AN EVALUATION OF IMPACT OF MONETARY POLICY ON ECONOMY OF PAKISTAN

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AN EVALUATION OF IMPACT OF MONETARY POLICY ON ECONOMY OF PAKISTAN

by

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In

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Pakistan
2015
CERTIFICATION

I hereby undertake that this research is an original and no part of this thesis falls under plagiarism, if found otherwise, at any stage, I will be responsible for the consequences.

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To My Parents,
For
Their Unconditional Love
To My Wife,
For
Her Eternal Encouragement and Support
And
To My Beloved Daughter
<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>List of Tables</td>
<td>ix</td>
</tr>
<tr>
<td>List of Figures</td>
<td>x</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>xii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>xiii</td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 MONETAERY POLICY</td>
<td>1</td>
</tr>
<tr>
<td>1.2 CHANNELS OF MONETARY POLICY</td>
<td>2</td>
</tr>
<tr>
<td>1.3 EFFECTIVENESS OF MONETARY POLICY</td>
<td>5</td>
</tr>
<tr>
<td>1.4 MONETARY POLICY OF PAKISTAN</td>
<td>12</td>
</tr>
<tr>
<td>1.5 RATIONALE OF STUDY</td>
<td>15</td>
</tr>
<tr>
<td>1.6 RESEARCH QUESTIONS</td>
<td>15</td>
</tr>
<tr>
<td>1.7 THE PURPOSE OF STUDY</td>
<td>16</td>
</tr>
<tr>
<td>1.8 FOCUS OF STUDY</td>
<td>16</td>
</tr>
<tr>
<td>1.9 THE SCOPE OF THE STUDY</td>
<td>16</td>
</tr>
<tr>
<td>1.10 THE OBJECTIVES OF THE STUDY</td>
<td>17</td>
</tr>
<tr>
<td>1.10.1 Primary Objective</td>
<td>17</td>
</tr>
<tr>
<td>1.10.2 Secondary Objectives</td>
<td>17</td>
</tr>
<tr>
<td>2 REVIEW OF LITERATURE</td>
<td>18</td>
</tr>
<tr>
<td>2.1 MONETARY EFFECTS FROM RICARDO TO KEYNES</td>
<td>18</td>
</tr>
<tr>
<td>2.1.1 Ricardo and Early Classicalals</td>
<td>21</td>
</tr>
<tr>
<td>2.1.2 J. S. Mill and Marx: The Mid Nineteenth Century</td>
<td>21</td>
</tr>
<tr>
<td>2.1.3 The Neoclassical of the Late Nineteenth Century</td>
<td>24</td>
</tr>
</tbody>
</table>
3.6.4 Homoskedasticity 73
3.6.5 Standardized Coefficient Technique 73
3.6.6 Multicollinearity 74
3.6.7 Autocorrelation or Serial Correlation 75

4 RESULTS AND DISCUSSION 78

4.1 IMPACT OF MONETARY POLICY VARIABLES AND CPI INFLATION IN GDP GROWTH RATE 78
4.2 IMPACT OF MONETARY POLICY ON ECONOMIC GROWTH IN CASE OF BROAD MONEY 82
4.3 IMPACT OF PREVIOUS PERIOD MONEY SUPPLY ON CURRENT MONEY SUPPLY 86
4.4 IMPACT OF MONETARY POLICY AND CPI INFLATION TO REDUCE UNEMPLOYMENT 87
4.5 IMPACT OF MONEY SUPPLY AND RATE OF INTEREST ON EXCHANGE RATE 89
4.6 IMPACT OF MONETARY POLICY TO REDUCE INFLATION 92
4.7 GDP GROWTH RATE, GROSS SAVING AND TOTAL CONSUMPTION EXPENDITURES 93

SUMMARY 98

CONCLUSION 99

FUTURE VISION 101

RECOMMENDATIONS 102

LITERATURE CITED 107

APPENDICES 118
# ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADF</td>
<td>Augmented Dickey Fuller</td>
</tr>
<tr>
<td>AEG</td>
<td>Augmented Engle Granger</td>
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<tr>
<td>ARIMA</td>
<td>Autoregressive Integrated Moving Average</td>
</tr>
<tr>
<td>BLUE</td>
<td>Best Linear Unbiased Estimator</td>
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<td>CPI</td>
<td>Consumer Price Index</td>
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<tr>
<td>CLRM</td>
<td>Classical Linear Regression Model</td>
</tr>
<tr>
<td>ECM</td>
<td>Error Correction Model</td>
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<tr>
<td>EG</td>
<td>Engle Granger</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>IT</td>
<td>Inflation Targeting</td>
</tr>
<tr>
<td>KPSS</td>
<td>Kwiatkowski-Phillips-Schmidt-Shin</td>
</tr>
<tr>
<td>MD</td>
<td>Demand for Money</td>
</tr>
<tr>
<td>MS</td>
<td>Money Supply</td>
</tr>
<tr>
<td>MEC</td>
<td>Marginal Efficiency of Capital</td>
</tr>
<tr>
<td>MIT</td>
<td>Massachusetts Institute of Technology</td>
</tr>
<tr>
<td>NAIRU</td>
<td>Non-Accelerating Inflation Rate of Unemployment</td>
</tr>
<tr>
<td>OMOs</td>
<td>Open Market Operations</td>
</tr>
<tr>
<td>OLS</td>
<td>Ordinary Least Square</td>
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<tr>
<td>RAND</td>
<td>Research and Development</td>
</tr>
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<td>SBP</td>
<td>State Bank of Pakistan</td>
</tr>
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<td>VAR</td>
<td>Vector Autoregressive</td>
</tr>
<tr>
<td>WPI</td>
<td>Wholesale Price Index</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table No.</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Economic Growth, Monetary Policy Variables and CPI Inflation</td>
<td>79</td>
</tr>
<tr>
<td>2</td>
<td>Correlation Matrix of Study Variables</td>
<td>79</td>
</tr>
<tr>
<td>3</td>
<td>Impact of Monetary Policy on Economic Growth in case of Broad Money</td>
<td>81</td>
</tr>
<tr>
<td>4</td>
<td>Current Period Money Supply and Previous Period Money Supply</td>
<td>81</td>
</tr>
<tr>
<td>5</td>
<td>Correlation Matrix of Current Money Supply and Previous Money Supply</td>
<td>88</td>
</tr>
<tr>
<td>6</td>
<td>Monetary Policy, CPI Inflation and Unemployment</td>
<td>88</td>
</tr>
<tr>
<td>7</td>
<td>Money Supply, Rate of Interest and Exchange Rate</td>
<td>91</td>
</tr>
<tr>
<td>8</td>
<td>Monetary Policy and CPI Inflation</td>
<td>91</td>
</tr>
<tr>
<td>9</td>
<td>Gross Saving and GDP Growth Rate</td>
<td>95</td>
</tr>
<tr>
<td>10</td>
<td>Total Consumption Expenditures and GDP Growth Rate</td>
<td>95</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monetary Policy Transmission Mechananism</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Liquidity Trap and Money Market</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>The Classical Case and Money Market</td>
<td>7</td>
</tr>
<tr>
<td>4</td>
<td>Flow Chart of Study</td>
<td>77</td>
</tr>
<tr>
<td>5</td>
<td>Scatter Diagram of Real GDP Growth Rate with Straight Line</td>
<td>84</td>
</tr>
<tr>
<td>6</td>
<td>Scatter Diagram of CPI Inflation with Straight Line</td>
<td>84</td>
</tr>
<tr>
<td>7</td>
<td>Scatter Diagram of Real Discount Rate with Straight Line</td>
<td>84</td>
</tr>
<tr>
<td>8</td>
<td>Scatter Diagram of Real Exchange Rate with Straight Line</td>
<td>85</td>
</tr>
<tr>
<td>9</td>
<td>Scatter Diagram of Broad Money $M_2$ with Straight Line</td>
<td>85</td>
</tr>
<tr>
<td>10</td>
<td>Combine Histogram of GDP Growth Rate, Real Exchange Rate, Real Discount Rate, Average CPI Inflation and Unemployment Rate</td>
<td>85</td>
</tr>
<tr>
<td>11</td>
<td>Scatter Diagram of Unemployment Rate with Straight Line</td>
<td>96</td>
</tr>
<tr>
<td>12</td>
<td>Scatter Diagram of Gross Saving with Straight Line</td>
<td>96</td>
</tr>
<tr>
<td>13</td>
<td>Scatter Diagram of Total Consumption Expenditures with Straight Line</td>
<td>97</td>
</tr>
<tr>
<td>14</td>
<td>Combine Histogram of GDP Growth Rate, Gross Saving and Total Consumption Expenditures</td>
<td>97</td>
</tr>
<tr>
<td>15</td>
<td>Filled Radar Diagram of Real GDP Growth Rate for Annual and Quarterly Data</td>
<td>103</td>
</tr>
<tr>
<td>16</td>
<td>Filled Radar Diagram of Average CPI Inflation for Annual and Quarterly Data</td>
<td>103</td>
</tr>
</tbody>
</table>
17  Filled Radar Diagram of Broad Money for Annual and Quarterly Data  
18  Filled Radar Diagram of Unemployment Rate for Annual and Quarterly Data  
19  Filled Radar Diagram of Real Discount Rate for Annual and Quarterly Data  
20  Filled Radar Diagram of Real Exchange Rate for Annual and Quarterly Data  
21  Filled Radar Diagram of Total Consumption Expenditures for Annual and Quarterly Data  
22  Filled Radar Diagram of Gross Saving for Annual and Quarterly Data
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May Allah Bless all these noble personalities, AMEEN

(AFTAB ANWAR)
ABSTRACT

Objective of the study is to evaluate the impact of monetary policy on the economy of Pakistan in the light of Monetarist and Keynesian views. Keynesian argue that monetary policy is ineffective in stimulating the economic growth of a country, which is said to be determined by the economic growth levels of its large and developed trading partners. Money supply and inflation are considered to be insignificantly related to economic growth. It is further argued that the monetary authorities cannot control money supply changes as desired, namely, to keep them within the set money supply guidelines, because of foreign external forces flowing out of international trade conducted with these large and developed partners. By contrast, the monetarist counter-argument affirms the efficacy of the money supply and inflation in influencing the economic growth of a country. Monetary authorities are said to be capable of controlling money supply via the bank rate (repo rate), that the current level of money supply is significantly related to that of the previous period. By using forty year data, it is evaluated that impact of interest rate on economic growth is negative and at the same time its impact on unemployment is positive. It is also investigated that there exist tradeoff between inflation and unemployment. It is also estimated that current money supply strongly depends upon the money supply of previous period. Impact of monetary base and broad money on economic growth and on unemployment is very much weak near to zero. Saving is the component of aggregate savings and consumption is the necessary component of aggregate demand but it is evaluated that impact of saving on GDP growth rate is significantly positive as compare to consumption. So those policies should be used which are helpful to increase the saving in the
country. In the case study of Pakistan, the empirical findings confirm that the economic growth is not significantly related to changes in money supply and inflation but it is significantly related to the changes in real exchange rate and interest rate and that ability of monetary authorities to control money supply is constrained by external factors. While monetary policy is ineffective in controlling changes in the money supply, keeping it within set target limits or guidelines, it is able to influence the current level money supply by operating on that of the previous period. The Keynesian argument that the monetary authorities cannot control money supply changes, i.e. keeping them within set target guidelines, is confirmed. The basis of this argument is said to be the unfair terms of trade faced in dealing with large and developed countries. This is despite the significant relationship between the current level of money supply and that of the previous period.
Chapter 1

INTRODUCTION

1.1 MONETARY POLICY

To maintain the price stability, central bank of any country tries to control the money supply of that country. Therefore, monetary policy plays its role to stabilize the economic growth through the number of channels. Price stability is major contribution of monetary policy for sustainable growth of a country. As it is considered that continuous rise in price level is only due to monetary phenomenon, so for maintaining the price stability monetary policy uses different tools to effect the money supply. Empirical evidence of economic literature recommends that low price level and sustainable long run growth are closely related to each other. Only the costs are not affected by the monetary policy but it has comprehensive impact on economy’s financing conditions. It also affects the credit’s availability and willingness of banks to assume the risks etc. Future expectations about economic activities, inflation, exchange rate, investment and consumption are also affected by the monetary policy.

If monetary authorities decide to cut the interest rate then in the result, the investment activities and expenditures on durable goods will increase. Currency depreciation is also the result of low interest rates because in case of more expensive imported goods, the demand for domestic goods rises. Due to all these causes unemployment will reduce but output, consumer expenditure and investment will rise.
1.2 CHANNELS OF MONETARY POLICY

Important channels of monetary policy which make it more effective to meet the economic targets are interest rate channel, credit channel and assets price channel. These channels are not alternative to each other but they can be operated simultaneously.

Interest rate channel is also known as workbook channel. Change in interest rate effect the cost of borrowing and capital. Consumption and investment both are affected by the direct impact of interest rate. From central bank to banks during the transmission process of monetary policy it is not fitting for macroeconomic time arrangement to recognize the credit channel from money channel in light of the fact that credit channel works through the benefits of the banks inasmuch as money channels works through banks liabilities. There exist close relation between assets and liabilities by accounting identities. Macroeconomic studies recommend that fluctuations in output and price in light of progress in the advance quantities and deposits are rarely conclusive (Bernanke and Blinder, 1992).

To check the importance of credit channel most credible studies have utilized the microeconomic information and have inspected the distinction in the middle of banks and firms in monetary policy as indicated by their size and specific. It is noted that little firms confront more liquidity requirements and for financing little firms relies on upon banks. On the other side little banks confronts trouble to issue the advances on the grounds that little banks can't utilize bond possessions as a shock absorber (Kashyap et al., 1993).
Figure: 1  Monetary policy transmission mechanisms
Credit channel is one of the important channels of monetary policy to depress the economic activities. In this channel, by utilizing low bank lending contractionary impacts of monetary policy are transmitted to a vast degree. In small and open economy exchange rate channel is also a crucial one. The monetary tightening causes the nominal exchange rate to increase. Due to nominal strictness prices remain constant in small time period and in the result we see the appreciation in real exchange rate (Mishkin, 1996).

Lastly asset prices like equity prices, houses price and forex rate also play their role for the transmission of monetary policy to economic activity. Whenever monetary policy affect the external value of country’s currencies to open the potential across countries for different effects then it means that exchange rate channel is in action.

Any rise in the currency rate by keeping other things as constant will lead to an appreciation. In the consequence of appreciation not just the import costs including import of middle merchandise and materials will diminished however this will end in the misfortune of intensity for exporters and import-contending firms. Improvement in the term of trade due to currency appreciation, will involve only in growth of real income, but on the other side output and employment will decrease due to competitiveness effects (McLennan et al., 1998).

Central bank of any country conducts the monetary policy to minimize the economic fluctuations and to keep low inflation. Monetary policy effects the
financial and economic decisions of the people. For example the decisions about
the loan for new business, to buy a new car or house, to invest in a new business or
put money in banks, bonds etc are affected by the monetary policy. To formulate
the monetary policy central banks focus primarily on the economic condition of the
country. However, other than the national economic conditions, central banks must
consider the regional economic conditions. In case of measuring the effects of
monetary policy, focus is on national level variables. As we know that there is lot
of difference in regional and state economic conditions so it is impossible to say
that impact of monetary policy would be same across different regions and states.
About 50 year ago founder of the Regional Science Foundation, Walter Isard,
stated that “since each of the nation’s regions has different resource potential and
confronts obstacles to growth, it follows that monetary policies alone generate both
retarding factors for some regions and problem intensifying factors other regions”.
It is important for each member of the nation to understand that how much their
region or state will be affected by the changes in the monetary policy (Han, 2012).

1.3 EFFECTIVENESS OF MONETARY POLICY

Discussion on the effectiveness of monetary policy is still going on between
Keynesian and monetarists. During the great depression (1929-33) with the
increase in money supply, income level of the people did not change and in the
result all this situation sparked the Keynesian view about monetary policy and from
Keynesian school of thought some extremists argued that to stimulate the economy
“money does not matter”. According to monetarist economists led by Milton
Friedman monetary policy is an effective tool to stimulate the economy, thus
“money matter”. Controversy about monetary policy is remained unsettled (Mohr and Fourie, 2007).

According to Keynesian there is very weak relationship between monetary sector and real sector. Conversely crucial element of interest rate is suggested as an indirect link between both the sectors to connect the changes in money supply and economic activities and all of this happen in two stages. In the first stage with prevailing interest rate any rise in money supply (Ms) above the demand for money (Md) causes an excess money supply (Ms > Md) and in the result demand for other financial assets like bonds increases and prices of these assets will rise and all this lead to drop in interest rate (i). In second stage decline in interest become the cause of increase in the aggregate demand via an increase in investment (I). Consequently country Gross Domestic Product increases
i.e., If Ms↑ → (Ms > Md) →↑prices of other financial assets → ↓i → ↑I → ↑GDP

By implication if due to increase in money supply further decline in interest rate is impossible, this situation is called Keynesians liquidity trap and in this situation money market equilibrium is represented by a horizontal LM curve. In liquidity trap situation money market is interest in-elastic and people are indifferent between holding money and financial instruments.

In this case increase in economic growth is possible through the movement in IS curve via fiscal policy. On the other side according to monetarist monetary transmission
Figure: 2  Liquidity trap and money market (SOURCE: Dornbusch et al. 2004)

Figure: 3  The classical case and money market (SOURCE: Dornbusch et al. 2004)
mechanism is to be direct and for this purpose they take the Irvin Fisher equation of exchange that is \[ MV = PQ \]

Where \( M \) is quantity of money, \( V \) is velocity of money, \( P \) is average price level and \( Q \) is real value of goods and services.

Now with constant \( V \), any change in quantity of money \( M \) result in equi-proportional change in total output \( PQ \) which is called direct monetary transmission mechanism because in this way any change in money supply directly effect the economy.

Against the Keynesian approach of horizontal LM curve due to liquidity trap, Monetarist considers a vertical LM curve that is called classical case. In this case any increase in government spending does not affect the level of income and lift up only the interest rate. Fiscal policy has no impact on the equilibrium of the economy and monetary policy has maximum effect. Increasing interest rate crowds out an amount of private spending equal to the increase in the government spending.

The economic issue tended to in this study streams straightforwardly from the Keynesian and Monetarist verbal confrontation laid out above. Though Keynesians consider the monetary transmission mechanism to be indirect, while monetarists respect it to be direct, the stress is sort of moved on account of the issue under examination. The center in this study is on whether monetary policy through the transmission mechanism can strengthen the economic growth of a little
and open economy. In the same way that the Keynesian revolution occurred as a consequence of the ineffectualness of monetary policy throughout the Great Depression, the disappointment of the business sector economy to address the socio-economic issues in Latin America started an economic school of thought called structuralism. The structuralist hypothesis, otherwise called the Latin American School of Development, created as an option to what was viewed as the disappointment of orthodox economics, alluded to as neo-progressivism by structuralists. The Latin American countries, which were experiencing socio-political conversion, made minimal economic advancement. These countries started to address the reliance of their developing economies on those of huge created western economies, which are said to profit at the cost of the little developing countries with which they exchange. The structuralist hypothesis is focused around the conviction that the issues of little economies exchanging with substantial created economies are structural instead of economic. As needs be, markets are questioned and disfavoured by structuralists, who rather advocate government mediation (Khabo, 2002).

Rising liberation assessments fought that substantial and created western countries devastated those little and developing countries with which they traded. Domestic monetary policy is accordingly said to be insufficient, on the grounds that the economic growth issue confronted is not monetary yet structural (Bruce 1980).

Objectives of monetary policy are price stability, progressive economic growth, achievement of full employment, smoothness of business cycle, prevention
of financial crises and maintaining the long run interest rates and exchange rates. No doubt some objectives are consistent with others, as objective of price stability often conflict with the interest rate stability. In this case country can assign equal weight to the objective or can put greater weight to one objective as compare to other. Monetary policy targets can be classified as intermediate targets or operating targets. Intermediate targets are not controlled by the central bank and these targets are variables that affect the objectives of monetary policy such as monetary aggregates and long term interest rates.

On the other side operating targets are short run goals of central bank. To affect intermediate targets central bank use monetary policy instruments like reserve money and short run interest rate. Monetary instruments are of two types such that direct and indirect. Direct instruments function according to regulations of central bank that directly effect the interest rate or volume of credit and these direct instruments become ineffective in case of developed money and financial markets. Market based instruments or indirect instruments are of three types such that open market operations central bank lending policies and reserve requirements and these are used to inject and absorb liquidity. Other indirect instruments are central bank obligations and central bank auction of central bank credits (Mohsin, 2010).

Monetary policy regime has very important consequences for the behavior of domestic variables like output and inflation but for international variables like current account and real exchange rate it has less importance. Best policy for
central bank is to focus on targeting the domestic inflation. It is also being noted that exchange rate system should be flexible because high valued currencies are not only inflationary but also become the obstacle in the way of economic growth (Sulaiman, 2010).

Impact of fiscal policy on economic growth is significant and there is cointegration relationship between exchange rate, government expenditures, inflation, growth and money stock but the of monetary policy variables like exchange rate and inflation on economic growth is negative. So monetary policy is not much supportive to uplift the economic growth of any country (Khosravi, A. and M. S. Karimi. 2010).

In macroeconomics the monetary policy affect on the real economy has been a divisive zone (Bernanke and Gertler, 1995). Important question is this that whether changing interest rate has some effect on the variables of real economy and how much these effects are powerful. This seems to be more important when it stew down to the regional level seeing as monetary policy naturally address the national targets whereas we see different structures and characteristics within a monetary union. Hence it is possible that they might respond in disproportionately to a wish for of a standardized monetary policy. Some distributional implications, as a consequence, there will be across the region because by policy any economic activity may be encouraged in core whereas the periphery may become more miserable (Ridhwan et al., 2008).
1.4 MONETARY POLICY OF PAKISTAN

In Pakistan primary roles of monetary policy are monetary policy management and financial sector stability. According to State Bank of Pakistan Act, 1956 monetary policy will be supportive for both the objectives of promoting the economic growth and price stability. By targeting the monetary aggregates such that broad money supply growth as an intermediate target and reserve money as an operational target in accordance with Government real GDP growth and inflation targets, SBP achieves its goals (Akhtar, 2007).

The Taylor rule (1993) centers just on two objectives: output and inflation as the rule insist on that central bank should raise the nominal interest rate by more than one percentage point for one percent increase in inflation but in practice, the central bank's loss function, particularly in developing countries, holds goals other than these two, in the same way as the interest rate smoothing, exchange rate stability, and so on. Variance decay demonstrates that the vast majority of the variation in the interest rate is explained by its lagged values. Other variables, in explaining variation in the interest rate, might be positioned as inflation, government borrowing, exchange rate, output gap, trade deficit and at last foreign exchange reserves. Result of study confirms that the State Bank of Pakistan does think about both inflation and output. However the policy has additionally been centered on different components as the majority of the goals we included in the estimation altogether influence the conduct of monetary policy instrument. The imperative result is that the trade deficit that is not taken as monetary policy objective in the exact writing has critical effect on the central bank (SBP's) actions.
Two variables that we have included other than destinations (government borrowing and foreign exchange reserves) and the exogenous factor (foreign interest rate) also explain significantly the variation in interest rate. Other objectives should take into account these other objectives for a country like Pakistan to modify the Taylor type rule. Basic Taylor rule that concentrates on inflation and output may be inadequate for the developing countries (Malik, 2007).

For the vast majority of the central banks on the planet, price stability has turned into the prime target of monetary policy alongside a worry to real adjustment in the short run. Thus summarizing monetary policy objectives by a loss function defined over deviations of inflation from target and that of output from potential level has become a norm in the literature on monetary economics. Yet monetary policy can settle real monetary movement just in the short run. Allocating monetary policy the goal of long run growth obliges setting operational focus in such a path, to the point that real interest rate is dependably beneath neutral interest rate. Pakistan has encountered cycles in inflation and real budgetary action. Inflation arrived at its crest of 23 percent in 1974, and touched the most minimal level of 2.4 percent in 2002. Essentially, the real output gap differed between -7 percent in 2002 and 6.5 percent in 2008. Generally, there has been more focus of SBP on growth objective as opposed to concentrating on inflation and output gap (Malik and Ahmed 2007).

During the most recent three decades the perspective has raised that monetary policy can attain just predetermined number of goals. Utilizing Pakistani information, this study endeavors to gauge Taylor-type response capacity and its
slight altered form characterized over inflation and real GDP growth. Our results show professional cyclical reaction of SBP to economic fluctuations. Other than this price stability alongside output stability, economic growth has been given priority. One of the paramount discoveries of the study is that SBP has been leading master cyclical policy; however, the level of pro-cyclicality diminished altogether after money related segment changes. This could have been because of SBP fixation on policy goals other than inflation and output adjustment. One of such targets has been discovered to be economic growth. Surprisingly, the level of master cyclicality towards economic growth has expanded after 1989. Finally, the study makes inconsistent reaction of SBP to inflation and output deviations from their separate targets; however policy consistency has enhanced since the start of this decade. State Bank of Pakistan has picked up self-governance in setting policy instrument as an after effect of budgetary division changes. The motivation behind why SBP’s reaction has not gotten counter-cyclical could be the center of policy on targets other than price stability in the long run and real adjustment in the short run. Other than this, SBP likewise need to withstand regular fiscal pressures which to a great extent weaken the monetary policy stance and there is a consistent struggle for keeping up stability of exchange rate. To achieve the target of price stability, there must be legislation to decrease the fiscal pressure and SBP need to give careful consideration to this target; otherwise inflationary expectations couldn’t be controlled (Malik and Ahmed, 2011).

In order to untie the issues related to the impact of monetary policy different studies are conducted. For this purpose Carlino and DeFina (1998, 1999)
and Owyang and Wall (2004) have conducted a research on USA economy on the impact of monetary policy while Ramaswamy and Slok (1998) and Clements et al. (2001) have studied the impact of monetary policy in European countries. In broad-spectrum their findings suggest disparity among the output effects in response to a common policy shock. Some studies have suggested that the output effects in eurozone are very common (Peersman, 2004). Gerlach and Smets (1995) and Kieler and Saarenheim (1998) conclude that there is no variation in the impact of monetary policy across the countries. All of these findings conclude that there are still significantly different views on the actual impact of monetary policy.

1.5 RATIONALE OF STUDY

Outstanding growth rate of many developing countries like India, China, Malaysia, Taiwan and Singapore is the big reason for the study motive. On the other side Pakistan is much behind than its targets. If these developing countries can manage to grow, then it is also possible for Pakistan to grow as well.

1.6 RESEARCH QUESTIONS

Questions that can create the confusion are as under

- Which one is true about the effectiveness of monetary policy, Keynesian or Monetarist?
- How much the monetary policy is effective to stimulate the economic growth?
- Either inflation is always and everywhere a monetary phenomenon?
- How much monetary policy is effective to trim down the unemployment?
• Whether there exist tradeoff between unemployment and inflation?

These questions are not explored scientifically and comprehensively especially in case of Pakistan.

1.7 THE PURPOSE OF STUDY

Purpose of study is to design a monetary policy which is non-inflationary on one side but on other side it is growth supportive and to encourage flexibility of interest rates to respond to market forces. It is also the purpose of this study to make a comparison between two opposing views that is, Keynesian and monetarist, about the monetary policy.

1.8 FOCUS OF THE STUDY

Main focus of this study is to check that either monetary policy can play its role to stimulate the economy or not in Pakistan and hopefully outcomes of this study will help most of the developing countries. To know about the basis behind the poor economic performance of Pakistan, hypotheses are formulated and a study about the impact of monetary policy is undertaken. Appropriate econometric model is used for the empirical analysis of Pakistan economy. Recommendations to achieve the growth through monetary policy are given in conclusion.

1.9 THE SCOPE OF THE STUDY

In term of scope this study is confined to evaluate the impact of monetary policy to stimulate the economic growth without any analysis of underlying reasons. Covering period of this study is from 1972 to 2011.
1.10  THE OBJECTIVES OF STUDY

Objectives of the study are as under

1.10.1 Primary Objective

To stimulate the economic growth of Pakistan, the prime objective of this study is to evaluate the impact of monetary policy on economy of Pakistan.

1.10.2 Secondary Objectives

Other objectives of the study are as under

- To find out whether or not the current period money supply depends on money supply of previous period.
- To measure the impact of monetary policy variables and CPI inflation on growth rate of the economy.
- To determine the effectiveness of monetary policy to trim down the unemployment.
- To study that impact of money supply and rate of interest on exchange rate.
- To estimate the impact of monetary policy on inflation.
- To identify the role of saving and consumption for increasing growth rate.
Chapter 2

REVIEW OF LITERATURE

2.1 MONETARY EFFECTS FROM RICARDO TO KEYNES

Many ideas and alternative approaches in the sphere of monetary theory have their antecedents in the theoretical contributions and controversies which arose in the history of economic thought. Writers such as David Hume and Adam Smith in the 1700s included as part of their discourse early expressions of the quantity theory of money, in which the general price level was related to the quantity of money in circulation. The writings of David Ricardo in the early 1800s are however generally recognised as a milestone in the comprehensive examination of economic issues using an analytical framework (Blaug 1996). Ricardo is recognised for use of the long period as an analytical device in which capital adjusts through investment between uses in such a way as to equalise the rate of profit between alternative allocations (Barber 1967). But the Classical conception of money was that of a facilitating fluid behind which real magnitudes were determined (Dennis 1981). Is there evidence that Ricardo portrayed monetary variables as having at least some influence on investment? When and through which economic writers did this connection emerge? These questions are examined through viewing the writings of prominent economic thinkers over the course of the nineteenth century, in particular Ricardo, Thornton, John Stuart Mill, Marx, Marshall, Bohm-Bawerk and Wicksell, relating to monetary influences on investment. This is of course not an exhaustive list of economic writers making significant contributions concerning monetary issues over this period. It serves though to capture the key perceptions and innovations concerning monetary
influences on real economic magnitudes over this period.

A crucial distinction in examining monetary theories for the purposes of this thesis is the distinction between Real Analysis and Monetary Analysis as put forward by Schumpeter (1954). A monetary theory in the tradition of Real Analysis may incorporate various monetary variables, but in equilibrium the magnitudes in the economy are precisely as they would be if only real economy magnitudes were involved. There is an underlying assumption that all essential features of an economy can be captured through the interaction of real magnitudes: "Money enters the picture only in the modest role of a technical device that has been adopted in order to facilitate transactions." (Schumpeter, 1954). Under the Monetary Analysis tradition, on the other hand, monetary variables are inextricably involved in determining real economic magnitudes.

Monetary variables lead to real outcomes which differ from the magnitudes which would arise if only real magnitudes were determinants. Monetary phenomena are reflected as persistent forces which combine with real forces in determining long-period equilibrium positions; they are not confined to transitory effects. The importance of the distinction in examining the relationship between monetary variables and investment (a real magnitude in this context) lies in that it requires a theory with the characteristics of Monetary Analysis to allow the possibility of such a relationship on a persistent and significant basis within its theoretical structure. Adoption of a theory in the Real Analysis tradition excludes the possibility of such a relationship ab initio in view of its underlying
assumptions. Blaug (1996) provides a less comprehensive portrayal, though in the same vein: "By 'monetary analysis', we mean any analysis that introduced the element of money at the outset of the argument and denies that the essential features of economic life can be represented by a barter model."

Three strands of particular importance to monetary theory which were introduced and examined by economic writers in the eighteenth and first half of the nineteenth centuries, relate to: the quantity theory relationship between money in circulation and the general price level as well as real economic magnitudes, the question of whether there is an automatic tendency of an economy to remain at or return to an aggregate supply–aggregate demand equilibrium level as captured by Say's Law, and the economic effects of non-commodity money arising through the bank system, as expressed in the Currency School versus Banking School alternative viewpoints and debates.

These three strands served as foundation stones on which increasingly advanced economic analyses were developed through the remainder of the nineteenth century and most of the twentieth. They remain as underlying theoretical departure points in alternative schools of thought and approach to monetary theory to the present. Their origins in classical economics are highlighted below, especially since they are frequently used, both in this thesis and in writings on monetary theory in general, to identify the theoretical foundations of alternative approaches and arguments concerning the economics of money.
2.1.1 Ricardo and Early Classical

Examination of Ricardo's analysis of economic issues suffers the dangers arising from his work having been so extensively re-cast and re-formulated. It is a tribute to Ricardo that his analytical method came to form the core of much of economic teaching for a period of almost seven decades after his death in 1823. But it is an indication of a great economic conception with many flaws and inconsistencies that subsequent economists have felt the need to re-examine the analyses in more clearly formulated and corrected terms, with mathematical expression that Ricardo himself did not use. Blaug (1996) for instance suggests that Ricardo operated with three models at different times: "a Pasinetti-type, constant wage model; a disequilibrium variable-wage model; and a genuine dynamic equilibrium growth model."

2.1.2 J S Mill and Marx: The Mid Nineteenth Century.

John Stuart Mill's *Principles of Political Economy* of 1848 draws openly and fully on the analytical framework of Ricardo in its primary coverage. Mill does however offer new approaches on various subjects as well as reformulations, and these do include issues pertaining to money. Contrary to Ricardo, Mill lends some support to the real bills doctrine and the Law of Reflux as being "far nearer to being the expression of the whole truth than any form whatever of the currency theory" (Mill 1848). However, in his more detailed analysis, he accommodates both a Banking School and Currency School approach by distinguishing a quiescent and speculative state of the economy. In the quiescent state, referring to a situation where markets are close to equilibrium and not overheated, the Law of
Reflux would be operative and would prevent an over-issue of notes. However, in the speculative state, corresponding to high relative economic activity, note issue could expand excessively without being automatically curbed by reflux, even if banks are cautious enough to follow a 'real bills' doctrine. The note issue could feed an inflationary spiral, with higher prices leading to still further note issues, in accordance with the quantity theory and Currency School view (Mill, 1848). As with the earlier Classicals, in respect of production, Mill was "steadfast in his defense" of Say's Law (Sowell:1972). J S Mill was acquainted with the work of Thomas Tooke, whose major book, *History of Prices*, was first published in 1838 (Makinen 1977).

Increasing interest rates were accompanied by increasing general price levels, decreasing interest rates by decreasing price levels. Tooke's explanation of this was that interest rates constitute an input cost for production, so that increasing interest rates raise production costs which in turn are passed on in the form of higher prices. Tooke also maintained from his statistical analysis that rises in the price level generally preceded rises in the quantity of money in circulation rather than vice versa. These two findings were strong ammunition against the Currency School view, and it appears that Mill sought to incorporate their consequence in the monetary theory that he expressed. Adoption of a Banking School viewpoint, even if only partially, opens up the possibility of a link between money and investment in Mill.

The Banking School recognised a broad range of financial instruments as constituting 'money' for analytical purposes in addition to bank notes and gold.
Short-term forms of credit such as trade bills, self-liquidating commercial paper and notes based on goods in process were considered close substitutes for narrowly defined money, since they were negotiable instruments which could be used to effect payment, even though they bore a discount or implicit interest rate. These were the very instruments that could be used directly or indirectly as a vehicle to finance investment expenditure. Thus both the extent of availability of these instruments and the effective interest rate at which they could serve to raise funds could be sources of a causal mechanism between money and investment. Mill did not however pursue this line of inquiry.

It is noteworthy that the Bank of England had commenced practising monetary management at the time when Marx was writing. The Bank Charter Act of 1844 provided a legal framework in which the Bank's discount rate could be used as an instrument of credit regulation. The Bank did also engage in a form of open market operations through borrowing against Consols (Blaug 1996). It was therefore eminently possible that Marx could have explored the possible effects Marx directly challenged Say's Law and "rejected the necessary equality of supply and demand (Sowell 1972). He however regarded the interest rate as a purely monetary phenomenon, with very little connection to rates of profit. He rejected the notion of a 'natural' rate of interest and did not accept the argument of Thornton and Ricardo that there is in principle a long period rate of interest which tends to equality with the long-period yield on real capital. He did maintain that the interest rate, along with profit rates on physical capital, would have a secular tendency to decline, but this was as much through the continued concentration of saving in the
hands of an expanding banking sector as through falling capital yields as a result of relentless capital accumulation.

His views were broadly in line with the Banking School, with the Law of Reflux operating, and monetary usage being determined by the requirements of commerce. He was explicitly opposed to the quantity theory, possibly regarding it as contrary to his labour theory of value (Blaug 1996). But with this combination, he viewed the monetary sector as providers of funds in his analysis of capitalistic production, rather than regarding money as a significant issue for examination from a theoretical viewpoint for his purposes. Marx’ conception of the workings of a capitalist economy could possibly be placed in the category of Monetary Analysis rather than Real Analysis in terms of Schumpeter's distinction (1954), but this would be somewhat tenuous since he did not consider monetary effects in depth.

2.1.3 The Neoclassical of the late Nineteenth century

The neoclassical economists in the last decades of the nineteenth century could once again best be categorised in the Real Analysis rather than Monetary Analysis tradition. These years saw the rapid advancement of the marginalist approach, applied to utility on the part of consumers and to revenue, costs, capital productivity and the like on the part of the firm. Walras was one of the discoverers and initiators of the principle of diminishing marginal utility and its implications, though he is most closely associated with the system of equations depicting an economy in general equilibrium which has come to be associated with his name.
Bohm-Bawerk, (1888) subsequently put forward a theory of determination of the rate of interest which differentiates the characteristics of capitalists and workers, with the interest rate determined by the marginal productivity of lengthening the average period of production. The interest rate becomes the factor which balances the consumption-over-time preferences of the workers with the accumulation-over-time preferences of the capitalists. Although Bohm-Bawerk does not bring monetary aggregates into the analysis, nor treat the interest rate as a monetary policy variable, he does at least put forward a theory in which there is a clear relationship between the interest rate and the accumulation of capital, and hence investment: "The rate of interest is limited and determined by the productiveness of the last extension of process economically permissible". In his analysis, the interest rate has moved significantly from being considered as the equilibrating factor between the supply and demand of loanable funds towards being a factor in the capital accumulation process.

2.1.4 The Innovation of Wicksell

A much greater stride occurred in linking money to investment in the work of Wicksell concerning monetary theory (Wicksell, 1901). Wicksell sought to extend the quantity theory of money to an economy which has moved beyond commodity money to the widespread use of bank credit and loans. His most noteworthy innovation was the distinction between a natural rate of interest and the money rate. The natural rate is the marginal productivity or yield on real (physical) capital, as against financial capital or capital value-in-exchange: "if capital was lent in kind, there would undoubtedly develop, through the supply and demand for the
available capital a certain rate of interest on the lending market, which would be
the natural rate of interest in the strictest sense" (Wicksell 1898). Wicksell
contemplates an equilibrium situation in the economy in which movements
between alternative uses of capital have led to a uniform yield on capital.

The gist of Wicksell's argument is that an adjustment process occurs
through the medium of money whereby the market rate of interest adjusts towards
the natural rate. "If the actual rate of interest on money corresponds with this
figure, the intervention of money will cause no change in the economic
equilibrium" (Wicksell 1898). If the market rate is below the natural rate, prices
will rise continuously, and conversely if the market rate exceeds the natural rate,
they will fall continuously. "A low rate of interest must lead to rising prices, a high
rate of interest to falling prices" (Wicksell 1898).

Furthermore, the falling prices "cannot cease at this first stage, but must
constantly be repeated as long as the low rate of interest continues" (Wicksell
1898). The rising prices reduce the level of money balances and this leads to an
increase in the market interest rate. Correspondingly, falling prices lead through
increased money balances to a decreased market interest rate, which has the effect
of moving the market rate toward the natural rate. Wicksell (1898) maintains that
"what is lent is money and nothing else". However, as Rogers (1989) points out,
Wicksell's analysis still lies in the tradition of Real Analysis, since the natural rate
is determined by real rather than monetary forces and it is the market interest rate
which adjusts to this. Wicksell envisages the natural rate being constantly subject
to change as technology, labour supply and wage levels alter. The banking sector would not be able to observe the natural rate directly, so that the market rate could diverge from the natural rate "for a long period" (Wicksell 1898), though being gradually brought back into line with it through the abovementioned adjustment process.

It is changes in real economic activity resulting from differences between natural and market rate that lead to changes in the quantity of money which in turn cause the market rate to adjust. Wicksell therefore did not break from the quantity theory tradition of the Classicals and neoclassicals, nor did he put forward a theory in which monetary magnitudes are clearly able to affect real economic activity, which could be placed in the Monetary Analysis category of Schumpeter. He did however put forward a concept in which the market interest rate could differ from the natural rate outside long-period equilibrium, and this served as the embryo on which Keynes in particular developed his theoretical framework in which money and monetary magnitudes can have substantive and enduring effects on the real economy. Keynes was strongly influenced by the work of Wicksell, and explicitly propounded his own theories on the workings of the interest rate in contrasted reference to those of Wicksell.

2.1.5 Keynes of the Treatise

Keynes in “A Treatise on Money (1930)” developed a comprehensive theory of the transmission mechanism between the interest rate and economic magnitudes through price level effects and the behaviour of grouped economic
actors. He refers to bank rate in order to use a single reference to short-term interest rates, but regards bank rate and short-term rates to inevitably move closely together through market forces in respect of short-term monetary instruments. From the outset, even before exploring the transmission mechanism, he explicitly recognises bank rate as an important policy variable under the control of the central bank, e.g. as "a means of regulating the quantity of bank money. This is the basis on which the practical method of bank rate as the characteristic instrument of the bank of England was developed in the middle of the nineteenth century". He proceeds to describe three ways in which bank rate policy could be considered to affect the economy. This places a foundation pillar for a theory in which monetary policy actions can have significant effects on real economic magnitudes.

Although Keynes (1930) traces the first recognition of bank rate as a policy variable to the mid-nineteenth century, to the period in which vigorous debates on monetary effects gave rise to the Bank Charter Act of 1844, he recognises that virtually no previous writers had given a clear account of the effects of bank rate on the economy. For a period of 76 years from 1746, the rate in England remained at 5 percent; from 1822 to 1839 there were small fluctuations between 4 percent and 5 percent; and in 1839 the rate was increased to 5.5 percent, then 6 percent. Over this historical period it is therefore perhaps not surprising that the possibility of bank rate as a policy variable did not arise in economic discourse. As indicated above in considering early Classicals, a primary concern was issue of notes by the Bank of England and the independent 'country' banks which were not under its control, and the role of gold or silver convertibility, as well as preserving the country's gold
reserves. But even in the decades following the Bank Charter Act, the interest rate charged by the central bank was viewed as little more than one possible means to influence the supply of bank money in circulation. Keynes traces the continuation of this strand of thinking through to the publications of Marshall in the late nineteenth century and Pigou in the early twentieth. To the extent that they and other writers make any reference to interest rate effects on real economic magnitudes, it is through the actions of speculators or traders.

It is only Wicksell, in Keynes' view, who breaks decisively from this mode of thought prior to his own analysis. Keynes recognises two other strands of thinking: that of 'practical bankers' in which bank rate serves as a means of protecting the country's gold reserves by influencing the volume of lending to foreign countries, and that in which bank rate in some way influences the rate of investment. The former he confirms as being used at various times from the 1840s. The latter he maintains had not been clearly expounded in a theoretical framework, other than by Wicksell, and it is this strand that he sought to develop further.

Keynes (1930) relates this process to a natural interest rate which he characterises in a similar manner to that of Wicksell. The natural rate is that which would prevail in equilibrium if all saving and investment were to take place in physical goods rather than through a monetary system. It is the rate at which saving is maintained in balance with the value of investment. But as soon as the market rate of interest departs from the natural rate, the above described causal sequence occurs in terms of the Fundamental Equations, leading to reducing prices of both
capital and consumption goods for as long as the market rate exceeds the natural rate, and increasing prices for so long as it is below the natural rate. "According, therefore, as the banking system is allowing the rate of investment to exceed or fall behind the rate of saving, the price-level will rise or fall" (Keynes 1930). In this respect, his fundamental equations are a more comprehensive depiction and expansion of the essential concept put forward by Wicksell.

Keynes (1930) warns of the danger of policy makers not recognising the protracted effect of an interest rate change. Although an interest rate increase has the effect of a reduction in capital and consumption goods prices, which could be perceived by monetary authorities as a beneficial effect, there may be incipient negative consequences still to unfold. If \( I' \), the cost of investment goods, is unchanged, the profit margins of firms is eroded, and their continued existence may be threatened. To the extent that entrepreneurs reduce employment to avoid losses, an ongoing situation may prevail in which the "monetary equilibrium will continue to require the indefinite prolongation of chronic unemployment"

Keynes (1930) maintains that, if the market interest rate change is sustained, the natural rate itself will be affected. This arises from the changed revenue stream expectations of entrepreneurs. For instance, an increased market rate, after having its effect through the Fundamental Equations described above, leaves profit margins at reduced levels, which entrepreneurs will expect to continue in the case of new investments to be undertaken. The natural rate is thereby decreased when the market rate has been increased, driving the gap between the
two wider. Attainment of a new equilibrium in the economy is prolonged, unless the natural rate happens to move to equality with the market rate as a result of factors outside this analysis. The reduced prices and profits experienced by entrepreneurs lead inevitably to their offering a lower volume of employment and decreased earnings levels. These reductions eventually enable profits to be restored at the lower activity and price level. Expectations of profits on new investment hence increase, and thereby the natural rate likewise increases. Whether this adjustment process is able eventually to bring the natural and market rate into alignment at a lower economic activity level depends on the degree of divergence between the two when the market rate change is instituted. It could lead to a continual price and activity deflation spiral, as propounded by Wicksell, until such time as the market rate is re-adjusted to alignment with the natural rate. There could also be an adjustment process through international flows resulting from a relative change of the domestic interest rate.

Although Keynes still sought to bind his theory of money in the *Treatise* to the quantity theory and to the market/natural rate distinction of Wicksell, the linkage appears as a wish to give due recognition to the theories of antecedents, and to incorporate prevailing economic thinking, rather than as a logical adjunct of his own theory. In the *General Theory*, Keynes overturned these linkages.

### 2.1.6 Keynes of the General Theory

Keynes “*General Theory (1936)*” systematically assembled concepts, measures and mechanisms to analyse the major aggregates of an economy as a
whole, in which monetary factors are bound into the analysis throughout. At the core of the connection between monetary variables and real magnitudes is the Marginal Efficiency of Capital (MEC) concept he introduced, and its interaction with the interest rate. The MEC represents the expected yield of capital assets which entrepreneurs could deploy, expressed as a discounted stream of future net revenues relative to the acquisition price of the asset. Aggregated from higher to lower yielding assets, this gives rise to a downward sloping schedule with yield shown vertically and capital value horizontally. The interest rate (simplifying from the spectrum of interest rates in an actual economy) establishes the value of new capital which it will be worth the while of entrepreneurs to acquire and bring into production, since the yield expected exceeds the interest rate to be paid.

Given that Classical economists were steeped in the dichotomy between monetary forces and the real economy, accepted the quantity theory with little question, and had few reservations towards the precepts of Say's Law, it has been important to examine when in economic thought a new strand emerged which allowed the possibility of a connection between monetary and real forces. It is apparent that this strand began to emerge with Wicksell, though even in his case, examination of the causal direction between natural and market rate shows his approach to be more correctly classified in the Real Analysis rather than Monetary Analysis tradition (Rogers 1989). It is only with the work of Keynes in the Treatise that a decisive break is made into a conceptual structure in which monetary and real economic forces are integrally bound, which can be classified in the tradition of Monetary rather than Real Analysis. This structure was taken forward and
revised in the *General Theory* with major implications for economic theory. In order to examine the possible relationship between monetary policy and investment in an economy, the theoretical underpinnings used need to allow in principle for the existence of such a relationship. The initiation of such a theoretical framework in economics can be largely attributed to the ideas of Keynes put forward in the *Treatise, General Theory* and related discussion articles, though bearing the influence of prior economic writers from the time of Ricardo and Thornton.

Rogers (1989) regards Keynes' *Treatise* analysis as being still best classified as Real Analysis, and that the break into Monetary Analysis came with the *General Theory*, but this is contestable.

### 2.2 MONETARY VARIABLES IN GROWTH THEORY

Investment is inevitably a key aspect in growth theory, in its relationship to capital accumulation and potential output, and this was recognised in the early modern growth theories put forward, such as those of Ramsey (1928), Harrod (1939), Domar (1946), Solow (1956), Swan (1956) and Kaldor (1960). Monetary effects on growth were raised as an issue of concern subsequent to these earlier contributions to growth theory, and contributions by Tobin (1965), Sen (1965) and Johnson (1967) sought to include a monetary component. Theories concerning the role of finance in economic development, such as those of McKinnon (1973), Thirlwall (1978), Kapur (1976) and Mathieson (1980), examined issues relating to money in a developing economy context. After relative quiescence in the late 1970s and early 1980s, growth theory expanded significantly from the mid-1980s
in the form of new (or endogenous) growth theory (Romer 1994). But to what extent and in what manner have monetary variables been incorporated into the growth models of endogenous growth theory, and to what extent do these accord with the integral role of money as posited by Keynes (1936)

2.2.1 Growth Theory in the early Twentieth century

Although classical economists were concerned with economic growth issues in broad terms at least from the time of Adam Smith's Wealth of Nations, the origins of modern growth theory can be attributed to the significant contributions by Ramsey (1928), Harrod (1939) and Domar (1946). Ramsey's (1928) contribution was concerned with determination of saving levels, based on household utility optimization over an extended period of time, in which the household is sustained indefinitely, even though older generations give way to their offspring. He put forward a mathematical time-based utility function and showed the conditions which would lead to its maximization, which "determines bliss, the maximum rate of utility obtainable". Households may borrow, or provide loans, and accumulate assets, with a single interest rate or yield applicable to debt or assets, which contributes to their future income stream. The household's objective is to maximize time-discounted consumption less the disutility of labour provision, over a long time horizon.

2.2.2 Monetary Models Inspired by Financial Repression

The theory put forward by McKinnon (1973) served as a foundation for further theories and models concerning monetary issues in a context of financial
repression. Fry (1995) identifies several models of money and finance which are extensions from the McKinnon-Shaw framework, and notes in particular the models of Kapur (1976) and Mathieson (1980), which provide additional analytical depth to the framework.

Kapur's (1976) purpose in the development of the model presented is to examine the means through which price stabilization can be attained in a less developed economy in which financial repression is prevalent. The concern is that a policy reduction in the rate of monetary growth is likely to reduce capital investment, and economic growth generally, before inflation expectations and realised inflation decrease. Kapur focuses on changes in the working capital component of total capital in particular, as being widely financed with bank credit. Also that of Shaw (1973), which is similar in essential characteristics and economic policy implications. Fry (1995) and others refer to the two jointly in terms of a 'McKinnon-Shaw' framework.

### 2.3 POST KEYNESIAN MONETARY THEORY

Post Keynesian economics could be characterised as a revival as well as extension of the macroeconomic conceptual framework put forward by Keynes, especially that of the General Theory (1936) and subsequent papers (King, 2002). It has posed challenges to orthodox economics, particularly in repudiating the neoclassical synthesis interpretation of Keynes' economics, and the associated extensive analysis using the IS-LM framework initiated by Hicks (1937). It is likewise critical of analysis based on a general equilibrium or neo-Walrasian
framework, which is an underlying paradigm of much of neoclassical economic theory. It has also been strongly critical of monetarism as a theory of the behaviour and effects of money. Some key conceptual tenets of Post Keynesian economics are: fundamental uncertainty needs to be taken into account in economic analysis, time needs to be viewed as historical (unidirectional) time, assumptions underlying theories need to accord with reality (contrasted with instrumentalism), scepticism toward a general equilibrium approach to economic modelling, preference for partial equilibrium approaches if equilibrium is used, importance of contracts and societal institutions more broadly, money being treated as credit-related in a modern economy, and monetary and real magnitudes in the economy being closely intertwined. The theories, research and arguments put forward by writers in the Post Keynesian mould are wide-ranging.

2.3.1 Money and the Real Economy

Time plays a crucial role in a Post Keynesian view of money in that money is viewed as an abode of purchasing power which can be transferred between past, present and future: it is a 'time machine' in this sense (Davidson 1980) This is an extension of Keynes (1936)’ perception that "the importance of money flows from its being a link between the present and the future". The Post Keynesian notion of time as being historical time rather than logical time, meaning that it needs to be recognised as moving in a single direction with changing surrounding conditions, accord to money attributes which would not exist under reversible logical time.

The concept of fundamental uncertainty brought forward from Keynes (1937) is regarded as an essential reason for the holding of money: money balances
are held as unspecified, generalized purchasing power to meet future expenditures which are uncertain rather than stochastically predictable. The propensity to hold money therefore depends on expectations relating to an uncertain future, rather than statistically definable future requirements. The link between uncertainty and money in Davidson (2002) view is that "It is only in a world where the future is uncertain that the importance of money, contractual arrangements, and financial market activity becomes predominant in determining future world outcomes."

Monetary holding may change in accordance with expectations concerning future circumstances, even if actual payment requirements do not change.

Post Keynesian views on money depart from first principles with any theory of money which has as its assumption base a general equilibrium framework, as is widely the case in neoclassical approaches to economics. There have been various attempts to accord money an essential and plausible role within a neo-Walrasian, general equilibrium economic framework. Early theoretical contributions in this debate were those of Patinkin (1965) and Clower (1967). Patinkin (1965) highlighted the apparent contradiction arising from the quantity theory in which an equi proportionate increase in prices leaves relative prices unaffected and therefore does not affect real demand and supply of commodities (the homogeneity postulate); and yet the price level increase must have reduced the real purchasing power of the money supply. To resolve this conundrum, he resorted to a real-balance (wealth) effect of money holding as an equilibrating force which can affect real magnitudes. Clower (1967) contested this analysis by exploring the introduction of money into a general equilibrium model using an approach based
on micro-foundations, in which money is required by agents in order to acquire goods, to determine its effects.

2.3.2 Post Keynesian Views on Interest Rate

Post Keynesian views on interest rates can best be seen against the backdrop of Wicksellian interest rate theory, Keynes' development of this in the Treatise (1930), and the liquidity preference approach together with the marginal efficiency of capital (MEC) introduced by Keynes in the General Theory (1936). Keynes' innovations concerning interest rates departed from the Classical and neoclassical view of interest as being determined by supply and demand of loanable funds. In Keynes (1936)' liquidity preference approach, interest is conceptualised as "the reward for parting with liquidity for a specified period". The liquidity preference theory is based on the notion that economic actors will adjust their holdings of financial assets and money in such a way as to reach, in equilibrium, equality of expected rates of return on financial assets and money held. Keynes expressed the holdings in terms of money balances and government bonds by way of simplification: the bonds category can be expanded to include a wide range of marketable financial assets. Of the three motives for holding money put forward in the General Theory: transactions, precautionary and speculative, the latter is directly dependent on the interest rate level in accordance with the preferences of economic actors between holding bonds and money.

In the case of an increase in the interest rate, agents increase their holding of bonds due to the reduction of bond prices, expectation of capital gain, and the
higher opportunity cost of non-interest bearing money holding. There is a strong psychological aspect to liquidity preference: Keynes (1936) regarded the 'psychological attitude towards liquidity' as one of the ultimate independent variables in his analysis. Liquidity preference is also Neo-Ricardians however, although broadly aligned to the Post Keynesian camp, take issue with Keynes' analysis of the rate of interest on the grounds that it is simply a restatement of the neoclassical relationship between natural and market interest rates (Rogers 1989). In Keynes' framework, the interest rate determined by the liquidity preference mechanism operates in conjunction with the MEC to establish the investment level in the economy. The MEC is defined as the expected future return of a capital asset, equal to the discount rate which equates the future income and cost stream associated with the asset to the present capital cost of the asset (Keynes 1936). The MEC will differ for individual capital assets; the schedule is compiled by ranking capital investments from highest to lowest, giving rise to a downward sloping MEC curve in return-investment space.

The interest rate exogeneity view applies, strictly speaking, to short-term nominal rates. However, Post Keynesian writers recognise a fairly strong relationship from short-term rates through the term structure to long-term rates. This is in line with Keynes' view in which long-term rates are determined by expectations of the future path of short-term rates (Moore, 1988). Moore appears to regard the relation of interest rates across the term spectrum to the short-term rate as fairly direct, based on weighted expectations of future short rates. Rogers (1989), on the other hand, describes a transmission mechanism from short to long
rates which "is somewhat elastic and manipulations of Bank rate to change long rates may not always be effective". The latter is more in line with the Radcliffe Report (1959) which regarded the spectrum of financial assets from short to long term, and with different risk and liquidity characteristics, as being complex and subject to multiple influences. Whether more or less direct, the Post Keynesian view is generally one of causality from short to longer term, rather than short rates varying about a norm or convention in respect of long rates, for instance in the nature of a real rate norm as suggested by Fisher (Moore 1988), but which has been shown empirically not to be valid.

Post Keynesian writers, however, recognise a conventional or psychological aspect to interest rates operating in conjunction with central bank determination. Rogers (1989), for instance, maintains that the interest rate "reflects psychological, institutional and other historical factors which cannot be specified a priori". He distinguishes between transitory and persistent changes in market rates, with the former being temporary fluctuations which do not affect the long-term rate and through it investment. The long rate then has psychological and institutional factors built into it and the monetary authorities need to ensure ongoing confidence in the rate to avoid deviations which could cause elastic expectations with a destabilizing result.

### 2.3.3 Monetary Equilibrium and Effective Demand

In the Post Keynesian analysis, monetary equilibrium is directly linked to determination of the point of effective demand, giving the level of output and employment at which the economy operates. This is crucial, since it is through the
principle of effective demand that Keynes demonstrated the possibility of the economy operating at less than full employment, without there being intrinsic forces to move it towards full employment. The money rate of interest is regarded as an exogenous-type variable based on a combination of central bank determination, convention, psychological and historical factors. The exogenous interest rate gives rise to a particular investment level which balances the marginal efficiencies of assets to the interest rate. This level of investment may or may not be such as to employ all resources in the economy. But since the investment rate is established by monetary equilibrium, which may be long-period equilibrium, there are no further economic forces towards asset price changes, interest rate adjustment or investment which will cause either aggregate demand or aggregate supply curve to shift. The economy is therefore confined to this involuntary unemployment equilibrium unless the interest rate changes. At the equilibrium point, there is no incentive for entrepreneurs to expand production of capital due to there being no profit from doing so beyond Marshallian normal profits. Say's Law is broken since additional supply does not create its own demand if it cannot be sold at a profit.

The Post Keynesian view of the inflation process contrasts directly with that of monetarists. Monetarists maintain a causal view of the quantity equation in which increases in the price level are directly and causally related to increases in the money stock. Many pages of Post Keynesian writing have been devoted to attacking the tenets of monetarism. Post Keynesians place the primary causal mechanisms of inflation outside the money creation process.
expositions of the inflation process can be found in Davidson (1994), Kaldor (1978), Kaldor and Trevithick (1981), and Moore (1988).

It should be noted that money supply increases in the Post Keynesian inflation framework are regarded as by and large *accommodatory* in nature. The only effect of money supply changes is through the indirect route in the case of a restrictive monetary stance, whereby economic activity in general is restricted which in turn leads to a climate in which wage demands are less strident and settlements lower through economic necessity. This view is linked to the endogenous view of credit money, in which money supply increases beyond requirements are extinguished through repayment of debt, as taken up below.

2.3.4 Monetary Policy Variables

The implication of an endogenous theory of money, together with an interest rate determined by convention or exogenously by the monetary authorities, is a reversal of the key policy variables as viewed by monetarists and many neoclassical economists. The money supply or money stock (by any defined aggregate) is no longer a key monetary variable over which close scrutiny and control by the central bank is imperative, as in the monetarist view. Whereas monetarists see growth of monetary aggregates as directly causally connected to inflation (through time lags) as well as a potential source of economic instability, Post Keynesians view monetary aggregates as passively adjusting to the demand for money and credit according to interest rate levels, investment activity and income. The level and growth of monetary aggregates are thus taken off centre
stage in a Post Keynesian policy view as being neither controllable by the authorities nor crucial in any economic causal chain. This is not simply a matter of a reduced empirical relationship between monetary aggregates and economic activity: it is rather a consequence of endogenous money, "a logical necessity rather than a policy choice." (Palley 2006). This should not, however, be seen as diminishing the importance of money in the Post Keynesian scheme: the existence and attributes of money remain crucial. It is simply that other aspects of money are regarded as most appropriate for policy intervention purposes.

In Post Keynesian monetary policy analyses, the interest rate takes centre stage as being both controllable by the monetary authorities and a key determinant of the level of investment activity and other economic expenditure through which, in terms of the principle of effective demand, the economy can be brought closer to full employment. The central bank is regarded as exercising monetary policy primarily through the level of interest rates, using as its instrument variable its discount rate, and any penalty premiums applied, at which the banking system can obtain borrowed reserves (taking account of foreign reserve holdings, especially in the case of a small open economy). This operates in conjunction with the reserve requirements placed on commercial banks, as well as open market operations conducted by the central bank. The central bank has its primary effect on short-term rates through use by commercial banks of discount window borrowing, but can also have an effect on the interest rate structure (yield curve) through open market operations and other financial market activities.
Interest rates become crucial for monetary policy purposes, not only for assisting in attaining inflation rate objectives, but for exercising influences in various ways on the behaviour of the real economy, including the level of investment activity. Although money and credit generation may well be largely endogenous through the role of banks in response to demand, the central bank may nevertheless have the possibility of exerting a wide array of influences through interest rates as well as through its engagement in open market transactions and exchange rate management actions. This leads to consideration of interest rate as well as money and credit flow effects which could occur within a Post Keynesian theoretical framework of the monetary system, and in particular alternative possible channels through which monetary variables could affect investment through the banking system.

2.4 CREDIT STRUCTURES IN MONETARY TRANSMISSION

Minsky (1997) is most closely associated with the notion of financial instability which can arise systemically from the credit structure of the economy. Minsky in particular, and other economists sympathetic to this notion, fall generally into the Post Keynesian view of how a modern economy operates. Since the credit structure of an economy is closely associated with the monetary system, it is pertinent to investigate the possibility that the credit structure of the economy could be a significant factor or channel in determining investment, both in itself and in the transmission of monetary policy. Minsky maintains that the changing credit mix itself contains forces which can lead to severe financial crises. But this surely indicates that, even outside periods of crisis, the credit structure is likely to
be a factor in relating monetary variables to investment.

The primary effect of monetary policy occurs via the central bank interest rate through to market rates and the real cost of capital, which influence aggregate demand, directly and indirectly, as well as capacity utilisation, which is regarded as a key factor in determining the inflation level. The Bank of England operates in an inflation targeting policy environment, yet its framework is compatible with an endogenous money view. Dalziel (2001) likewise notes the compatibility of the approach and modelling used by the central bank of New Zealand in recent years to an endogenous money view. This is significant in that New Zealand was at the forefront of introducing inflation targeting in 1989-90, and in that monetary aggregate intermediate targets have given way to an approach which focuses on a more direct policy interest rate influence through to components of aggregate demand.

In the case of South Africa, inflation targeting was formally introduced from February 2000, though the Reserve Bank had been informally using an inflation targeting approach from a year earlier. Monetary aggregate targets or guidelines were used from 1985, but the actual growth rate in M3 money supply fell outside the upper and lower limits far more frequently than within them. The Reserve Bank moved increasingly toward an eclectic approach, taking into account a range of indicators, during the 1990s, before abandoning expression of any monetary aggregate guidelines in 1999 during the lead-in to inflation targeting.
The Reserve Bank of South Africa considered that the relationship between monetary aggregates and demand for goods and services had become subject to shifts resulting from increasing integration of the South African economy with global financial markets, liberalisation of domestic financial markets, relaxation of exchange controls and financial deepening in the form of more widespread use of financial services across the population (DeJager and Smal 2001).

2.5 MONETARY POLICY OBJECTIVES

In the Reserve Bank’s inflation targeting monetary policy framework, the policy interest rate/repo rate is regarded as primary, but as having multiple channels through which it affects the economy, as well as the effects being subject to significant and variable lags, typically of the order of six months to two years. The main channels as viewed by the Bank occur through market rate influences on investment and consumption, through exchange rate effects on imports and exports, through credit provision and through changes in asset prices (equities, property, etc).

The primary objective pursued is domestic price stability, in the form of maintaining inflation within the specified target range, but other economic objectives such as exchange rate stability, economic growth and unemployment reduction are not ignored entirely, though only receiving consideration to the extent that they do not conflict with attainment of the primary objective (Vander Merwe 2004).

2.6 EFFECTIVENESS OF MONETARY POLICY

With the beginning of new fiscal year pushiness in inflation fiscal
Weaknesses are consuming the improvement in the external current account deficit and economic recovery. Due to decline in investment gap between saving and investment has narrowed. Domestic aggregate demand is picking up due to public sector expenditure while prospects of aggregate supply remain weak due to energy crisis and dismal law and order situation all over the country. Actual average CPI inflation is 2.7 percent higher the targeted CPI inflation that was 9 percent. Current trends and expected developments indicate risks of inflation pressures continuing in fiscal year 2011 and is projected to remain high between 11 to 12 percent which is also higher than the announced target of 9.5 percents (SBP, 2010).

Impact of monetary policy shocks on current account is consistent with expenditure switching effects. Monetary policy has important consequences for the behavior of domestic variables like current account and real exchange rates. Best policy rule for central bank is to focus on targeting domestic producer inflation. Findings also suggested applying flexible exchange rate system because the high valued currencies are not only inflationary but also hinder economic growth (Sulaiman, 2010).

Much of the misunderstanding regarding monetary policy implementation can be traced to the failure to distinguish between different monetary aggregates and their relationship with the interest rate that central banks target. In countries where reserve requirements are in place, balances are comprised of required reserves balances and excess reserves balances. Each component of balances is driven by different factors. Required reserves are generally fixed as a proportion of
outstanding deposits, often with a lag so that required reserves for any given maintenance period that is the period over which banks’ average holdings of reserves are assessed relative to requirement, depends on the average amount of deposits in some past calculation period. As such, the level of required reserves is not directly affected by interest rates. The only way that interest rates may affect required reserves is if an increase in rates, say, results in a lower demand for deposits as economic activity slows down which, in turn, reduces the base used to calculate reserve requirements for subsequent maintenance periods (Disyatat, 2008).

Monetary policy was success to control inflation only if it successfully controlled the money supply targets. Money supply targets needs to improve the target level of M2. It is also find out in recent years State Bank of Pakistan failed to control the money supply and hence rate of inflation within the targets which is the result of lack of coordination between the fiscal and monetary authorities and there seems inconsistency in the reaction function of monetary policy (Qayyum, 2008).

State Bank of Pakistan was established with two broad objectives. One is to secure the monetary stability and other is to fully utilization of country’s resources but according to State Bank of Pakistan amended Act 1956, the target growth rate and target inflation rate set by government are the targets of monetary policy. So target rate of inflation is prime objective of monetary policy in Pakistan. In Pakistan role of monetary policy is much supportive for dual objective of economic growth and price stability. However, during the period from 2001 to 2005
monetary policy in Pakistan was biased towards supporting growth because of expectations that inflation could be maintained at low levels while giving the economy a monetary stimulus. Inflation started accelerating in 2005 that forced a reversal of monetary policy (SBP, 2006).

To control inflation one of the important monetary policy variable is money supply and both the broad money (M2) and private sector credit growth are leading indicators of inflation in Pakistan. It has already established that excess money supply growth causes inflation in Pakistan. The selection of M2 as a policy variable is based on the assumption that the demand for M2 function is stable in Pakistan and it has strong association with the rate of inflation (Qayyum, 2006).

Two fundamental propositions about the effect of the quantity of money on the economy are as under. The first is that increases in the quantity of money that is not associated with corresponding increases in real output will eventually lead to inflation, and the second is that a shortage of money can depress the volume of economic activity. A considerable literature has emerged, attempting to give credence or discordance to these propositions, using parsimoniously restricted multivariate time series models (Sims and Zha, 2005).

The central misconception regarding monetary policy implementation is the proposition that monetary policy actions are effected through open market operations that alter some quantity aggregate, such as the monetary base or a reserve aggregate. Such a depiction of monetary policy implementation is prevalent
in the academic literature and standard in leading macroeconomic textbooks. It is however also distinctly at odds with how implementation is viewed by practitioners. One is to use open market operations to adjust the quantity of reserves to bring about the desired short-term interest rate, implicitly or explicitly drawing on an identified demand schedule (Tucker, 2004).

Some of great economists like Milton Friedman and Anna Schwartz inspired the campaign in their seminal work as they documented the strong time series correlation of monetary aggregates with both output and prices. They explain that these correlations did not primarily represent passive responses of monetary aggregates to development in the private sector, but instead mainly the effects on monetary policy shifts on the private sector. From their argument, it follows that innovation in monetary policy variables have the potential for stimulating the economy when it is sluggish or cooling it down when it overheats (Nagel and Parker, 2003).

Fiscal and monetary policy is generally believed to be associated with growth, or more precisely, it is held that appropriate fiscal measures in particular circumstances can be used to stimulate economic development or growth (Barro and Sala-i-Martin, 1991).

Monetary policy can eliminate the cost of money illusion by correcting the alteration on money illusion agent’s decisions about consumption and saving. People think about currency in nominal rather than real term because in this way
numerical face value of money is mistaken for its purchasing power. Evidence indicates that money illusion is constantly increasing. It effects an agent perception about the growth and riskiness of real wealth. It also alters his decisions about consumption and saving decision and in this way it effects the long run growth (Miaoy and Xiez, 2007).

In macroeconomics the impact of monetary policy on the real economy has been a controversial area (Bernanke and Gertler, 1995). Important question is this that whether changing interest rate has some impact on real economic variables and how much these effects are powerful. This seems to be more important when it stew down to the regional level seeing as monetary policy naturally address the national targets whereas within a monetary union exhibit different structures and characteristics. Hence it is possible that they might respond in disproportionately to a desire of a uniform monetary policy. As a result there will be some distributional implications across the region because any economic activity in a core may be encouraged by the policy while the periphery may become more depressed (Ridhwan et al., 2008).

Traditional model explain the impact of monetary policy through aggregate demand side where interest rate is known as most important transmission channel because any increase in interest rate leads to increase in the cost of capital. This becomes the cause of reduction in the interest responsive component of aggregate demand. Any increase in short run interest rates lessen the cost of assets which indirectly become the reason of reduction in consumption expenditures through
wealth effects and investment expenditures through Tobin’s q-effect whereas Tobin’s q is ratio of market value and replacement value of same physical asset. Another important channel through which a tightening of monetary policy tends to depress economic activity is the credit channel. In the credit view, the contractionary effects of monetary policy are transmitted to a large extent through lower bank lending. Also, the exchange rate channel of monetary policy is crucial, especially in small open economies. The monetary tightening causes the nominal exchange rate to appreciate. Assuming that nominal rigidities cause prices to be rather constant in the short run, an appreciation of the real exchange rate results. In turn, this may squeeze net exports (Mishkin, 1995).

Empirically, Vector Autoregressive models have been widely used to study the transmission mechanism of monetary policy (Leeper et al., 1996, and Christiano et al., 1996). The VAR approach has several advantages. Since all the variables are treated symmetrically, there is no requirement to make a distinction between exogenous and endogenous variables (Sims, 1980, 1986; Bernanke, 1986). In a regional context, some analyses such as Carlino and DeFina (1998, 1999) and Fratantoni and Schuh (2003) adopt the VAR model to allow for spillover effects between regions. In principle, a VAR model consists of a set of equations in which each variable in the system is determined by its lagged values and the lags of all the other variables in the system.

Pakistan's national bank has considered the full ramifications on its economy of moving from the current monetary regime into inflation targeting. Though more likely than not Pakistan meets the crucial specialized prerequisites to
execute some adjustment of inflation targeting (IT), the SBP should research different issues before it settles on a distinct decision whether to development to IT or not. There is no brain boggling observational evidence that transient interest rates are alternately related to inflation. While monetary targeting is not suitable any more in Pakistan in light of the nonappearance of consistency of the money interest limit, what is not by any stretch of the creative energy clear is that inflation targeting is the ideal monetary regime, given the nation's structural peculiarities, specifically, a creating economy with significant unemployment and underemployment. One interesting a piece of the IT model is that the economy is seen as unbiased concerning monetary disturbances. By then the apparent request is the reason should inflation be centered around, and why should the disposal of inflation be a key focus of monetary strategy? If inflation is really a distortionary force, then the truths can't affirm that the real economy is not affected by monetary unsettling influences. Different issues have been raised. Regardless, the speculative model underlying. Inflation targeting expect that inflation is just an investment liveliness sensation. Then again, the exact verification open exhibits that inflation in Pakistan is, as it were, controlled by the improvement rate of import prices. Wheat support prices similarly give off an impression of being a determinate of inflation, in which case the compelling voices in the Ministry of Agriculture would need to examine the issue. It is not an issue of monetary policy. The impact of monetary policy on prices depends on upon the kind of information used inside the examination.
The inflation targeting exhibits a vertical long-run Phillips curve that portrays long-run possible output, reliable with the non-accelerating inflation rate of unemployment (NAIRU). In any case, it is tricky to understand the importance of a tradeoff between inflation and unemployment when, in Pakistan, underemployment in the agrarian and urban casual segments coincide with the formal economy yet without a pleasing point of confinement. At the practical level, examiners have rejected to gage the non accelerating inflation rate of unemployment (NAIRU) suitably in the US economy. Furthermore in addition, empirical proof demonstrates that changes in limit use require just be inflationary at levels of limit, close full usage. Prior to this, inflation will not expand. It is at exactly that point (abnormal amounts of limit usage) that there may be a trade off in the middle of inflation and unemployment (Felipe, 2009).

Question that needs to be addressed is that ought to the SBP use interest rate (policies) scarcely and with the goal of holding inflation? Should it, may be, consider diverse objectives and variable, for instance, the exchange rate, unemployment, growth or productivity and what about fiscal policy? Results demonstrates that complement the conventional inflation targeting structure with discretionary and fiscal policy; consider the long-run effects of movements in interest rates; and direction money related and fiscal policies. It has similarly been supported that the SBP should execute "Inflation Targeting Lite" (Moinuddin, 2007).
The choice suggestion that I have progressed is to target full employment subject to an inflation prerequisite. There is no hypothetical inspiration driving why a national bank should not consider this more broad command. An essential for the SBP to seek after inflation targeting is that there should exist a steady and critical relationship between the measure of inflation to be controlled and transitory interest rates. The test examination gives motivation to feel questionable about it. Unless this relationship is clearly settled, use of transitory interest rates to pleasing inflation may be pointless. Additionally, higher interest rates may help higher inflation through the cost side. There is no brain-boggling exact confirmation that temporary interest rates are contrarily related to inflation. There are diverse decisions open to Pakistan's national bank, for instance, to target full employment subject to an inflation prerequisite (Felipe, 2009).

Moinuddin (2007) has argued that to measure inflation in Pakistan, the CPI satisfies the prerequisites to qualify as a yardstick. Transitory investment rates and inflation are inversely related in the inflation targeting (IT) model. Keynes (1930) contended that may be these variables are positively related. It is noted that there is no affirmation of causality running from interest rates into the two price indices when yearly data is used. With quarterly data, the 6-month Treasure bill Granger-causes the WPI in the short-run, and the CPI in the long-run. Furthermore with month to month data, there is evidence of short-run causality from both the national bank policy rate and the 6-month Treasury bill to both the WPI and the CPI; and of long-run causality from the 6-month Treasury bill to the WPI. To acknowledge these findings, the national bank should use an undeniable econometric model that
tracks how interest rates relate to inflation. It may well be, regardless, that the relationship between interest rates and inflation is uncommonly confusing and thereafter this fundamental examination does not get it. In any case, the SBP must give affirmation of the relationship between the measure of inflation to be controlled and transitory interest rates to present a reliable safeguard for IT. Other than the clear precondition for successful IT as a financial organization that the national bank should be self-ruling, the writing recognizes a plan of additional preconditions for undeniable inflation targeting (IT).

Moinuddin (2007) has broke down the suitability of an IT regime for Pakistan centered, and has gathered that the principal conditions are satisfied, and that the SBP should grasp what he checks "Inflation Targeting Lite", after the experiences of Chile, Peru and Turkey and recommends that the SBP "keep a by and large broad mixture of inflation target (e.g., 1 percent below the mid-point center) for a medium term horizon all through its beginning time of practicing IT". He argues that: (a) the SBP is an independent foundation that rejoices in pleasant flexibility and is free from political effect; (b) the consumer price index (CPI) fulfills the necessities to qualify as a benchmark to measure inflation in Pakistan. Regardless, the house rent index (with a weight of 23.43% in the CPI wicker compartment) is not audit based and its estimation evidently needs to be improved; (c) despite the way that an advanced macro-econometric model is not an imperative condition for IT, it is a basic gadget for operational correspondence that moreover enhances acceptability; (d) the non-accessibility of national income data on a quarterly premise is a real impediment in regards to serious examination and
fruitful checking of key macroeconomic variables; and (e) adoption of IT obliges a conventional understanding of the monetary policy transmission mechanisms (Arestis and Sawyer, 2006), notwithstanding the way that, he fights, it is possible to accept this monetary regime without having such comprehensive data.

Akbari and Rankaduwa (2006) also assess whether Pakistan fulfills the real requirements to establish an inflation targeting (IT) regime. Since right on time 1990s the SBP has encountered reforms that have improved the financial soundness of commercial banks. On the SBP's self-sufficiency, they battle that this has to be assessed in terms of economic and political opportunity. The previous refers to the restrictions on the SBP's ability to finance the government's budget deficits and the part it plays in banking supervision. In common, the authors argue that the SBP has increased its self-sufficiency of late. The resolve of the government to lessen the budget deficit has helped this more huge economic self-sufficiency.

On the issue of political independence, Akbari and Rankaduwa (2006) asserts that while the SBP has all the reserves of being politically self-sufficient in regards to how its governors are named and cleared; of course, the SBP has not been free the extent that its monetary policy record. As per above creators, monetary policy in Pakistan is transparent and that the exchange rate is sensibly flexible, despite the way that the SBP intervene in the foreign exchange market to avoid tremendous instabilities in the estimation of the rupee, which may be seen "as a violation of a considerable need for an inflation concentrating on administration"
MATERIALS AND METHODS

In research role of methodological techniques to collect and analyse the data are very significant whereas the methodology refers as the logic to scientific procedure. This study will be confined to Pakistan

3.1 DATA SOURCES

In this study time series secondary data covering the period 1972(Q_1) to 2011(Q_4) is used for quantitative analysis that is collected from State Bank of Pakistan statistical data site, World Bank data site, International finance statistic, different government and semi government organizations and from internet. The State Bank of Pakistan compiles a wide range of monetary sector related data for Pakistan on a regular, typically monthly or quarterly basis.

3.2 EMPIRICAL EXAMINATION OF DATA

Various necessary steps are taken to ensure the validity of the data regarding the evaluation of monetary policy. For appropriate examination of the model, the data are identified, compiled and reformulated. As time based models raised number of econometric issues, so appropriate techniques are used to address those issues. For econometric analysis model is expressed in its most suitable form. Different econometric techniques are used to estimate the parameters of the models and also different tests are conducted to assess the degree of correspondence of the model with the reality as manifested by the data. Some simulation using possible monetary policy actions serve to illustrate its operation and implications.
3.3 VARIABLES OF STUDY

Variable that are selected for the analysis are, Real GDP Output Growth Rate(factor cost) percent at constant prices 1999-00, Average Inflation CPI or Domestic Prices percent, Reserve Money/High Powered Money/Monetary Base in Million Rupees (H or Mo), Broad Money M2 in Million Rupees, unemployment rate percent, Real Interest Rate/Discount Rate percent, Real Exchange Rate (Nominal Exchange Rate that is adjusted by the Ratio of foreign price and domestic price Pf/P) = e(Pf/p), Gross Saving (percent of GDP) and Total Consumption Expenditures percent of GDP (Household final consumption expenditures + Govt. final consumption expenditures). Investment is not taken as independent variables because objective of study is to evaluate the impact of monetary policy on economic growth. Investment also not taken by researchers like Gul et al. (2012), Malik and Ahmad (2011), Sulaiman (2010), Saizar and Chalk (2008) and Khabo (2002).

3.4 HYPOTHESIS OF STUDY

(1) Null Hypothesis for Keynesian Argument:

There is weak relationship between monetary sector and real sector

Alternative Hypothesis for Monetarist Arguments:

There is strong relationship between monetary sector and real sector

(2) Null Hypothesis

Current year money supply $M_{2t}$ depends on that of previous period money supply $M_{2t-1}$.

Alternative Hypothesis
Current year money supply $M_{2t}$ does, $t$ depends on that of previous
Period money supply $M_{2t-1}$.

(3) Null Hypothesis

Economic growth is significantly related to monetary policy
variables and CPI inflation

Alternative Hypothesis

Economic growth is insignificantly related to monetary policy
variables and CPI inflation

(4) Null Hypothesis

Monetary policy has significant impact to reduce the
Unemployment

Alternative Hypothesis

Monetary policy has not significant impact to reduce the
Unemployment

(5) Null Hypothesis

Money supply, interest rate and exchange rate are significantly
related to each other

Alternative Hypothesis

Money supply, interest rate and exchange rate are not significantly
related to each other

(6) Null Hypothesis

Monetary policy has significant impact to reduce Inflation.

Alternative Hypothesis

Monetary policy is ineffective to reduce the inflation.
3.5 MODELS OF STUDY

Structural empirical papers are still published in several leading economic journals such as RAND and Econometrica but in public and labor economics has been on the decline due to aggression of the editors of journals like Journal of Political Economy, American Economic Review and the Quarterly Journal of Economics. There are still some leading departments in the field of economics where structural econometrics is taught and practiced like Yale, Duke and Penn. However structural econometrics is near to its end from most of the top ranked economics departments like MIT, Princeton, Harvard, Berkeley, and Chicago (Rust, 2010).

Kim et al (2000) stated that there are some empirical problems associated with the monetary policy in both open and close economies and among those two important are price poser in which due to positive interest rate shock price level increases and the exchange rate poser in which exchange rate depreciates due positive interest rate shock. VAR base studies meet many difficulties to detect the impact of monetary policy. There is no need to include the non monetary policy variables to successfully identify the monetary policy like various VAR studies.

ARIMA model is popular forecasting technique instead of explanation of economic theory whereas in VAR all the variables are treated as endogenous. Both the approaches i.e. ARIMA and VAR are theoretic in nature that in both of these approaches there is no pre-assumed casual relationship. Therefore to observe the models derived from theory both of these approaches are not well suited.
So multiple linear regressions are used for the data analysis instead of time series modeling of ARIMA or VAR. Multiple equation models are used with related endogenous and exogenous variables, so important issues of regression analysis like stationarity, autocorrelation, multicollinearity, heteroscedasticity and collinearity of explanatory variables, needs to be considered.

Gujrati (2003) states that Classical Linear Regression Model must satisfy the property of BLUE in accordance with the Gauss-Markov Theorem. It means parameters in model should be best, linear and unbiased estimators. The implication of this property is that the estimators are linear function of one or more stochastic variables, estimated value of each estimator is equal to the true value of population and each estimator has least variance of all estimators which are linear and unbiased. For the validity of these qualities model and data act in accordance with the assumption of CLRM, Which includes zero mean value of stochastic disturbance of dependent variable values for each explanatory variable value, equal variances such that homoscedasticity, zero autocorrelation between stochastic disturbances and zero covariance between disturbances and explanatory variables.

However if one or more of the CLRM assumption is violated then any alternative approach needs to be considered but practically in many cases violations of the assumptions produce insignificant impact. So such deviation of assumptions may not justify the use of any alternative approaches. Under such circumstances appropriate way is to know the manner and degree of violated assumption and
possible dangers are highlighted for the justification of adopted approach (Jackson, 2007).

The prime intention of econometric examination can be characterised as the structural analysis, in the sense of determination and investigation of underlying relationships based on hypotheses, rather than prediction or policy simulation (Intrilligator et al, 1996).

The models specified for the analysis are as under

\[
y = f(P, M_0, er, r, \mu_i) \quad (1)
\]
\[
y = f(P, M_2, er, r, \mu_i) \quad (2)
\]
\[
M_{2t} = f(M_{2t-1}, \mu_i) \quad (3)
\]
\[
u = f(P, M_2, r, \mu_i) \quad (4)
\]
\[
er = f(M_2, r, \mu_i) \quad (5)
\]
\[
P = f(M_2, r, er, \mu_i) \quad (6)
\]
\[
y = f(c, \mu_i) \quad (7)
\]
\[
y = f(s, \mu_i) \quad (8)
\]

Where

\(M_{2t}\) = Broad Money M2 in Million Rupees consists Mo, Scheduled Bank,s Demand Deposits, Scheduled Bank,s Time Deposits and Presidents Foreign Currency Deposits

\(M_{2t-1}\) = Previous year money supply M2 in Million Rupees consists Mo, Scheduled Bank,s Demand Deposits, Scheduled Bank,s Time Deposits and Presidents Foreign Currency Deposits
Y = Real GDP Output Growth Rate(fc) in percent at constant prices 1999-00
P = Average Inflation CPI or Domestic Prices (percent).
\( M_o = \) Reserve Money/High Powered Money/Monetary Base in Million Rupees (H or Mo) Coins, Paper Money and Commercial Bank,s Reserve Money with Central Bank i.e. Currency in circulation, Other deposits with SBP like Deposits of Foreign Central Banks, Foreign Governments etc, Currency in Tills/Drawers/Cash Boxes/Strongboxes of Schedule Banks and Bank Deposits with SBP
r = Real Interest Rate/Discount Rate (percent).
u = Unemployment Rate (percent)
er = Real exchange rate which is nominal exchange rate adjusted by the ratio of foreign inflation Pf and domestic inflation P (ePf/P)
c = Total Consumption Expenditures percent of GDP (Household Final Consumption Expenditures + Govt Final Consumption Expenditures)
s = Gross Saving (percent of GDP)
\( \mu_i \) = Random error or disturbance term.

3.6 RESEARCH METHODOLOGY

The ordinary least squares (OLS) regression technique is used to test the correctness of the two contending views Keynesian theory and Monetarist theory, on the role of monetary policy in stimulating economic growth in a small and open economy. For each objective single-equation model was be used, to which commonly used measures, namely the coefficient of determination \( (R^2) \), the adjusted coefficients of determination \( (R^2) \), and the correlation coefficient \( (r) \), were
applied to determine how well the estimated equations fitted the actual data. OLS was used because it is commonly used and not because it is the only technique.

The main reason for OLS's popularity is the useful properties of the estimates it generates, which are mean zero and constant variance. To fulfill the assumption of normally distributed error terms, the time series used have to be stationary, with joint and conditional distributions being time-invariant. This will produce error terms, which satisfy the assumption, thereby allowing the use of test and F-test to test the hypotheses propounded.

There are at least three important reasons for using OLS to estimate the regression model. Firstly, it is relatively easy to use and to understand. Secondly, the goal of minimizing error sum of square is quite appropriate from a theoretical point of view. Final reason to use OLS is that its estimates have at least three desirable characteristics. First, the estimated regression line goes through the means. This property is known as centroid characteristic. Second the sum of residuals is exactly zero. Third OLS can be shown to be the best estimator possible under a set of fairly restrictive assumptions.

However, most time series are not stationary. Consequently, performing ordinary regression on non-stationary time series will often lead to a problem of spurious regression, whereby the results obtained suggest that there are statistically significant relationships between variables in the regression model when in fact all that is obtained is evidence of contemporaneous correlation rather than meaningful
caused relations" (Harris 1995).

The economic interpretation of cointegration is that if two or more series are linked to form an equilibrium relationship spanning the long-run, then even though the series themselves may contain stochastic trends (i.e. be non-stationary) they will nevertheless move closely together over time and the difference between them will be stable (i.e. stationary). Thus the concept of cointegration mimics the existence of a long-run equilibrium to which an economic system converges over time" (Harris 1995).

In evaluating the quantitative effects of monetary policy on the economic growth, the data is analyzed statistically and reported in the form of tables. The ordinary least squares (OLS) regression technique is used to test the correctness of monetarist and Keynesian views on the role of monetary policy in stimulating economic growth of Pakistan. Coefficient of determination $R^2$ is used to determine that how well the fitted model is better for the actual data. OLS technique is used only because of importance of its useful properties. To fulfill the assumption of normally distributed error term, the used time series data must be stationary. Further Standard Error Test, F-test and t-test are used to test the hypothesis. In this study 5 percent level of significance is used.

Thus most relevant aspects of econometrics are hypothesis testing that makes use of the predictable statistical techniques like statistical distributions related to the normal distributions (t, chi-square) to reject or accept the null
hypothesis. These techniques are well established. Here in this study these techniques are used for the possible rejection or acceptance of the null hypothesis. Hypothesis testing shows the degree of confidence about the parameters of equations in the formulated model.

### 3.6.1 Unit Root Test

One of the major issues of the data is stationarity especially in case of time series secondary data. Studenmund (2010) affirm that if time series data don’t change over time, then it is called stationary and other than this if variables have some sort of upward or downward swings, then it is called nonstationary. There are more chances of nonstationarity in nominal variables as compare to real variables.

During regression analysis a time series variable will be considered as stationary if mean and variance remained constant over time and furthermore simple correlation coefficient between $x_t$ and $x_{t-k}$ (also called autocorrelation) depends on the length of lags ($k$) but not on the other variables (for all $k$). If any one of these properties is not met, then variable is nonstationary and problem is called nonstationarity. In this analysis deseasonalised quarterly data for different real variables are used to overcome the problem of nonstationarity of data.

In general time based economic data are non stationary due to price inflation and growth trends as well as the other secular movements. So it is necessary to use such econometric technique which deals the issue of non stationarity to identify the spurious regression relationship. Before processing any
time series data the first step is to test the presence of unit roots or the problem of non-stationarity. These non stationary time series may result to spurious regression, as variables are non-stationary and does not co-integrate. We can obtain high r-squared values and significant t-ratios, although the trending variables would be completely unrelated. Thus we would say that there is meaningful relation between the variables, but actually it would not be the case. Therefore unit root testing should be done to see whether time series are stationary or not.

First differencing is one of the most common technique to check the stationarity of a series which is integrated of order one i.e. I(1). Similarly second differencing I(2) can also be used. These are used only if primary concern is difference relation instead of between level relationship.

To test the stationary of variables Augmented Dickey-Fuller test is used. For cointegration tests, time series data is tested for the presence of unit roots in the level series as well as in first differences. Cointegration amounts to the existence of a linear stationary combination of the individually non-stationary variables in the model. We use a unit root test that is Augmented Dickey-Fuller test (Dickey and Fuller, 1979).

Augmented Dickey-Fuller test based on Dickey-Fuller test is used to check the stationarity. Null hypothesis for this test is that there exists a unit root in time series data that means there is continuous movement in the data from its mean value. Time series data is considered as stationary if null hypothesis is rejected.
Some lagged points of series are established in augmented test to correct the autocorrelation between disturbance terms (stochastic values). ADF test is also used to check whether the series are cointegrated, though the tests have different critical values due to the use of an estimated cointegrating parameter vector. In this way Engle-Granger (EG) or Augmented Engle Granger (AEG) are frequently used (Jackson, 2007)

Other than the above tests we have two more stationarity tests i.e. Phillips-Perron (PP) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS). These tests are used to support the ADF test especially in view that all the stationarity tests have some limitations. Phillips-Perron (PP) test is used to control the higher order serial correlation in the series. While the ADF test corrects for higher order serial correlation using lagged differenced terms, the Phillips-Perron test makes a correction to the t statistic of the coefficient from a first-order autoregression to adjust for serial correlation. These and most unit root tests are inclined to overstate rather than understate the likelihood of a unit root, i.e. the power of the tests is limited. The KPSS test however uses a null hypothesis that the series has no unit root (is trend stationary), so is less inclined to overstate the likelihood of a unit root. Each variable, explanatory as well as endogenous, was tested prior to equation estimation to determine its stationarity or order of integration, using the Augmented Dickey Fuller (ADF), Phillips-Perron and KPSS tests (Gujarati 2003).

After establishing non stationarity of the variables, the first step in cointegration approach is to determine the order of integration of each series. In case of same order of integration, cointegration relationship can be established and
although the series are non stationary, the regression model can be reliably estimated. Confirmation of the cointegration relationship can be provided by showing that the time series of residuals from the regression model are I(0), i.e. stationary (Granger and Newbold, 1986).

In support of cointegration based relationship, an error correction mechanism can be used as supplement for the model. For the prediction of the model ECM moves progressively toward the relationship defined by the cointegration regression model. Short run behavior towards a long run relationship given by cointegration regression can be visualized (Granger and Newbold 1986).

In this analysis real values of the variables are taken instead of nominal values. Other than this data of all the variables are converted into quarters. Filled radar diagrams, from figure 24 to figure 31, are used to see that whether the forty year data is properly converted into 160 quarters. In the end quarterly data are properly deseasonalised by using different statistical techniques to overcome the problem of nonstationarity of data. The regression analysis results are tested for stationarity of the time-series, to avoid spurious conclusions about the established relationships. ADF test results shows that all the variables are stationary at level. Detail results of ADF test are given in the appendix-A to appendix-I.

3.6.2 Error Correction Mechanism

Augmented Dickey-Fuller test tells the order of integration of each time series. If variables will be stationary at level, simple OLS can be used. If variables
are integrated of the same order then we can apply Engle Granger approach to see the long run relationship between the variables. If the residual $\mu_t$ is integrated of order zero i.e. estimated $U_t \sim I(0)$ then there will be cointegration between the variables otherwise not. An error correction mechanism can be established to determine the short run dynamics of the regression model.

Like the entire econometric model, the specified model cannot be expected to imitate. Error correction mechanism (ECM) increases the forecasting accuracy of structural relationship. Regression analysis is used to find the trend of econometric relationships which are in accordance with the economic theory. Most of regression coefficients are significant at a 95 percent or 99 percent level of confidence.

The error correction model (ECM) approach was not followed, because the purpose of this study was to establish the presence or absence of a significant relationship between economic variables. Short-run models or ECMs are important from a forecasting perspective (Harris, 1995), which has been not part of this study. As in this thesis primary objective is to evaluate the monetary policy, so for this purpose sustained relationship is required and hence it is needless to use ECM.

3.6.3 Granger Causality Test

To test the direction of causality in economic relationships Granger causality test is used especially in that case where we know the relationship between two variables but we don’t know that which variable causes the other to
move. For example most of economist believes that rise in MS stimulate GDP, but other feels that rise in GDP eventually lead the monetary authorities to increase the MS. So Granger causality test is used to solve this issue that what is right to say. We use regression analysis to deal the dependence of one variable on other variables and Granger causality test is used to check the causation between the variables.

The Granger causality tests support the notion that monetary policy actions are primary in the sense of having causal effects into the economy rather than being purely reactive.

Studenmund (2010) states that there are different test for Granger causality and all the tests involves distributed lag models in one way or other. In this study preference is given to the expanded version of the model that is developed by Granger. Granger suggested that to see if $\beta$ Granger caused $Y$, we should run

$$ Y_t = f(Y_{t-1}, Y_{t-2}, \ldots, Y_{t-p}, \beta_{t-1}, \beta_{t-2}, \ldots, \beta_{t-p}) + \varepsilon_t $$

(7)

Here null hypothesis is that the coefficients of the lagged $\beta$s jointly equal to zero. We can reject the null hypothesis by using F-test and conclude that $\beta$ Granger causes $Y$. By taking $p$ equal to 1 above equation is similar to Koyck distributed lag model. Due to so many reasons two Granger tests, one for each direction must run. So one for above equation and other for the following equation also run:
\[ \beta_t = f(Y_{t-1}, Y_{t-2}, \ldots, Y_{t-p}, \beta_{t-1}, \beta_{t-2}, \ldots, \beta_{t-p}) + \varepsilon_t \]

(8)

If F-test is significant for equation 7 but not for equation 8, then we conclude \( \beta \) Granger causes \( Y \).

### 3.6.4 Homoskedasticity

One of the important assumption of classical linear regression model is that the variance of the each disturbance or error term is equal to a constant number \( \sigma_i^2 \). Symbolically we have \( \text{Var}(\mu_i) = \sigma_i^2 \). This assumption is known as the assumption of homoskedasticity. If it is not satisfy in any particular case, we say that the \( \mu_i \)'s are heteroskedastic, it means \( \text{Var}(\mu_i) \neq \sigma_i^2 \).

There is more likely hood of heteroskedasticity in case of cross section data as compare to time series data. As in this analysis time series data is used so there are less chances to have the problem of heteroskedasticity.

### 3.6.5 Standardized Coefficient Technique

To find the relative importance of the variables Standardized coefficient technique is used. An explanatory variable is called more important if the standardized coefficient with it has the biggest magnitude.

After estimating the regression coefficients by using OLS technique, the following expression is used for relative importance of explanatory variables.

\[ \hat{\beta}_j = \hat{\beta}_j \frac{S.D(X_j)}{S.D(Y)} \]
Here $\hat{\beta}_j$ is estimated regression coefficient associated with $X_j$ explanatory variable and $S.D(X_j)$ and $S.D(Y)$ are respectively the standard deviation of $X_j$ and $Y$.

### 3.6.6 Multicollinearity

Multicollinearity mean the existence of a perfect or exact linear relationship among some or all explanatory variables of a regression model. It occurs when independent variables are not free from each other. So multicollinearity problem arises when there is some sort of relationship between two or more independent variables. In the presence of this problem we cannot estimate the true value of estimators and correlation coefficient is used for the detection of this problem.

Collinearity is known as alternative of Multicollinearity. Drawback of collinearity is that it increase the standard error of estimators and decrease the confidence for the statistical significance of the estimator. Importance must be given to the degree of the collinearity rather than its presence or absence and whenever degree of collinearity is very high then statistical significance become a difficult task.

In the presence of multicollinearity we cannot estimate the true values of parameters and our estimates are not reliable. Simple correlation coefficient is used in this analysis to check the correlation between explanatory variables.

In a regression model if there is high coefficient of determination ($R^2$) and low statistical significance of parameter estimates then it means that there is high
degree of collinearity. There are several approaches to overcome this problem. First one is to explore the relationship of explanatory variables and drop of one regressor where two are closely associated. Secondly this problem can also solved to incorporate the existing relationship of the regressors in the estimation process. In the modeling process of this study these two approaches are used to overcome the problem of collinearity.

In this study, the independent variables are taken from monetary orientation economic time series, so more probably they could have some sort of relationship between them. Presence of collinear relationship does not break the assumptions of CLRM and estimators still remained consistent, unbiased and efficient (BLUE).

As Gujarati (2003) argues, collinearity should be regarded in much the same light as micronumerosity (low number of data points relative to estimators), needing to be taken into account, but not necessarily invalidating the estimation process.

### 3.6.7 Autocorrelation or Serial Correlation

Autocorrelation is an uncommon instance of connection. It refers to the relationship not between two or more diverse variables yet between the progressive estimations of the same variable. According to the assumption of OLS, the successive values of random variable $\mu_i$ are temporally independent.
Autocorrelation between the successive stochastic disturbances is a common problem in case of using time series data and this must be considered in the estimation of the model. Presence of autocorrelation does not affect the unbiased assumption of CLRM estimators but it affect the efficiency of the estimators and it is impossible for the estimators to remain BLUE due to in efficiency of the estimators.

Durbin Watson d statistic is used to determine the significant presence of the autocorrelation.

\[ d = \frac{\sum_{2}^{n}[et - (et - 1)2]}{\sum_{1}^{n}et^2} \]

Range of this statistic is between 0 and 4, in which 0 shows a perfect positive autocorrelation, 4 shows the perfect negative autocorrelation and 2 indicate that there is no autocorrelation. Lower and upper bounds of 2 indicates that within which autocorrelation can be considered to be unimportant. This statistic is used in each regression analysis and if degree of autocorrelation is excessive then further steps can be taken (Gujrati 2003).

Major issues of regression analysis like stationarity, collinearity, autocorrelation, heteroscedasticity are tackled during the regression analysis. Granger causality approach is used for various monetary policy variables having a causal relationship between each other.
FIGURE 4: Flowchart of study

- **MONETARIST AND KEYNESIAN THEORIES, PAST EXPERIENCE, OTHER STUDIES**
- **FORMULATION OF MODEL**
- **GATHER TIME SERIES DATA 1972-2011**
- **ESTIMATION OF MODEL**
  - **TESTING OF HYPOTHESIS**
    - **REFORMULATION OF MODEL IF REQUIRED AND AGAIN TESTING OF HYPOTHESIS**
    - **INTERPRETATION OF RESULTS**
  - **FORECASTING**
- **RECOMMENDATIONS**
Chapter 4

RESULT AND DISCUSSION

Traditional classical regression analysis was used to evaluate the equations representing the Keynesian and Monetarist arguments. If the Keynesian arguments are rejected as null-hypotheses, then the Monetarist arguments will be have seen confirmed. On the other hand, if the null hypotheses cannot be rejected, then the Keynesian arguments will be confirmed.

4.1 IMPACT OF MONETARY POLICY VARIABLES AND CPI INFLATION ON ECONOMIC GROWTH

Time series quarterly data from 1972(Q1) to 2011(Q4) with 160 data points of each variable is used for the analysis. The specified model was used to know the impact of monetary policy on economic growth that is

\[ Y_t = \beta_0 + \beta_1 P_t + \beta_2 M_{ot} + \beta_3 er_t + \beta_4 r_t + \mu_i \]

From the estimation of the above model (table 1) we find that inflation and real exchange rate has positive impact on GDP growth rate but high powered money and rate of interest have negative impact on growth rate. Standard error test, t statistic and p values confirm the significance of estimates. Interest rate has more negative impact on GDP growth rate as compare to high powered money supply that is shown by their coefficient values. Real exchange rate has more positive impact on growth rate of the country. Correlation matrix (Table 2) also confirms the relationship of the variables used in this model. Values of correlation matrix indicate that there exists weak relationship near to zero of GDP growth rate with CPI inflation and real exchange rate that is -0.06 and 0.02. There exist negative
Table 1: Economic growth, monetary policy variables and CPI inflation

\[ Y_t = \beta_0 + \beta_1 P_t + \beta_2 M_{Ot} + \beta_3 r_t + \beta_4 r_t + \mu_t \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_0$</td>
<td>4.837964</td>
<td>0.769948</td>
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</tr>
<tr>
<td>$\beta_1$</td>
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<td>0.033552</td>
<td>2.546258</td>
</tr>
<tr>
<td>$\beta_2$</td>
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<td>3.03E-07</td>
<td>-4.312988</td>
</tr>
<tr>
<td>$\beta_3$</td>
<td>0.307222</td>
<td>0.069188</td>
<td>4.440390</td>
</tr>
<tr>
<td>$\beta_4$</td>
<td>-0.301009</td>
<td>0.054147</td>
<td>-5.559071</td>
</tr>
</tbody>
</table>

R-squared 0.225250  Durbin-Watson stat 2.179181
Adjusted R-squared 0.205256  F-statistic 112.6613

Table 2: Correlation matrix of study variables

<table>
<thead>
<tr>
<th></th>
<th>$Y_t$</th>
<th>$U_t$</th>
<th>$S_t$</th>
<th>$r_t$</th>
<th>$er_t$</th>
<th>$P_t$</th>
<th>$M_{2t}$</th>
<th>$M_{Ot}$</th>
<th>$C_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_t$</td>
<td>1</td>
<td>-0.14</td>
<td>0.45</td>
<td>-0.31</td>
<td>0.02</td>
<td>-0.06</td>
<td>-0.22</td>
<td>-0.23</td>
<td>0.14</td>
</tr>
<tr>
<td>$U_t$</td>
<td>-0.14</td>
<td>1</td>
<td>0.45</td>
<td>0.34</td>
<td>0.66</td>
<td>-0.40</td>
<td>0.53</td>
<td>0.56</td>
<td>-0.79</td>
</tr>
<tr>
<td>$S_t$</td>
<td>0.46</td>
<td>0.45</td>
<td>1</td>
<td>-0.03</td>
<td>0.53</td>
<td>-0.50</td>
<td>0.11</td>
<td>0.13</td>
<td>-0.24</td>
</tr>
<tr>
<td>$r_t$</td>
<td>-0.31</td>
<td>0.34</td>
<td>-0.03</td>
<td>1</td>
<td>0.43</td>
<td>0.11</td>
<td>0.16</td>
<td>0.18</td>
<td>-0.41</td>
</tr>
<tr>
<td>$er_t$</td>
<td>0.02</td>
<td>0.66</td>
<td>0.54</td>
<td>0.43</td>
<td>1</td>
<td>-0.49</td>
<td>0.39</td>
<td>0.41</td>
<td>-0.57</td>
</tr>
<tr>
<td>$P_t$</td>
<td>-0.06</td>
<td>-0.40</td>
<td>-0.51</td>
<td>0.12</td>
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<td>0.01</td>
<td>-0.00</td>
<td>0.32</td>
</tr>
<tr>
<td>$M_{2t}$</td>
<td>-0.23</td>
<td>0.53</td>
<td>0.12</td>
<td>0.16</td>
<td>0.39</td>
<td>0.01</td>
<td>1</td>
<td>0.99</td>
<td>-0.26</td>
</tr>
<tr>
<td>$M_{Ot}$</td>
<td>-0.23</td>
<td>0.56</td>
<td>0.13</td>
<td>0.18</td>
<td>0.41</td>
<td>-0.00</td>
<td>0.99</td>
<td>1</td>
<td>-0.29</td>
</tr>
<tr>
<td>$C_t$</td>
<td>0.14</td>
<td>-0.79</td>
<td>-0.24</td>
<td>-0.41</td>
<td>-0.57</td>
<td>0.32</td>
<td>-0.26</td>
<td>-0.29</td>
<td>1</td>
</tr>
</tbody>
</table>
relationship of GDP growth rate with interest rate and high powered money that is -0.31 and -0.23.

It is noted that during the study period of forty year, in fourth quarter of 2005 growth rate of Pakistan was maximum equal to 8.57 percent while it was remained low equal to 1.65 percent in first quarter of 1972. Average quarterly CPI inflation was remained 9.48 percent. In fourth quarter of 1974 CPI inflation was maximum equal to 30 percent whereas CPI inflation was remained low equal to 3.10 percent in fourth quarter of 2003. Average quarterly real exchange rate was remained rupees 14.25 per dollar. In fourth quarter of 2000 real exchange rate was maximum equal to rupees 49.56 per dollar whereas real exchange rate was remained low in fourth quarter of 2009. Average quarterly monetary base was remained 391053.2 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 1965842 million rupees whereas it was remained low equal to 8138 million rupees in fourth quarter of 1972. Average quarterly interest rate was remained 11.01 percent. In fourth quarter of 1997 interest rate was maximum equal to 19 percent whereas it was remained low equal to 3.88 percent in first quarter of 1972.

Scatter diagram of GDP growth rate (Figure 5) indicates that there exist negative trend from 1972(Q1) to 2011(Q4) where per quarter decline is 0.0073. Scatter diagram of CPI inflation (Figure 6) indicates that there exist also negative trend from 1972(Q1) to 2011(Q4) with 0.0263 per quarter change. Scatter diagram of interest rate (Figure 7) indicates that there exist positive trend from 1972(Q1) to
Table 3: Impact of monetary policy on economic growth in case of broad money

\[ Y_t = \beta_0 + \beta_1 P_t + \beta_2 M_{2t} + \beta_3 e_t + \beta_4 r_t + \mu_i \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>4.878049</td>
<td>0.771689</td>
<td>6.321262</td>
</tr>
<tr>
<td>( \beta_1 )</td>
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<td>0.033734</td>
<td>2.529654</td>
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<tr>
<td>( \beta_2 )</td>
<td>-3.71E-07</td>
<td>8.89E-08</td>
<td>-4.176567</td>
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<tr>
<td>( \beta_3 )</td>
<td>0.299541</td>
<td>0.069008</td>
<td>4.340675</td>
</tr>
<tr>
<td>( \beta_4 )</td>
<td>-0.301841</td>
<td>0.054378</td>
<td>-5.550841</td>
</tr>
</tbody>
</table>

R-squared 0.220047 Durbin-Watson stat 1.938009
Adjusted R-squared 0.199919 F-statistic 246.9324

Table 4: Current period money supply and previous period money supply

\[ M_{2t} = \beta_0 + \beta_1 M_{2t-1} + \mu_i \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
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<td>1783.823</td>
<td>0.609077</td>
</tr>
<tr>
<td>( \beta_0 )</td>
<td>1.033986</td>
<td>0.000887</td>
<td>1165.335</td>
</tr>
</tbody>
</table>

R-squared 0.999884 Durbin-Watson stat 1.848059
Adjusted R-squared 0.999884 F-statistic 1358005
2011(Q4) with 0.0263 per quarter rise. Scatter diagram of real exchange rate (Figure 8) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.1305 per quarter rise. Adjusted \( R^2 \) shows that from the total only 20.53 percent variation in GDP growth rate is caused by the explanatory variables of the model. Result are also significant statistically like the other researchers Gul et. al. (2012) and Khabo (2002).

4.2 IMPACT OF MONETARY POLICY ON ECONOMIC GROWTH IN CASE OF BROAD MONEY

After including broad money \( M_2 \), specified model was used to know the impact of monetary policy on economic growth that is

\[
Y_t = \beta_0 + \beta_1 P_t + \beta_2 M_{2t} + \beta_3 e_r t + \beta_4 r_t + \mu_i
\]

From the estimation of above model (table 3) we find that inflation and real exchange rate also has positive impact on GDP growth rate but broad money supply and rate of interest have negative impact on growth rate. Standard error test, \( t \) statistic and \( p \) values confirm that explanatory variables have significant impact on growth rate. Interest rate has more negative impact on GDP growth rate as compare to broad money supply that is shown by their coefficient values. Real exchange rate has more positive impact on growth rate of the country. Correlation matrix also confirms the relationship of the variables used in this model.

Statistics of the variables used in above model shows that average quarterly growth rate was remained 5.07 percent. It is noted that during the study period of forty year, in fourth quarter of 2005 growth rate of Pakistan was maximum equal to
8.57 percent while it was remained low equal to 1.65 percent in first quarter of 1972. Average quarterly CPI inflation was remained 9.48 percent. In fourth quarter of 1974 CPI inflation was maximum equal to 30 percent whereas CPI inflation was remained low equal to 3.10 percent in fourth quarter of 2003. Average quarterly real exchange rate was remained rupees 14.25 per dollar. In fourth quarter of 2000 real exchange rate was maximum equal to rupees 49.56 per dollar whereas real exchange rate was remained low in fourth quarter of 2009. Average quarterly broad money was remained 1238410 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 6695195 million rupees whereas it was remained low equal to 22059 million rupees in fourth quarter of 1972. Average quarterly interest rate was remained 11.01 percent. In fourth quarter of 1997 interest rate was maximum equal to 19 percent whereas it was remained low equal to 3.88 percent in first quarter of 1972.

Scatter diagram of GDP growth rate (Figure 5) indicates that there exist negative trend from 1972(Q1) to 2011(Q4) where per quarter decline is 0.0073. Scatter diagram of CPI inflation (Figure 6) indicates that there exist also negative trend from 1972(Q1) to 2011(Q4) with 0.0263 per quarter change. Scatter diagram of interest rate (Figure 7) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.0263 per quarter rise. Scatter diagram of real exchange rate (Figure 8) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.1305 per quarter rise. Scatter diagram of broad money (Figure 9) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 30113 million rupees per quarter rise. Adjusted R$^2$ shows that from the total only 19.99 percent variation in
Figure 5: Scatter diagrams of real GDP growth rate with straight line

Figure 6: Scatter diagram of CPI inflation with straight line

Figure 7: Scatter diagrams of real discount rate with straight line
Figure 8: Scatter diagrams of real exchange rate with straight line

Figure 9: Scatter diagrams of broad money $m_2$ in million rupees with straight line

Figure 10: Combine histogram of GDP growth rate, real exchange rate, real discount rate, average CPI inflation, and unemployment rate.
GDP growth rate is caused by the explanatory variables of the model. Figure 10 is the combined graphical representation of GDP growth rate, Real exchange rate, interest rate, CPI inflation rate and unemployment rate, which shows the actual relationship between the variables. Results of above model shows that GDP growth rate can be increased by increasing CPI inflation rate or by exchange rate appreciation. It can also increased by declining the interest rate.

4.3 IMPACT OF PREVIOUS PERIOD MONEY SUPPLY ON CURRENT MONEY SUPPLY

The specified model was used to know the impact of previous period money supply on current period money supply that is

\[ M_{2t} = \beta_0 + \beta_1 M_{2t-1} + \mu_i \]

Table 4 shows the relationship between current period money supply and money supply of previous period. Estimates of table shows that current time period money supply of any time period is highly correlated to previous period money supply. Here high value of adjusted \( R^2 \) also shows that how much current money supply depend upon previous period money supply. Average quarterly broad money was remained 1238410 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 6695195 million rupees whereas it was remained low equal to 22059 million rupees in fourth quarter of 1972.

Value of correlation coefficient (table 5) between current year money supply and previous year money supply is 0.9999 which is very high. This high correlation also maintained even if we find the correlation between current money
supply and the money supply of forty periods back that is 0.9957 as indicated in table 5. Scatter diagram of broad money (Figure 9) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 30113 million rupees per quarter rise. Results of above the model shows depicts that current money supply is strongly correlated to the previous period money supply.

4.4 IMPACT OF MONETARY POLICY AND CPI INFLATION TO REDUCE UNEMPLOYMENT

The specified model was used to know the impact of monetary policy on unemployment that is

\[ Ut = \beta_0 + \beta_1 P_t + \beta_2 M_{2t} + \beta_3 r_t + \mu_t \]

From the estimation of this model (table 6), we find that money supply and rate of interest has positive impact on unemployment. It means that with the increase in money supply or interest rate, the unemployment will also rise. It is also clear from the analysis that impact of interest rate is more positive and stronger as compare to broad money. CPI inflation has negative impact on unemployment which means there is tradeoff between unemployment and inflation. With high inflation unemployment can be reduced. Unemployment can also be reduced by decreasing the interest rate. Adjusted R\(^2\) value is 0.5396 which mean 53.96 percent variation in unemployment is due to explanatory variables used in this model.

Statistics of the variables used in above model shows that average quarterly unemployment rate was remained 4.73 percent. It is noted that during the study period of forty year, in 2003 unemployment rate of Pakistan was maximum equal
Table 5: Correlation matrix of current money supply and previous money supply

<table>
<thead>
<tr>
<th></th>
<th>$M_{2t}$</th>
<th>$M_{2t-1}$</th>
<th>$M_{2t-2}$</th>
<th>$M_{2t-3}$</th>
<th>$M_{2t-4}$</th>
<th>$M_{2t-5}$</th>
<th>$M_{2t-10}$</th>
<th>$M_{2t-20}$</th>
<th>$M_{2t-40}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_{2t}$</td>
<td>1</td>
<td>0.9999</td>
<td>0.9998</td>
<td>0.9996</td>
<td>0.9993</td>
<td>0.9990</td>
<td>0.9969</td>
<td>0.9934</td>
<td>0.9957</td>
</tr>
<tr>
<td>$M_{2t-1}$</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9999</td>
<td>0.9998</td>
<td>0.9996</td>
<td>0.9993</td>
<td>0.9971</td>
<td>0.9934</td>
<td>0.9954</td>
</tr>
<tr>
<td>$M_{2t-2}$</td>
<td>0.9998</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9999</td>
<td>0.9998</td>
<td>0.9995</td>
<td>0.9975</td>
<td>0.9936</td>
<td>0.9949</td>
</tr>
<tr>
<td>$M_{2t-3}$</td>
<td>0.9996</td>
<td>0.9998</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9999</td>
<td>0.9979</td>
<td>0.9938</td>
<td>0.9943</td>
<td></td>
</tr>
<tr>
<td>$M_{2t-4}$</td>
<td>0.9993</td>
<td>0.9996</td>
<td>0.9998</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9983</td>
<td>0.9941</td>
<td>0.9936</td>
<td></td>
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<tr>
<td>$M_{2t-5}$</td>
<td>0.9990</td>
<td>0.9993</td>
<td>0.9995</td>
<td>0.9998</td>
<td>0.9999</td>
<td>1.0000</td>
<td>0.9987</td>
<td>0.9945</td>
<td>0.9927</td>
</tr>
<tr>
<td>$M_{2t-10}$</td>
<td>0.9969</td>
<td>0.9971</td>
<td>0.9975</td>
<td>0.9979</td>
<td>0.9983</td>
<td>0.9987</td>
<td>1.0000</td>
<td>0.9970</td>
<td>0.9881</td>
</tr>
<tr>
<td>$M_{2t-20}$</td>
<td>0.9934</td>
<td>0.9934</td>
<td>0.9936</td>
<td>0.9938</td>
<td>0.9941</td>
<td>0.9945</td>
<td>0.9970</td>
<td>1.0000</td>
<td>0.9880</td>
</tr>
<tr>
<td>$M_{2t-40}$</td>
<td>0.9957</td>
<td>0.9954</td>
<td>0.9949</td>
<td>0.9943</td>
<td>0.9936</td>
<td>0.9927</td>
<td>0.9881</td>
<td>0.9880</td>
<td>1.0000</td>
</tr>
</tbody>
</table>

Table 6: Monetary policy, CPI inflation and unemployment

$$U_t = \beta_0 + \beta_1 P_t + \beta_2 M_{2t} + \beta_3 r_t + \mu_t$$

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta_0$</td>
<td>3.408763</td>
<td>0.415605</td>
<td>8.201925</td>
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<tr>
<td>$\beta_1$</td>
<td>-0.164040</td>
<td>0.019933</td>
<td>-8.229765</td>
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<tr>
<td>$\beta_2$</td>
<td>5.52E-07</td>
<td>6.15E-08</td>
<td>8.972046</td>
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<tr>
<td>$\beta_3$</td>
<td>0.199291</td>
<td>0.034837</td>
<td>5.720610</td>
</tr>
</tbody>
</table>

| R-squared   | 0.548328   | Durbin-Watson stat     | 1.792744 |
| Adjusted R-squared | 0.539642 | F-statistic     | 631.2769 |
to 8.27 percent while it was remained low equal to 1.83 percent in first quarter of 1972. Average quarterly CPI inflation was remained 9.48 percent. In fourth quarter of 1974 CPI inflation was maximum equal to 30 percent whereas CPI inflation was remained low equal to 3.10 percent in fourth quarter of 2003. Average quarterly broad money was remained 1238410 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 6695195 million rupees whereas it was remained low equal to 22059 million rupees in fourth quarter of 1972. Average quarterly interest rate was remained 11.01 percent. In fourth quarter of 1997 interest rate was maximum equal to 19 percent whereas it was remained low equal to 3.88 percent in first quarter of 1972.

Correlation coefficients of the variables (table 2) used in this model also satisfy the estimates of regression analysis. Average rate of unemployment is 4.73 throughout the forty year time span with slightly positive skewed distribution of the low peak. Scatter diagram of unemployment (figure 11) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.0346 per quarter rise. Results of the above the model indicates that unemployment can be reduced by declining the money supply and interest rate or it can also be reduced by facing high value of inflation.

4.5 IMPACT OF MONEY SUPPLY AND RATE OF INTEREST ON EXCHANGE RATE

The specified model was used to estimate the impact of monetary policy on exchange rate that is
\[ er_t = \beta_0 + \beta_1 M_{2t} + \beta_2 r_t + \mu_t \]

Estimates of the above model (table 7) shows that the impact of money supply and rate of interest on exchange rate is positive but rate of interest has more impact on exchange rate instead of money supply that is indicated by its coefficient value. Correlation values of the variables also satisfy the results of above regression analysis. Adjusted \( R^2 \) value is 0.2822 which shows the 28.22 percent variation in the exchange rate is only due to broad money supply and interest rate.

Statistics of the variables used in above model shows that average quarterly real exchange rate was remained rupees 14.25 per dollar. In fourth quarter of 2000 real exchange rate was maximum equal to rupees 49.56 per dollar whereas real exchange rate was remained low in fourth quarter of 2009. Average quarterly broad money was remained 1238410 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 6695195 million rupees whereas it was remained low equal to 22059 million rupees in fourth quarter of 1972. Average quarterly interest rate was remained 11.01 percent. In fourth quarter of 1997 interest rate was maximum equal to 19 percent whereas it was remained low equal to 3.88 percent in first quarter of 1972.

Scatter diagram of real exchange rate (Figure 8) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.1305 per quarter rise. Results of above the model point out that like unemployment, exchange rate can also be stabilized by using both the money supply and interest rate but interest rate is more effective as compare to broad money.
Table 7: Money supply, rate of interest and real exchange rate

\[ e_{rt} = \beta_0 + \beta_1 M_{2t} + \beta_2 r_t + \mu_i \]

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>5.723261</td>
<td>0.762262</td>
<td>7.508259</td>
<td>0.0000</td>
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<tr>
<td>( \beta_1 )</td>
<td>5.79E-07</td>
<td>1.20E-07</td>
<td>4.808982</td>
<td>0.0000</td>
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<tr>
<td>( \beta_2 )</td>
<td>0.376693</td>
<td>0.067733</td>
<td>5.561410</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

R-squared 0.291240  Durbin-Watson stat 2.054817
Adjusted R-squared 0.282211  F-statistic 322.5682

Table 8: Monetary policy and CPI inflation

\[ P_t = \beta_0 + \beta_0 M_{2t} + \beta_2 r_t + \beta_3 e_{rt} + \mu_i \]

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
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<tr>
<td>( \beta_0 )</td>
<td>14.82105</td>
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<td>10.62367</td>
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<tr>
<td>( \beta_1 )</td>
<td>7.48E-07</td>
<td>2.02E-07</td>
<td>3.696369</td>
<td>0.0003</td>
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<tr>
<td>( \beta_2 )</td>
<td>0.697754</td>
<td>0.116340</td>
<td>5.997538</td>
<td>0.0000</td>
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<tr>
<td>( \beta_3 )</td>
<td>-1.317426</td>
<td>0.125294</td>
<td>-10.51470</td>
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</tbody>
</table>

R-squared 0.422661  Durbin-Watson stat 1.906556
Adjusted R-squared 0.411558  F-statistic 380.6836
4.6 IMPACT OF MONETARY POLICY TO REDUCE INFLATION

The specified model was used to know the impact of monetary policy on CPI inflation that is

\[ P_t = \beta_0 + \beta_1 M_{2t} + \beta_2 r_t + \beta_3 e_{rt} + \mu_t \]

Table 8 shows the impact of monetary policy variables on inflation. Money supply and interest rate have positive impact on inflation but real exchange rate has negative impact on rate of inflation. Correlation statistics also satisfy the estimates of above regression analysis. Standard error test, t statistic and p values verify the significance of the results. In this analysis adjusted \( R^2 \) is equal to 0.4116 which shows the percentage of variation in CPI inflation caused by broad money supply, interest rate and real exchange rate.

Graph and statistics of CPI inflation rate indicates that average quarterly CPI inflation was remained 9.48 percent. In fourth quarter of 1974 CPI inflation was maximum equal to 30 percent whereas CPI inflation was remained low equal to 3.10 percent in fourth quarter of 2003. Average quarterly broad money was remained 1238410 million rupees. In fourth quarter of 2011 monetary base was maximum equal to 6695195 million rupees whereas it was remained low equal to 22059 million rupees in fourth quarter of 1972. Average quarterly interest rate was remained 11.01 percent. In fourth quarter of 1997 interest rate was maximum equal to 19 percent whereas it was remained low equal to 3.88 percent in first quarter of 1972. Average quarterly real exchange rate was remained rupees 14.25 per dollar. In fourth quarter of 2000 real exchange rate was maximum equal to rupees 49.56 per dollar whereas real exchange rate was remained low in fourth quarter of 2009.
Correlation matrix (Table 2) also confirms the relationship of the variables used in this model. Scatter diagram of CPI inflation (Figure 6) indicates that there exist also negative trend from 1972(Q1) to 2011(Q4) with 0.0263 per quarter change. Scatter diagram of interest rate (Figure 7) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.0263 per quarter rise. Scatter diagram of real exchange rate (Figure 8) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 0.1305 per quarter rise. Scatter diagram of broad money (Figure 9) indicates that there exist positive trend from 1972(Q1) to 2011(Q4) with 30113 million rupees per quarter rise. Results of above the model point out that inflation can be reduced by declining the money supply and interest rate or it can also be reduced by real exchange rate appreciation.

4.7 GDP GROWTH RATE, GROSS SAVING AND TOTAL CONSUMPTION EXPENDITURES

Correlation matrix (table 2) depicts that there exist positive relationship between GDP growth rate and gross saving that is 0.46. There exists also positive relationship between total consumption and GDP growth rate that is 0.14 but not much strong as in case of saving. There exist negative relationship between saving and consumption that is -0.24. To see the impact of saving and consumption on growth rate simple regression is used (table 9 and 10). Results indicate that impact of saving is significant to stimulate the growth rate but impact of consumption is not significant in this regards.

Graph and statistics of GDP growth rate indicates that average quarterly growth rate was remained 5.07 percent. It is noted that during the study period of
forty year, in fourth quarter of 2005 growth rate of Pakistan was maximum equal to 8.57 percent while it was remained low equal to 1.65 percent in first quarter of 1972. Average quarterly gross saving was remained 21.92 percent of GDP. In fourth quarter of 1983 gross saving was maximum equal to 30.43 percent of GDP whereas it was remained low equal to 10.34 percent of GDP in first quarter of 1972. Average total consumption expenditures were remained 88.31 percent of GDP. In fourth quarter of 1975 total consumption expenditures was maximum equal to 95.31 percent of GDP whereas it was remained low equal to 81.14 percent of GDP in third quarter of 1993.

Scatter diagram of saving (figure 12) point out that there exist slight positive trend whereas scatter diagram of consumption (figure 13) point out the negative trend during the forty years. Figure 14 depicts the existing relationship between GDP growth rate, gross saving and total consumption expenditures.

From the above results it is clear that rise in saving and consumption positively affect the growth of country but impact of saving is much stronger in this regards as compare to consumption. On one side if consumption is the part of country aggregate demand, on the other side saving is the part of aggregate supply.
Table 9: Gross saving and economic growth

\[ Y_t = \beta_0 + \beta_1 S_t + \mu_t \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>0.684307</td>
<td>0.687674</td>
<td>0.995105</td>
</tr>
<tr>
<td>( \beta_1 )</td>
<td>0.200443</td>
<td>0.030825</td>
<td>6.502556</td>
</tr>
</tbody>
</table>

R-squared: 0.211117
Durbin-Watson stat: 1.718980
Adjusted R-squared: 0.206124
F-statistic: 42.28324

Table 10: Total consumption expenditures and economic growth

\[ Y_t = \beta_0 + \beta_1 C_t + \mu_t \]

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_0 )</td>
<td>-0.601004</td>
<td>3.240590</td>
<td>-0.185461</td>
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<tr>
<td>( \beta_1 )</td>
<td>0.064281</td>
<td>0.036662</td>
<td>1.753361</td>
</tr>
</tbody>
</table>

R-squared: 0.019086
Durbin-Watson stat: 1.87160
Adjusted R-squared: 0.012878
F-statistic: 33.74276
Figure 11: Scatter diagrams of unemployment rate with straight line

Figure 12: Scatter diagrams of gross saving (percent of GDP) with straight line
Figure 13: Scatter diagrams of total consumption expenditures (percent of GDP) with straight line

Figure 14: Combine histogram of GDP growth rate, gross saving, and total consumption expenditure
Country growth can be increased by increasing the savings or by increasing the consumption expenditures but effectiveness of saving is more as compare to consumption expenditures.

**SUMMARY**

Central bank of any country conducts the monetary policy to minimize the economic fluctuations and to keep inflation low. Monetary policy effects the financial and economic decisions of the people. It is important for each member of the nation to understand that how much their region or state will be affected by the changes in the monetary policy. Objective of the study is to evaluate the impact of monetary policy on the economy of Pakistan in the light of Monetarist and Keynesian views. The former says that monetary policy is ineffective to stimulate the economy such that economic growth, money supply and inflation are insignificantly related to each other while according to monetarist it is an effective tool for stabilizing the economy. The Ordinary Least Squares technique is used to test the correctness of these views. Major issues of regression analysis like stationarity, autocorrelation, heteroscedasticity, multicollinearity etc are tackled during the regression analysis by using different statistical techniques. Variable that are selected for the analysis are real GDP growth rate, CPI inflation rate, Unemployment rate, Real interest rate/discount rate, Real exchange rate, Reserve money/High powered money $M_0$, and broad money $M_2$. By using forty year data, it is evaluated that impact of interest rate on economic growth is negative and at the same time impact of this variable on unemployment is positive. It means contractionary monetary policy is not fruitful to stimulate the economic growth and to reduce the unemployment. It is suggested to use expansionary monetary policy
to reduce the unemployment and to increase the growth rate of the country. It is also investigated that there exist tradeoff between inflation and unemployment, so State Bank of Pakistan should use monetary policy to reduce unemployment because cost of unemployment is more as compare to inflation due to underutilization of resources (Dornbusch et al., 2004). Saving is the component of aggregate savings and consumption is the necessary component of aggregate demand but it is evaluated that impact of saving on GDP growth rate is significantly positive as compare to consumption. So those policies should be used which are helpful to increase the saving in the country.

**CONCLUSION**

On the basis of the empirical results of the analysis of this study, it must be concluded that the monetary authorities of Pakistan cannot control money supply changes although they are able to influence such changes, as demonstrated by the significant relationship between \( M_{2t} \) and \( M_{2t-1} \). It was also concluded that economic growth, GDP, was not significantly influenced by money supply \( M_{2t} \), and the domestic level of inflation, CPI but it is significantly influenced by real exchange rate and interest rate.

These conclusions have serious implications for Pakistan, grappling with the eradication of poverty and reduction of unemployment or job-creation must reduce the increasing trend of crime, which can only have a negative impact on economic growth. Furthermore, the fact that monetary policy cannot stimulates economic growth by changing monetary base or by changing broad money but monetary policy can stimulate growth rate by using exchange rate policy or by
decline the interest rate. Monetary authorities cannot control money supply levels by keeping them within the set targets, despite their ability to influence the current period money supply level by manipulating that of the previous period, require further study and a re-examination.

Inflation and real exchange rate have positive impact on growth rate. Impact of real exchange rate is stronger as compare to CPI inflation. High powered money $H/Mo$ and rate of interest both have negative impact on growth rate of economy. Impact of interest rate is more negative. CPI inflation has positive impact on growth rate of country. Broad money $M_2$ and rate of interest both have positive impact on unemployment where impact of interest rate is more positive. CPI inflation has negative impact on unemployment. Current period money supply is strongly correlated with previous period money supply. Broad money and rate of interest both have positive impact on exchange rate where impact of interest rate is more positive. Broad money and interest rate both have positive impact on CPI inflation in which impact of interest rate is more positive. Real exchange rate has negative impact on CPI inflation. It is noted that inflation can be reduced by declining the money supply and interest rate or by real exchange rate appreciation. There exists strong relationship between saving and growth rate as compare to consumption and growth rate. On one side if consumption is the part of country aggregate demand, on the other side saving is the part of aggregate supply. Country growth can be increased by increasing the savings or by increasing the consumption expenditures but effectiveness of saving is more as compare to consumption expenditures.
FUTURE VISION

The scope of this study was limited to the empirical evaluation of the impact of monetary policy to stimulate the economic growth of Pakistan. Thus for this purpose only the monetary policy variable are used to see the impact on growth rate, unemployment and on inflation rate but growth rate, unemployment and inflation are not only affected by monetary policy variables. Growth rate, inflation and unemployment rate of any country are also affected by fiscal policy variables like government spending and taxes. So another research can be conducted to estimate the combine impact of both the policies such that monetary policy and fiscal policy. Impact of monetary and fiscal policy to eradicate poverty can also be evaluated in a separate study.

Given that monetary policy in Pakistan cannot control money supply changes, even if M2t is significantly related to M2t-1 and that economic growth, GDP, is significantly related to M2 and CPI, the policy of protecting the value of the Rupee by adjusting the money supply should be reevaluated. A question to be answered is whether or not the policy instrument, namely, the repo rate, is appropriate, given the impact of foreign and external forces on M2, and in turn on economic growth.

A further study, using more rigorous econometric prediction techniques, including short-run models or error correction models (ECMs), must be undertaken to further explore the empirical results obtained. This is important because the recent monetary policy is based on setting inflation targets, and inflation is related
to money supply changes, noting that money supply targeting was not successful. Such a study would also indicate how long it would take to correct a long-term equilibrium disturbance. Furthermore, such a study should include the determination of specific external forces which impact on the changes in the money supply and for what reasons.

**RECOMMENDATIONS**

By using forty year data, it was evaluated that impact of interest rate on economic growth is negative and at the same time its impact on unemployment and on CPI inflation is positive. So it means contractionary monetary policy is not fruitful to stimulate the economic growth and to reduce the unemployment or inflation. On the other side impact of broad money $M_{2t}$ on GDP growth rate, unemployment rate and on CPI is very much weak near to zero. It is suggested to use contraction in interest rate to reduce the unemployment and to stimulate the growth rate of the country. In other way all the efforts to achieve the economic targets will get no result. It is also investigated that there exist tradeoff between inflation and unemployment, so State Bank of Pakistan should use monetary policy to reduce unemployment because cost of unemployment is more as compare to inflation due to underutilization of resources (Dornbusch et al., 2004). Country growth can be increased by increasing the savings or by increasing the consumption expenditures but effectiveness of saving is more as compare to consumption expenditures. So government should use those policies which are supportive to increase the saving in the country.
Figure 15: Filled radar diagram of real GDP output growth rate (for annual data and quarterly data)

Figure 16: Filled radar diagram of average inflation CPI (for annual data and quarterly data)
Figure 17: Filled radar diagram of broad money $M_2$ (for annual data and quarterly data)

Figure 18: Filled radar diagram of unemployment rate (for annual data and quarterly data)
Figure 19: Filled radar diagram of real discount rate (for annual data and quarterly data)

Figure 20: Filled radar diagram of real exchange rate (for annual data and quarterly data)
Figure 21: Filled radar diagram of total consumption expenditures growth rate (for annual data and quarterly data)

Figure 22: Filled radar diagram of gross saving (for annual data and quarterly data)
LITERATURE CITED


Han, T. 2012. “Regional Effects of Monetary Policy” PhD Dissertation Graduate Faculty Dept. of Economics Louisiana State University http://www.oenb.at/en/geldp_volksw/geldpolitik/wirtschaft/how_does_monetary_policy_impact_the_economy.jsp Searched on 19-08-2013


Khosravi, A. and M. S. Karimi. 2010. To Investigation the Relationship between Monetary, Fiscal Policy and Economic Growth in Iran: Autoregressive


http://www.eurojournals.com/ejsr.htm Searched on 12-12-13


http://www.stanford.edu/~johntayl/Papers/Discretion.PDF Searched on 10-05-13


APPENDIX-A

Null Hypothesis: $Y_t$ has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3.649291</td>
<td>0.0058</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
1% level -3.473096
5% level -2.880211
10% level -2.576805


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($Y_t$)
Method: Least Squares
Sample (adjusted): 7 160
Included observations: 154 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Y_t(-1)$</td>
<td>-0.080610</td>
<td>0.022089</td>
<td>-3.649291</td>
<td>0.0004</td>
</tr>
<tr>
<td>D($Y_t(-1)$)</td>
<td>0.723341</td>
<td>0.076855</td>
<td>9.411735</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($Y_t(-2)$)</td>
<td>0.062236</td>
<td>0.089303</td>
<td>0.696907</td>
<td>0.4870</td>
</tr>
<tr>
<td>D($Y_t(-3)$)</td>
<td>0.029213</td>
<td>0.089040</td>
<td>0.328093</td>
<td>0.7433</td>
</tr>
<tr>
<td>D($Y_t(-4)$)</td>
<td>-0.372661</td>
<td>0.089117</td>
<td>-4.181725</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($Y_t(-5)$)</td>
<td>0.283969</td>
<td>0.077859</td>
<td>3.647212</td>
<td>0.0004</td>
</tr>
<tr>
<td>C</td>
<td>0.409475</td>
<td>0.118429</td>
<td>3.457568</td>
<td>0.0007</td>
</tr>
</tbody>
</table>

R-squared            0.563764  Mean dependent var  -0.011079
Adjusted R-squared   0.545958  S.D. dependent var  0.586745
S.E. of regression   0.395364  Akaike info criterion 1.026371
Sum squared resid    22.97800  Schwarz criterion 1.164414
Log likelihood       -72.03055  Hannan-Quinn criter. 1.082444
F-statistic          31.66227  Durbin-Watson stat 1.999455
Prob(F-statistic)    0.000000
APPENDIX-B

Null Hypothesis: $U_t$ has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-2.985576</td>
<td>0.05865</td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.473096
- 5% level: -2.880211
- 10% level: -2.576805


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($U_t$)
Method: Least Squares
Sample (adjusted): 7 160
Included observations: 154 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>U($t$-1)</td>
<td>-0.015110</td>
<td>0.005061</td>
<td>-2.985576</td>
<td>0.0762</td>
</tr>
<tr>
<td>D(U($t$-1))</td>
<td>0.860968</td>
<td>0.067315</td>
<td>12.79006</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(U($t$-2))</td>
<td>0.001822</td>
<td>0.079046</td>
<td>0.023053</td>
<td>0.9816</td>
</tr>
<tr>
<td>D(U($t$-3))</td>
<td>0.007112</td>
<td>0.079047</td>
<td>0.089973</td>
<td>0.9284</td>
</tr>
<tr>
<td>D(U($t$-4))</td>
<td>-0.697371</td>
<td>0.079069</td>
<td>-8.819823</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(U($t$-5))</td>
<td>0.567013</td>
<td>0.067309</td>
<td>8.424085</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.050695</td>
<td>0.026015</td>
<td>1.948662</td>
<td>0.0532</td>
</tr>
</tbody>
</table>

R-squared                   | 0.705013    | Mean dependent var | 0.026515|
Adjusted R-squared          | 0.692973    | S.D. dependent var  | 0.206212|
S.E. of regression          | 0.114262    | Akaike info criterion | -1.456250|
Sum squared resid           | 1.919215    | Schwarz criterion   | -1.318207|
Log likelihood              | 119.1313    | Hannan-Quinn criter. | -1.400177|
F-statistic                 | 58.55459    | Durbin-Watson stat  | 1.915462|
Prob(F-statistic)           | 0.000000    |                   |        |
APPENDIX-C

Null Hypothesis: $S_t$ has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-2.918348</td>
<td>0.0514</td>
</tr>
<tr>
<td>Test critical values:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1% level</td>
<td>-3.473096</td>
<td></td>
</tr>
<tr>
<td>5% level</td>
<td>-2.880211</td>
<td></td>
</tr>
<tr>
<td>10% level</td>
<td>-2.576805</td>
<td></td>
</tr>
</tbody>
</table>


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($S_t$)
Method: Least Squares
Sample (adjusted): 7 160
Included observations: 154 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$S_t(-1)$</td>
<td>-0.027771</td>
<td>0.009516</td>
<td>-2.918348</td>
<td>0.0098</td>
</tr>
<tr>
<td>D($S_t(-1)$)</td>
<td>0.836150</td>
<td>0.076524</td>
<td>10.92657</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($S_t(-2)$)</td>
<td>0.002812</td>
<td>0.095075</td>
<td>0.029579</td>
<td>0.9764</td>
</tr>
<tr>
<td>D($S_t(-3)$)</td>
<td>0.030151</td>
<td>0.095070</td>
<td>0.317142</td>
<td>0.7516</td>
</tr>
<tr>
<td>D($S_t(-4)$)</td>
<td>-0.473507</td>
<td>0.095100</td>
<td>-4.979037</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($S_t(-5)$)</td>
<td>0.323773</td>
<td>0.075947</td>
<td>4.263143</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.560107</td>
<td>0.213891</td>
<td>2.618654</td>
<td>0.0098</td>
</tr>
</tbody>
</table>

R-squared    0.647592  Mean dependent var 0.037502
Adjusted R-squared 0.633208  S.D. dependent var 0.733527
S.E. of regression 0.444248  Akaike info criterion 1.259522
Sum squared resid 29.01140  Schwarz criterion 1.397566
Log likelihood -89.98321  Hannan-Quinn criter. 1.315595
F-statistic 45.02177  Durbin-Watson stat 1.927912
Prob(F-statistic) 0.000000
APPENDIX-D

Null Hypothesis: $r_t$ has a unit root

Exogenous: Constant
Lag Length: 9 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.966883</td>
<td>0.0441</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.474265
- 5% level: -2.880722
- 10% level: -2.577077


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($r_t$)
Method: Least Squares
Sample (adjusted): 11 160
Included observations: 150 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r_t$(-1)</td>
<td>-0.021501</td>
<td>0.007247</td>
<td>-2.966883</td>
<td>0.0249</td>
</tr>
<tr>
<td>D($r_t$(-1))</td>
<td>0.892658</td>
<td>0.076355</td>
<td>11.69082</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($r_t$(-2))</td>
<td>0.008967</td>
<td>0.099298</td>
<td>0.090301</td>
<td>0.9282</td>
</tr>
<tr>
<td>D($r_t$(-3))</td>
<td>0.008095</td>
<td>0.098816</td>
<td>0.081916</td>
<td>0.9348</td>
</tr>
<tr>
<td>D($r_t$(-4))</td>
<td>-0.435602</td>
<td>0.098996</td>
<td>-4.40182</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($r_t$(-5))</td>
<td>0.394629</td>
<td>0.100279</td>
<td>3.935317</td>
<td>0.0001</td>
</tr>
<tr>
<td>D($r_t$(-6))</td>
<td>0.006720</td>
<td>0.098392</td>
<td>0.068298</td>
<td>0.9456</td>
</tr>
<tr>
<td>D($r_t$(-7))</td>
<td>0.005200</td>
<td>0.098313</td>
<td>0.052890</td>
<td>0.9579</td>
</tr>
<tr>
<td>D($r_t$(-8))</td>
<td>-0.469026</td>
<td>0.098709</td>
<td>-4.751591</td>
<td>0.0000</td>
</tr>
<tr>
<td>D($r_t$(-9))</td>
<td>0.405989</td>
<td>0.075462</td>
<td>5.380019</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.188449</td>
<td>0.082941</td>
<td>2.272093</td>
<td>0.0246</td>
</tr>
</tbody>
</table>

R-squared | 0.717751 | Mean dependent var | 0.026762 |
Adjusted R-squared | 0.697445 | S.D. dependent var | 0.412931 |
S.E. of regression | 0.227133 | Akaike info criterion | -0.056059 |
Sum squared resid | 7.170912 | Schwarz criterion | 0.164721 |
Log likelihood | 15.20440 | Hannan-Quinn criter. | 0.033637 |
F-statistic | 35.34725 | Durbin-Watson stat | 1.982233 |
Prob(F-statistic) | 0.000000 |
**APPENDIX-E**

**Null Hypothesis: er, has a unit root**

Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th></th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-3.174037</td>
<td>0.0234</td>
</tr>
<tr>
<td>Test critical values:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1% level</td>
<td>-3.471987</td>
<td></td>
</tr>
<tr>
<td>5% level</td>
<td>-2.879727</td>
<td></td>
</tr>
<tr>
<td>10% level</td>
<td>-2.576546</td>
<td></td>
</tr>
</tbody>
</table>


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(er)
Method: Least Squares
Sample (adjusted): 3 160
Included observations: 158 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>er(-1)</td>
<td>-0.044059</td>
<td>0.013881</td>
<td>-3.174037</td>
<td>0.0018</td>
</tr>
<tr>
<td>D(er(-1))</td>
<td>0.627145</td>
<td>0.061720</td>
<td>10.16111</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.482398</td>
<td>0.152565</td>
<td>3.161919</td>
<td>0.0019</td>
</tr>
</tbody>
</table>

R-squared       | 0.412970    | Mean dependent var | 0.041159 |
Adjusted R-squared | 0.405395  | S.D. dependent var | 0.660395 |
S.E. of regression | 0.509235  | Akaike info criterion | 1.506989 |
Sum squared resid | 40.19459  | Schwarz criterion | 1.565140 |
Log likelihood   | -116.0521   | Hannan-Quinn criter. | 1.530605 |
F-statistic      | 54.52042    | Durbin-Watson stat | 1.981809 |
Prob(F-statistic)| 0.000000    |                   |          |
Null Hypothesis: $P_t$ has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4.095387</td>
<td>0.0013</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.471987
- 5% level: -2.879727
- 10% level: -2.576546


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($P_t$)
Method: Least Squares
Sample (adjusted): 3 160
Included observations: 158 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$P_t$(-1)</td>
<td>-0.055460</td>
<td>0.013542</td>
<td>-4.095387</td>
<td>0.0001</td>
</tr>
<tr>
<td>D($P_t$(-1))</td>
<td>0.747015</td>
<td>0.053576</td>
<td>13.94298</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>0.546047</td>
<td>0.145304</td>
<td>3.757964</td>
<td>0.0002</td>
</tr>
</tbody>
</table>

R-squared 0.563513 Mean dependent var 0.054836
Adjusted R-squared 0.557881 S.D. dependent var 1.296731
S.E. of regression 0.862223 Akaike info criterion 2.560199
Sum squared resid 115.2314 Schwarz criterion 2.618350
Log likelihood -199.2557 Hannan-Quinn criter. 2.583815
F-statistic 100.0540 Durbin-Watson stat 1.994997
Prob(F-statistic) 0.000000
APPENDIX-G

Null Hypothesis: \( M_{at} \) has a unit root
Exogenous: Constant
Lag Length: 9 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Augmented Dickey-Fuller test statistic</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.906593</td>
<td>0.0485</td>
<td></td>
</tr>
</tbody>
</table>

Test critical values:
- 1% level: -3.474265
- 5% level: -2.880722
- 10% level: -2.577077


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(\( M_{at} \))
Method: Least Squares
Sample (adjusted): 11 160
Included observations: 150 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( M_{at}(-1) )</td>
<td>-0.011109</td>
<td>0.003822</td>
<td>-2.906593</td>
<td>0.0269</td>
</tr>
<tr>
<td>D(( M_{at}(-1) ))</td>
<td>-0.912606</td>
<td>0.071900</td>
<td>-12.69270</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(( M_{at}(-2) ))</td>
<td>-0.005770</td>
<td>0.078935</td>
<td>-0.073103</td>
<td>0.9418</td>
</tr>
<tr>
<td>D(( M_{at}(-3) ))</td>
<td>-0.005307</td>
<td>0.078974</td>
<td>-0.067199</td>
<td>0.9465</td>
</tr>
<tr>
<td>D(( M_{at}(-4) ))</td>
<td>-0.756286</td>
<td>0.084035</td>
<td>-8.999667</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(( M_{at}(-5) ))</td>
<td>0.681655</td>
<td>0.095413</td>
<td>7.144241</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(( M_{at}(-6) ))</td>
<td>-0.012471</td>
<td>0.081663</td>
<td>-0.152716</td>
<td>0.8788</td>
</tr>
<tr>
<td>D(( M_{at}(-7) ))</td>
<td>0.006098</td>
<td>0.081699</td>
<td>0.074635</td>
<td>0.9406</td>
</tr>
<tr>
<td>D(( M_{at}(-8) ))</td>
<td>-0.873828</td>
<td>0.089158</td>
<td>-9.800891</td>
<td>0.0000</td>
</tr>
<tr>
<td>D(( M_{at}(-9) ))</td>
<td>0.778338</td>
<td>0.088867</td>
<td>8.758464</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>384.5611</td>
<td>486.5393</td>
<td>0.790401</td>
<td>0.4306</td>
</tr>
</tbody>
</table>

R-squared: 0.941166
Mean dependent var: 13050.09
Adjusted R-squared: 0.936934
S.D. dependent var: 18131.67
S.E. of regression: 4553.401
Akaike info criterion: 19.75564
Sum squared resid: 2.88E+09
Schwarz criterion: 19.97642
Log likelihood: -1470.673
Hannan-Quinn criter.: 19.84534
F-statistic: 222.3599
Durbin-Watson stat: 1.914077
Prob(F-statistic): 0.000000
APPENDIX-H

Null Hypothesis: $C_t$ has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Statistics</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-3.102681</td>
<td>0.0528</td>
</tr>
<tr>
<td>Test critical values:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1% level</td>
<td>-3.471987</td>
<td></td>
</tr>
<tr>
<td>5% level</td>
<td>-2.879727</td>
<td></td>
</tr>
<tr>
<td>10% level</td>
<td>-2.576546</td>
<td></td>
</tr>
</tbody>
</table>

Augmented Dickey-Fuller Test Equation
Dependent Variable: $D(C_t)$
Method: Least Squares
Sample (adjusted): 3 160
Included observations: 158 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$C_t(-1)$</td>
<td>-0.037834</td>
<td>0.012194</td>
<td>-3.102681</td>
<td>0.0435</td>
</tr>
<tr>
<td>$D(C_t(-1))$</td>
<td>0.388784</td>
<td>0.074028</td>
<td>5.251866</td>
<td>0.0000</td>
</tr>
<tr>
<td>$C$</td>
<td>1.619514</td>
<td>1.077278</td>
<td>1.503339</td>
<td>0.1348</td>
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</tbody>
</table>

R-squared       0.156520 Mean dependent var 0.001639
Adjusted R-squared 0.145636 S.D. dependent var 0.654588
S.E. of regression 0.605047 Akaike info criterion 1.851784
Sum squared resid  56.74271 Schwarz criterion 1.909934
Log likelihood    -143.2909 Hannan-Quinn criter. 1.875400
F-statistic       14.38124 Durbin-Watson stat 2.059015
Prob(F-statistic) 0.000002
APPENDIX-I

Null Hypothesis: $M_{2t}$ has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=13)

<table>
<thead>
<tr>
<th>Test</th>
<th>t-Statistic</th>
<th>Prob.*</th>
</tr>
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<tbody>
<tr>
<td>Augmented Dickey-Fuller test statistic</td>
<td>-2.891236</td>
<td>1.0000</td>
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<tr>
<td>Test critical values:</td>
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<tr>
<td>1% level</td>
<td>-3.472259</td>
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<tr>
<td>5% level</td>
<td>-2.879846</td>
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<tr>
<td>10% level</td>
<td>-2.576610</td>
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</tr>
</tbody>
</table>


Augmented Dickey-Fuller Test Equation
Dependent Variable: D($M_{2t}$)
Method: Least Squares
Sample (adjusted): 4 160
Included observations: 157 after adjustments

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$M_{2t}(-1)$</td>
<td>0.008304</td>
<td>0.002872</td>
<td>-2.891236</td>
<td>0.0000</td>
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<tr>
<td>D($M_{2t}(-1)$)</td>
<td>0.301715</td>
<td>0.077500</td>
<td>3.933119</td>
<td>0.0001</td>
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<tr>
<td>D($M_{2t}(-2)$)</td>
<td>0.358129</td>
<td>0.078846</td>
<td>4.542144</td>
<td>0.0000</td>
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<tr>
<td>C</td>
<td>380.3171</td>
<td>1554.040</td>
<td>0.244728</td>
<td>0.8070</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-squared</td>
<td>0.929683</td>
<td>Mean dependent var</td>
</tr>
<tr>
<td>Adjusted R-squared</td>
<td>0.928305</td>
<td>S.D. dependent var</td>
</tr>
<tr>
<td>S.E. of regression</td>
<td>15509.88</td>
<td>Akaike info criterion</td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>3.68E+10</td>
<td>Schwarz criterion</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-1735.677</td>
<td>Hannan-Quinn criter.</td>
</tr>
<tr>
<td>F-statistic</td>
<td>674.2918</td>
<td>Durbin-Watson stat</td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.000000</td>
<td></td>
</tr>
</tbody>
</table>

126