Sources to Finance Fiscal Deficit and Their Impact on Inflation:

A Case Study of Pakistan

Submitted By:

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In the name of

Allah

Most Merciful and Compassionate, the Most Gracious and Beneficent,

Whose help and guidance we always solicit at every step at every moment.

Dedication

I Affectionately Dedicate This Effort To

My Beloved Mother

Razia Begum

And

Shaheed Foundation Pakistan

Whose Sincere Prayers, Cordial Well Wishes and Matchless Kindness have made me extremely successful in each to every sphere of this mortal life.

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Kashif Ali

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List of Abbreviations Used

AD	Aggregate Demand
ADF	Augmented Dickey Fuller test
AIC	Akaike Information Criteria
ARCH	Auto Regressive Conditional Heteroskedastic
ARDL	Autoregressive Distributed Lag Model
AS	Aggregate Supply
BG	Breusch Godfrey
CDNS	Central Directorate of National Saving
FTPL	Fiscal Theory of Price Level
GOP	Government of Pakistan
LM	Langrange Multiplier
M2	Broad Money Supply
MOF	Ministry of Finance
NBFIs	Non-Bank Financial Institutions
NSS	National Saving Scheme
PBS	Pakistan Bureau of Statistics
PP	Philips Parron test
QTM	Quantity Theory of Money
SBC	Schwarz Bayesian Criteria
SBP	State Bank of Pakistan
VAR	Vector Auto Regressive
VECM	Vector Error Correction Method
JB	Jerque-Berra

Abstract

Fiscal deficit is good as well as bad for the economy. Along with other side effects, one of the major side effect of fiscal deficit is inflation. Theoretically, fiscal deficit is inflationary but the sources of financing fiscal deficit may vary in terms of their inflation impact. The question arises then what should be the least inflation cost source of financing then? This study attempts to answer the question as well as try to find out the long run relationship among the sources to finance fiscal deficit and inflation. To fulfill the desired objectives, after a careful literature review and theoretical considerations the estimation has been done in four stages on the basis of categorization of the deficit financing heads. In the very first stage it is been tested that fiscal deficit along with money supply are inflationary. In the second stage fiscal deficit is bifurcated into two components, domestic borrowing and external borrowing for fiscal deficit. In the third stage, domestic borrowing is further divided into two heads, bank and non-bank borrowing. While in the fourth and last stage, bank borrowing is further categorized into two parts borrowing from schedule banks and central bank, and, non-bank borrowing only comprises of National Saving Scheme borrowing for budgetary support. On the basis of time series properties of data, i.e. stationarity of data, Johansen Cointegration Technique is used for the stage of estimation while Auto Regressive Distributed Lag Model is employed for the rest of the three stages. This study finds that there is a long run relationship among sources of financing fiscal deficit and inflation. Inflation is positively affected by domestic borrowing, bank borrowing and borrowing from central bank, while central bank borrowing is more inflationary in nature. On the basis of the findings recommendations regarding financing are put forward. Fiscal deficit should be financed through external sources, non-bank and schedule bank borrowings.

Chapter 1

Introduction

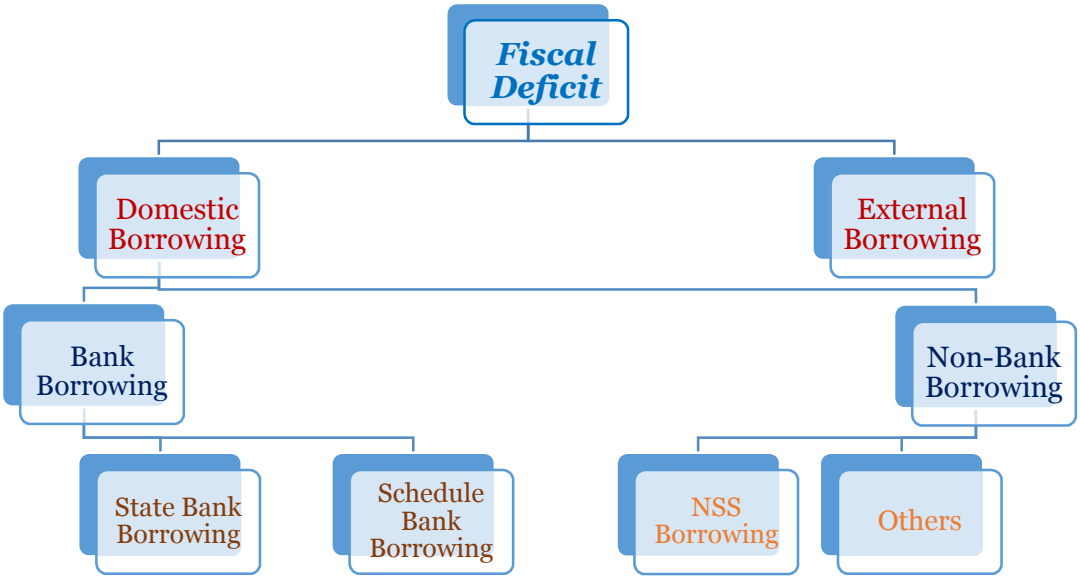
1.1 Background of the study

Borrowing is good as well as bad for economic development of any country. It is beneficial for the economy as long as it is exercised with diligence. A rational household would borrow if he/she can earn more economic return than the cost on invested funds. The borrowers can translate these economic returns into financial returns. The same rationale works in the case of a government, but, for governments, debt problem arise if they have no debt servicing capacity or their debt servicing does not grow with growth of debt (GOP, 2008). In this situation borrowing hits the economy. Besides other problems, high interest rate, unstable exchange rate, one of the major problem that may arise from such kind of borrowings is the high inflation. Inflation is continual rise in general price level in an economy, and, it's been generally related with the monetary expansion. Pakistan is experiencing the same as all other countries do (Agha and Khan, 2006). However, it's been generally argued that in developing countries fiscal imbalances might have a key role in spelling out the fluctuations in the price level (Catao and Torrens, 2005). As both the Classical model and Keynesian model of the economy suggest that fiscal deficit can shift aggregate demand to the right more than the aggregate supply, which leads to increase in the price level (Abel. *et. al*, 2008)

In different economies fiscal deficit is financed through various methods i.e. printing of money, using foreign reserves, borrowing from external sources, and borrowing domestically (Fischer and Easterly, 1990). In Pakistan domestic borrowing is comprised of bank borrowing and non-bank borrowings. Bank borrowing is further

categorized as borrowing from State Bank of Pakistan (SBP) and borrowing from schedule banks, while non-bank borrowing is of National Saving Scheme (NSS) and others (SBP, 2010).

Figure 1.1: Sources to Finance Fiscal Deficit in Pakistan



Along with the fiscal deficit, each mode of financing this deficit have their own disadvantages (Fischer and Easterly, 1990). Financing from external sources would cause external debt burden to swell which makes fiscal imbalances more unbearable. If it is done via printing of new money, it directly contributes to inflation. Further financing through internal borrowings including bank and non-bank borrowings, this may results in crowding out investment (Sarfaraz and Anwar, 2009).

According to Sargent and Wallace (1981), those governments who have prolonged fiscal deficit have to finance with monetization causing high inflation in the long run. In the same manner hike in the fiscal deficit would cause to increase the real interest rate in the economy, which in turn results in crowding out of private investment. This low investment will tend to increase the level of prices in the economy.

The government may choose to borrow from domestic means. This would cause the interest rate to rise which also bestowed us with inflation by reduction in investment and aggregate supply (Tellius, 2007). While financing from schedule banks, the loans to private sector becomes expensive and crowd out the private investment. Which results in reducing aggregate supply and increasing price level in the economy (Fischer and Easterly, 1990). If this deficit is financed from central bank directly by seignorage it means that people would have more money in their hands and have excess demand in the economy, which causes inflation (Fischer and Easterly, 1990).

Similarly financing from external sources negatively effects the current account deficit. This may depreciate the real exchange rate causing price level to increase in the economy (Pasha and Ghaus, 1996).

But in general, for a given year the fiscal deficit is budgeted in nominal terms. The restrictions imposed by the autonomous central bank on government borrowing facility from the banking system compel the government not to borrow more from banking sector (Feltenstein and Iwata, 2002). Although this is not being practiced in Pakistan and still the law Fiscal Responsibility and Debt Limitation (FRDL-2005) is devoid of it (Qasim and Khalid, 2012). This hard ceiling suggests that the government must search for other source of financing. Given its limited access to foreign borrowing, non-bank borrowing may be the other source of financing for the government. The limitation to finance the fiscal deficit from bank and external borrowing, suggests that borrowing from these sources are a given fiscal policy makers. After getting funds from these two sources, therefore, the rest of the funds may be raised by the non-bank borrowing mainly from the National Saving Schemes (NSS) in Pakistan (Feltenstein and Iwata, 2002).

It's been generally agreed that all financing modes have low inflationary footprints except bank borrowings. Although it might be less inflationary but it may have adverse effect on domestic debt sustainability. In Pakistan, NSS borrowing is very costly due to high servicing on it, to the tune of 18 percent in 1996-97. This high interest rate is not only leading to decrease the bank deposits which deteriorate the banking sector but also adds to the high debt servicing obligations. Hence more money creation will be required for repayment which will bring more inflation (Agha and Khan, 2006). The decline in bank deposits may have its own serious implications in many directions for itself. First it may increase the market interest rate, which may depress already stagnant investment. Second, it would cause an outflow of deposits from dollar accounts, thereby putting pressure on the country's already depleted foreign reserves. So in both ways, ultimately it leads to inflation.

In Pakistan, there may be several factors of supply side as well as demand responsible for inflation. From supply side, prices of food items and oil are considering as very much responsible for inflation. Most prices of the commodities in a basket of a consumer fluctuate with the ups and downs in oil prices. However, role of food prices were statistically insignificant (Khan, *et al*, 2007) and therefore it is argued that high inflation may be the fruit of the persistent fiscal deficit and the financing modes. [(Khan and Agha, 2006), (Sarfarz and Anwar, 2009)]. The intensity of inflation may be different i.e. some sources will leads to inflation more than the other. The question arise that which source of financing fiscal deficit is less inflationary. This study attempts to answer the question empirically so that government may choose such mode which does not hurt the economy severely in terms of higher inflation.

1.2 Significance of the Study

Inflation in Pakistan as a developing economy is very important. High inflation have negative impact on the standards of living and purchasing power of the vulnerable segments of society. Inflation also has a political cost as political governments cannot afford to allow undue increase in prices as it would have a negative impact on their vote bank. This has induced the need to find the underlying cause of inflation in Pakistan.

This study has manifold importance, first it would contribute to the existing literature related to inflation in Pakistan as none of the study has been conducted to check the relationship between all the said sources of financing fiscal deficit and inflation likewise, some studies are carried out with internal and external sources of finances, while this study will focus on the schedule banks and central bank borrowings along with the non-bank borrowings specially from national saving scheme (NSS). Second, it will use an extended data span from 1976-2014.

1.3 Objective of the study

This study focuses on the following objectives:

a) To find out the long run relationship among the sources of financing deficit and inflation.
b) To find out that which source of financing fiscal deficit is less inflationary in nature.

1.4 Hypothesis of the Study

Based on objectives of the study, hypothesis of the study are formulized as follows:

I. H_1: There is long run relationship between modes of financing and inflation.

II. H_2: There is different elasticity of each source of financing mode with respect to inflation.

1.5 Organization of the Study

This study is comprised of seven chapters. The first chapter encompasses on main components of the research study. It enlightened the introduction of the research topic, its objectives, hypotheses and significance of the study. In the second chapter Pakistan specific historical context of inflation and different sources of financing are presented. The next chapter is the review of literature. Fourth chapter gives the theoretical background which provides the entire foundation for the study. Fifth chapter presents the research methodology related to analysis. Along with the methodology, data source and description are discussed in the same chapter. Sixth chapter presents a detailed discussion on empirical results of the study. The last chapter gives the conclusion and policy recommendations.

Chapter 2

Historical Context of Inflation and Fiscal Deficit Financing

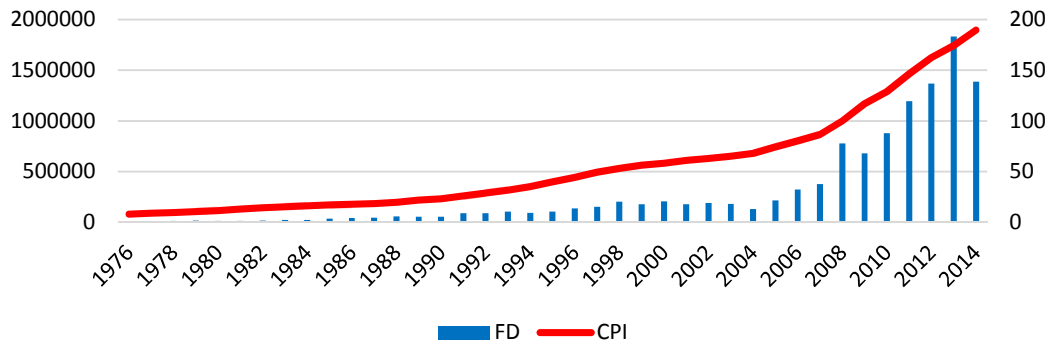
2.1 Introduction

This chapter discusses in detail that how inflation and sources of financing fiscal deficit move over the time. Such kind of analysis is helpful to understand the scenario that what Pakistan has really experienced in the past.

2.2 Fiscal Deficit and Inflation

Pakistan has faced large fiscal deficit in the last four decades. Fiscal deficit was one of the main problems. One of the main reasons behind this low fiscal performance is sluggishness of revenue growth. Revenue growth is not moving with economic growth and is stagnant with tax to GDP ratio increasing by just 2.3 % over a period of last five decades (SBP, 2010). This can be seen if inflation and fiscal deficit in Pakistan is plotted over the time. [1]In the previous four decades fiscal deficit is rising over time

Figure 2.1: Inflation and Fiscal Imbalances



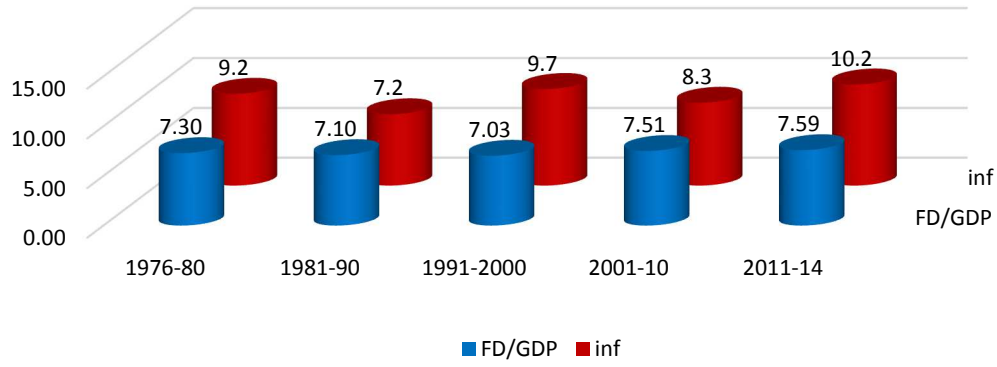
Source: Pakistan Economic Survey (various Issues)

as inflation does. Both inflation and fiscal deficit over the time show positive association.

[1] Data of CPI has been taken from 1976 to 2010 from the Hand book of Statistic on Pakistan Economy (2010), while from 2010 to 2014 it is taken from SBP annual reports.

The picture may be more cleared if we look to the fiscal deficit to GDP ratio and inflation in the different decades.

Figure 2.2: Fiscal Deficit to GDP ratio and Inflation 1976-2014



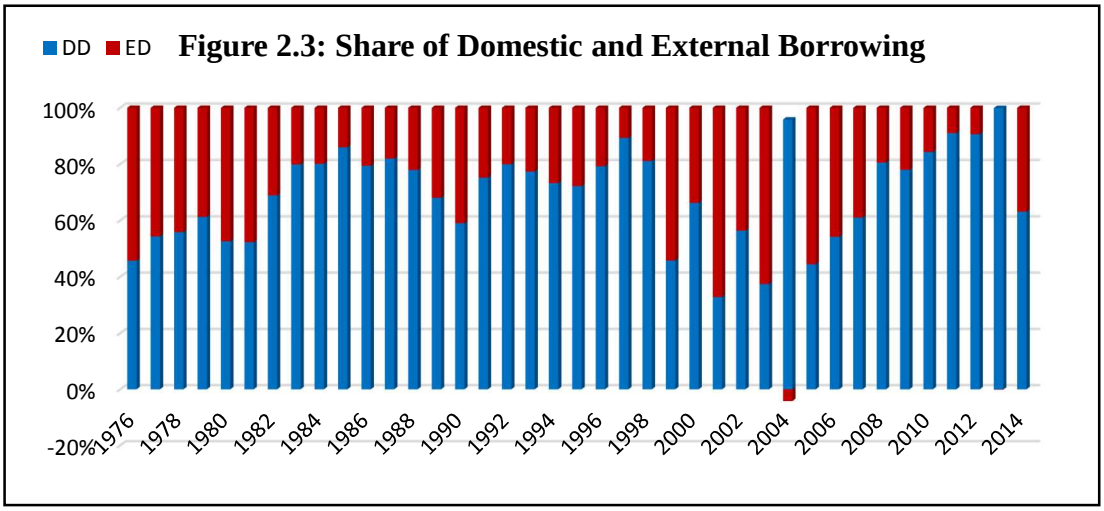
Source: Pakistan Economic Survey, (Various issues)

In the period FY1976-80 the average inflation was 9.22 % while in the same period fiscal deficit to GDP ratio was 7.30%. Similarly in 1981-90 the price level decreases by 2% to 7.2% while deficit to GDP ratio was also decreased to 7.10%. In 2001-10, and 2011-15 inflation once again goes up to 8.3% and 10.2% as the deficit increases to 7.51% and 7.59% of the total GDP respectively. So inflation is increasing as fiscal deficit to GDP ratio is increasing. So over the time both inflation and fiscal deficit show positive relationship.

2.3 Domestic, External Borrowing and Inflation

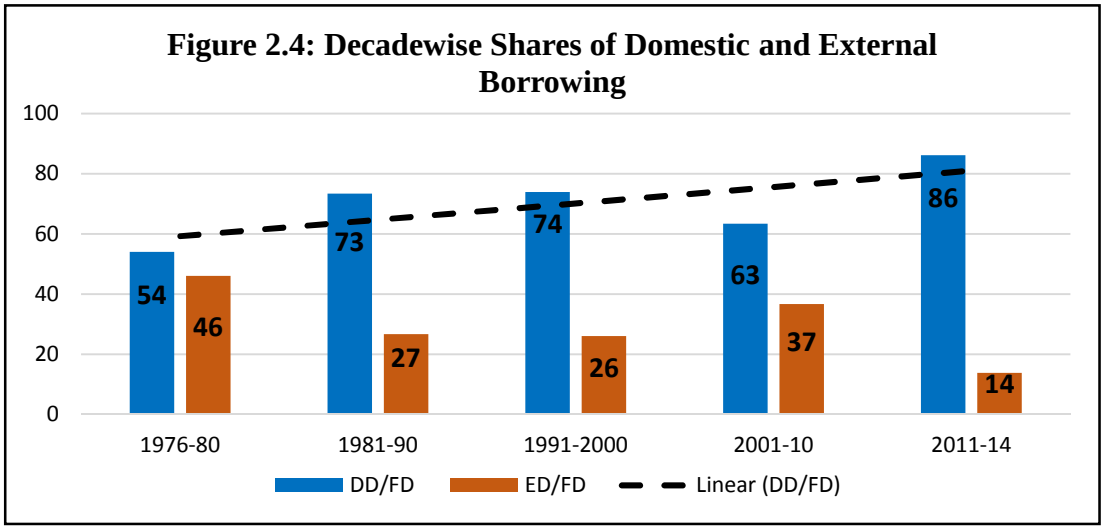
Fiscal deficit in Pakistan is financed through the mix of domestic and external borrowings. The mix of the domestic and external sources of financing both are changing over the time. Fiscal deficit was mostly financed through external borrowing in large proportion as compared to the domestic borrowing in the first two decades. It was almost 54.25% of the total fiscal deficit in 1976. But after that proportion of the

domestic financing starts to rise gradually and reaches to 100% in 2004 and 2013. Proportion of the deficit financing is reported in figure.



Source: Pakistan Economic Survey, (Various issues)

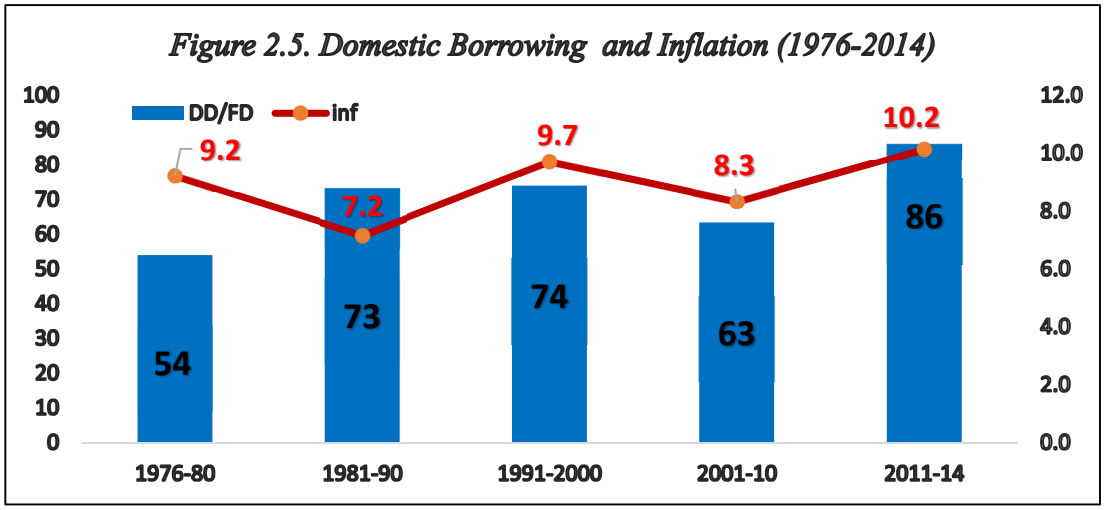
To see the trend of the financing mix more clearly, the decade wise distribution of the domestic and foreign sources are given in the following figure.



Source: Pakistan Economic Survey, (Various issues)

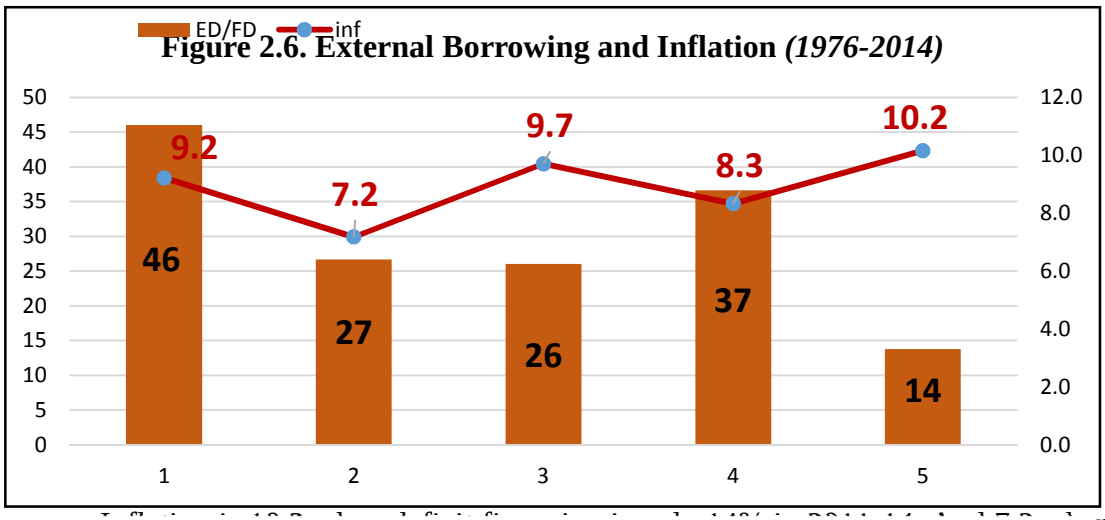
On average 73% of the total deficit was financed via domestic sources in 1981-90. And it raised to 86% in the last four years (2011-14). While domestic financing of the total deficit was merely 54% during 1976-80. Pakistan moved over the time from external sources to domestic financing.

In 1981-90 deficit financing through domestic borrowing was 73 % and inflation was 7.2 % while it went to 10.2% in the period of 2011-14 as domestic



Source: Pakistan Economic Survey, (Various issues)

financing was 86%. In general there is a positive trend between inflation and domestic borrowing, while external borrowing shows movements in opposite direction to inflation, as depicted in the figure.



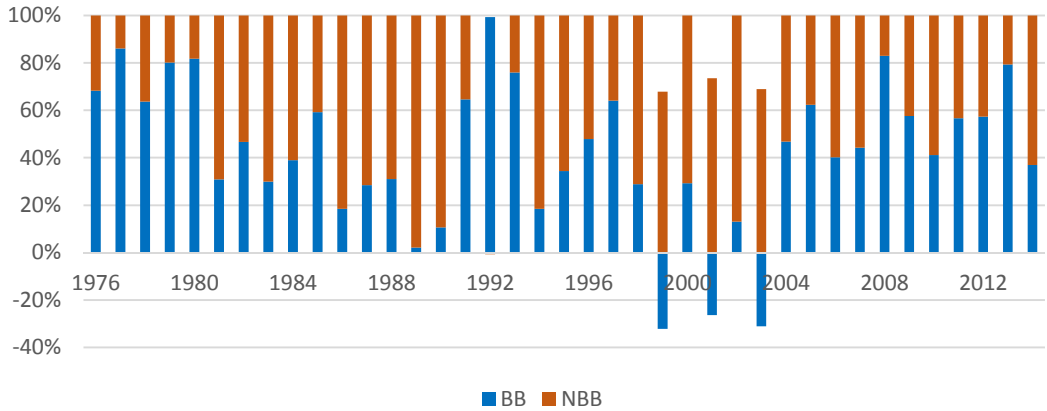
Source: Pakistan Economic Survey, (Various issues)

27% is financed by external sources. According to Agha and Khan (2006) the moderate level of inflation may be because of the high accumulation of the foreign reserves which acts as a shock absorber to make safe the domestic prices from external effects.

2.4 Bank, Non-Bank Borrowing and Inflation

There is a mix trend in the bank borrowing and non-bank borrowings. Out of total domestic borrowing more than 60% was borrowed from banking sector from 1976-80. While after it declined to 18.4% in 1986 and went down more in 1989 up to the level of 2%. Some of the payment has been repaid to the lenders in 1999, 2001 and 2003.In these years domestic source of financing was done through the non-bank

Figure 2.7. Bank and Non-Bank Borrowing (1976-2014)

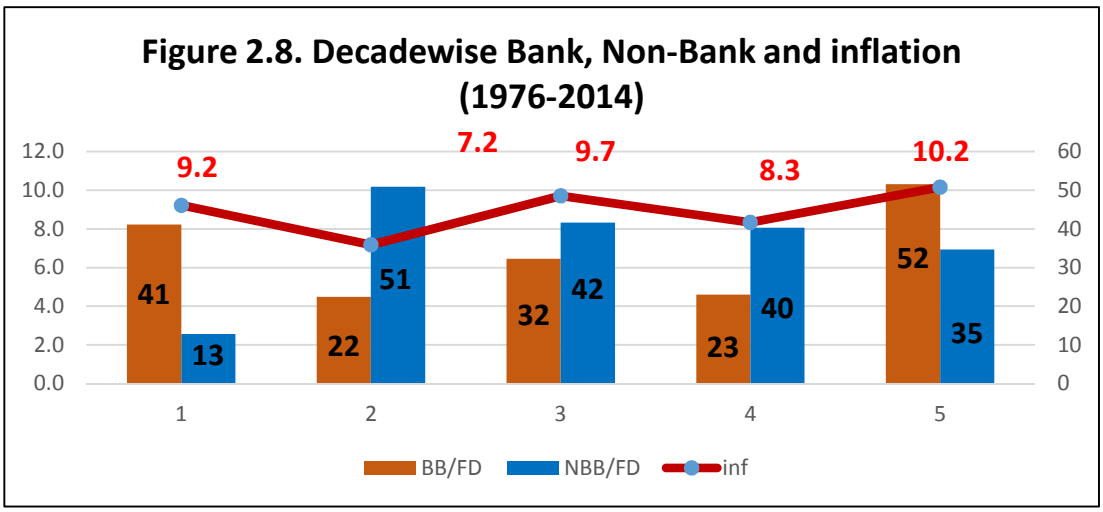


Source: Pakistan Economic Survey, (Various issues)

borrowing by 189.89%, 155.93% and 182.24% in respective years. After 2004 once again bank borrowing started inclining showing heavy reliance on the bank borrowing. In late 70's out of total fiscal deficit financing was 41% via bank borrowing, 13% from non-banking sector. The rest of the 46% was done from external sources. While in 1981-90 banking sector borrowing reduces to 22% almost half of the 1970's financing.

Decade wise distribution of the domestic borrowing from bank and non-bank is showing that recently borrowing from banking sector is increasing up to 52%. While from in the three decades 1980 to 2000 bank borrowing was significantly in small amounts merely from 22 to 32 percent. In these decades inflation rate was also low to

the tune of 7%, moderate level of inflation in the economy. So both bank borrowing and inflation shows positive association over the history in Pakistan.



Source: Pakistan Economic Survey, (Various issues)

If we look to the relationship of deficit financing via bank borrowing and inflation, both moves in the same directions. In those era where there is high bank borrowing for financing fiscal deficit is related to the high inflation regime.

The historical background of the non-bank borrowing in Pakistan and inflation they are quite opposite to each other. In those periods where there is less non-bank borrowing is attached to high inflation and have low inflation where there is high non-bank borrowing for budgetary support. This may be an indication that non-bank borrowing is less inflationary as quoted by Khan and Agha (2006). The question is inflation was reduced by the non-bank budgetary support or there was some other factor which encounter inflation with high non-bank fiscal deficit financing.

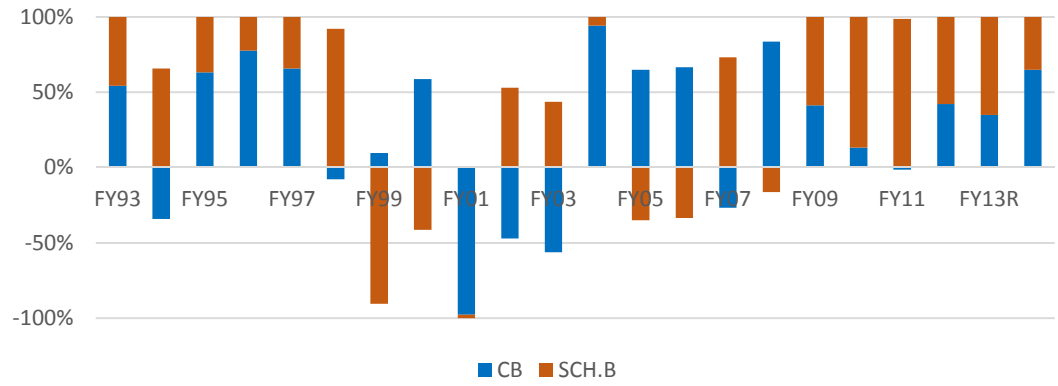
2.5 Schedule Banks, Central Bank Borrowing and Inflation

The budget financing from banking sector is comprised of borrowing from schedule bank borrowing and central bank borrowing. Schedule banks are commercial banks and those specialized banks in the Pakistan. The data of budget financing in bifurcated form from banking sector is very limited from 1993 onwards. For a time

series analysis it is very limited but however we try to have some fruitful discussion. Plotting the data gives some mixed results.

In 1993 54% of the total bank borrowing was done from central bank of Pakistan represented by the CB. While the rest of the 46% was done from the schedule banks of Pakistan represented by Sch.B line. While after that central bank borrowing was negative means 25.125 million Pakistani rupees were pay back to the central bank of

Figure 2.9: Central Bank and Schedule Banks Borrowings (1993-2014)



Source: State Bank of Pakistan

Pakistan. After that borrowing from central bank start increasing and more than 50 % of the total bank borrowing was raised from central bank borrowing.

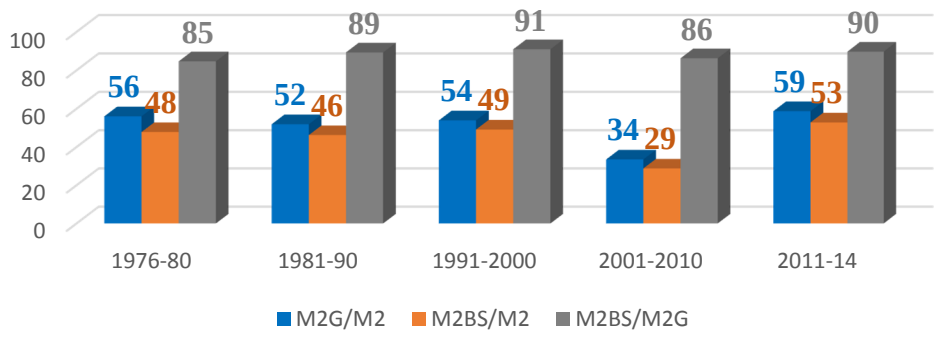
In 1998, 2001, 2002, 2003 and 2007 some of the amount was paid back to central bank. While to the schedule bank 1999, 2000, 2005, 2006 and 2008 the budget deficit was not financed from the schedule banks rather they were paid back the loan. To have more clearer look we make division of the 5 years due to less data availability.

2.6 Money supply and Inflation

It is generally agreed that inflation is related to money supply and from the data it is also clear that both money supply and inflation are correlated. As the money supply increases in the economy inflation also goes up. But according to Sargent and Wallace

(1981) money supply is not exogenously determined rather it is endogenous. Fiscal deficit in the economy is backed up by the money creation. If it is considered true, even then total changes in the money supply are not fully endogenous. Some portion of the money supply is still exogenously determined. So we can bifurcate the total money supply in two parts. Endogenous and exogenous part of the money supply. That portion of the money supply which is increased for government borrowing. Total government borrowing is comprised of borrowing for budgetary support, borrowing for commodity operations and others. While the exogenous part is the gap between total money supply and net government borrowing. Since the study is related to the inflation and fiscal deficit therefore money supply uses for budgetary support is high lightened. The decade wise net government borrowing from creation of new money and borrowing for budge

Figure 2.10. M2 as a Total Government and Budgetary Support Borrowings (1976-2014)

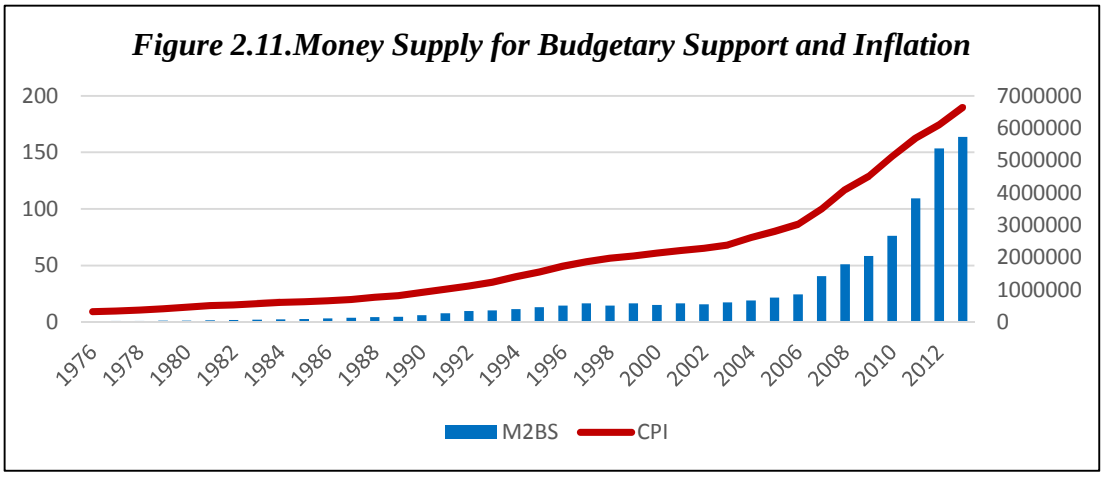


Source: State Bank of Pakistan.

In 1976-80, 56% of the total money supply were increased for government borrowing while 85% of the net government borrowing was increased for budgetary support. Almost in all decades, more than 50% changes in money supply were taken place for net government borrowing except in 2001-10. Even than the changes in money

supply for government borrowing is 34%, 86% of the government borrowing was used for budgetary support.

Figure 2.11.Money Supply for Budgetary Support and Inflation



Source: State Bank of Pakistan.

The relationship between money supply used for budgetary support and inflation can be depicted by the data. There is a positive relationship between exogenously determined money supply and inflation, as can be seen in the figure. So in Pakistan it is either increased for budget deficit or upon discretionary power exogenously, money supply brings inflation in the economy.

2.7 Conclusion

The historical background of inflation, fiscal deficit and their sources to finance the budget deficit shows some interesting results. There is a linear association between fiscal deficit and inflation. All the means of financing fiscal deficit move together with inflation except borrowing from external sources and non-bank borrowing. Domestic borrowing specially from banking sector is inflationary in nature.

Chapter 3

Literature Review

3.1 Introduction

This chapter is comprised of a detailed examination of the relevant literature on inflation, budget deficit and sources of financing budget deficit that how these theoretically and empirically interact with each other. Therefore, this chapter is comprised as it will cover the theoretical aspect of the issue as well as the empirical aspects. At the end, conclusion related to the existing literature will be drawn and how this study will add to the existing literature.

3.2 Theoretical Literature

Classical school of thought presented the dynamics of inflation though quantity theory of money (QTM). According to Irving Fisher (1911), an increase in the money supply would result an increase of price level in the economy with same proportion. However monetarist school of thought following the same QTM but does not support the proportionality relationship between money supply and inflation. Further Friedman (1956), the most prominent monetarist, stated “inflation is always and everywhere a monetary phenomenon” which shows that money supply is exogenously determined by monetary policy. On the other hand Sargent and Wallace (1981) contradicts with monetarists that it is budget deficit which determines the money supply in the economy and thus leads to inflation. Sargent and Wallace (1981) showed the way of interaction between fiscal and monetary authorities. They argue that if fiscal authority moves firs t and decide independently about budget and revenues generated through sale of government bonds and seignorage, then sooner or later government will have to monetize this fiscal deficit, leading to more inflation in the economy. Therefore, money supply is endogenous and inflation is a fiscal driven phenomenon. But Leeper (1991)

and Sims (1994) present the idea of fiscal theory of price level (FTPL) strongly suggesting that inflation is fiscal phenomenon. This theory shows that how fiscal and monetary authorities interact and influence the price level in the economy. They put forward considerations that the government deficit must be financed in a sustainable manner and inter temporal budget constraint should be balanced. Sims (1994) reinforces that in most of the cases inflation is more of a fiscal phenomenon and is dependent upon the expectations of the people have regarding fiscal policy and fiscal deficit. However FTPL is empirically tested for many countries which provides mix results.

3.3 Empirical Literature

Different studies are conducted to find out the connection between fiscal deficit and inflation. Most of the studies show that there is positive relationship between fiscal deficit and inflation in developing economies. Catao and Terrones (2005) found, in their study conducted for 127 economies, that inflation is associated with fiscal deficit in less or undeveloped economies. In a similar study Lin *et.al* (2013) found, using the panel ARDL approach, inflation is strongly related to fiscal deficit in these 91 countries, in high inflation periods. They conclude that fiscal consolidation is effective in price stabilization if there is high inflation rate in the economy. Sahan (2010) for the European economies also give the same results that inflation and deficit have positive relationship in developing economies while there is no causal link for developed economies. Habibullah et.al (2011) conducted a study for thirteen Asian countries including Pakistan found the evidence of the long run relationship between fiscal deficit and inflation keeping money supply as a third variable. Similarly Chaudhary and Parai (1991) did a study and found that huge and persistent budget deficit brings inflation in the Peruvian economy. Similarly in South Africa causality runs from budget deficit to

inflation, Anoruo (2003). Lozano (2008) too dig out that inflation in Columbia is affected by deficit. In another study Metin (1998) investigate the existence of the link between fiscal deficit and inflation in Turkey. This study used the conditional model technique and found a positive connection between budget deficit and inflation. In another study, Kia (2010) found same results for the same country while using Vector Error Correction Model (VECM). While Erkam and Çetinkaya (2014) shows that fiscal deficit granger caused inflation in the period of high inflation while in low inflation periods the relationship does not hold in Turkey.

Vieira (2000) found little supporting evidence to the hypothesis of the existence of long run relationship in the Europe Union 6 economies using panel ARDL. Koru and Özmen (2003) established no long run relationship between fiscal deficit and inflation while using currency in circulation and broad money supply sets independently with whole sale price index and consolidated budget deficit in their model for Turkish economy. Samimi (2011) also have the results of no long run relationship between budget deficit and inflation in Iran. Same results were obtained by Guess and Koford (1984) for 17 OECD countries from 1949-81 while using the Granger causality test.

According to Catao and Terrones (2005) there may be multiple factors involve in the previous failure of showing a long run relationship between fiscal deficit and inflation. This may be because of selection biasness, using wrong model specification and/or wrong econometric techniques. These all factors are unable to accommodate the main and important features of the theory. Once these limitations are disappeared, the argument fiscal deficit have inflationary impact is strong supported.

Developed economies shows weak or no association between budget deficit and inflation. King and Plosser (1985) found no relationship of budget deficit with inflation

for United States of America (USA) and other developed countries which are most likely same as USA. Catao and Terrones (2005) also developed no evidence of long run relationship between fiscal deficit and inflation in developed economies. They are of the view that in developed economies there is monetary policy independence and credibility. There is also other institutional constraints which make borrowing of the public concisely associated to tax and spending smoothing, rather than a systematic source of financing given the exhaustion of other, non-inflationary source.

3.4 Empirical Literature Related to Pakistan

Literature related to Pakistan also gives some mix result. Kemal (2006), Malik (2006), Qayyum (2006), found money supply and output growth are responsible for inflation in Pakistan, using Johanson cointegration test, Vector Auto Regressive model and Autoregressive Distributed Lags model (ARDL) respectively. According to these studies inflation is a monetary phenomenon in Pakistan. These studies ignored fiscal deficit to be an important factor in determination of inflation in their studies. Although Mukhtar and Zakaria (2010) included money supply and fiscal deficit both in their econometric modeling and found that inflation is monetary phenomenon but Shabbir and Ahmad (1994) have different results that fiscal deficit is directly linked with inflation. Agha and Khan (2006) using Johanson Cointegration technique also found that changes in inflation do not take place only by the money supply but also by the fiscal deficit. According to Agha and Khan (2006) if fiscal deficit increases by one billion Rupees in a fiscal year this would cause the inflation to rise by 0.0215 percentage points. This support the argument that in Pakistan, inflation is a fiscal phenomenon. Ammamma and Mughal (2011) show that deficit strongly effect inflation in Pakistan using Granger causality test from 1960-2010. Same results were found by Jalil and Bibi (2014) using panel ARDL model. The results are in line with Chaudhary and Ahmed

(1995), suggesting that money supply is not exogenous but it is endogenously determined by foreign reserves, domestic borrowings and credit to commercial banks. They found that money supply and deficit financing from domestic sources specially from banking sector effect the inflation in a positive way.

Agha and Khan (2006) exhibited in their work that inflation is positively influenced by the total domestic bank borrowings. They concluded that if there is increase of 1 billion rupees in domestic bank borrowing for budgetary support the prices would go up by 0.0048 percentage points. While Sarfaraz and Anwar (2009) find a positive relationship between total domestic borrowings including banking and non-banking borrowings for financing fiscal deficit. Furthermore it is concluded that borrowing from international sources are also inflationary in nature.

3.5 Literature Gap and Concluding Remarks

The review of the relevant literature shows that money supply, fiscal deficit along with sources of financing of the fiscal deficit such as domestic borrowings, and foreign borrowings are important factors to determine inflation in the economy. To the best of the reviewer's knowledge, no study has been conducted that what is the relationship between bank borrowings, borrowings from commercial banks, borrowings from central bank, and, non-bank borrowings for fiscal deficit financing with inflation. The literature also do not show any empirical evidence about their interaction that how they interact in the long run and which source is more inflationary than the other. So this study aims to fill this literature gap.

Chapter 4

Theoretical Background

4.1 Introduction

This chapter gives a detail discussion on theoretical background of the study, that how the relationship evolves in the long run. First theoretical model is presented which shows that inflation is a function of fiscal deficit. After that fiscal deficit is bifurcated in different sources of financing this deficit. And in the end, equations to be tested are derived from the model.

4.2 Theoretical Model

The prolonged relationship that exists between the variables is well indicated by the theory. This section shows that how general equilibrium models surveyed by Ljungqvist and Sargent (2000) of a small open economy can be modified and extract a parsimonious and testable specification. In this model, money is playing a significant role in recognizing the macroeconomic equilibrium through reducing the transaction cost, which enables a fiscally influential government to effect nominal money demand and inflation. This model shows that fiscal deficit is inflationary, further bifurcation of the fiscal deficit in different sources of financing will lead us to achieve the desired objectives. The main assumptions of the model economy are as follows.

There is only one endowment good in the economy with a fixed amount of $y > 0$ for $t \geq 0$. This endowment can be allocated to two sectors, private and government. Private sector can consume $\{c_t\}_{t=0}^{\infty}$ while government can make purchases$\{g_t\}_{t=0}^{\infty}$. They both faces a constraint that their consumption expenditure must be equal to their resources i.e.

$$c_t + g_t = y \tag{4.1}$$

A household can maximize his life time utility by making choices between consumption and leisure;

$$\sum_{t=0}^{\infty} \beta^t U(c_t, l_t) \tag{4.2}$$

where;

$\beta^t$is the subjective discount rate of utility and it lies between o and 1, c_t is the consumption of the household at time t and, is non-negative, l_t is the leisure time of the household, and, is non-negative. It is further assumed that marginal utility of both consumption and leisure are strictly increasing, while their substitution is strictly negative, i.e. $U_c, U_l > 0$, Ulc, $U_{ll} < 0$ and $U_{cl} \geq 0$, implying that utility is a concave in consumption and leisure.

Time Constraint for Household

The household has the time constraint; if there is a single unit of time period, some of his time will be consumed in shopping while some in leisure, i.e.

$$1 = l_t + s_t \tag{4.3}$$

where:

s_t is the amount of time of shopping required for purchasing a certain quantity of consumption goods c_t. s_t is negatively associated with the household's demand for real money balances$^{m_{t+1}}/_{p_t}$. Thus, shopping or transaction technology is given therefore:

$$s_t = H(c_t, {}^{m_{t+1}}/_{p_t}) \tag{4.4}$$

where H_c, H_{cc}, $H_{m/pm/p} \geq 0$ and $H_{m/p} < 0$

A parametric example of the transaction technology is;

$$s_t = \frac{c_t}{m_{t+1}/p_t}\ \varepsilon \qquad (4.5)$$

$\varepsilon > 0$ corresponds the transaction cost, and it rises in the framework of Baumol (1952) and Tobin (1956).

If a household spends, $\boldsymbol{m_{t+1}/p_t}$ for consuming c_t at a constant rate per unit of time, then $\frac{\boldsymbol{c_t}}{\boldsymbol{m_{t+1}/p_t}}$ measures the total number of trips to bank, and ε measures the time cost of a trip to the bank.

The household maximizes its life time utility function given by equation (4.1),

$$\sum_{t=0}^{\infty} \beta^t\ U(\ c_t, l_t)$$

Subject to transaction technology or time constraint, stated as equation (4.2)

$$1 = \ l_t + \ s_t$$

And the sequence of the budget constraint

$$c_t + \ \frac{b_{t+1}}{R_t} + \frac{m_{t+1}}{p_t} = \ y - \ \tau_t + \ b_t + \frac{m_t}{p_t} \qquad (4.\ 6)$$

Here

m_{t+1} is the holding of nominal balances between time t to t+1. p_t is the price level prevails in the economy at time t. b_t measures the value of government bonds maturing at the beginning of period t . τ_t is the total lump sum tax. $R_t$measures the real gross rate of return earned on holding one period bond from period t to t+1. If initial conditions or stock of m_0 and b_0 are given, the maximization is subject to $m_{t+1} \geq 0$, $\forall\ \boldsymbol{t} \geq 0$ and there is no sign restriction on b_{t+1} for time $\boldsymbol{t} \geq 0$.

The two consecutive budget constraints are given, after consolidation, by equation (4.6) we have;

$$c_t + \frac{c_{t+1}}{R_t} + \frac{m_{t+1}}{p_t} - \frac{m_{t+1}}{R_t p_{t+1}} + \frac{b_{t+2}}{R_t R_{t+1}} + \frac{m_{t+2}/p_{t+1}}{R_t} = y - \tau_t + \frac{y - \tau_{t+1}}{R_t} + b_t + \frac{m_t}{p_t} \quad (4.7)$$

By re-arranging we have,

$$c_t + \frac{c_{t+1}}{R_t} + (1 - \frac{p_t}{R_t\, p_{t+1}})\frac{m_{t+1}}{p_t} + \frac{b_{t+2}}{R_t R_{t+1}} + \frac{m_{t+2}/p_{t+1}}{R_t} = y - \tau_t + \frac{y - \tau_{t+1}}{R_t} + b_t + \frac{m_t}{p_t}$$

For ensuring of a bounded budget set, the term $(1 - \frac{p_t}{R_t\, p_{t+1}})$ is multiplied by non-negative$\frac{m_{t+1}}{p_t}$. Therefore,

$$\left(1 - \frac{p_t}{R_t\, p_{t+1}}\right)\frac{m_{t+1}}{p_t} \geq 0$$

$$\left(1 - \frac{p_t}{R_t\, p_{t+1}}\right) \geq 0$$

Since$\frac{p_t}{p_{t+1}} \cong R_{mt}$, is the inverse of inflation rate that is equal to the real gross return on money holdings from time t to t+1, the above expression, therefore, becomes;

$$\left(1 - \frac{R_{mt}}{R_t}\right) \geq 0$$

But as $\frac{R_t}{R_{mt}} = 1 + i_t$ gross nominal interest rate, therefore $\frac{R_{mt}}{R_t} \cong \frac{1}{1+ i_t}$

So replace the $\frac{R_{mt}}{R_t}$ by $\frac{1}{1+ i_t}$ the above expression becomes,

$$\left(1 - \frac{1}{1+i_t}\right) \geq 0,$$

By re-arranging gives

$$\frac{i_t}{1+i_t} \geq 0 \quad (4.8)$$

According to expression (4.8), the net nominal interest rate is non-negative which ensure that R_{mt} (the real return on money holding) should be less than (R_t) the real return on bond i.e.

$$R_{mt} < R_t$$

What will happen if it is not true? The agents will choose any large money holdings that is financed by issuing bonds. Such money holding will make them to make arbitrarily large profit.

The Household's Utility Maximization can be represented through the Langrangian set for the problem as;

$$\mathcal{L} = \sum_{t=0}^{\infty} \beta^t \{U(c_t, l_t) + \lambda \left(y - \tau_t + b_t + \frac{m_t}{p_t} - c_t - \frac{b_{t+1}}{R_t} - \frac{m_{t+1}}{p_t}\right) + \mu_t [1 - l_t - H\left(c_t, \frac{m_{t+1}}{p_t}\right)]\}$$

Choice variables

The household can maximize its life time utility by choosing Consumption,c_t, Leisure, l_t, Bond holdings, b_{t+1}, and, Money Holdings, m_{t+1}. So take derivative w.r.t the mentioned variables and setting equal to zero gives;

$$\mathcal{L}_{c_t} = \beta^0 \{U_c(t) - \lambda_t - \mu_t H_c(t)\} = 0 \quad (4.9)$$

$$\mathcal{L}_{l_t} = \beta^0 \{U_l(t) - \mu_t\} = 0 \quad (4.10)$$

$$\mathcal{L}_{b_{t+1}} = \beta^0 \left\{\lambda_t \frac{1}{R_t}\right\} + \beta^1 \lambda_{t+1} = 0 \quad (4.11)$$

$$\mathcal{L}_{m_{t+1}} = \beta^0 \left\{\lambda_t \frac{1}{p_t} - \mu_t H_{m/p}(t)\right\} + \beta^0 \lambda_{t+1} \frac{1}{p_t} = 0 \quad (4.12)$$

From equation (4.10) we have,

$$U_l(t) = \mu_t \qquad (4.10)^*$$

Substitute (4.10)* in equation (4.9) we have;

$$U_c(t) - \lambda_t - U_l(t)\, H_c(t) = 0$$

By re-arranging;

$$\lambda_t = U_c(t) - U_l(t)\, H_c(t) \qquad (4.13)$$

Equation (4.13) represents the Langrange Multiplier of the budget constraint,(λ_t) is the marginal utility of consumption minus the marginal disutility of shopping of consumption goods.

Replace equation (4.13) in equation (4.1) we have;

$$-\{U_c(t) - U_l(t)\, H_c(t)\}\frac{1}{R_t} + \beta\{U_c(t+1) - U_l(t+1)\, H_c(t+1)\} = 0$$

This implies that

$$R_t = \frac{1}{\beta}\frac{U_c(t) - U_l(t)\, H_c(t)\}}{U_c(t+1) - U_l(t+1)\, H_c(t+1)} \qquad (4.14)$$

Now from equation (4.11) we have,

$$-\lambda_t \frac{1}{R_t} + \beta\lambda_{t+1} = 0$$

$$\beta\lambda_{t+1} = \lambda_t \frac{1}{R_t} \qquad (4.11)`$$

Substituting (4.11)` in (4.12) we get,

$$-\lambda_t \frac{1}{p_t} - \mu_t\, Hm_{/p}(t)\frac{1}{p_t} + (\lambda_t \frac{1}{R_t})\frac{1}{p_{t+1}} = 0$$

Multiplying both sides by p_t

$$-\lambda_t - \mu_t Hm_{/p}(t) + (\lambda_t \frac{1}{R_t})\frac{p_t}{p_{t+1}} = 0$$

This further implies that

$$\lambda_t - (\lambda_t \frac{1}{R_t})\frac{p_t}{p_{t+1}} = -\mu_t Hm_{/p}(t)$$

Since $\frac{p_t}{p_{t+1}} \cong R_{mt}$ therefore,

$$\lambda_t - (\lambda_t \frac{1}{R_t})R_{mt} = -\mu_t Hm_{/p}(t)$$

$$(1 - \frac{R_{mt}}{R_t})\lambda_t = -\mu_t Hm_{/p}(t) \quad (4.15)$$

Or

$$(\frac{R_t - R_{mt}}{R_t})\lambda_t = -\mu_t Hm_{/p}(t) \quad (4.15)`$$

Equation (4.15) states that the cost is equal to benefit of the marginal unit of holdings real money balances from period t to t+1 represented in time t utility.

Instead of holding bonds, holding of money balances bears some cost. The cost is measure as the loss in the interest earnings $(R_t - R_{mt})$ lessen by the rate of R_t multiplied by the shadow price λ_t .

An additional unit of holding real money balances gives benefits in the saving of shopping time $-Hm_{/p}(t)$ assess at the shadow price μ_t.

Substitute (4.10)`, (4.13) into (4.15)

$$(1 - \frac{R_{mt}}{R_t})U_c(t) - U_l(t) H_c(t) = -U_l(t) Hm_{/p}(t)$$

Dividing by $U_l(t)$

$$\left(1 - \frac{R_{mt}}{R_t}\right)\frac{U_c(t)}{U_l(t)} - \ H_c(t) = -Hm_{/p}\ (t)$$

$$\left(1 - \frac{R_{mt}}{R_t}\right)\frac{U_c(t)}{U_l(t)} - \ H_c(t) + \ Hm_{/p}\ (t) = 0 \qquad (4.16)$$

As $U_c(t)$ and $U_l\ (t)$ are evaluated at $l_t = 1 - H\ (\ c_t, \frac{m_{t+1}}{p_t})$, therefore, (4.16) implicitly defines a money demand function. So

$$\frac{m_{t+1}}{p_t} = F\ (\ c_t, \frac{R_{mt}}{R_t}) \qquad (4.17)$$

Equation (4.17) shows that real money demand is an increasing function of consumption and real gross return on holding bonds.

The Government also faces the budget constrain while financing the purchase of stream $\{g_t\}_{t=0}^{\infty}$ so,

$$g_t = \ \tau_t + \ \frac{\beta_{t+1}}{R_t} - \ B_t + \ \frac{M_{t+1} - M_t}{P_t} \qquad (4.18)$$

Where initial condition of bonds and money supply, $B_0\ and\ M_0$ respectively are given. β_t measures the government liabilities from the private sector termed in time t goods. This β_t will be maturing at the start of period. Likewise M_t is the measure of the stock of currency, issued by the government at the starting of period t.

Long Run (Stationary) Equilibrium:

Government budget will be in equilibrium if following conditions holds;

$$\begin{aligned} g_t &= \ g, && \forall\ t \geq 0 \\ \tau_t &= \tau, && \forall\ t \geq 0 \\ B_t &= B, && \forall\ t \geq 0 \end{aligned} \qquad (4.19)$$

We permit $\tau_0 \neq \tau$ and$B_0 \neq B$. These restrictions allow us to study the economy in an equilibrium state for t ≥ 0, but starting from some other position other than at t=0. We may have other policy variables discussed as alternatives. In theoretical literature it is attached to the phrase, "Open Market Operations". So we seek an equilibrium for which

$$\begin{aligned} &\frac{p_t}{p_{t+1}} = R_m , && \forall\, t \geq 0 \\ &R_t = R , && \forall\, t \geq 0 \\ &C_t = c , && \forall\, t \geq 0 \\ &s_t = s && \forall\, t \geq 0 \end{aligned} \qquad (4.20)$$

Substitute (4.20) in (4.14) implies that $R = \frac{1}{\beta}$

And substitute (4.20) in (4.17) we have, $\frac{m_{t+1}}{p_t} = F(c, \frac{R_m}{R})$

Further we can write this as

$$\frac{m_{t+1}}{p_t} = f(R_m) \qquad (4.21)$$

Where consumption 'c' and interest rate 'R' were constant therefore it is suppressed in the money demand function $f(R_m)$, also it is noteworthy that $f'(R_m) \geq 0$

This inequality is important for discovering the relationship of fiscal deficit with inflation. So substitute (4.19), (4.20) and (4.21) in equation (4.18), we get

$$g = \tau + \frac{B}{R} - B + \frac{M_{t+1} - M_t}{P_t}$$

$$g = \tau + \frac{B}{R} - B + [\frac{M_{t+1}}{P_t} - \frac{M_t}{P_t}]$$

$$g = \tau + \frac{B}{R} - B + [f(R_m) - \frac{M_t}{P_t} . \frac{P_{t-1}}{P_{t-1}}]$$

$$g = \tau + \frac{B}{R} - B + f(R_m) - \frac{M_t}{P_{t-1}} . \frac{P_{t-1}}{P_t}$$

$$g = \tau + \frac{B}{R} - B + f(R_m) - f(R_m) . R_m$$

By taking common $f(R_m)$from both sides

$$g - \tau + \frac{B}{R} - B = f(R_m)[1 - R_m] \quad (4.22)$$

The policy variables$(g, \tau\ B)$ mentioned in equation (4. 22) establishes the rate of return on currency,R_m in equilibrium state. $g - \tau$ measures the interest deficit also called as operational deficit.

Whereas $g - \tau + \frac{B(R-1)}{R}$ describes the gross interest on government deficit.

$f(R_m)[1 - R_m]$ is the rate of seniorage revenues from printing currency. $[1 - R_m]$ is inflation tax rate and $f(R_m)$ represents the quantity of real money balances.

Now we have that

$R_m = \frac{1}{1+\pi}$,

And $f(R_m) = \frac{M_t}{P_{t-1}}$ while in the long run

$f(R_m) = \frac{M}{P}$, therefore, substitute in equation (4.22) we get,

$$g - \tau + \frac{B(R-1)}{R} = \frac{M}{P} (1 - \frac{1}{1+\pi})$$

$$\frac{\pi}{1+\pi} = \frac{P(g - \tau + \frac{B(R-1)}{R})}{M} \quad (4.22)^*$$

Equation (4.22)* shows the long run relationship stating that inflation growth is proportional to the ratio of gross of interest government deficit to the average stock of transaction or narrow money during the period. Demand for transaction money is negatively associated to inflation, the size of the inflation tax base will be lower (higher) as inflation is higher (lower). Therefore, fiscal deficit may be a stronger instrument for price stabilization.

According to Catao and Torrens (2005) that generally $\frac{\pi}{1+\pi} \cong \pi$ is the inflation growth rate, and $P(g - \tau + \frac{B(R-1)}{R}) \cong G - T$ is equivalently equal to the nominal budget deficit. Therefore,

$$\pi = \frac{G-T}{M} \tag{4.23}$$

4.3 Modifications in the Model[2]

The equation (4.23) shows that inflation is a function of budget deficit.

$$\pi_t = f(G - T)$$

The above function shows that fiscal deficit is inflationary in nature. Now the question is, if fiscal deficit occurs, how governments raise the funds to finance this deficit? The fiscal deficit can be financed from issuing some debts. If the government does not issue debt, there is no alternative without printing money. In the very first option she can finance her whole budget deficit via printing new money, i.e. the nominal value of the budget deficit (G-T) will be equal to the changes in the stock of money supply, therefore

$$G_t - T_t = dM_t \tag{4.24}$$

[2] The model is modified according to Agha and Khan (2006), therefore, Equation (4.24) to (4.27) are used same as they are in the paper.

The government can also use the option of getting currency into the system by changing the composition of interest and non-interest bearing debt. If DBt represents the domestic borrowing then,

$$G_t - T_t = \mathrm{d}M_t + dDB_t \tag{4.25}$$

A government may finance the deficit through domestic sources as well as from external sources to fulfill its requirements. Domestic debt is comprised of the printing new money and the issuance of the interest bearing debt. While external debt is the borrowing from the international financial market. So

$$G_t - T_t = \mathrm{d}M_t + dDB_t + dE_t \tag{4.26}$$

Domestic interest bearing debt can be further categorized in bank,(BB_t) and non-bank borrowings $(dNBB_t)$. Therefore,

$$G_t - T_t = \mathrm{d}M_t + dBB_t + dNBB_t + dE_t \tag{4.27}$$

Similarly the bank borrowings are made of from schedule banks (SBB_t) and state bank,(CBB_t), while non-bank borrowings is equal to the debt comprised of national saving scheme, (NSS_t), therefore it becomes,

$$G_t - T_t = \mathrm{d}M_t + dCBB_t + dSBB_t + dNSS_t + dE_t$$

By replacing equation (4.26), (4.27) and (4.28) we can estimate the inflation. So to achieve our objectives estimation will be done in four stages. In the very first stage it will be shown that fiscal deficit is inflationary. In the second stage fiscal deficit is bifurcated into two parts, domestic and external borrowing. While in the third stage domestic borrowing is divided into two parts, bank and non-bank borrowing. In the fourth stage bank borrowing has two components borrowing from schedule bank and state bank, while non-bank is further divided into two parts national saving scheme.

Chapter 5

Estimation Methodology and Data Description

5.1 Introduction

This chapter discusses that what type of estimation technique will be employed so that our objective are being fulfilled. In the very first section econometric issues and their solutions regarding time series analysis are discussed. Then appropriate model that will be used in the analysis are discussed in brief. After that variables definition and sources are discussed.

5.2 Econometric Methodology and Issues

As this study deals with the time series analysis. Time series data has its own issues. The most common issue is the non-stationarity. A series is said to be weak or covariance stationary if it's mean, variance and auto covariance do not affect by the change of time origin. Precisely it can be defined as, if y_t is a sequence, y_t is stationary if it follows the following properties;

i) Mean ; $E(y_t) = E(y_{t-s}) = \mu$

ii) Variance; $E(y_t - \mu)^2 = E(y_{t-s} - \mu)^2 = \sigma_y^2$

iii) Covariance; $E(y_t - \mu)(y_{t-s} - \mu) = E(y_{t-j} - \mu)(y_{t-j-s} - \mu) = \gamma_s$

Where $\mu, \sigma_{y,} and\ \gamma_s$ are constant over time. If a series hold these properties at level then it is called stationary at level, otherwise the series is made stationary by differencing[3].

[3] See Walter and Enders(2008)

In classical linear regression model (CLRM), regression analysis assumes that all the variables must be stationary. If they are not stationary, there may be problem of nonsense regression. A nonsense or spurious regression is a regression in which the model seems to be very good in terms of R^2 and t-statistics but having no economic meaning, as the ordinary least square (OLS) estimators are biased and statistical inferences are not valid[4]. So testing of a series' stationarity is very important.

5.3 Unit root Testing

A series can be tested either it is stationary or not by checking out the unit root process in the data. Consider the following model,

$$y_t = a_1 y_{t-1} + \epsilon_t \tag{5.1}$$

Where ϵ_t is a pure white noise error term[5]. If $a_1 = 1$, y_t follows purely random walk process in data generating process and y_t have a unit root. Equation (1) can be re-arranged,

$$\Delta y_t = (a_{1-1}) y_{t-1} + \epsilon_t$$

$$\Delta y_t = \gamma y_{t-1} + \epsilon_t \tag{5.2}$$

Where γ=(a_{1-1}). So to test for unit root i.e. $a_1 = 1$ is same as to test $\gamma = 0$. If null of a unit root is rejected, series is stationary at level.

5.3.1 Augmented Dicky and Fuller Test (ADF)

Dickey and Fuller (1979) formulate a test to formally examine the existence of a unit root in the data using Random Walk model with different specifications.

[4] Granger and Newbold (1974)

[5] A pure white noise error term is a random error which have the following properties, Zero mean, constant variance and zero covariance.

The Dicky and Fuller test equations are;

$$\Delta y_t = \gamma y_{t-1} + \epsilon_t \quad (5.3)$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + \epsilon_t \quad (5.4)$$

$$\Delta y_t = a_0 + a_2 t + \gamma y_{t-1} + \epsilon_t \quad (5.5)$$

They main difference among the three is the presence of the deterministic elements of intercept a_0 and trend$a_2 t$. Equation (5.3) is the pure random walk model while (5.4) and (5.5) includes intercept and trend respectively. In the above three models $\gamma = 0$ represents a unit root in the series.

The Dicky and Fuller (1979) assumes that error term is normally, identically and independently distributed (n.i.i.d). But most of the time they are not independent, in the presence of auto correlation Dickey and Fuller test does not predict the unit root accurately. To handle this problem Dickey and Fuller introduce the augmented lags[6]. And hence the test is known as Augmented Dickey Fuller (ADF) test. The three specification of the ADF test can be represented as follow;

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \mu_{1t} \quad (5.6)$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \mu_{2t} \quad (5.7)$$

$$\Delta y_t = a_0 + a_2 t + \gamma y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta y_{t-i+1} + \mu_{3t} \quad (5.8)$$

This ADF models have same testing procedure, $\gamma < 0$ leads to the conclusion of no unit root in the process.

[6] Lags of the dependent variableΔy_t.

5.4 Cointegration Analysis

As it is a known fact that most of the time series data carry a unit root process. So in the presence of unit root, simple regression analysis gives spurious results. If non-stationary data is converted into stationary process, the results of regression analysis are only applicable for the short run analysis, while economists are generally interested in long run relationship. To solve this problem Granger (1981) proposed the concept of cointegration. According to this if the data is non stationary at level[7], there may be a linear combination (cointegration vector) which would bring the system to the long run equilibrium. This concept was further elaborated by Engle and Granger (1987), by using two stage Engle and Granger approach. This was a crucial breakthrough in the field of econometrics, but it carries few drawbacks. (a) Its results depend on the choice of variable to be used for normalization; (b) the method does not tell about the number of cointegrating equations if variables are more than two; (c) it relies on a two stage procedure.

5.4.1 Johansen Cointegration Test

To avoid these problems[8] Johansen (1988) and Stock and Watson (1988) can be used[9]. Johansen's cointegration technique is mostly used in the empirical work as it is considered superior, based on maximum likelihood procedure which not only makes us allow to specify the number of cointegrating vectors but also their estimates.

Johansen's cointegration technique is a generalization of the Dickey and Fuller test in a multivariate scenario. It can be represented as follow;

[7] But stationary at first difference
[8] Refers to the drawbacks of Engle and Granger Approach
[9] For detail see Enders (2008)

$$\Delta x_t = \pi x_{t-1} + \sum_{i=1}^{p-1} \pi_i \Delta x_{t-i} + \varepsilon_t \quad (5.9)$$

Where $\pi = -(I - \sum_{i=1}^{p} A_i)$ and $\pi_i = -\sum_{j=i-1}^{p} A_j$.

This π is the rank of the matrix consisting of the number of independent cointegrating vectors. If there is no cointegrating vector i.e. $\pi = 0$, the matrix is of zero rank. We are left with the common Vector Auto Regressive (VAR) model. If $\pi = 1$ then there is an only one cointegrating vector and πx_{t-1} becomes the error correction term in the Johanson cointegration approach. For all others, $1 < \pi > n - 1$ implies that there may be multiple cointegration equations.

If there is no cointegrating vector in the system, the rank matrix is a null matrix i.e.($\pi = 0$) and all the characteristic roots will be equal to zero ($\hat{\lambda}_i = 0$) which implies that $\ln(1 - \hat{\lambda}_i) = 0$. If there is unit rank, $0 < \hat{\lambda}_i < 1$, therefore $\ln(1 - \hat{\lambda}_1) < 0$ and all other $\hat{\lambda}_i = 0$. To test for the presence of cointegration vectors, following two test statistics are used;

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \hat{\lambda}_i) \quad (5.10)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (5.11)$$

Where $\hat{\lambda}_i$ represents the characteristic roots (also known Eigen Value), they are acquired from the estimated rank matrix, and, T is the total number of usable observations

The equation (5.10) tests the null of the number of different cointegrating vectors is less than or equal to 'r' against the general alternative. The equation (5.11) test statistic test the null of the 'r' number of cointegrating vectors against the 'r+1'

cointegrating vectors. For comparison purpose to accept or reject the null of no cointegration critical values given by Johanson and Juselius (1990) are used.

5.4.3 Auto Regressive Distributed Lag Model

Both Engle and Granger (1987) and Johansen (1988) cointegration tests involves data to be stationary at first difference. If some of the variable are stationary at level and some are at first difference then both tests cannot be used for cointegration analysis. In such situation Auto Regressive Distributed Lag (ARDL) model may be used. In general, to estimate the long run relationship, if Y_t is an explained variable, where X_t is independent variable, long run model has following form;

$$Y_t = \alpha_0 + \beta_1 X_t + \varepsilon_t \tag{5.12}$$

Where ε_t is a white noise error term. The ARDL (p , q) can be written as,

$$\Delta Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta X_{t-j} + \mu_t \tag{5.13}$$

To check the long run relationship, coefficients on the one period lagged value of Y_t and X_t in equation (5.13) are jointly tested i.e. H_0: $\alpha_1 = \alpha_2 = 0$, through F–Test.

This null hypothesis expressed no cointegration between $Y_t$andX_t. Critical bound for the joint significance is obtained for the cases where there are I(1) regressors purely and purely I(0) regressors or mutually cointegrated.

This F-test does not follow a standard distribution, rather it depends on the following factors; a) The order of the integration[10] , b) Number of regressors. c) Intercept and/or trend in the model and d) Sample size

[10] Variables are I(0) or I(1)

Therefore, instead of using the critical values given by Pesaran and Pesaran (1997) as well as Pesaran *et.al* (2001)[11], this study will incorporate the critical values presented by the Narayan (2005) for small sample. If the calculated F-statistic falls in the critical bound then there results are inconclusive[12]. If F-statistic is less than the lower bound, no cointegration is concluded, while outside to the upper bound then there is long run relationship.

5.5 Data and Variables

This section discusses the nature and the source of the data, how variables are defined and from what source it's been taken. They are given under the following heads.

5.5.1 Consumer Price Index (CPI_t)

There are many measures of the inflation, some uses consumer price index (CPI), Wholesale Price Index (WPI), Sensitive Price Index (SPI), GDP Deflator and many more. In empirical analysis, CPI is the most commonly used gauge of the level of prices in an economy (Mankiw, 2005). Therefore this study also incorporate CPI as a measure of inflation[13].

CPI measures the cost of living of a consumer in a specific time period. CPI is the changes in retail price level. In Pakistan CPI is computed through the Laspeyer's formula;

$$CPI_t = \frac{\sum(P_t|P_0)\,W_i}{\sum W_i} * 100$$

[11] The critical bound by Pesaran et.al (2001) was generated for 500 and 1000 observations, which can be used in large sample size. As this study is related to only 38 observations therefore, the critical bounds given by Narayan (2005) are used for testing the bound test of cointegration.
[12] Inconclusive means that we not sure about the status either there is long run relationship or not.
[13] CPI is broader measure than WPI and SPI, comparison is given in appendix I.

Where

P_t = Price of a commodity in the current year

P_0 = Price of the commodity in base year

W_i = Weight assigned to the i^{th} commodity in the base year (SBP, 2015).

5.5.2 Fiscal Deficit (FD_t)

Budget deficit is the difference between total revenue and expenditure during fiscal year of an economy. In Pakistan fiscal year starts from July, and, ends at June of the next year. Total revenue is the pool of the total tax revenue and non-tax revenue in a fiscal year. While total expenditure is the sum of total current and developmental expenditure during a fiscal year. So budget deficit is calculated as;

$$BD_t = TR_t - TE_t$$

Where

BD_t is the budget deficit in period t

TR_t is the total revenue that is generated in period t and

TE_t is the total expenditure in period t

If FD_t is the fiscal deficit and SAB_t is the surplus of autonomous bodies and D_t is the discrepancies then budget deficit can be converted into fiscal deficit by;

$$FD_t = BD_t + SAB_t - D_t$$

It is expected that inflation is positively associated with fiscal deficit.

5.5.3 Money Supply

Money supply is the amount of money that circulates in the economy. As most of the researcher uses M2 for empirical analysis, this study also incorporate broad money (M2) as a measure of money supply. M2 is defined as the sum of currency in circulation, other deposits with state bank of Pakistan, demand and time deposits including resident foreign currency deposits with schedule banks. It is likely to have direct relationship with inflation.

5.5.4 Domestic Borrowing for Budgetary Support (DB)

The domestic financing is the amount that is owed to borrowers residents in the same country as the lenders. Domestic financing for budgetary support is the borrowing from domestic sources that is used for budget deficit financing. It includes both bank and non-bank sources of financing. The study uses domestic borrowing for budgetary support as a flow variable. It is expected that domestic borrowing for budgetary support has a positive association with inflation.

5.5.5 Bank Borrowing for Budgetary Support (BB_t)

Bank borrowing for budgetary support is the borrowing of a government from banking sector within the economy during a specific fiscal year. Bank borrowing is comprised of the borrowings from State Bank of Pakistan and schedule banks[14]. So it is the sum of the total state bank borrowing and total schedule banks borrowing.

$$BB_t = CBB_t + SBB_t$$

Where

BB_t is the bank borrowing for budgetary support

[14] Commercial plus specialized banks are specified as Schedule banks

CBB_t is the borrowing from central bank for budgetary support

SBB_t is the borrowing from schedule banks for budgetary support

5.5.6 Central Bank Borrowing for Budgetary Support (CBB_t)

The government may borrow from state bank of Pakistan directly for fiscal deficit financing through new money creation in the economy which is reflected in the growth of money supply. The government may borrow through Ways and Means Advances or purchase of Market Related Treasury Bills (MRTBs). Both federal and provincial governments along with Government of Azad Kashmir can borrow from SBP directly for budgetary support within limits define for them (SBP, 2015).

5.5.7 Schedule Banks Borrowing for Budgetary Support (SBB_t)

It is the bank borrowing from all commercial banks and specialized banks such as Industrial Development Bank of Pakistan (IDBP) and Zarai Taraqiati Bank (ZTBL) etc. The government of Pakistan can borrow from these banks using different instruments i.e. Market Treasury Bills (MTBs) of 3, 6, and 12 months maturities, Market Related Pakistan Investment Bonds (PIBs) of 3, 5, 10, 15, 20 and 30 years maturities.

It is expected that inflation may rise with the increase of the borrowing from schedule banks for deficit financing as it may create crowd out effect in the economy.

5.5.8 Non-Bank Borrowing For Budgetary Support (NBB_t)

The domestic financing of a fiscal deficit other than bank borrowing comes under the non-bank borrowing for budgetary support. In Pakistan funds from the non-banking sector is generated mostly from the National Saving Schemes (NSS) and other

bonds issued through SBP to the individuals and other Non-Bank Financial Institutions (NBFIs). Non-bank borrowing brings inflation but theoretically it is less inflationary.

5.5.9 Borrowing from National Saving Scheme for Budgetary Support (NSS_t)

The fiscal deficit may also be financed through national saving scheme. The funds are generated through Central Directorate of National Saving (CDNS) under Ministry of Finance (MOF). This is one of the most important tool by which government can finance the deficit. NSS funds are generated through different schemes. i.e. Certificates[15], Accounts[16] and prize bonds.

5.5.10 External Borrowing for Budgetary Support (EB)

The external financing is the amount of financing that is owed to nonresidents by the residents of an economy. External borrowing for budgetary support is the fiscal deficit financing through external sources of financing including governments, international financial agencies.

5.6 Data Source:

The data of the above mentioned variables are collected from State Bank of Pakistan (SBP), Ministry of Finance (MOF) and Pakistan Bureau of Statistics (PBS). Variable wise data source and time span is given in Table 5.1.

[15] a)Defense Saving Certificates (DSC), b) Special Saving Certificates Registered (SSCR), c) Regular Income Certificates (RIC), Bahbood Saving Certificates (BSC)

[16] a) Saving Account (SA), b) Special Saving Account (SSA), c) Pensioner's Benefit Account (PBA)

Table 5.1 Variables and their Source of Data Collection

Variables' name	Time Span	Data Source
Consumer Price Index (CPI)	1976-2014	State Bank of Pakistan[17]
Fiscal Deficit (FD)	1976-2014	Pakistan Economic Survey
Domestic Borrowing (DB)	1976-2014	Pakistan Economic Survey
External Borrowing (EB)	1976-2014	Pakistan Economic Survey
Bank Borrowing (BB)	1976-2014	Pakistan Economic Survey
Non-Bank Borrowing (NBB)	1976-2014	Pakistan Economic Survey
Schedule Bank Borrowing (SBB)	1993-2014	State Bank of Pakistan
Central Bank Borrowing (CBB)	1993-2014	State Bank of Pakistan
Borrowing from NSS (NSS)	1993-2014	Pakistan Economic Survey
Money Supply M2	1976-2014	State Bank of Pakistan
Real Gross Domestic Product at	1976-2014	Pakistan Bureau of Statistics

[17] Cross checked with Pakistan Bureau of Statistic (PBS)

[18] Cross-checked with the Hand book of Statistic on Pakistan Economy 2010, SBP

[19] Cross checked with the Pakistan Economic Survey, MOF various issues.

Chapter 6

Results and Discussion

6.1 Introduction

Results of the econometric analysis are discussed in this chapter. This chapter is organized as follows, results of the unit root test is presented in section 6.2. While results of the cointegration analysis has been discussed in section 6.3, 6.4, 6.5 and 6.6.

6.2 Results of Augmented Dickey Fuller Test

To test the stationarity of the given series used in the analysis, ADF test was used. The results of the unit root testing is presented in the following table.

Table 6.1: Results of ADF Test

	Variables[20]	At Level	At First	Conclusion
Dependent Variable	cpi_t	-2.688	-3.117*	I(1)
	$m2_t$	-3.357	-4.511*	I(1)
Control Variable	$rgdp_t$	-2.376	-3.681*	I(1)
Stage 1	fd_t	-2.442	-5.304*	I(1)
Stage 2	db_t	-2.448	9.479*	I(1)
	eb_t	-6.689*	_____	I(0)
Stage 3	bb_t[21]	-5.347*	_____	I(0)
	nbb_t	-5.507*	_____	I(0)
Stage 4	cbb_t	-3.837*	_____	I(0)
	sbb_t	-3.927*	_____	I(0)
	nss_t	-2.303	-3.588*	I(1)

According to this all of the variables used in first stage of estimation are integrated of order one i.e. they are non-stationary at level but having stationary properties at first difference. The rest of the variables are of mixed order of

[20] Small alphabets represents that variables are in log form. Along with ADF, same results were obtained from applying Phillips and Perron (1988) test. Results of PP test is given in appendix II

[21] Unit root results are mentioned with trend and intercept in Level except NBB, SBB and NSS, they have only intercept. There is no trend at first difference in all variables.

integration, some are I(1) and some are I(0). They are checked for the white noise properties of the error term. The estimated error term is normally identically and independently distributed around zero mean.

6.3 First Stage Estimation

In the very first stage this study shows that fiscal deficit and inflation has long run relationship. The expected model is given below;

$$cpi_t = \alpha_1 + \beta_1 fd_t + \beta_2 m2_t + \beta_3 rgdp_t + v_t \qquad (6.1)$$

v_t is a stochastic process. Both fiscal deficit (fd_t), money supply ($m2_t$) are considered as endogenous variable while real gross domestic product ($rgdp_t$) employed as a control variable. Table 6.1 indicates that all of the variable, used in the first stage estimation, are I (1), for long run relationship, therefore, Johansen cointegration technique is used.

6.3.1 Results of Johansen Cointegration Test

Results of the Johansen cointegration technique is given in the table, Table6.2.

Table 6.2 Results of Johansen Cointegration Technique

Trace Test				
H_0	**H_1**	**Trace Statistic**	**95% Critical Value**	**Probability**
r = 0	r = 1	43.9145*	29.7971	0.0007
r = 1	r = 2	15.8346*	15.4947	0.0444
r = 2	r = 3	2.3965	3.8415	0.1216
Maximum Eigen Value Test				
H_0	**H_1**	**Max-Eigen Statistic**	**95% Critical Value**	**Probability**
r = 0	r ≥ 0	28.0800*	21.1316	0.0045
r = 1	r ≥ 1	13.4381	14.2646	0.0672
r = 2	r ≥ 2	2.3965	3.8415	0.1216

Note; * indicates rejection of null hypothesis at 5% level of significance

After specifying the appropriate lag length of 2 lags by most of the lag selection criterion i.e. LR, FPE, AIC, SC and HQ while using Vector auto regressive (VAR) model, Trace test gives indication that two cointegrating vectors may exist in the

system, whereas Maximum Eigenvalue test give only one cointegrating vector. But according to Toda (1994) and Lutkipohl et.al. (2000) trace test is size distorted, therefore we may conclude on the basis of Eigenvalue test statistic that there may be only one cointegrating vector[22]. The estimated long run relationship is given below:

$$\widehat{cpi}_t = \underset{(0.02693)}{0.1665 fd_t} + \underset{(0.05152)}{0.6644 m2_t} \quad (6.2)$$

Equation (6.2) shows that inflation is positively affected by money supply and fiscal deficit i.e. if fiscal deficit and money supply increases inflation goes up in the long run. This equation further tells us that if fiscal deficit increases by one million Pakistani rupees, price level would go up by 0.17 percentage points while increase in money supply by one million increase the inflation level by 0.66 percentage points. Results of explaining are in line with Shabbir and Ahmad (1994), Agha and Khan (2006), and, Jalil and Bibi (2014), while this is in contradiction with Mukhtar and Zakaria (2010).

6. 3.2 Vector Error Correction Model

After Johansen cointegration test, cointegration analysis involves vector error correction mechanism (VECM). In three variables case, VECM is given in the following equations.

$$\Delta cpi_t = \alpha_0 + \sum \alpha_i \Delta cpi_{t-i} + \sum \beta_i \Delta fd_{t-i} + \sum \gamma_i \Delta m2_{t-i} + \varphi_1 \mu_{t-1} + \varepsilon_{1t} \quad (6.3)$$

$$\Delta fd_t = \alpha_0 + \sum \alpha_i \Delta fd_{t-i} + \sum \beta_i \Delta cpi_{t-i} + \sum \gamma_i \Delta m2_{t-i} + \varphi_2 \mu_{t-1} + \varepsilon_{2t} \quad (6.4)$$

$$\Delta m2_t = \alpha_0 + \sum \alpha_i \Delta m2_{t-i} + \sum \beta_i \Delta fd_{t-i} + \sum \gamma_i \Delta cpi_{t-i} + \varphi_3 \mu_{t-1} + \varepsilon_{3t} \quad (6.5)$$

validity of the error correction in the system depends on the lag of the estimated error

[22] If Trace test is true and we have two cointegrating vectors, Qayyum (2005) argued that conventionally the first vector may be used as a long run equation, otherwise we have to use restricted VECM. First the system should be identified then VECM results can be interpreted.

[23] In parenthesis standard error of the corresponding coefficient is mentioned. Both fiscal deficit and inflation are statistically significant at 1% level of significance. Their corresponding t value are; t-calculated for fd= 6.18 while for m2 it is 12.9.

term(μ_{t-1}). If $\varphi_k < 0$ and statistically significant then the cointegration relationship is confirmed between variables used underlying theory. This φ_k defines the speed of adjustment of the system that how much correction will be done if the system shows deviation from the long run.

Results of the VECM for Δcpi_t as a dependent variable, stamped the long run relationship. The error correction term (ECM_{t-1}) is negative and statistically significant which confirms convergence to the long run equilibrium in the system. VECM results are given in Table 6.3.

Table 6.3: Results of VECM[24]

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
ECM_{t-1}	-0.4649	0.0973	-4.7794	0.0001
Δcpi_{t-1}	0.5383	0.1460	3.6873	0.0010
Δcpi_{t-2}	0.1088	0.1368	0.7953	0.4334
Δfd_{t-1}	-0.0567	0.0201	-2.8218	0.0088
Δfd_{t-2}	-0.0560	0.0195	-2.8677	0.0079
$\Delta m2_{t-1}$	0.0090	0.1170	0.0773	0.9389
$\Delta m2_{t-2}$	0.0784	0.1095	0.7153	0.4806
Constant	5.2013	1.1359	4.5791	0.0001
$rgdp_t$	-0.3347	0.0729	-4.5937	0.0001
R-squared	0.7317	$\chi^2{}_{auto}(2)$		0.4561
Adjusted R-squared	0.6522	$\chi^2{}_{ARCH}(2)$		0.3402
$\chi^2{}_{Normality}(2)$	0.5650			

According to Table 6.3, 46.5 percent of the disequilibrium if occurs in the short run will be corrected in a proceeding year. The model is good in R-squared value, there is no problem of normality, serial correlation and heteroscedasticity in model.[25] On the

[24] One cointegration equation results are mentioned due to; a) Trace is size distorted. b) Conventional Method. c) Inflation is of interest only.
$\chi^2{}_{auto}(2)$ is the LM statistic of the autocorrelation test
$\chi^2{}_{Normality}(2)$ is the LM statistic of the Jerque-Berra Normality test
$\chi^2{}_{ARCH}(2)$ is the LM Statistic of the ARCH test

[25] The model is also checked for stability of the parameters by CUSUM and CUSUM-Square test. Parameters are stable in the system. Results of the CUSUM and CUSUM-Square are given in Appendix-III

basis of the results, we may therefore, conclude that there is long run relationship between fiscal deficit and inflation.

6.4 Second Stage Estimation

In stage one, existence of the long run relationship was confirmed between fiscal deficit and inflation. Now we are supposed to make an argument that fiscal deficit is itself a statement that this much funds will be generated from some sources which are not raising from the sources of revenue. Therefore, sources of financing fiscal deficit is more important in determining inflation in the economy.

As fiscal deficit, in Pakistan, is financed from both domestic and external sources but due to limited access to the foreign funds most of the financing relies on the domestic borrowing. Therefore, domestic borrowing is considered as endogenous while external borrowing is exogenous variable but for comparison reasons external borrowing is also considered as endogenous variable. Money supply is also endogenous in the system. So the model may be treated as,

$$cpi_t = \alpha_2 + \beta_1 db_t + \beta_2 eb_t + \beta_3 m2_t + \beta_4 rgdp_t + \nu_{2t} \quad (6.6)$$

Where, db_t is the domestic borrowing, eb_t is the external borrowing, and, ν_{2t} is the white noise error term.

6.4.1 Results of ARDL Model

Table 6.1 shows that external borrowing is stationary at level while the rest of variables[26] used in the second stage estimation are stationary at first difference. Variables are, therefore, of mixed order of integration. Auto regressive Distributed Lag model was applied, and, results are given in Table 6.4.

[26] Inflation, domestic borrowing, Money supply and Real GDP are stationary at first difference.

Table 6.4: Results of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
cpi_{t-1}	1.1717	0.1510	7.7616	0.0000
cpi_{t-2}	-0.5086	0.1306	-3.8955	0.0005
db_t	0.0186	0.0091	2.0507	0.0494
eb_t	0.0019	0.0020	0.9857	0.3324
$m2_t$	-0.0571	0.1056	-0.5406	0.5929
$m2_{t-1}$	0.3180	0.1219	2.6077	0.0143
$rgdp_t$	-0.2601	0.1012	-2.5688	0.0156
C	1.5290	0.9466	1.6153	0.1171
R-Square	0.9995	$\chi^2{}_{ARCH}(1)$		0.9597
Std. Error of Regression	0.0215	$\chi^2{}_{ARCH}(2)$		0.1469
$\chi^2{}_{auto}(1)$	0.7913	$\chi^2{}_{Norm}(2)$		0.8386
$\chi^2{}_{auto}(2)$	0.8938	$F_{RESET}(1,28)$		0.7853

Note: P-values of the LM test are reported for Diagnostic test[27]

$\chi^2{}_{auto}(.)$ Represents LM statistic of BG test.

$\chi^2{}_{ARCH}(.)$ Indicates LM Statistic of ARCH test.

$\chi^2{}_{Norm}(2)$ is the p-value of LM statistic of Jerque-Berra Normality test.

$F_{RESET}(1,28)$ is p-value of F-Statistic of Ramsey RESET

Same notes are applicable for results of ARDL in third and fourth stage of estimations.

For the presence of long run relationship between inflation and sources of financing from domestic and external borrowing equation (6.6) were run with 1 lag[28] and ARDL (2, 0, 0, 1)[29] was selected. The model clears all the diagnostic test i.e. test of misspecification, normality, heteroscedasticity and autocorrelation. These tests show that the estimated error term is a pure white noise process and the model is correctly specified which indicates that estimated parameters will maintain consistency over the period of 1976 to 2014 and the bound test along with the long run and short run estimators are true.

[27] Both LM and F statistic have asymptotically same distribution, while in small sample F is preferred (Pesaran and Pesaran 1997) therefore only chi square probability values is reported.

[28] One lag was selected by SIC criterion, the most consistent lag selection criterion Pesaran and Shin (2001).

[29] E-Views 9 was used for ARDL analysis. First ARDl (1, 0, 0, 1) was selected but there was autocorrelation problem therefore one additional lag of dependent variable was introduced. Both SIC and AIC selects the ARDL (2, 0, 0, 1) which is free of autocorrelation.

6.4.2 Results of Bound Test of Cointegration

Clearance of the diagnostic tests allows us to run the bound test of cointegration for confirmation of the long run relationship. Bound test results are given in Table 6.5.

Table 6.5: Results of Bound Test of Cointegration

Test Statistic	Value[30]	K
F-statistic	6.002	3
Critical Value Bounds		
Significance	**I_0 Bound**	**I_1 Bound**
10%	2.618	3.532
5%	3.164	4.194
1%	4.428	5.816

Note: Critical values are taken From Narayan (2005)

Even at 1% level of significance, F-statistic is greater than the critical bound, the null of no cointegration may be rejected. This allows us to establish the long run relationship between variables.

6.4.3 Results of Long Run Relationship

The estimated long run relationship is expressed in equation 6.7.

$$\widehat{cpi}_t = \underset{(2.486)}{4.539} + \underset{(0.026)}{0.055}db_t + \underset{(0.006)}{0.006}eb_t + \underset{(0.076)}{0.775}m2_t - \underset{(0.226)}{0.772}rgdp_t \qquad (6.7)$$

Equation (6.7) shows that domestic borrowing, money supply along with real GDP contribute to inflation in the long run as their coefficients are highly significant[31]. While external borrowing is statistically insignificant. The reason of external borrowing to be statistically insignificant may be whenever a government borrow from external sources, it does not put upward pressure on the money supply to monetize the borrowing.

[30] . The bound test also shows long run relationship at 1 % even by the critical bound generated by Pesaran et.al (2001)

[31] Real GDP has negative relationship with inflation, results are same with Aysha et.al. (2013).

Therefore external borrowing is insignificant. So in comparison to the domestic borrowing, external borrowing is less inflationary[32].

6.4.2 Error Correction Mechanism (ECM)

To verify convergence to from short run to the long run equilibrium, the results of the ECM are given in Table 6.6.

Table 6.6: Results of ECM

	Coefficient	**Std. Error**	**t-Statistic**	**Prob.**
ECM_{t-1}	-0.337	0.071	-4.767	0.0000
Δcpi_{t-1}	0.509	0.131	3.895	0.0005
Δdb_t	0.019	0.009	2.051	0.0494
Δeb_t	0.002	0.002	0.986	0.3324
$\Delta m2_t$	-0.057	0.106	-0.541	0.5929
$\Delta rgdp_t$	-0.260	0.101	-2.569	0.0156

As the negative and statistically significant error correction term ($\boldsymbol{ECM_{t-1}}$) confirms the long run convergence. Adjustment in the error is quite good, almost 34 percent per year. So we can conclude that there may be long run relationship of borrowing from domestic sources, external sources and money supply with inflation[33].

6.5 Third Stage Estimation

The second stage results conclude that there is long run correspondence between domestic, external borrowing for fiscal support and inflation. In the third stage, domestic borrowing is split into two parts, bank borrowing and non-bank borrowing. While external source of financing is kept same as exogenous variable. The purpose of bifurcating domestic borrowing into two different heads is to check whether bank

[32] Even if external borrowing is considered as exogenous, same results were found.

[33] As diagnostic test results for the Error Correction Mechanism are the same, as presented in the Results of ARDL, therefore they are not mentioned here.

borrowing is inflationary or non-bank borrowing. To test this, the model may became as,

$$cpi_t = \alpha_3 + \beta_1 bb_t + \beta_2 nbb_t + \beta_3 m2_t + \beta_4 eb_t + v_{3t} \quad (6.8)$$

Where bb_t represents the domestic bank borrowing for financing fiscal imbalances, nbb_t is the non-bank borrowing to finance fiscal deficit. $m2_t$ is the money supply and eb_t is the external borrowing. Except external borrowings all of the variables are considered as endogenous.[34]

6.5.1 Results of ARDL

As variables that are used in the analysis of this third stage of estimation are integrated of order zero and one[35], therefore in such situation ARDL is the best option to be used for checking the existence of long run relationship among variables. To find the long run relationship equation (6.8) was run through ARDL approach while specifying the appropriate lag length of one lag[36]. ARDL (1, 1, 0, 1) was selected but it shows autocorrelation therefore one additional lag of AR process was introduced to handle the problem of autocorrelation. On the basis of AIC[37] 16 models were evaluated and ARDL (2, 1, 0, 1) was selected. The results of the ARDL (2, 1, 0, 1) model is presented in Table 6.6.

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[34] Although there are restrictions on the bank borrowing which makes it partly exogenous, but they are not in practice, and for comparison purpose too, it is considered as endogenous.
Bank borrowing is the part of total money supply (m2), but correlation between them is just 23 percent. So it is expected that multicollinearity problem may not be there. The model is also checked as a ratio of fiscal deficit, ratio of domestic borrowing, and M2 minus bank borrowing, but their results were insignificant.

[35] Inflation, money supply are I (1), while bank borrowing, non-bank borrowing and External borrowing are I (0).

[36] All of the criterion LR, FPE, AIC, SC, and HQ show one lag to be optimal. On the basis of SIC one lag is selected to be optimal for the analysis.

[37] Same model was selected by SIC

Table 6.7: Results of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
cpi_{t-1}	1.358	0.131	10.358	0.000
cpi_{t-2}	-0.540	0.133	-4.068	0.000
bb_t	0.004	0.002	1.740	0.093
bb_{t-1}	0.003	0.002	1.443	0.160
nbb_t	-0.002	0.002	-0.655	0.518
$m2_t$	-0.215	0.131	-1.642	0.112
$m2_{t-1}$	0.320	0.135	2.371	0.025
eb_t	0.001	0.002	0.444	0.660
C	-0.741	0.231	-3.212	0.003
R-Square	0.9993	$\chi^2_{ARCH}(1)$		0.4653
Std. Error of Regression	0.0229	$\chi^2_{ARCH}(2)$		0.3026
$\chi^2_{auto}(1)$	0.4969	$\chi^2_{Norm}(2)$		0.7077
$\chi^2_{auto}(2)$	0.6433	$F_{RESET}(1,27)$		0.2454

The model is best fit in the sense of high R-square, the model is free of specification bias, and, the estimated error term is also free of autocorrelation, heteroscedasticity. The residual of the model is normally distributed. So the estimated error term is normally, identically and independently distributed (n.i.i.d) around zero mean.

6.5.2 Results of Bound test of Cointegration

After confirmation, that ARDL model has passed all the required tests, the next step is to test for the long run relationship. The results of the bound test of cointegration is given in Table 6.7

Table 6.8: Bound Test of Cointegration

Test Statistic	Value	K
F-statistic	4.575	3
	Critical Value Bounds	
Significance	**I_0 Bound**	**I_1 Bound**
10%	2.618	3.532
5%	3.164	4.194
1%	4.428	5.816

Note: Critical values are taken from Narayan (2005) for 35 observations

The null of no cointegration may not be accepted at 5% level of significance, as F-statistic (4.575) lies outside of the upper bound (4.194). Therefore, long run relationship may be concluded. The existence of long run relationship permit us to interpret the long run relationship among the variable.

6.5.3 Results of the Long Run Relationship

The estimated relationship between inflation, non-bank and banking sectors, in the long run, are given in the equation 6.9.

$$\widehat{cpi}_t = \underset{(0.0209)}{0.0354}bb_t - \underset{(0.0143)}{0.0088}nbb_t + \underset{(0.0197)}{0.5708}m2_t + \underset{(0.0115)}{0.0051}eb_t - \underset{(0.2501)}{4.0655} \quad (6.9)$$

The long run estimates of the third stage analysis indicates that bank borrowing has positive impact on inflation at 11% level of significance, while non-bank borrowing decrease inflation. The non-bank borrowing is insignificant but have negative sign. As quoted by Agha and Khan (2006) that non-bank borrowing is theoretically non-inflationary in nature, and the historical context of the non-bank borrowing also show negative association with inflation. In case of non-bank borrowing public have papers in hand while money goes to hands of government. Aggregate demand decreases which may reduce the inflation. So this may be the reason that non-bank borrowing is with negative sign, but insignificant. Another justification may be in case of borrowing from non-banking sector does not increase the monetary base, and hence do not contribute to inflation. Money supply plays an important role in determining inflation.

6.5.4 The Error Correction Mechanism

The ECM of the ARDL model shows short run fluctuations along with the error correction. The results of the ECM is given in Table 6.9

Table 6.9 : Results of Error Correction Mechanism

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM_{t-1}	-0.1824	0.0568	-3.2123	0.0033
Δbb_t	0.0036	0.0021	1.7397	0.0929
Δnbb_t	-0.0016	0.0025	-0.6548	0.5179
$\Delta m2_t$	-0.2155	0.1312	-1.6423	0.1117
Δeb_t	0.0009	0.0021	0.4444	0.6602
Δcpi_{t-1}	0.5400	0.1327	4.0684	0.0003

According to the short run analysis (Table 6.9) money supply and non-bank borrowing play no role in determining of inflation, as they are statistically insignificant. While previous year inflation plays major role in determination of inflation in the short run. The reason may be people expect more inflation in the next period. Therefore they may increase the demand for goods, increasing the price level in the economy. Correction in the error is 18.24 % every year, which is abit low. This may be because of the insignificance of the major variables in the model. However, on the basis of all these analysis we can say that bank borrowing is inflationary in nature as compared to the non-bank borrowing.

6.6 Fourth Stage Estimation

As it has been confirmed that both bank and non-bank borrowing have long run relationship with inflation. To check which part of the bank borrowing and non-bank borrowing is inflationary, bank borrowing is further bifurcated into two components, central bank borrowing (CBB) and schedule bank borrowing (SBB), while non-bank borrowing is comprised of National Saving Scheme (NSS), Pakistan Investment Bonds (PIBs) to individual and other non-bank institutions. The privatization proceeds were also counted into non-bank borrowing for budgetary support. But due to data

limitations, NSS is calculated as non-bank borrowing minus privatization proceeds[38]. In the same manner, central bank borrowing and schedule bank borrowings are the part of broad money M2. So to avoid multi time using same nature variable both CBB and SBB are subtracted from M2, named as M2M.

In this stage it is test which source of domestic financing fiscal deficit is less inflationary keeping external borrowing (EB) and M2 less CBB and SBB (M2M), the following equation is tested.

$$cpi_t = \beta_1 cbb_t + \beta_2 sbb_t + \beta_3 nss_t + \beta_4 eb_t + \beta_5 m2m_t + \nu_{4t} \qquad (6.10)$$

Where ν_{4t} is the white noise error term. Here $cbb_t, sbb_t \; and \; nss_t$ are considered as endogenous while eb_t and $m2m_t$[39] are exogenously treated.

Limitation in Fourth Stage Estimation: CBB and SBB data is available for 22 years only[40]. In such a small sample, to find long run relationship, we are left with the choice of ARDL[41]. Narayan and Narayan (2005) uses ARDL with 27 observations, and compare the computed bound test statistic with 30 observations critical bound given by Narayan (2005) while Pattichis (1999) uses only 19 observations for ARDL and compared the bound test statistic with critical bound given by Pesaran *et.al* (1996). These studies gives an edge to run ARDL with 22 observations using the critical values used by Narayan (2005).

[38] As according to Agha and Khan (2006) and Hussain, Ishrat (2007) non-bank borrowing is mostly comprised of NSS. Therefore it is assumed that NBB-Privatization proceeds=NSS

[39] M2 that part which is endogenously increased for fiscal deficit is removed from total m2. Therefore, only exogenous part is left.

[40] Thanks to Dr. Mansoor Saleemi, SBP who provided access to the data. Published data is only for 2001-14

[41] In small sample ADF is biased while ARDL do not require pre testing of unit root.

6.6.1 Results of ARDL Test

To find the long run relationship between central bank borrowing, schedule bank borrowing, national saving scheme and inflation, equation 6.10 is used for ARDL specification with 1 lag.[42] The results of the ARDL (1, 1, 0, 1) model is presented in Table 6.10.

Table 6.10 Results of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
cpi_{t-1}	0.478	0.088	5.447	0.0001
cbb_t	0.041	0.018	2.256	0.0435
cbb_{t-1}	0.034	0.019	1.793	0.0983
sbb_t	0.004	0.005	0.799	0.4399
nss_t	0.016	0.007	2.372	0.0353
nss_{t-1}	0.028	0.010	2.876	0.0139
eb_t	0.004	0.002	1.694	0.1161
$m2m_t$	0.247	0.043	5.780	0.0001
C	-2.725	0.401	-6.801	0.0000
R-Square	0.9991	$F_{ARCH}(1)$		0.8248
Std. Error of Regression	0.1919	$F_{ARCH}(2)$		0.8371
$F_{auto}(1)$	0.9048	$\chi^2{}_{Norm}(2)$		0.4574
$F_{auto}(2)$	0.6583	$F_{RESET}(1,27)$		0.6072

F-statistic probability is reported, as according to Pesaran and Prsaran (1997) in small sample F is preferred over LM.

ARDL (1, 1, 0, 1) clears all the diagnostic test, all the lagged coefficients are statistically significant, there is no problem of heteroscedasticity, autocorrelation, normality biasness, miss-specification error, which give confidence for bound test to be corrected.

[42] As there is less than 30 observation Lag selection criteria seems to work inappropriately. With 1 one lag, all of the selection criterion gives only one lag to be optimal. With 2 lags, 2 were optimal. Therefore for small sample only one lag was selected to save degrees of freedom. The reason of one lag to be appropriate also depends on the autocorrelation problem. The rest of the lag 2, 3 and even 4 lags were showing auto correlation problem therefore one lag was selected.

6.6.2 Results of Bound Test of Cointegration

The results of the bound test of cointegration is given in the Table 6.11.

Table 6.11: Results of Bound Test of Cointegration

Test Statistic	Value	K
F-statistic	11.355	3
	Critical Value Bounds	
Significance	**I_0 Bound**	**I_1 Bound**
10%	2.676	3.586
5%	3.272	4.306
1%	4.614	5.966

Note: Critical values are taken from Narayan (2005) for 30 observations

According to the Table 6.11 there is long run relationship among the said variables in equation 6.10, as the F-statistic lies outside the upper bound of the critical values.

6.6.3 Results of the Long Run Relationship

The estimated Long run relationship of equation (6.10) is expressed below;

$$\widehat{cpi}_t = \underset{}{-5.215} + \underset{(0.364)}{} \underset{}{0.144cbb_t} + \underset{(0.041)}{} \underset{}{0.007sbb_t} + \underset{(0.009)}{} \underset{}{0.083nss_t} + \underset{(0.010)}{} \underset{}{0.007eb_t} + \underset{(0.004)}{} \underset{}{0.472m2m_t} \underset{(0.013)}{}$$

This equation says that central bank borrowing(cbb_t), national saving schemes(nss_t) and exogenously increased money supply ($m2m_t$) contribute toward inflation, as they are statistically significant at 5% level of significant. In comparison, if significance is ignored, central bank borrowing is more inflationary than schedule bank borrowing as CBB have more coefficient magnitude than SBB and NSS. Similarly NSS is more inflationary than SBB. So CBB is the most inflationary source of financing fiscal deficit in Pakistan.

6.6.4 The Error Correction Mechanism

After confirmation of the long run relationship, the convergence to the long run mean is tested through ECM. The Results of the ECM is given in Table 6.12.

Table 6.12: Results of ECM

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ECM_{t-1}	-0.522	0.088	-5.958	0.0001
Δcbb_t	0.041	0.018	2.256	0.0435
Δsbb_t	0.004	0.005	0.799	0.4399
Δnss_t	0.016	0.007	2.372	0.0353
Δeb_t	0.004	0.002	1.694	0.1161
$\Delta m2m_t$	0.247	0.043	5.780	0.0001

There is negative and statistically significant ECM_{t-1} which gives sign of long run convergence may take place if short run deviation occurs due to some unexpected shocks. Which gives the confidence about long run relationship to be true, and hence we may conclude that there is long run relationship between borrowing from schedule banks, central bank and National Saving Schemes with inflation.

Chapter 7

Conclusion and Policy Recommendations

7.1 Conclusion

The basic aim of this study was to find the least inflationary source of financing fiscal deficit and to analyze the long run relationship between sources to finance fiscal deficit and inflation. For this purpose fiscal deficit was divided into different sources which are in practice in Pakistan, estimation was done in four segments depending upon the categorization of the sources of financing fiscal deficit. On the basis of unit root results two techniques were used, Johansen Cointegration Technique, and Autoregressive Distributed Lag model. The results of the first stage shows that there is long run relationship between fiscal deficit and inflation along with money supply. While the second stage results indicate that there is long run relationship between domestic borrowing, external borrowing and inflation, but domestic borrowing is more inflationary than external borrowing. In the third stage of estimation, it was experienced that bank borrowing and non-bank borrowing (parts of Domestic borrowing) have long run relationship with inflation. In this case bank borrowing was significantly contributing to inflation as compared to non-bank borrowing. So bank borrowing was more inflationary in nature then non-bank borrowing. In the fourth and last stage of estimation it was found that central bank borrowing, schedule banks borrowings (parts of bank borrowings), National Saving Scheme (part of non-bank borrowing) inflationary effects in the long run on inflation. Central bank borrowings were the most expensive source of financing as compared to schedule and National Saving Schemes.

7.2 Policy Recommendations

On the basis of the findings of the study following recommendations are put forwarded in order to fiscal deficit financing.

1. As external borrowing and non-bank borrowing were not contributing to inflation, so the government may try to manage the fiscal deficit from external sources.
2. If this is not in the hands of government to finance deficit from external sources then in the government may raise their funds for budgetary support from the non-bank borrowing and schedule bank borrowing. This will fulfill the budget deficit and would not cause the inflation to rise.

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Appendices

Appendix-1

Price Indices in Pakistan

Features	Price Index		
	CPI	WPI	SPI
Cities Covered	40	21	17
Markets Covered	76	-	53
Items Covered	487	463	53
Number of commodities Group	12	5	5
Number of Quotations	148,048[43]	-	11,236
Income Groups	5	5	5
Reporting Frequency	Monthly	Monthly	Weekly

Source: Pakistan Bureau of Statistic

[43] Price Quotations are taken from 4 different shopkeepers. Therefore total number of quotation is equal to the product of Number of quotation of a one commodity, number of markets covered and number of items covered. So 4*487*76=148,048

Appendix – II

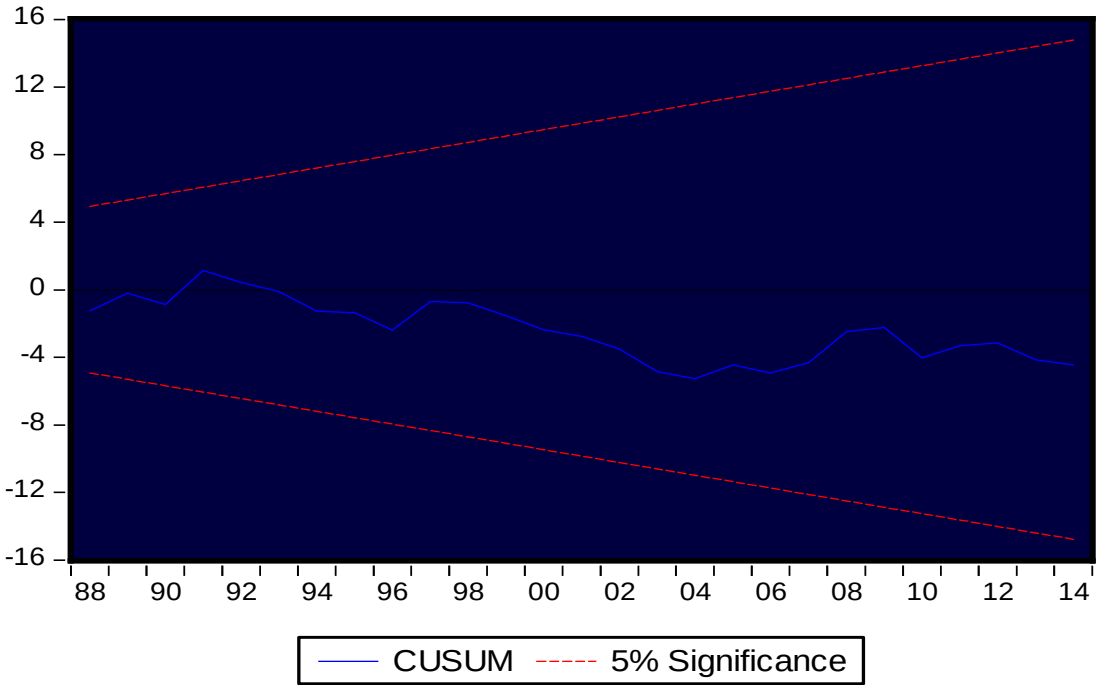
Results of Phillips Parron (PP) Test

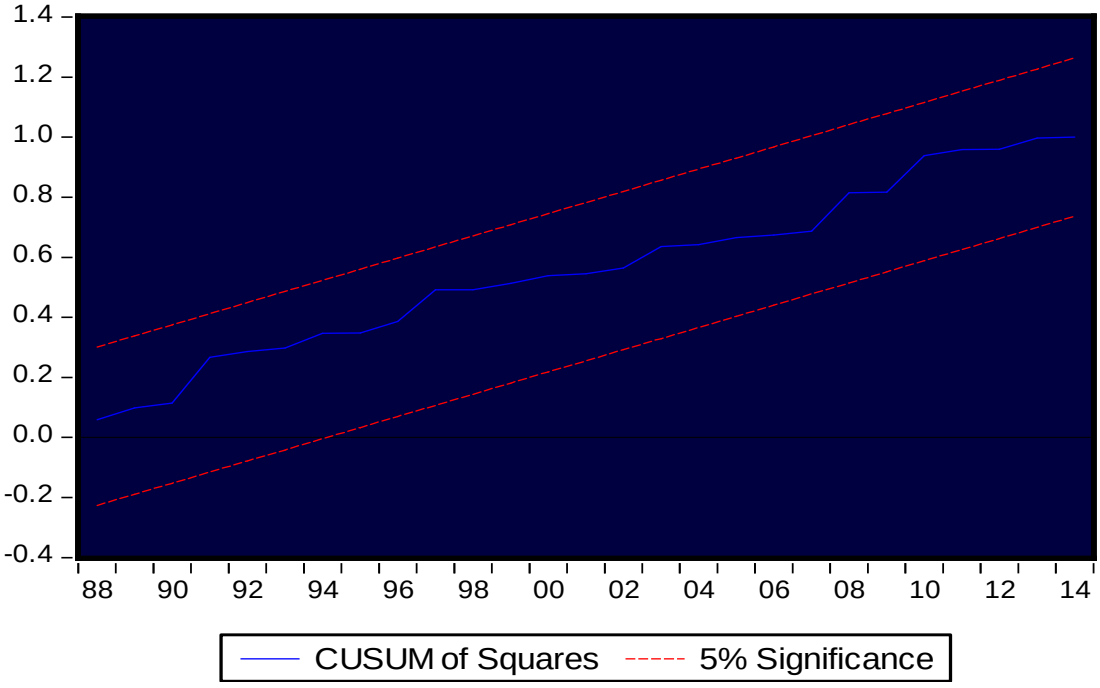
	Variables[44]	At Level	At First	Conclusion
Dependent Variable	cpi_t	-1.992	-3.211*	I(1)
	$m2_t$	-2.439	-4.527*	I(1)
Control Variable	$rgdp_t$	-1.5261	-3.713*	I(1)
Stage 1	fd_t	-2.584	-7.067*	I(1)
Stage 2	db_t	-2.633	-9.274*	I(1)
	eb_t	-8.451*	_____	I(0)
Stage 3	bb_t	-5.347*	_____	I(0)
	nbb_t	-5.483*	_____	I(0)
Stage 4	cbb_t	-3.779*	_____	I(0)
	sbb_t	-3.925*	_____	I(0)
	nss_t	-1.416	-3.389*	I(1)

[44] Unit root results are mentioned with trend and intercept in Level except NBB, SBB and NSS, they have only intercept. There is no trend at first difference in all variables.

Appendix-III

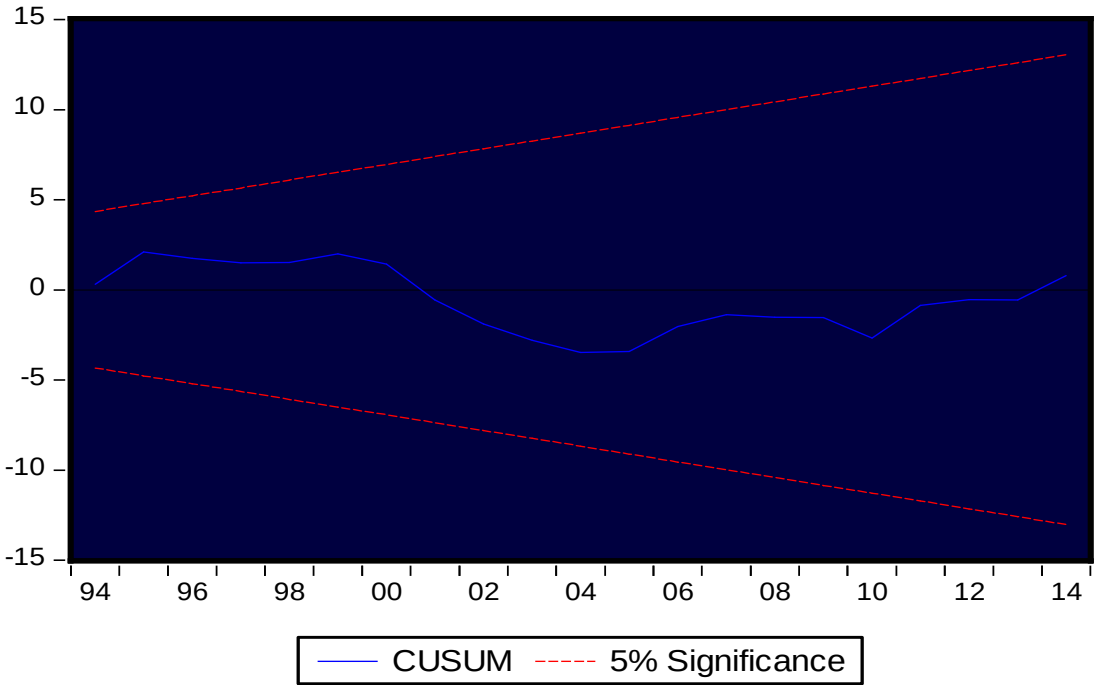
Results of CUSUM and CUSUM-Square of First Stage Estimation

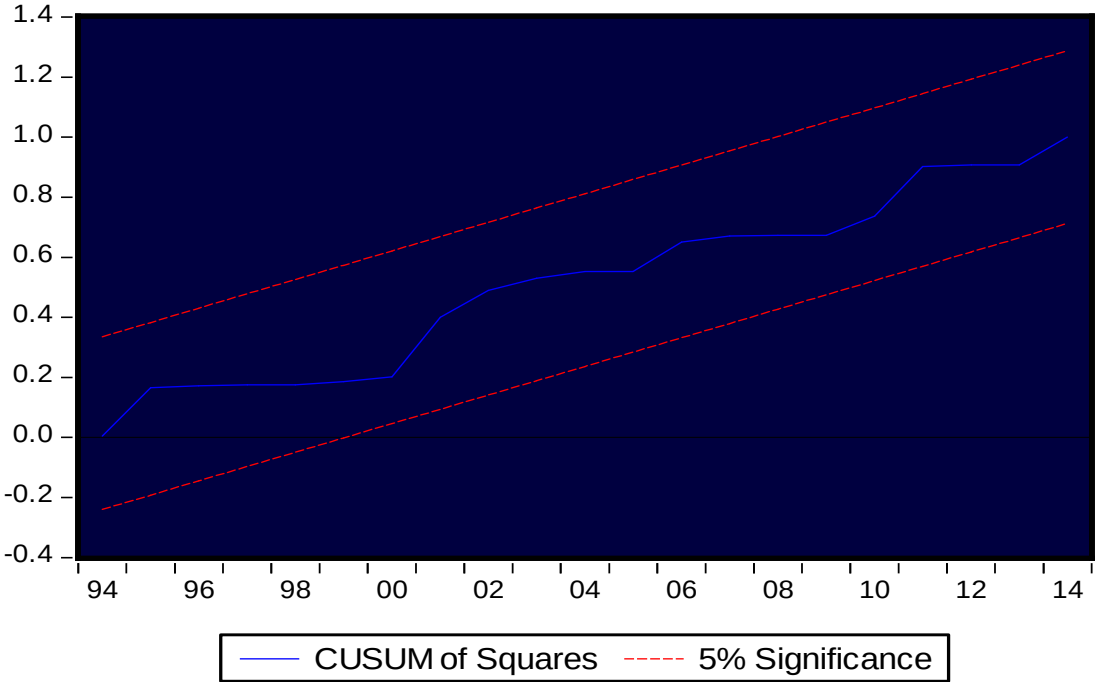




Appendix-IV

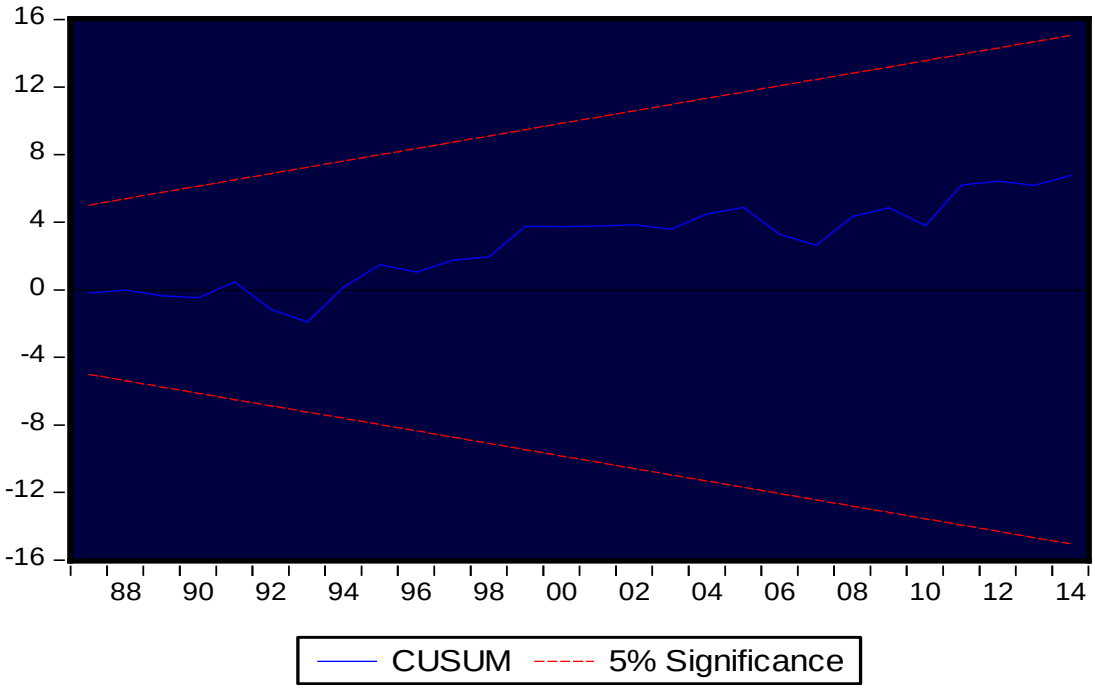
Results of CUSUM and CUSUM-Square of Second Stage Estimation

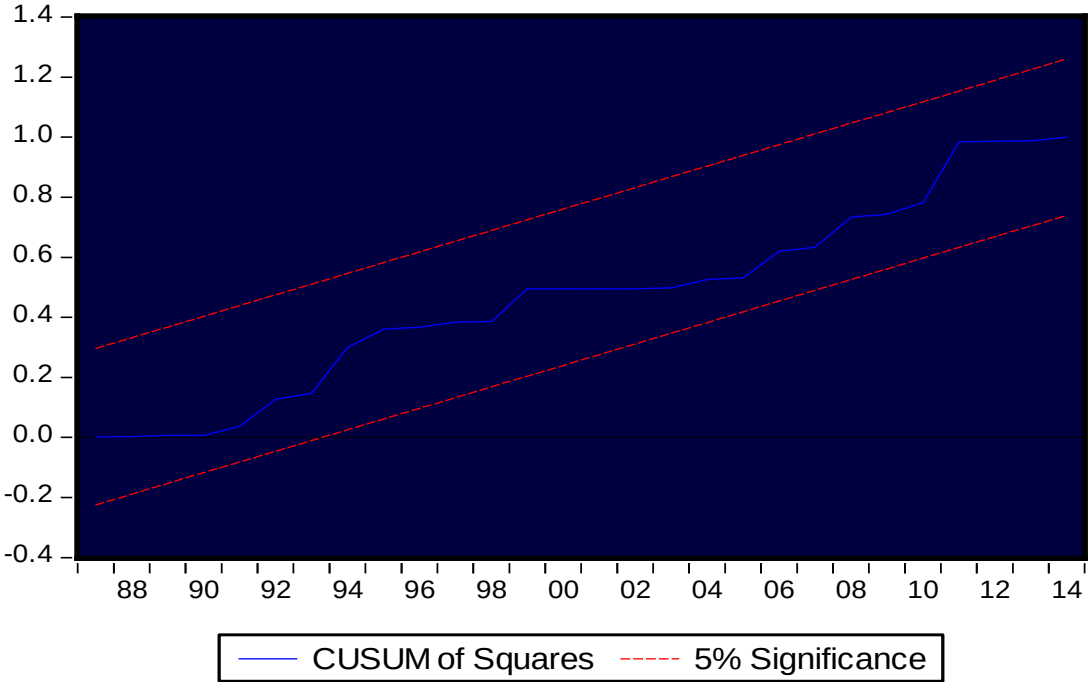




Appendix-V

Results of CUSUM and CUSUM-Square of Third Stage Estimation





Appendix-VI

Results of CUSUM and CUSUM-Square of Fourth Stage Estimation