADF test, but modify the t-ratio so that the serial correlation does not affect the asymptotic distribution of the test statistic. In the PP test, you have to decide whether or not to include a constant and/or time trend.

In the unit root testing of time series generated by the process with autocorrelated and heteroscedastic non-systematic component, there is often a problem of selection of lag p in the regression model. Phillips and Perron (1988) were dealing with this problem and instead of describing the autocorrelation structure of the generating process by the corresponding autocorrelation models, they used standard Dickey-Fuller test with non-parametrically modified test statistics. Phillips-Peron test is the non-parametric test

which means that if a series is found to be not normally distributed then we use Phillips-Peron test to check the stationarity of that particular series. Similarly Phillip-Peron test is good for large samples but not so good for small samples.

3.2.4 Autoregressive Distributed Lag Model

To examine the relationship between the chosen variable study employs the autoregressive distributed lag model (ARDL) suggested by Pesaran et al. (2001). ARDL examine the long run equilibrium relationship in our case between Bank credit and the explanatory variables, because there is shortage of checking long run relationship between bank credit and monetary aggregates in most of the literature regarding Pakistan. After checking the stationarity, the long-term relationship among the chosen variables is tested.

There are several methods to check the cointegration (long run relationship). For example; Engle Granger, Johanson cointegration and Autoregressive Distributed Lag model. However, each methodology has several conditions and also have some pro and cons[3]. Pesaran and Pesaran (1997), Pesaran and Smith (1998), Pesaran and Shin (1999) and Pesaran *et al.* (2001), based on General to Specific modeling technique, proposed Autoregressive distributed lag (ARDL) model. The technique is preferred over the other methodologies because all variables being integrated of same order or even if fractionally integrated is not a requirement (Pesaran and Pesaran 1997). Moreover, it distinguishes dependent and independent variables, and thus, allows for testing existence of a relationship between them. ARDL model also take the sufficient number of lags to capture the dynamic relationship among variables. Further the model

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[3] (a paragraph about Johanson and Engle Granger)

allows to capture the short run relationship through Error Correction Model (ECM). The other advantage is that ARDL technique is free of residual correlation, therefore; the presence of endogeniety is rare. However; even in presence of endogeniety, ARDL procedure is possible and estimates are consistent (Pesaran *et al.*, 2001; Pesaran & Pesaran, 1997).

The ARDL specification in the case of equation 3.1 is as follows

$$\Delta LBC_t = \beta_0 + \sum_{i=0}^{n-1} \gamma_i \Delta LBC_{t-i} + \sum_{i=0}^{n-1} \phi_i \Delta LMB_{t-i} + \sum_{i=0}^{n-1} \varphi_i \Delta LFD_{t-i} + \lambda_1 LBC + \lambda_2 LMB + \lambda_3 FD + \varepsilon_t$$

....3.7

The first step of ARDL model estimation technique comprises of bound test.

Step 1: The equation is estimated using Ordinary Least Square (OLS) method. The misspecification of the variables is checked through diagnostics of the model.

Step 2: The long-term relationship between the chosen variables is tested using bound test procedure and the F-test. F statistics is of considerable practical importance if such a relationship among the variables exists because in such situations, it shows which variables should be normalized. In this regard, two critical values for the cointegration test have been given by Pesaran *et al.,* (2001). The null hypothesis assumes that the variables have not long run relationship,

$$\lambda_1 = \lambda_2 = \lambda_3 = 0$$

And whereas the alternative is

$$\lambda_1 \neq 0 \,, \; \lambda_2 \neq 0 \,, \; \lambda_3 \neq 0$$

Step 3: The calculated value is then related with the two critical values of the cointegration test provided by Pesaran *et al.* (2001). The lower critical bound depicts that no cointegration relationship exists among the chosen variables primarily because it assumes that all the variables are I (0). The upper bound, on the other hand, dictates

that cointegration exists among the variables, that is, all the variables are I (1). The H_0 is rejected if the computed F-statistic value is greater than the upper bound critical value. It indicates that the variables are cointegrated. On the other hand, the H_0 cannot be rejected if the F-statistic is below the lower bound critical value. It indicates that there is no cointegration among the variables. The findings remain inconclusive when the computed F statistics falls among the upper- and lower-bound. We can write all equations from 3.2 to 3.6 in ARDL framework. However, it seems repeating the things that's why we shall avoid.

Lag selection is of critical importance for determining the relationship among variables, therefore; selected cautiously. For the purpose, different criterions as Schwartz –Bayesian Criteria (SBC) and Akike information criteria (AIC). AIC allows selecting maximum relevant lag length while SBC selects the smallest lag length because it is a parsimonious model.

After forming the long-term relationship among the chosen variables; the next step is to estimate the short run coefficient and for this purpose Error Correction Method (ECM) is used. It also allows testing the speed of adjustment which is a prerequisite to adjusting the long-term values aftershocks occurs in variables in short term. On establishing the existence of long-term relationship between the variables, the Error Correction Model becomes:

$$\Delta LBC_t = \beta_0 + \sum_{i=1}^{n-1} \gamma_i \Delta LBC_{t-i} + \sum_{i=0}^{n-1} \phi_i \Delta LMB_{t-i} + \sum_{i=0}^{n-1} \varphi_i \Delta LFD_{t-i} + \lambda_1 LBC + \lambda_2 LMB + \lambda_3 FD + \alpha ECM_{t-1} + \varepsilon_t$$

....3.8

This step comprises of estimating the correct sign and significance of the error correction coefficient. It is called convergence to equilibrium after a shock of disturbance to the economy. The primary rule is that larger error correction coefficient findings in faster convergence towards the equilibrium by the economy. After these

estimations, the fitness of the estimated models is checked through diagnostic and stability tests. In this respect, several statistical tests are conducted for checking heteroscedasticity in the error term, functional form of the equation, normality of the variables, and the serial correlation.

Moreover, cumulative (CUSUM) and cumulative sum of square (CUSMSQ) suggested by the Pesaran and Pesaran (1997) in the case of ARDL estimators, have been utilized for checking stability tests. The null hypothesis cannot be rejected in the presence of obtained statistics are two-tests statistic stay within the critical bonds of level of significance at 5 percent.

3.3: Conclusion

Autoregressive Distributed Lag (ARDL) technique is used to find out the empirical evidence of endogeniety of money supply in Pakistan from time period 1980-2017. Also find out short- and long-term relationships between variables which are used to find out the empirical evidence of endogeniety of money supply.

CHAPTER 04:

DATA AND VARIABLES

This chapter focuses on the construction of variables. As mentioned earlier that the liquid preference view on the endogenous money is going to be tested. In chapter three we mentioned a variant of equation to test the view. Therefore, it is important to speak about the all monetary aggregates so that we may understand clearly the outcome of the estimations.

4.1 Variables

The debate on money supply being endogenous or exogenous has a long history. It is of critical practical importance to observing, as policy intervention is valid only if we know that whether money supply is exogenous or affected by economic variables or endogenous. This study intends to test the endogeniety of money supply in Pakistan for thirty-five years running from 1980 to 2015. For this purpose, the variables of the study is going to use are as under;

4.1.1 Total Bank Credit (BC)

Bank credit is an agreement between bank and the borrower that the borrower would repay their loan with interest rate that is stated already in the agreement. This agreement indicates the total lending capacity of banks as well. Yet, an exact minimum payment for specific time span remains a prerequisite for it. In other words, bank credit is the total amount that is imposed on borrower including banking interest rates also. Earlier literature as the study of Shanmugan *et al.* (2003), Badarudin *et al.* (2011), Nayan *et al.* (2013), Tas *et al.* (2013) and Badarudin *et al.* (2013) show that total bank credit is a variable of critical importance in explaination of endogeniety of money supply.

4.1.2 Gross Domestic Products (GDP)

Gross domestic product is defined as a monetary measure of all services and goods which are produced in the economy within the frontiers of a country for a specific period. The economic performances of a whole region or country is dictated commonly through Nominal GDP estimates. Earlier, Nayan *et al.* (2013), Badarudin *et al.* (2013) and Tas *et al.* (2013) has used the variable in their studies and found that it affects the money supply.

4.1.3 Monetary Base (MB)

The currency in the depositary of banks or held either in the hands of public is known as Monetary Base. More specifically, traditionally speaking monetary base equals to liquid currency and also added the current bank reserves. MB = R+C. The amount of money in hands known as liquid currency while money in banks also called bank reserves. Monetary base is of critical importance in determination of money supply is proposed by Shanmugan *et al.* (2003), Badarudin *et al.* (2011), Nayan *et al.* (2013), Tas *et al.* (2013) and Badarudin *et al.* (2013).

4.1.4 M1 (Money Supply)

M1 (money supply), it is also known as narrow money which is used as medium of exchange including checking accounts and demand deposits only. M1 is defined as most liquid part in all component of the money supply. It doesn't include saving account etc.

M1= demand deposits and traveler's checks + currency in circulation. Tas *et al.* (2013) has used this variable M1 in his study – a trend that this study follows.

4.1.5 M2 (Money Supply)

M2 is also the liquid part of money supply but not as much liquid then M1. Similarly, it includes currency in circulation, demand deposits, time deposits, saving deposits, mutual funds, traveler's cheques and securities of money markets. These instruments are not easily convertible in cash and also less liquid for medium of exchange. This variable collected from WDI as Money plus Quasi Money. Earlier Nayan *et al.* (2013), Tas *et al.* (2013) and Badarudin *et al.* (2013) have used M2 as money supply in their studies.

4.1.6 Money Multipliers (MM)

Money multiplier is defined as the rise or expansion in money supply give findings bank being able to offer some loan to the borrower. More specifically, money used for creating more money is calculated by dividing the total bank deposits by reserve requirements.

MM1= M1/MB and MM2= M2/MB. As the definition show money multiplier do affect the money supply.

4.1.7 Financial Development (FD)

Primarily, three different types of financial development can be identified from these three variables in the existing literature, that is, M2 to GDP (gross domestic product), liquid liabilities, and credit to private sector. As a matter of fact, financial development is most commonly obtained through the channel of credit to private sector (as ratio of GDP).

Although the channel of financial development through M2 to GDP works on an established route, that is, the value of currency increases for one reason or another and resultantly, an increase in financial development is observed. However, the increase in the value of currency also results in an increase in the prices of goods and services

within an economy. It means that the increasing prices successfully set off the amount of financial development being increased due to the increase in the value of currency. Thus, for this reason, at the end of the day, financial development observed in the economy is not so much reliable.

Financial development maintains its growth in an economy via liquid liabilities as well. Liquid liabilities consist of demand deposits. However, the issue arises when the growth in financial development is not channelized. Therefore, such development does not remain authentic anymore. Moreover, the element of financial development cost prevails in the situation as well. Based on these grounds, any financial development obtained through liquid liabilities remains unauthentic and thus, does not enjoy the privilege of acceptance among the researchers and practitioners.

Credit to private sector plays a major role in the context of financial development too. As a matter of fact, it is the most commonly used channel for obtaining financial development primarily due to the fact that the increase in credit results in increase in investment in the private sector. Financial development results as a result of the investment in the economy, and credit to private sector provides an opportunity to the investors in this regard. Therefore, it is the most authentic channel of obtaining financial development.

4.2 Data Sources

The data for this study have been collected from several sources, that is., International Financial Statistics by International Monetary Fund and World Development Indicator. The dataset comprises of IFS Feb-2017 and WDI modified data of May-2017. Moreover, data for only one independent variable, that is, monetary aggregates has been taken from IFS whereas the remaining datasets have been collected from WDI.

CHAPTER 5:

RESULTS AND DISCUSSIONS

This study aims at testing endogeneity of money supply for the case of Pakistan. In this respect, it uses time-series data from period of 1980 to 2017. Particularly, this study uses the ARDL estimators for testing the long-term relationships between variables. A specific path to work in this technique has largely been adopted by the researchers in the field of applied econometrics. Thereby, it follows the standard route. The essential steps of the analysis include: *firstly,* unit root test is applied on the extracted set of time-series data for the purpose of checking its stationary properties. *Secondly,* using the ARDL estimators for testing the long-term relationships among the variables. Thirdly, using statistical testing for finding the long-term and short-run coefficients. Lastly, testing stability through CUSUMSQ and CUSUM tests along with checking robustness of the data.

5.1 Unit Root Tests

ARDL estimators can be used without taking into consideration that if the data series is I (0), I (1) or frictionally cointegrated. However, the ARDL estimators become impractical in the presence of I (2) series primarily of the assumption the bound test remains subject to, that is, the variables are either integrated of I (0) or I (1). Thus, the level of stationarity remains valid to testing. Following it, this study tests the order of integration of the data series using Augmented Dicky Fuller (ADF) estimators and Phillips and Perron test. It is evident from the findings of the tests that the extracted time

Table 1: Unit Root Tests

	τ_u	τ_t	τ	τ_u	τ_t	τ	Method
lngdp	-0.383	-1.542	5.502*	-4.270*	-4.243*	NA	PP[!]
	-0.365	-1.615	1.944	-4.289*	-4.234*	6.678*	ADF[1]
LBC	-1.631	-1.177	4.599*	-3.285*	-4.127*	NA	PP
	0.813	-1.588	1.944	-3.294*	-3.422*	-4.425*	ADF
LMB	-1.314	-1.880	2.692	-3.367*	-3.394*	-2.382	PP
	-1.405	-1.816	3.705*	-3.330*	-3.349*	NA	ADF
LM1	0.566	-2.427	4.106*	-3.330*	-3.413*	NA	PP
	0.922	-2.528	2.646	-3.367*	-3.431*	-1.907	ADF
LM2	-2.208	-0.812	11.415*	-4.216*	-4.626*	NA	PP
	-2.190	-0.785	13.012*	-4.234*	-4.617*	NA	ADF
LMM1	-0.383	-1.542	5.502*	-4.270*	-4.243*	NA	PP
	-0.365	-1.615	6.506*	-4.289*	-4.234*	NA	ADF
LMM2	-2.600	-2.591	-0.228	-6.551*	-6.524*	-6.716*	PP
	-2.528	-2.509	-0.182	-5.675*	-5.593*	-5.758*	ADF
FD	-1.916	-1.807	0.000	-4.115*	-3.997*	-4.206*	PP
	-2.208	-3.924*	-0.109	-4.097*	NA	-4.161*	ADF

Notes: t_u is the model with an intercept and without trend, t_T represents with an intercept and trend; and t is without an intercept and trend.

[!]PP is an abbreviation of Phillips and Perron test for unit root. [1] is an abbreviation of Augmented Dicky Fuller test for unit root.

* implies that the data series is stationary.

The hypothesis of the Unit Root Test is that the data is stationary, that is, there is no unit root for the series. The findings of the Unit Root tests show that there are no data sets of order I (2) or above. It means that all data sets for the selected variables are of order I (0) or I (1) or frictionally integrated. The table above presents the model with level form, that is, I (0) and first difference form, that is, I (1). For the Augmented Dicky Fuller test, the number of lags present the maximum delay of the autoregressive terms on the right-hand side of the model. However, for Phillips and Perron test, the number

of lags represent the terms included in the model to calculate the long-term variance. For this reason, the findings are rather sensitive to the number of lags.

The model τ_u is with an intercept and without trend, the model τ_t is without an intercept but with trend whereas the last model is without an intercept and trend. It is evident from the findings of the Unit Root Tests that the some of the chosen variables for this study, that is, gross domestic product (lngdp), bank credit (LBC), money multiplier of M2 (LMM2), and financial development (FD), are stationary in the first difference form in two of the models, that is, the first model which is with intercept but without trend and the second model which is without intercept but with trend. It indicates that these variables are exhibiting a time trend, that is, they show a deterministic trending behavior. Only a few variables including monetary base (LMB), money supply M2 (LM2), and money multiplier of M1 (LMM1) exhibit to be stationary in the level form using Augmented Dicky Fuller test whereas the same variables along with bank credit (LBC) and money supply M1(LM1) are stationary in the level form using Phillips and Perron test. series data sets are either of order I (0) or I (1) or frictionally integrated. More importantly, none of the data sets are of order I (2) or above. Thus, ARDL estimators are best-suited estimator procedure at hand. Therefore, this study employs ARDL estimators. Therefore, the choice of ARDL estimators has been made in this study because it is an appropriate method for estimating variables with such stationary conditions.

5.2 ARDL Test of Cointegration

The findings of the Unit Root Tests indicate that the extracted time series data sets are integrated of order I (1) or below. None of the series belongs to order I (2) or above. For this reason, the ARDL estimators or Bound testing procedures can be used for checking the long-term relationship among the chosen variables in the context of

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endogeneity of money supply. It is the best-suited test for incorporating I (0) and I (1) variables in the same estimation. Ordinary Least Square (OLS) method is appropriate if the variables are stationary, that is, I (0) and Vector Error Cointegration Method (VECM) Johanson Approach is advisable if all of the variables are non-stationary, that is, I (1). However, if some of the variables are (1) then Ordinary Least Square (OLS) method is not the right choice because it requires these variables to behave like constants. In the present study, Ordinary Least Square (OLS) will mistakenly show high *t*-values because most of the variables are changing. It will produce spurious findings. Thus, ARDL estimation becomes the appropriate choice for this particular study. The findings are shown in the following table:

Table 2: ARDL Test of Cointegration

Model	F-Stats Imposing 1 lag length	F-Stats Optimal lag length	Optimal Lag length
Dependent Variable is Credit to Banks			
$lbc = f(lmb)$	7.8965	7.3920	2
$lbc = f(lm_1)$	7.0200	7.0200	1
$lbc = f(lm_2)$	7.9763	11.7888	3
$lbc = f(lmm_1)$	6.4135	6.0372	2
$lbc = f(lmm_2)$	5.0716	8.1384	2
Dependent Variable is GDP			
$ly = f(lmb)$	8.4567	7.9164	2
$ly = f(lm_1)$	7.5180	7.8209	1
$ly = f(lm_2)$	8.5421	12.6250	3
$ly = f(lmm_1)$	6.8685	6.4655	2
$ly = f(lmm_2)$	5.4313	8.7157	2

Note: *The calculated are compared with critical values of Pesaran *et al.* (2001)

The preconditions for running this method have been checked, that is, (i) dependent variables (gross domestic product and bank credit) are non-stationary and (ii) none of the variables are of order I (2) in normal condition using Augmented Dicky Fuller test. If the calculated values of F-statistics remain below the lower bound of the critical value then it indicates that there is no long-term relationship. For this particular study, the findings of the ARDL test of Cointegration of Bivariate Model indicate a strong long-term relationship between the variables because the F-Statistic is away from the critical value at level of significance at 5 percent.

5.3 Long-term Estimates through ARDL

Two dependent variables, that is, bank credit and gross domestic product, have been chosen as dependent variables for this study of cointegration. In order to study the long-term effect of the independent variables, that is, monetary base, M1, M2, money multiplier of M1, money multiplier of M2, and financial development, on the bank credit and gross domestic product, this study uses Autoregressive Distributed Lag Cointegration technique on equation (3.1 to 3.6). Different criteria including $\overline{R^2}$ criterion, Akaike Information Criterion (AIC), Hannan Quinn criterion, and Schwartz Bayesian Criterion (SBC) have been used for finding the coefficients of the level variables. The long-term findings of all five models of this study are nearly identical.

Thereby, only one model has been selected on the Schwartz Bayesian (SBC) criterion. Based on the likelihood function, it is used for selecting models among a finite number of models. It is possible to add the likelihood by increasing the number of variables when fitting the model. However, it might sometimes result in overfitting of the model. To resolve this issue, a penalty term is added to the model. The most parsimonious model among all has been selected which is a model that accomplishes a desired level of prediction or explanation with the fewest possible predictor. It helped

in selecting the minimum possible lag length and minimizing the loss of degree of freedom.

Table 3: Long run Estimates through ARDL

lnBC is Dependent variable

Regressor	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
LMB	0.6435***	…	…	…	…
	(0.1572)	…	…	…	…
LM1	…	0.2118***	…	…	…
	…	(0.0438)	…	…	…
LM2	…	…	0.2447**	…	…
	…	…	(0.1079)	…	…
LMM1	…	…	…	0.3676***	…
	…	…	…	(0.1315)	…
LMM2	…	…	…	…	0.1562**
	…	…	…	…	(0.0840)
LFD	0.4279***	0.6481***	0.1240***	0.9752***	0.4746***
	(0.1049)	(0.1656)	(0.0384)	(0.1790)	(0.1079)
Constant	0.8127***	0.0734	0.3405	0.6467***	0.7772**
	(0.0777)	(0.7306)	(0.4034)	(0.2611)	(0.3106)
Diagnostics Test					
Functional Form	0.9563	0.3446	0.4659	0.2540	0.8499
Normality	0.1732	0.7717	0.1196	0.7185	0.1634
Heteroscidaticty	0.9786	0.9961	0.1254	0.4129	0.6167
Serial correlation	0.2450	0.6590	0.7419	0.9365	0.4818

The findings of the long-term estimates through Autoregressive Distributed Lag cointegration are presented in Table 3 where bank credit is a dependent variable. The coefficients of LM2, LMB, and LM1 are significant this implies that the Accommodationist view is not valid in this case which means both theories are valid that is liquidity preference view and Structuralists. The findings explain that the Liquidity Preference views and Structuralists view of monetary theories are valid and

also found that there is a two-way (a bidirectional relationship) exists between monetary aggregates and bank credits. The findings of LM2, LM1 and LMB under liquidity preference theory indicate the existence of a bidirectional relationship between bank credits and monetary aggregates. Theoretically this scenario explains that money supply is affecting by commercial banks through creating the loans.

In the first model, the coefficient of monetary base which is 0.6435, implies that 1-percent rise in monetary base findings in 0.6435 rise in Pakistan's bank credit in the long-term. In a similar fashion, the coefficient of financial development which is 0.4279, implies that 1-percent rise in monetary base - financial development nexus findings in 0.4279 rise in Pakistan's bank credit in the long-term.

In the second model, the money supply M1 coefficient is 0.2118, implies that 1-percent rise in money supply M1 findings in 0.2118 rise in Pakistan's bank credit in the long-term. Similarly, the coefficient of financial development which is 0.6481, implies that 1-percent rise in money supply M1-nexus financial development findings in 0.6481 rise in Pakistan's bank credit in the long-term.

In the third model, the coefficient of money supply M2 is 0.2447, implies that 1-percent rise in money supply M2 findings in 0.2447 rise in Pakistan's bank credit in the long-term. Moreover, the coefficient of financial development which is 0.1240, implies that 1-percent rise in money supply M2-nexus financial development findings in 0.1240 rise in Pakistan's bank credit in the long-term.

In the fourth model, the coefficient of money multiplier of M1 is 0.3676, implies that 1-percent rise in money multiplier of M1 findings in 0.3676 rise in Pakistan's bank credit in the long-term. Likewise, the coefficient of financial development which is 0.9752, implies that 1-percent rise in money supply M1-nexus financial development findings in 0.9752 rise in Pakistan's bank credit in the long-term.

In the fifth model, the coefficient of money multiplier of M2 is 0.1562. It implies that 1-percent rise in money multiplier of M2 findings in 0.1562 rise in Pakistan's bank credit in the long-term. In a similar fashion, the coefficient of financial development which is 0.4746, implies that 1-percent rise in money supply M2-nexus financial development findings in 0.4746 rise in Pakistan's bank credit in the long-term. These findings are accordant to the hypothesis that the rise in the money multiplier M2 nexus financial development of the country findings in positive change in the bank credit of the same.

The findings of long-term estimates obtained through Autoregressive Distributed Lag cointegration technique, where bank credit is the dependent variable, indicate that correlation between monetary base nexus financial development and bank credit is the strongest among all the five models. Therefore, it can be concluded, based on these findings, that the change in monetary base positively influences the level of bank credit in Pakistan at the highest level in comparison to other chosen variables for this study, that is, money supply M1, money supply M2, money multiplier of M1, and money multiplier of M2 over a period of 37 years from 1980 to 2017.

Table 4: Long run Estimates through ARDL

ln$Y$ is Dependent varizable

Regressor	Model 6	Model 7	Model 8	Model 9	Model 10
LMB	0.7301*	…	…	…	…
	(0.4365)	…	…	…	…
LM1	…	0.3132**	…	…	…
	…	(0.1533)	…	…	…
LM2	…	…	0.5135**	…	…
	…	…	(0.2444)	…	…
LMM1	…	…	…	0.6540***	…
	…	…	…	(0.1141)	…
LMM2	…	…	…	…	0.7698***
	…	…	…	…	(0.1626)
LFD	0.5106**	0.7432***	0.3496**	0.5322***	0.7996**
	(0.2150)	(0.1497)	(0.1655)	(0.1627)	(0.4152)
Constant	0.5191*	0.7989	0.2222	0.7858**	0.1716
	(0.3189)	(0.8271)	(0.6061)	(0.3972)	(0.1395)
Diagnostics Test					
Functional Form	0.2237	0.8045	0.2444	0.3260	0.7469
Normality	0.3633	0.4820	0.3911	0.5139	0.6857
Heteroscidaticty	0.3175	0.3018	0.7774	0.8799	0.0908
Serial correlation	0.7048	0.5184	0.2602	0.3282	0.1153

Next, the findings of the long-term estimates through Autoregressive Distributed Lag cointegration are presented in Table 5 where GDP is a dependent variable. In the first model, the coefficient of monetary base which is 0.7301, implies that 1-percent rise in monetary base findings in 0.7301 rise in the GDP of the country in the long-term. In a similar fashion, the coefficient of financial development which is 0.5106, implies that 1-percent rise in financial development findings in 0.5106 rise in the GDP of the country in the long-term.

In the second model, the coefficient of money supply M1 is 0.3132, implies that 1-percent rise in money supply M1 findings in 0.3132 rise in the GDP of the country in the long-term. Similarly, the coefficient of financial development which is 0.7432, implies that 1-percent rise in money supply M1-nexus financial development findings in 0.7432 rise in the economic growth of the country, that is, Pakistan's gross domestic product in the long-term.

In the third model, the coefficient of money supply M2 is 0.5135, implies that 1-percent rise in money supply M2 findings in 0.5135 rise in Pakistan's gross domestic product in the long-term. Moreover, the coefficient of financial development which is 0.3496, implies that 1-percent rise in money supply M2-nexus financial development findings in 0.3496 rise in Pakistan's economic growth in the long-term.

In the fourth model, the coefficient of money multiplier of M1 is 0.6540, implies that 1-percent rise in money multiplier of M1 findings in 0.6540 rise in Pakistan's gross domestic product in the long-term. Likewise, the coefficient of financial development which is 0.5322, implies that 1-percent rise in money supply M1-nexus financial development findings in 0.5322 rise in Pakistan's bank credit in the long-term.

In the fifth model, the M2 money multiplier's coefficient is 0.7698. It implies that 1-percent rise in money multiplier of M2 findings in 0.7698 rise in Pakistan's gross domestic product in the long-term. In a similar fashion, the coefficient of financial development which is 0.7996, implies that 1-percent rise in money supply M2-nexus financial development findings in 0.7996 rise in Pakistan's bank credit in the long-term.

The findings of long-term estimates obtained through Autoregressive Distributed Lag cointegration technique, where gross domestic product is the dependent variable, indicate that correlation between money multiplier of M2 nexus financial development and gross domestic product is the strongest among all the five models.

Therefore, it can be concluded, based on these findings, that the change in money multiplier of M2 positively influences the level of economic growth in Pakistan at the highest level in comparison to other chosen variables for this study, that is, money supply M1, money supply M2, money multiplier of M1, and monetary base over a period of 37 years from 1980 to 2017.

5.4 Diagnostic and Stability Test

All five models of this study successfully pass the analytical tests. The findings of this test are presented in the lower-half section of Table 3 and Table 4. From Table 3 where bank credit is a dependent variable, the absence of heteroscedasticity and serial correlation is evident seeing the p-values χ^2 of the models. Moreover, the p-values of 0.95, 0.34, 0.46, 0.25, and 0.84 of the functional form of all five models provide an evidence of the well-specification of the models. On the other hand, the p-values of 0.17, 0.77, 0.11, 0.71, and 0.16 of normality assumption of the residents of all five models successfully indicate acceptance of the *null hypothesis* in this regard. Furthermore, from Table 5 where gross domestic product is a dependent variable, the absence of heteroscedasticity and serial correlation is evident seeing the models' p-values χ^2. Moreover, the p-values of 0.22, 0.80, 0.24, 0.32, and 0.74 of the functional form of all five models provide an evidence of the well-specification of the models. On the other hand, the p-values of 0.36, 0.48, 0.39, 0.51, and 0.68 of normality assumption of the residents of all five models successfully indicate acceptance of the *null hypothesis* in this regard as well.

5.5 ECM and Other Diagnostic

In order to capture the short-term dynamics and long-term equilibrium simultaneously in the time-series modelling, this study adopts an Error Correction Model. It incorporates a mechanism for restoring a variable from a disequilibrium position to its long-term relationship. In other words, it explains the time taken by a dependent variable to come back to its original position after a change has been introduced in the relevant independent variables. It is the best-suited model for a study of cointegration where two or more variables have a common trend in the long-term. For this particular study, error correction model has been run on both equations of bank credit and gross domestic product being taken as dependent variables. The findings of ECM and other diagnostics are provided as under:

Table 5: ECM and Other Diagonastic

Model	ECM	R^2	DW	CUSUM	CUSUMSQ
$lbc = f(lmb)$	-0.0319*** (0.0130)	0.6348	1.6026	Stable	Stable
$lbc = f(lm_1)$	-0.0503*** (0.0041)	0.6515	1.7996	Stable	Stable
$lbc = f(lm_2)$	-0.0658*** (0.0059)	0.6853	1.9277	Stable	Stable
$lbc = f(lmm_1)$	-0.0567*** (0.0158)	0.7359	1.5125	Stable	Stable
$lbc = f(lmm_2)$	-0.0521*** (0.0157)	0.5594	1.6999	Stable	Stable
$ly = f(lmb)$	-0.0242* (0.0148)	0.5375	1.8340	Stable	Stable
$ly = f(lm_1)$	-0.0611*** (0.0078)	0.7389	2.0035	Stable	Stable
$ly = f(lm_2)$	-0.0272*** (0.0070)	0.6996	2.0916	Stable	Stable
$ly = f(lmm_1)$	-0.0719*** (0.0093)	0.6998	1.7950	Stable	Stable
$ly = f(lmm_2)$	-0.0262*** (0.0106)	0.7193	1.4550	Stable	Stable

In the first section of the table, bank credit (bc) has been shown in connection with the five independent variables including monetary base, money supply M1, money supply M2, money multiplier of M1, and money multiplier of M2. The findings show a value of -0.0319, -0.0503, -0.0658, -0.0567, and -0.0521 at 10-percent significance for these independent variables respectively. It indicates that after introducing a change in monetary base, the dependent variable of bank credit will converge up to 30-percent of its original position of before shock. Similarly, bank credit will converge to its original position for up to 50-percent if a change is introduced to the money supply M1. It is evident from these values that the bank credit will converge up to 6-percent of its original position on introducing a change in the money supply M2.

Similarly, in the second section of the table, gross domestic credit (y) has been shown in connection with the same five independent variables including monetary base, money supply M1, money supply M2, money multiplier of M1, and money multiplier of M2. The findings show a value of -0.0242, -0.0611, -0.0272, -0.0719, and -0.0262 at 10-percent significance for these independent variables respectively. It indicates that after introducing a change in monetary base, the dependent variable of gross domestic product will converge up to 2-percent of its original position of before shock. Similarly, gross domestic product will converge to its original position for up to 6-percent if a change is introduced to the money supply M1. It is evident from these values that gross domestic product will converge up to 7-percent of its original position on introducing a change in the money multiplier of M1.

5.6 Discussion

The current study is aimed at finding out empirical evidence of endogenous money supply in the economy of Pakistan. In this regard, it seeks to find out evidence of endogenous money supply in the economy of Pakistan and to check the robustness

of the contemporaneous correlation of bank credit, financial development and money supply. In this respect, it tests the cointegration of bank credit and gross domestic product as dependent variables on money supply M1, monetary base, money supply M2, money multiplier of M1, and money multiplier of M2 as the independent variables. The cointegration has been tested statistically through Autoregressive Distributed Lag technique.

Initially, stationarity of data has been tested using two unit roots tests, that is, Augmented Dicky Fuller test and Phillips and Pearson test, because non-stationary data provide spurious findings. Moreover, ARDL estimators can be used without considering that if the data series is I (0), I (1) frictionally cointegrated. Otherwise, in the presence of I (2) series, they become useless primarily of the assumption being subjected to the bound test, that is, the chosen variables are either integrated of I (0) or I (1). The findings of the tests that the extracted time series data sets are either of order I (0) or I (1) or frictionally integrated. Significantly, the data sets are also not found of order I (2) or above. Hence, the choice of ARDL estimators has been made in this study because it is an appropriate method for estimating variables with such stationary conditions.

Although ordinary Least Square (OLS) method is appropriate if the variables are stationary, that is, I (0), it method is not the right choice for this particular study because it requires these variables to behave like constants whereas here, only a few variables including monetary base (LMB), money supply M2 (LM2), and money multiplier of M1 (LMM1) exhibit to be stationary in the level form using Augmented Dicky Fuller test whereas the same variables along with bank credit (LBC) and money supply M1(LM1) are stationary in the level form using Phillips and Perron test. Thereby, Ordinary Least Square (OLS) in this particular study would mistakenly have

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shown high *t*-values and produced spurious findings. Thus, ARDL estimation is the appropriate choice.

The findings of the ARDL estimation indicate that 1-percent rise in monetary base findings in 0.6435 rise in Pakistan's bank credit in the long-term. These findings are in sync with the hypothesis that the rise in the monetary base nexus financial development of the country findings in positive change in the bank credit of the same. Moreover, it is evident from the findings that 1-percent rise in money supply M1 findings in 0.2118 rise in Pakistan's bank credit in the long-term. These findings go hand in hand with the hypothesis that the rise in the money supply M1 nexus financial development of the country findings in positive change in the bank credit of the same.

Similarly, the findings show that 1-percent rise in money supply M2 findings in 0.2447 rise in Pakistan's bank credit in the long-term. These findings are accordant to the hypothesis that the rise in the money supply M2 nexus financial development of the country findings in positive change in the bank credit of the same. Moreover, the findings show that 1-percent rise in money multiplier of M1 findings in 0.3676 rise in Pakistan's bank credit in the long-term. These findings are accordant to the hypothesis that the rise in the money supply M1 nexus financial development of the country findings in positive change in the bank credit of the same.

Lastly, the coefficient of money multiplier of M2 is 0.1562. It implies that 1-percent rise in money multiplier of M2 findings in 0.1562 rise in Pakistan's bank credit in the long-term. These findings are accordant to the hypothesis that the rise in the money multiplier M2 nexus financial development of the country findings in positive change in the bank credit of the same. Overall, it is evident from the findings that the change in monetary base positively influences the level of bank credit in Pakistan at the highest level in comparison to other chosen variables for this study, that is, money

supply M1, money supply M2, money multiplier of M1, and money multiplier of M2 over a period of 37 years from 1980 to 2017.

Coming to the gross domestic product, the findings indicate that 1-percent rise in monetary base findings in 0.7301 rise in the GDP of the country in the long-term. These findings are in sync with the hypotheses that the rise in the monetary base and financial development of the country findings in positive change in the economic growth, that is, GDP, of the same. Similarly, it is evident that 1-percent rise in money supply M1 findings in 0.3132 rise in the GDP of the country in the long-term. These findings go hand in hand with the hypothesis that the rise in the money supply M1 nexus financial development of the country findings in positive change in its long-term economic growth.

The findings also indicate that 1-percent rise in money supply M2 findings in 0.5135 rise in the GDP of the country in the long-term. These findings are accordant to the hypothesis that the rise in the money supply M2 nexus financial development of the country findings in positive change its long-term economic growth. Moreover, it is evident that 1-percent rise in money multiplier of M1 findings in 0.6540 rise in the GDP of the country in the long-term. These findings are accordant to the hypothesis that the rise in the money supply M1 nexus financial development of the country findings in its long-term economic growth.

Lastly, the findings show that 1-percent rise in money multiplier of M2 findings in 0.7698 rise in Pakistan's gross domestic product in the long-term. These findings are accordant to the hypothesis that the rise in the money multiplier M2 nexus financial development of the country findings in its long-term economic growth. Overall, the findings indicate that the change in money multiplier of M2 positively influences the level of economic growth in Pakistan at the highest level in comparison to other chosen variables for this study, that is, money supply M1, money supply M2, money multiplier of M1, and monetary base over a period of 37 years from 1980 to 2017.

CHAPTER 6:

CONCLUSION AND POLICY RECOMMENDATION

Money plays a vital role in working of an economy. The conventional doctrine of money supply supports exogenous flow of money in an economy, and hold monetary authorities, that is, central banks being responsible for directly determining the money supply in an economy. Post-Keynesian, on the other hand, believe the money supply to be endogenous with the claim that determining money supply under the umbrella of banks' supply of loans and demand for credit is of considerable practical importance. In the context of Pakistani economy, only one study, that is, Ahmed and Ahmed (2006), have tested the nature of money supply in the country. But the findings of the study concludes that money supply is exogenous in long run while shortrun is in favor of endogeneity of money supply.

6.1 Conclusion

In the case of Pakistan; exogeneity and endogeniety of money have always been under discussion due to mixed findings. Ahmad and Ahmad (2006) empirically investigated the long- and short-run money supply endogeneity in the country. Their study concludes that, in the short-run, the country's money supply is not dictated exogenously. Additionally, the empirical findings of this study supported both Liquidity Preference view and Structuralists' view on money endogeneity. It is of critical importance to observe that whether money supply is exogenous or endogenous as if we consider money supply as exogenous but in actual it is endogenous then the policy intervention of Central bank has different implications. This literature review has arguably put forward argument in favor of endogeneity of money supply. However,

this theoretical argument is needed to be supported through empirical evidence. For this reason, this study aimed at finding out empirical evidence of endogenous money supply in the economy of Pakistan.

Earlier literature shows that total bank credit is a variable of critical importance variable in explaining the endogeniety of money supply (Shanmugan *et al.*, 2003; Badarudin et al., 2011; Nayan *et al.*, 2013; Tas *et al.* 2013; Badarudin *et al.* 2013). The previous studies have also used the variable of gross domestic product in their studies and found that it affects the money supply (Nayan *et al.,* 2013; Badarudin *et al.* 2013; Tas *et al.*, 2013). Similarly, Shanmugan *et al.* (2003), Badarudin *et al.* (2011), Nayan *et al.* (2013), Tas *et al.* (2013) and Badarudin *et al.* (2013) provided evidence that monetary base is of critical importance in determination of money supply. Additionally, Tas *et al.* (2013) used monetary variable M1 in this regard as well.

Moreover, the variable collected from WDI as Money plus Quasi Money in the form of M2 has also been used by Nayan *et al.* (2013), Tas *et al.* (2013) and Badarudin *et al.* (2013). Simultaneously, Tas *et al.* (2013) and Badarudin *et al.* (2013) have indicated that money multiplier does affect the money supply. Lastly, financial development has been incorporated as well. Time-series data analysis has been carried out on these variables for a period of thirty-seven years. The methodology ARDL has been used after testing the stationarity of data. The findings conclusively indicate the existence of endogenous money supply in the economy of Pakistan.

6.2 Policy Implications

Based on the results presented and discussion developed in the previous corresponding sections, it can be deduced that the State Bank does not obligatory to control money supply in the economy of Pakistan. Moreover, the country must not implement or use money multipliers and monetary aggregates as a target for money

supply. Primarily, the country must adopt or implement money multiplier and monetary aggregates as a target for money supply because it is more effective and appropriate policy. In this respect, the policy and recommendations on the context of this particular study is that the current endogenous money supply is created through commercial and private banking system of the country.

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APPENDIX A: EMPIRICAL STUDIES

Authors	Time Period	Methodology	Country	View Supported
Pollin (1991)	1953 – 1988	Granger Causality Test	United States	Structuralists view
Chaudhary *et al.,* (1995)	1973 – 1992, 1973 – 1982, and 1982 – 1992	Ordinary Least Squares	Pakistan	--
Nell (1999)	1996 - 1997	Granger Causality Type Tests Auto Regressive Distributed Lag	South Africa	Liquidity Preference View
Nell (2000 – 2001)	1966 - 1997	Error Correction Method	South Africa	Liquidity Preference, Accommodative, and Structuralists views
Vera (2001)	1987 – 1998	Granger Causality Test	Spain	Accommodative and Structuralists views
Shanmugam *et al.*, (2003)	1985 – 2000	Cointegration and Standard Granger Causality	Malaysia	Liquidity Preference and Accommodative views
Lavoie (2005)	-	Review of theoretical and empirical literature	United States and Canada	Accommodative view
Ahmad & Ahmed (2006)	1980 - 2013	Granger Causality Test Augmented Dickey Fuller test	Pakistan	Structuralism
Kapounek (2011)	1999/Q1 – 2010/Q2	Vector and Regression Models	Eurozone Area	*Post-Keynesians' Assumptions*
Nayan *et al.,* (2013)	1970 – 2011	System Generalized Method of Moment	Panel dataset of 177 countries	Post-Keynesian Theorists
Lopreite (2014)	1999 – 2010	Vector Auto Regression Model Granger Causality Procedure	Eurozone Area	Accommodations view
Chaudhary *et al.,* (2015)	1973 - 2013	Wald test (F-Statistic)	Pakistan	Monetarist Approach
Kaplan & Gungor (2017)	2008:1 - 2015:12	Cholesky Decomposition Method of Variance based Vector Autoregression Model	Turkey	--

Appendix B: Empirical Evidence from Pakistan

Authors	Time Period	Methodology	Country	View Supported
Chaudhary *et al.,* (1995)	1973 – 1992, 1973 – 1982, and 1982 – 1992	Ordinary Least Squares	Pakistan	--
Ahmad & Ahmed (2006)	1980 - 2013	Granger Causality Test Augmented Dickey Fuller test	Pakistan	Structuralism
Chaudhary *et al.,* (2015)	1973 - 2013	Wald test (F-Statistic)	Pakistan	Monetarist Approach