IMPACT OF POLICY RATE ON MACROECONOMICS PERFORMANCE IN PAKISTAN

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CERTIFICATE

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Abstract

There are different theories explaining the relationship between policy rate and inflation. Some of these theories conclude that policy rate causes to reduce inflation, whereas some theories states that rising policy rate will lead to rise in inflation. The most popular theory is called "Demand channel of Monetary Transmission Mechanism", which states that increase in policy rate would reduce the money supply, aggregate demand and hence the inflation. On the other hand, the cost channel states that rising policy rate will increase the cost of production; therefore, inflation will rise and mark-up channel states that rising policy rate will increase mark-up payment which leads to increase in overall domestic debt. It is also possible that the downward push due to decrease in aggregate demand is cancelled by upward push due to increase in cost of production, and the net effect becomes insignificant which was seen in the study of Ghaffari (2013). The appropriate policy for controlling inflation would depend on the relative importance of demand and cost side of the monetary transmission mechanism. This study takes the help of historical data from 1975 to 2018 via source of World Bank data set to explore the nature of relationship between policy rate and macroeconomics performance. General to specific methodology was used by utilizing ARDL approach for investigating the desired relationship. We found the effect of policy rate on inflation and domestic debt is significantly positive but insignificant with budget deficit.

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Chapter 1

Introduction

Mainstream economic theory argued that when interest rate increases, inflation decreases which provides basis for traditional monetary policy while, since the beginning of history of monetary economics, the literature reveals the direct relationship between policy rate and inflation. This is also supported by Gibson (1923) about positive relationship between policy rate and inflation for United Kingdom (UK) and later on well known as Gibson paradox. Further, Sarjant (1973) worked on Gibson paradox and concluded positive relation between interest rate and inflation which was also confirmed by Tooke (1992).

A large number of economic theories argued a negative relationship between interest rate and inflation. This relationship is supported by the demand channel. According to this view when interest rate increases then people reduce current spending; keep their money in banks to earn high profits through high interest rate which leads to decrease in spending and decrease in aggregate demand (AD) then ultimately decrease in overall price level (inflation). But there are a large number of evidences against this view.

But Sims (1992) argued that the tendency of interest rate increases to predict inflation are harder to resolve with effective monetary policy. Similarly, Rehman (2016) established that the correlation between interest rate and inflation can be either positive or insignificant. He explained that when interest rate goes up then investors have to pay more interest which is directly transferred into the cost of products and then price of that commodity goes up. These arguments provide doubt about the validity of mainstream theory.

An important dimension missing from the literature that relates to government borrowing. As most of the governments have borrowed extensively from commercial banks. When interest rate increases then the mark-up payment on domestic debt (DD) also increases which leads to increase in budget deficit, as a result the governments need to impose more taxes. These taxes are directly transferred into the prices of goods. There are very strong evidences about this point of view in literature. Political leaders often justify the taxes referring to debt servicing. These arguments motivated us that the literature is just silent on the impact of taxes on debt servicing.

In traditional monetary policy, money supply was used as a policy tool and interest rate was determined by market. But from 1990s many central banks have adopted inflation targeting framework, where the inflation is the primary target and the interest rate is main policy tool. According to the theory, interest rate is increased to reduce inflation. But for the economies where public borrowing is high, then increase in interest rate leads to increased mark-up payments. Governments need more money to finance these markup payments and increasing expenditure which increases budget deficit (BD). This Deficit can be financed by one of the two methods:

i) Money printing

ii) Imposing Taxes

But unfortunately, both options are inflationary. Therefore, the increase in interest rate may end up in more inflation. But so far there is harder a study which explores this aspect, so this piece of research tries to explain the causal impact of policy rate on domestic debt, budget deficit and inflation in case of Pakistan.

1.2 Significance of the Study:

Pakistan is facing fiscal stress and inflation simultaneously. Interest rate is increased to control inflation which adds to domestic debt and fiscal stress. On the other hand, inflation does not seem to reduce by hike of interest rate. This may indicate the presence of cost channel and for presence of borrowing effect. Therefore, this study tries to investigate whether interest rate can work to control inflation in case of Pakistan. This will help policymakers in informed policymaking process.

1.3 Motivation

Since the independence, Pakistan economy has been facing budget deficit and huge domestic debt. The government heavily relied on internal debt to overcome the situation. Currently Pakistan economy is facing serious budget deficit, high interest rate and high inflation. There is a massive literature on impact of debt and budget deficit on long run interest rate, however, reverse causality has been unexplored. This study is motivated by the idea that whether the reverse causality exists. This study will also try to explain the effect of policy rate on domestic debt, budget deficit and inflation and to understand the sequences through which policy rate affects inflation.

1.4 Research Questions:

i) What is impact of policy rate on domestic debt, budget deficit and inflation?

ii) We want to understand through which channel policy rate affects inflation?

1.5 Objectives of the Research

i) To analyze the impact of policy rate on domestic debt and budget deficit in Pakistan.

ii) To identify the channel through which policy rate affects inflation.

1.6 Research Gap

There is sizeable literature available on the impact of domestic debt and budget deficit on long-term interest rate; and impact of either domestic debt or budget deficit on long term interest rate. We found few studies on the reverse causality like: impact of policy rate on domestic debt in case of Nigeria; and impact of policy rate on budget deficit volatility in Pakistan. But hardly a study found to check the impact of policy rate on direct budget deficit and on domestic debt. Therefore, this piece of study will try to fill this space in literature.

Chapter 2

Literature Review

Many papers have studied the impact of public debt and budget deficit on short run and long run interest rate. Some researchers discussed the impact of budget deficit on interest rate while others examined the impact of public debt on interest rate. However, the question that how short run interest rate (policy rate) effects public domestic debt is unexplored.

2.1 Effects of Budget Deficit and Debt on Interest Rate:

Laubach (2003) noted the significant impact of budget deficit and debt on interest rate. 25 points were seen increased in interest rate due to 1-point increase in deficit-GDP ratio. They took data from Congressional budget office (CBO) and Office of management and budget (OMB) of span 1976-1982. Similarly, Ardagna et.al (2007) also explored that one point increase in deficit/GDP ratio causes ten points increase in IR, and effect of TD on IR is non-linear in case of single country wise. Similar findings can be seen in the study of Kumar (2010) for the US. Collectively when OECD countries borrowing increases then interest rate also increases. They utilized time series data of 16 OECD countries of time span 1960-2002 from OECD economic outlook and financial data system of WB. They used unit root test and Generalized least square method as econometric technique.

Baldacci and Kumar (2010) concluded that increase in fiscal deficit and public debt both lead to significant increase in long-term interest rates in United States. They utilized the data of 31 advanced and emerging market economies from 1980 to 2008-. They have applied

the Generalized method of movement (GMM) to estimate the impact of fiscal deficit and and public debt on long-term interest rate.

2.2 Impact of Budget Deficit on Interest Rate:

Barth, Iden and Russek (1984) wrote a paper "Do deficit really matter?" They took data of United States. Budget deficit and debt were taken as independent variables and interest rate was taken as dependent variable. They concluded that both variables have significantly positive impact on interest rate. When budget deficit increases then interest rate also increases similarly when debt increases then interest rate also increases. Like Barth, Iden and Russek, Cebula (1988) also took annual data of U.S (1955-1984). He concluded that the effect of BD on IR is significantly positive. When BD rises then IR also increases. Cebula again (1992) took annual data of Italy from 1955 to 1989. He concluded from the estimation of data that there is positive significant effect of BD on IR in case of Italy. Instrumental variable technique was used to control endogeneity of budget deficit. But Giannaros and Kalluri (1989) took real interest rate and found no statistically significant relationship between budget deficit and real interest rate in five industrialized countries (Canada, France, UK, USA and Germany).

Durrat (1990) took the data of U.S (1955 to 1984) to check the causal relationship between FP and IR. To check causality, he used granger causality test and full information maximum likelihood test. He concluded that there is no causal relationship between fiscal policy and interest rate in case of no long run relationship between fiscal policy and interest rate. If there is long run relationship between fiscal policy and interest rate then causality between them would be possible. Similarly, Day (1992) also took United States data. He took both structural deficit and cyclical deficit and saw the impact of both on interest rate. He concluded that both structural deficit and cyclical deficit have significantly positive impact on interest rate.

Saji (1993) checked the correlation between BD and long term IR (both real & nominal) in U.K by taking quarterly (1960.1 to 1990.2). He came to the point that the impact of budget deficit is significantly positive on both nominal long term interest rate ad ex-real long term interest rate. He followed ISLM model for interest rate. Like Saji, Cebula (1997) took annual data and noted the significant positive impact of federal budget deficit on ten years treasury notes in United States of America. Previous study deals either nominal or real short term or nominal long term interest rate or real interest rate.

Gale and Orgzag (2004) saw the impact of budget deficit and national saving on long-term interest rate in United States by using time series data of range 1962 to 1980 from the sources CBO and OMB. Ordinary least square (OLS) was used as econometric technique for model estimations. When budget deficit increases then government saving decreases which leads to increase aggregate demand (Elmendorf and Minkiw, 1998). This creates excess supply of government debt, leading to higher interest rate.

Faini (2006) showed the relationship between fiscal policy and interest rate in Europe. He used time series data of span 1979-2002. ARMA model is used for inflation. He noticed that 1% increase in FD increase 41% in IR.

2.3 Impact of Total Debt on Interest Rate:

Tanzi and Fanizza (1995) took data from 18 industrial countries and G-7 countries to check the impact of public debt on interest rate. Data from 1970 to 1994 were taken from IMF and central bank of each country. They winded up that positive impact of public debt on interest rate through fiscal deficit channel; when public debt increases then fiscal deficit increases which leads to increase in interest rate.

Ganguly (1980) took United States data of government debt quarterly from 1954.1 to 1975.4 and checked the impact of government debt on interest rate. He concluded that there is significantly positive effect of TD on IR if more money is not injected into the system Similarly Karanga (2013) took data of domestic debt of Kenya from 2003 to 2012 and saw the impact of domestic debt on interest rate by using inferential statistics. He came to the point that it was seen significantly positive impact of domestic debt in interest rate in Kenya. Like Ganguly, Gamber and Seliski (2019) also scrutinized the impact of public debt of United States on interest rate by using reduced form regression. They took data from 1976 to 2017 and winded up that 1% increase in debt to GDP ratio leads to 2.3 basic points in interest rate.

Parveen and Munir (2017) took data of total debt, internal debt and external debt of Pakistan from 1973 to 2016 and checked their impacts on interest rate and got interesting results. They used loanable fund as theoretical model and ARDL, Bond testing approach for cointegration and granger causality test to estimate the results. They concluded that there is significantly negative impact of both total debt and external debt on interest rate but no significant long run relationship was found between internal debt and interest rate.

2.4 Impact of Inflation(π) on Interest Rate:

Feldstein and Eckstein (1970) took data of U.S quarterly (1954.1 to 1969.2). They concluded that there is significantly positive correlation between inflation and interest rate. Similarly Levi and Makin (1979) reworked on fisher hypothesis and took both anticipated inflation and real interest rate and checked their impacts on nominal interest rate. They took data from 1950 to 1960 and also from 1947 to 1975 and they got different results. The impact of both anticipated inflation and real inflation on nominal interest rate is unitary in case of date 1950-1960 but the correlation between them is less than unity in case of taking data span 1947 to 1975.

Levi and Makin (1979) took data of two time spans from 1950 to 1960 (short span) and 1947 to 1975 (long span) and got different results. They concluded that the impact of inflation upon interest rate is just opposite of fisher hypothesis short term impact of inflation is unity on interest rate while the long term impact of inflation on interest rate is less than unity in United States. Like Levi and makin, Tanzi (1980) saw the relationship between expected inflation and interest rate. Inflationary expected variable was used as only independent variable in explaining change in interest rate. He took data from 1959 to 1975. He concluded the positive effect of expected π on IR but not in same amount.

2.5 Impact of Interest Rate on Budget Deficit and Domestic Debt:

Moses and Ebere (2019) took data of Nigeria from 1975 to 2015 from the sources World bank (WB) national account data, debt management office (DMO) and central bank of Nigeria (CBN). They used cointegration and error correction model to check long run relationship and short run relationship between DD and its determinants respectively. They found short run impact of lagged values of BD, ED and GDP growth on DD and long run effects of current values of BD, TO, ED, IR and GDP growth on Domestic Debt in Nigeria.

Javed et.al (2011) took data of selected south Asian and association of south east Asian (ASEAN) countries from 1984 to 2010 by applying dynamic panel model and GMM of Blundell and Bond (1998) as econometric techniques for the interpretations of coefficients. They concluded that high income, inflation rate, and large budget deficit to GDP ratio are associated with large budget instability. Small countries with low population growth have more volatile budget deficit. Previous year budget deficit volatility is positively significant with current budget deficit volatility which indicates that budget deficit volatility has persistent effect and this result is consistent with inertia of budgetary process.

Rehman, A. U. (2015) concluded that the existence of Tooke's cost side effects of monetary policy is a serious concern because if these effects exist than the use of monetary policy would be counterproductive. Using the data from entire globe, he attempted to explore the nature of relationship between the interest rate and inflation. He found that the data supports the perception of Tooke and Gibson and denies that the effectiveness of monetary policy currently adapted by the correlation between interest rate and inflation is positive. The results are robust to sample size, sample period, and various definitions of interest rate and inflation.

Saleem, N. (2008) suggested that inflation is a monetary phenomenon. His examined the relationship between the determinants of inflation and its volatility by using monthly data for 1990:M1-2007:M5. The determinants of inflation are estimated by a VAR analysis, which shows that inflation, the interest rate and money supply move together. A VAR model assumes constant error variance. He relaxed this assumption by employing an ARCH/GARCH model and conclude that inflation is volatile in nature. For measuring the qualitative nature of the inflationary process we used an EGARCH model. It was confirmed that the time effect model is significant. It was also suggested that in the first four months of the calendar year, the inflationary shock is negative and it can, therefore, hamper growth.

Agnello, L., & Sousa, R. M. (2009) assessed the political, institutional and economic sources of public deficit volatility. Using a system-GMM estimator for linear dynamic panel data models on a sample covering 125 countries from 1980 to 2006, their study showed that a higher level of political instability leads to an increase in public deficit volatility. The effects are magnified in the face of episodes of hyper-inflation and quantitatively large: an additional cabinet change raises deficit volatility by 15%, while a new incoming signal of government crisis increases it by

45%. In addition, they found the political regime and the country size are other important sources of the instability of the budget deficit. Finally, the empirical findings suggested that high inflation rate and a large deficit-to-GDP ratio are typically associated to deficit instability. Moreover, richer countries - that is, the ones where real GDP per capita is larger - are frequently characterized by stable budget deficits.

Agnello, L., & Sousa, R. M. (2008) decomposed fiscal policy in three components in their previous study: i) responsiveness, ii) persistence and iii) discretion. Using a sample of 132 countries, their results pointed out that fiscal policy tends to be more persistent than to respond to output conditions. It was also found that while the effect of cross-country covariates is positive (negative) for discretion, it is negative (positive) for persistence thereby suggesting that countries with higher persistence have lower discretion and vice versa.

Akitoby, M. B. et.al, (2004) examined the short and long term government spending as compare to output in 51 countries. They found in short term the main parts of government spending increase with output in about half of the sample countries, with some variation across spending categories and countries, further they found that there is a long term relationship between government spending and output for the majority of the countries for at least one spending aggregate in the short term, they found that power diffusion and government size typically diminish the positive response of government appending to output.

Alesina, A., & Perotti, R. (1995) provided a critical survey of the literature on politico-institutional determinants of the government budget. they organized their discussion around two questions: Why did certain OECD countries, but not others, accumulate large public debts? Why did these fiscal imbalances see in the last twenty years rather than sooner? they began by discussing the “tax smoothing” model and concluded that this approach alone cannot provide

complete answers to these questions. they then moved to a discussion of political economy models, which they organized into six groups: (1) models based upon opportunistic policy makers and naive voters with "fiscal illusion"; (2) models of intergenerational redistributions; (3) models of debt as a strategic variable, linking the current government with the next one; (4) models of coalition governments; (5) models of geographically dispersed interests; and (6) models emphasizing the effects of budgetary institutions.

Alesina, A., & Tabellini, G. (2008) found that Fiscal policy is procyclical in many countries, and especially in developing ones. They explained that policy failure with a political agency problem. Procyclicality is driven by voters who seek to "starve the Leviathan" to reduce political rents. Voters observe the state of the economy but not the rents appropriated by corrupt governments. When they observe a boom, voters optimally demand more public goods or fewer taxes, and this induces a procyclical bias in Öscal policy. The empirical evidence is consistent with this explanation: procyclicality of Öscal policy is more pronounced in more corrupt democracies.

Furceri, D., & Ribeiro, M. P. (2008) provided empirical evidence showing that smaller countries tend to have more volatile government spending for a sample of 160 countries from 1960 to 2000. They argued that the larger size of a country decreases the volatility of government spending because it acts as an insurance against idiosyncratic shocks, and it leads to increasing returns to scale due to the higher ability of the government to spread its cost of financing over a larger pool of taxpayers. The results are robust to different time and country samples, different econometric techniques and to several sets of control variables. The analysis also reveals that country size is negatively related to the optional part of government spending and to the volatilities of most of the government spending items.

Leachman, L. L et.al, (2007) pointed out that political economy literature suggested that several characteristics of populations and politico-economic institutions – extent of poverty, partisanship of government, parliamentary support, government duration, federalism, corporatism, transparency in budgeting, and strength of the fiscal bureaucracy – may influence budgetary management. they empirically assessed the significance of these factors as determinants of fiscal outcomes.

Ramey, G., & Ramey, V. A. (1994) presented empirical evidence against the standard dichotomy in macroeconomics that separates growth from the volatility of economic fluctuations. In a sample of 92 countries as well as a sample of OECD countries, they found that countries with higher volatility have lower growth. The addition of standard control variables strengthens the negative relationship.

Ahmed, S., & Rogers, J. H. (1995) tested whether long-term data from the U.S. and U.K. are consistent with the intertemporal government budget constraint and external borrowing constraint, both individually and simultaneously. A very strong test was provided by our focus on whether the present value constraints (PVCs) continue to hold despite unusual events, such as wars, that cause a structural break in the short-run dynamic behavior of the variables.

Alesina, A., & Tabellini, G. (1990) considered that an economy in which policymakers with different preferences alternate in office as a result of elections. Government debt is used strategically by each policymaker to influence the choices of his successors. If different policymakers disagree about the desired composition of government spending between two public goods, the economy exhibits a deficits bias; that is, debt accumulation is higher than it would be with a social planner.

Adams, F. G. (1988) concluded that the federal government's budget deficit of more than $150 billion, some 3 to 4 percent of gross national product, is widely perceived as a serious problem. He considered policy for wiping out the deficit without recession. Simulations of the Wharton econometric model showed that a tax increase would have some slowing effect on the economy but would not cause a recession. Recognition of the possibilities for monetary stimulus, once the deficit is in hand, suggests that the domestic budget deficit can be eliminated without causing an economic slowdown.

Barro, R. J. (1986) concluded that the British data from the early 1700s through World War I provided an unmatched opportunity for studying the effects of temporary changes in government purchases. He examined the effects of these changes on interest rates, the quantity of money, the price level, and budget deficits. Temporary increases in government purchases--showing up in the sample as increases in military outlays during wartime--had positive effects on long-term interest rates. The effect on the growth rate of money (bank notes) was positive only during the two periods of suspension of the gold standard (1797-1821 and 1914-1918).

Maria, G. A. examined that a large set of economic, sociopolitical, and institutional variables in a panel of 31 developed and developing countries over the period of 1995-2012 to derive robust conclusions about which variables are important in explaining cross-country differences in public sector deficits. Financial depth, income inequality, cabinet size, and centralization of authority in budgetary decisions are found to be significant and robust determinants of public deficits. arrangements.

Abbas, S. A., & Christensen, J. E. (2010) developed a new public domestic debt database covering 93 low-income countries and emerging markets over 1975–2004 to estimate the growth impact of domestic debt. Moderate levels of noninflationary domestic debt, as a share of GDP

and bank deposits, are found to exert a positive overall impact on economic growth. Granger-causality regressions suggested support for a variety of channels: improved monetary policy; broader financial market development; strengthened domestic institutions/accountability; and enhanced private savings and financial intermediation.

Adofu, I., & Abula, M. (2010) pointed that the rise in domestic debt profile in Nigeria is attributed to government extra budgetary activities, which most often are not used for the intended project. Commitment to budget should be encouraged for fiscal discipline on the part of the government and its agencies. The government and the Debt Management Office (DMO) should drawn up guidelines to limit the growth of future domestic debt. In this regard, debts service ratio must not exceed 40percent of allocation from the federation account. Effective mechanism should be put in place to ensure that any new borrowing is judiciously utilized to contribute to economic growth

Atique, R., & Malik, K. (2012) examined the determinants of economic growth for Pakistan, the impact of domestic debt and external debt on the economic growth of Pakistan separately over period of 1980 to 2010, using Ordinary Least Square (OLS) approach to Cointegration, Unit Root Testing, Serial Correlation Testing, test for checking Heteroskedasticity and CUSUM test of stability. The findings suggested an inverse relationship between domestic debt and economic growth and also the relationship between external debt and economic growth was found to be inverse. These relationships were found to be significant as well. The results also concluded that external debt amount slows down economic growth more as compared to domestic debt amount. The negative effect of external debt is stronger on the economic growth in comparison to domestic debt. Some policy implications for coming out of debt overhang scenario are also presented.

Sheikh, M. R., Faridi, M. Z., & Tariq, K. (2010) investigated the impacts of domestic debt on economic growth in Pakistan applying the OLS technique for the period of 1972 to 2009. Their study indicated that the stock of domestic debt affects the economic growth positively in Pakistan. This clearly means that the resources generated through domestic borrowing have been used partially to finance those expenditures of government which contribute the economic growth. The study also observes that there is an inverse relationship between domestic debt servicing and economic growth.

Hayat M & Hayat (2010) concluded that Foreign Aid or External debt is considered a significant source of income for developing countries. Pakistan has relied much on foreign debt to finance its balance of payments deficit and saving investment gap. This heavily dependence on external resources became uncontrollable in late 1980s. Primary objective of this paper is to explore the relationship between external debt and economic growth in Pakistan for the period of 1972 to 2005, using time series econometric technique. they took a point of glance of external debt and economic performance of Pakistan.

Levy and Chowdhury (1993) has concluded that an increase in the public and publicly guaranteed external debt may indirectly depress the level of GNP by discouraging capital formation and encouraging capital flight due to tax increase expectations. Cunningham (1993) found that debt burden has a negative effect on economic growth because of the impact on the productivity of labour and capital. In another study Sawada (1994), found that heavily indebted countries (HICs) have debt overhang problems.

Singh, C. (1999 investigated the relationship between domestic debt and economic growth. The traditional view considers that in the long run, domestic debt has a negative impact on economic growth while the Ricardian equivalence hypothesis implies the neutrality of domestic debt to

growth. In India, domestic debt has been incurred mainly on the consideration that it shall be used for investment purposes. The issue was empirically examined using the cointegration test and the Granger causality test for India over the period 1959-95. Cointegration and the Granger causality tests supported the Ricardian equivalence hypothesis between domestic debt and growth.

Jibran, et.al. (2016) examined the effect of public debt on economic growth for Pakistan over the period 1972 to 2012. Autoregressive distributed lag (ARDL) bounds testing procedure was applied to explore the long and the short run liaison between public debt and economic growth. This study examined the effect of public debt on both the Gross Domestic Product (GDP) and the Grass National Product (GNP) unlike other studies, which examined only one indicator of economic growth. Public debt includes both external debt and domestic debt. Their findings revealed a significant negative effect of external debt on GDP and GNP in the long run and in the short run. Further, debt servicing is inversely influencing GDP and GNP in the short run. However, domestic debt is found to have no effect on economic growth.

Shah U.M (2018) identified the potential determinants of inflation rate in the presence of ARCH effect for Pakistan using monthly data over 2001:M1-2015:M12. These variables based on the theory of price mark-up model with non-nested theory-based model. It was comprised into two applications of econometric modeling and issue. Dynamic analysis for inflation is without ARCH effect through time series analysis like co-integration, model selection, general to specific methodology.

Agha, A. I., & Khan, M. S. (2006) investigated the long-run relationship between inflation and fiscal indicators in Pakistan using annual data from Fiscal Year (FY) 1973 through FY 2003. The empirical results, using Johansen cointegration analysis, suggested that in the long-run inflation

is not only related to fiscal imbalances but also to the sources of financing fiscal deficit, assuming the impact of real GDP and exchange rate as exogenous. In VECM model, inflation has significant error correction coefficients that implicitly conclude that inflation is affected by government's bank borrowing for budgetary support as well as fiscal deficits. Therefore, in Pakistan, fiscal sector is dominant in explaining price movements.

Bokil, M., & Schimmelpfennig, A. (2005) presented three empirical approaches to forecasting inflation in Pakistan. The preferred approach is a leading indicators model in which broad money growth and private sector credit growth help forecast inflation. A univariate approach also yielded reasonable forecasts, but seems less suited to capturing turning points. A vector autoregressive (VAR) model illustrates how monetary developments can be described by a Phillips-curve type relationship

Balakrishnan, R. et.al (2006) reported U.S. inflation dynamics by separating out structural from cyclical effects using frequency domain techniques. Most empirical studies of inflation dynamics do not distinguish between secular and cyclical movements, and they showed that such a distinction is critical. In particular, they studied traditional Phillips curve (TPC) and new Keynesian Phillips curve (NKPC) models of inflation, and conclude that the long-run secular decline in inflation cannot be explained in terms of changes in external trade and global factor markets.

Bulkley, G. (1981) noted that the extra saving which is induced is not to be regarded per se as an addi- tional cost of inflation as in the case of Deaton (I978) or Juster and Wachtel (1972), for it represents a rational response by consumers to inflation under fixed wage contracts. The model developed in his paper also suggests an explanation of why the demand for liquid assets should have been so high during the inflation of the I 970S, when the real yield was so low.

Ahmad N, & Chaudhary A.M (1995) concluded that the domestic financing of budget deficit, particularly from the banking system, is inflationary in the long run. Our results provide support for a positive relationship between budget deficit and inflation during acute inflation periods, i.e., 1970s.

Dwyer Jr, G. P. (1982) pronounced positive correlation of inflation and government deficits in the United States since World War II. The purpose of this paper is to test the three leading explanations of this correlation. These three explanations are: (a) a deficit increases prices through a wealth effect; (b) a deficit results in the Federal Reserve purchasing debt, thus increasing the money supply and prices; and (c) expected inflation increases the deficit (which is the change in the nominal value of bonds).

Edwards, S., & Tabellini, G. (1991) investigated empirically that determinants of inflation and fiscal deficits in developing countries. They first tested the optimal taxation theory of inflation for a group of 21 LCDs. They found that the implications of this theory are rejected for all these countries. They then proceeded to implement a number of tests based on the new political economy approach to macroeconomic policies: they dealt with some of the implications of a credibility and reputation model, and of a strategic government behavior model.

Galı, J., & Gertler, M. (1999) developed and estimated a structural model of inflation that allows for a fraction of firms that use a backward-looking rule to set prices. The model nested the purely forward-looking New Keynesian Phillips curve as a particular case. They used the measures of marginal cost as the relevant determinant of inflation, as the theory suggests, instead of an ad hoc output gap. Real marginal costs are a significant and quantitatively important determinant of inflation.

Khan, A. H. et.al (1996) attempted in their paper to provide some explanation regarding the persistence of inflation. Using annual time series data for the period 1971-72 to 1994-95 they estimated three types of inflation equations - namely, the overall inflation, the food-price inflation, and the non-food price inflation. The reason why they disaggregated the overall inflation is that they believed that an aggregate inflation equation may conceal important information regarding the factors contributing to the recent upsurge in inflation. They showed that the relationship between the studied variables is insignificant in the long-run but the outcomes of VAR model illustrate that a short run positive relationship between the studied variables cannot be ignored. The study further indicates that 1% change in budget deficit and money supply caused to change the inflation by 0.29 and 0.31 times respectively in the short run.

Mubarik, Y. A., & Riazuddin, R. (2005) estimated the threshold level of inflation in Pakistan [à la Khan and Senhadji (2001)] using annual dataset from 1973 to 2000. The estimated model suggests 9 percent threshold level of inflation above which inflation is inimical for economic growth. They estimated the causality test, an application of threshold model and finally its sensitivity analysis using home country dataset of inflation and output growth suggest the following major findings. The Granger Causality test defines causality direction from inflation to economic growth and not vice versa (uni-directed). The threshold model estimation recommends 9 percent threshold inflation level for economic growth at which inflation is red alert for economic growth. The sensitivity analysis, conducted for the robustness of the model, also suggests the same level of threshold inflation.

Conclusion:

Existing literature has focused on impact of public debt and budget deficit on interest rate. This investigation was meaningful when the interest rate was endogenously determined. But now, the interest rate is exogenously determined by central banks. Now the appropriate question is to investigate the effect of interest rate on the other variables including the inflation, public debt and budget deficit.

Unfortunately, literature cannot be found investigating effect of policy rate on the budget deficit and domestic public debt. The literature has focused on the impact of public debt and budget deficit on the interest rate, but not the reverse effect has been discussed, because traditionally interest rate was endogenous (market determined) variable. But after popularity of inflation targeting framework, interest rate has become the policy variable determined exogenously by central bank and the budget deficit depends on it. Therefore, there is need to investigate effect of policy rate on the budget deficit, domestic debt, inflation and other variables.

Chapter 3

Methodology and Data Description:

As stated above that, different theories argue different impact of interest rate on domestic debt (DD), budget deficit (BD) and inflation (π). Some theories noticed positive impact of interest rate on debt and budget deficit; a few studies showed no relationship between them. A number of studies suggested positive relation between interest rate and inflation(π) which is prominently supported by the famous demand side effect of monetary transmission mechanism, whereas cost channel and mark-up channel suggest that rise in interest rate leads to increase in prices. The impact of interest rate on inflation also show opposite results. So we cannot rely to prefer one theory on another. Therefore, we start with general model that should contain all relevant variables and construct a final model by simplifying it. The methodology consists of the following:

- General to Specific(GETS) Methodology
- Simplifying the Most General Model(MGM)
- Test the Long-run relationship
- Test Granger Causality(GC) Test
- Contemporaneous Granger Causality(CGC) and estimating long run relationship(LRR).
- Estimation of Static long run Solution(SLRS).

Before the explanation of the methodology and empirical models, here is a brief description of the variables that will be used in the analysis.

Data and Variables Description:

For studying the relationship among the macroeconomic variables like policy rate, domestic debt, budget deficit and inflation we have considered annual time series data for the period 1975 to 2018.

There are number of relationships among variables that have been analyzed in the literature but, in our study we have chosen variables in accordance with the relevance to our study objectives.

The explanation of the variables is as follows:

We have used discount rate (DR) as proxy of interest rate or policy rate and Consumer price index (CPI) as proxy for inflation will be denoted by (π) in the analysis. Policy rate is an independent variable but the budget deficit, domestic debt and inflation are considered as dependent variables.

Budget deficit is actually the difference between total expenditures (TE) and total revenue (TR). While domestic debt of the government includes Treasury securities (TS) or Securities (S) borrowed from central bank.

Other variables used in the model for analysis are following:

- Current Expenditure (CE)
- External Debt(ED)
- Total Expenditure (TE)
- GDP Growth(GDPG)
- Domestic Credit to Private Sector(DCPS)
- GDP Per Capita(GDP)

- Trade Openness(TO)
- Import Value Index(IVI)
- Export Value Index(EVI)
- Exchange rate (ER)
- Money supply (MS)
- Tax revenue (TaxR)
- Total Debt(TD)

The data on these variables has been obtained from the World Bank and different Pakistan economic surveys.

3.1 GETS methodology and construction of the Most General Model:

Our objective is to find out the impact of interest rate on DD, BD and π. In this way DD, BD and π are taken as dependent variables and interest rate is taken as explanatory variable. However, DD, BD and π are not only depending on interest rate, but also on many other variables, and if these variables are excluded from model, the estimates of remaining model may provide misleading results. Therefore, it is important to incorporate all the major determinants of DD, BD and π in the model to have consistent and unbiased estimates of the parameters.

As we know the theories connecting interest rate with DD, BD and π are conflicting. This problem can be solved by formulating the Most General Model (MGM) which encompasses different theories and then applying various restrictions on the parameters and then testing their validity. This approach was applied by Davidson et al. (1979) on different theories of consumption behaviors of U.K consumers. The study of Davidson et al. (1979) is one of the most cited and appreciated research in economics. They formulated the MGM containing all variables

used in previous studies and obtain a general model after testing certain restrictions; finally, the simplified model had sound theoretical explanation and matched with data. Therefore, in our study we will apply GETS methodology.

We construct three models as follows:

1) We formulate a model to see the effect of interest rate on domestic debt,
2) We construct a model to analyze the effect of interest rate on budget deficit.
3) A model to see the impact of interest rate on inflation (π).

3.2 Constructing the Most General Model:

As the objective of our study is to analyze the impact of policy rate on domestic debt and budget deficit in Pakistan. So we have incorporated discount rate and other variables as explanatory in the model. So the functional form of the domestic debt model can be:

$$DD = f(DR, CE, \pi, ED, TE, GDPG, BD, DCPS\ )$$

Where

DD = Domestic Debt;

DR = Discount Rate as a Proxy of Policy Rate

CE = Current Expenditures

π = Inflation

TE = Total Expenditures

GDPG = GDP Growth

BD = Budget Deficit

DCPS = Domestic Credit to Private Sector

On the basis of the functional form we have an econometric model as:

$$DD_t = \alpha_0 + \alpha_1 DR_t + \alpha_2 CE_t + \alpha_3 \pi_t + \alpha_4 ED_t + \alpha_5 TE_t + \alpha_6 GDPG_t + \alpha_7 BD_t + \alpha_8 DCPS_t + \varepsilon_{1t}$$

Where subscript 't' indicates time and ε_{1t} is the error term.

Similarly, interest rate effects budget deficit through different channels. So budget deficit may be function of interest rate, inflation rate, tax rate, government revenue, government spending, capital expenditure and growth rate. Therefore the function will be:

$$BD = f(DR, CE, \pi, GDP, TR, TE, TO, ED)$$

Where

GDP = GDP Per Capita,

TO = Trade Openness;

ED = External Debt

So the econometric model specification will be:

$$BD_t = \beta_0 + \beta_1 DR_t + \beta_2 CE_t + \beta_3 \pi_t + \beta_4 GDP_t + \beta_5 TR_t + \beta_6 TE_t + \beta_7 TO_t + \beta_8 ED_t + \varepsilon_{2t}$$

Different channel of monetary transmission mechanism show that π may be a function of DR, total credit (TC), import prices index (IPI), export price index, exchange rate and money supply (MS). Which are shown as

$\Pi = f\ (DR, TD, IVI, EVI, ER, MS)$

Where

TD = Total Debt

IVI = Import Value Index

EVI = Export Value Index

ER = Exchange Rate

MS = Money supply

3.3 Simplifying the Most General Model:

There are many theories for the determinants of DD, BD and π containing different set of independent variables. All of them have important implication theoretically for domestic debt, budget deficit and π. So if we want to analyze the effect of policy rate on domestic debt, budget deficit and π, we should the control the effect of all the covariates so that the marginal effect of interest can be calculated. However, including all the relevant variables in models for domestic debt, budget deficit and inflation yield a very large model, which is not suitable because a parsimonious model are always preferable over a large model. Therefore, GETS can be adopted to select the set of regressors for domestic debt, budget deficit and π. GETS methodology can be applied in many ways. The method which we are using is described as below:

We are using various measures of government DD and DR

Let $Set\ 1 = (DD_{1t}, DD_{2t}, \ldots\ldots DD_{kt})$ be the set of DD in different time periods and $Set\ 2 = (DR_{1t}, DR_{2t}, \ldots\ldots DR_{kt}$ be the set of DR in different times.

Now we are going to use different measures of BD and IR

Let $Set\ 1 = (BD_{1t}, BD_{2t}, \dots \dots BD_{kt})$be the set of BD in different time periods and $Set\ 2 = (DR_{1t}, DR_{2t}, \dots \dots DR_{kt})$ be the set of interest rate in different time periods.

At last our third model, in which ae are using different measures of π and IR.

Let $Set\ 1 = (\pi_{1t}, \pi_{2t}, \dots \dots \pi_{kt})$ be the set of π in different time periods and $Set\ 2 = DR_{1t}, DR_{2t}, \dots \dots DR_{kt})$ be set of different DR in different time periods.

1. We take pairs of $(DD_i,\ DR_m), (BD_i,\ DR_m)\ and\ (\pi_i,\ DR_m)\ where\ DD_i, BD_i, \pi_i$ are the measures of domestic debt, budget deficit and inflation respectively from set 1 and DR_m is the measure of policy rate from set 2.
2. Estimate (ARDL) taking DD, BD and Π as dependent variables and lag of DD, BD, and Π, lag and current values of other regressors as independent variables.
3. Apply restrictions on all lags of each regressor.
4. Repeat the above-mentioned process for all possible combination of DD & DR, BD & DR and Π & DR
5. Remove the variable in case of insignificant in all the models in step 4

Autoregressive Distributed Lag (ARDL) Model OR Bound Testing Approach:

This approach was introduced by Pesaran et al. (2001) which is based on his own paper in (1995, 1999). It is also known as Bound Testing Approach to find out long run relationship between time series variables and it is a single equation model. It also finds the short run and long-run dynamics. This approach is distinguished than others on the following grounds: In the first place the variables to be studied either are I (0) OR I (1) OR mixture of both; Secondly, it is appropriate for small sample data; Thirdly, it do not require the pretesting of unit root; Fourthly,

it considers all variable as endogenous; and finally, it is most appropriate than any other approach like Engle Granger which can be applied only for two variables, the multivariate cointegration techniques like Stock and Watson (1988), Johansen (1988), Johansen and Juselius (1990) are more appropriate for large samples but Johansen and Juselius approach also requires that all variables should be integrated of order one.

3.4 Testing the Long Run Relationship using Bound Testing Approach:

Non stationary in economic variables have generated extraordinary problems in the of time series data. The existence of a long run relationship between two variables will be analyzed by Bound Testing approach. This approach was introduced by Pesaran (2001). It has the characteristic to bypass the complications involved in stationary testing and can be used to verify the existence of the long run relationship between series regardless of the fact that whether they are stationary or not. It is described as:

Run the following Regressions.

$$\Delta DD = \alpha + \beta_1 DD_{t-1} + \beta_2 DR_{t-1} + \alpha_2 \Delta DR_t + \sum_{j=1}^{k} (\sigma_j \Delta DD_{j-1} + \gamma_j \Delta DR_{t-j}) + \varepsilon_{1t} \dots\dots\dots\dots (1)$$

$$\Delta BD = \alpha + \beta 1 DR_{t-1} + \beta 2 \Delta DR_t + \sum_{j=1}^{k} (\sigma_j \Delta BD_{j-1} + \gamma_j \Delta DR_{t-j}) + \varepsilon_{2t} \dots\dots\dots\dots (2)$$

$$\Delta \pi = \alpha + \beta 1 DR_{t-1} + \beta 2 \Delta DR_t + \sum_{j=1}^{k} (\sigma_j \Delta \pi_{j-1} + \gamma_j \Delta DR_{t-j}) + \varepsilon_{3t} \dots\dots\dots\dots (3)$$

The Greek letters α, α_1, β_1, β_2, σ_j and γ_j denote the parameter coefficient and ε_t is the error term.

- Apply restriction of $\beta_1 = \beta_2 = 0$ through F-Test
- Compare the F-statistics with the bounds, proposed by Pesaran (2001)
- If the F-statistics > upper bounds, then long run relationship exist.
- If the F-statistics < lower bounds, then the long run relationship does not exist.

3.4 Testing Granger Causality

The First purpose of this research is to analyze whether if there is some effect of DR on DD, BD and π. For this purpose we will test the existence of relationship between two variables via GC. GC test states that the past values of cause variables DR has help in predicting DD, BD and π. If the past values of i help in predicting DD, BD and π then DR Granger causes DD, BD and π.

Suppose we test whether DR Granger causes on DD, BD and π or not. If the distributions of DD, BD and π & lag values of DR is equal to distribution of DD, BD and π respectively conditional it`s on lag then DR does not grange cause DD, BD and π.

There are different procedures of testing GC. The procedure we will adopt is as follows.

- Regress DD, BD and π on its own lags, lag value of DR and lag value of other control variables.
- Apply restriction of all lags of DR via standard long run test
- If the restriction is significant then previous values of DR play no role to determine DD, BD and π and DR does not Granger Cause DD, BD and π.

3.5 Contemporaneous Granger Causality (GC) and Estimating Long Run Relationship:

Major difference between GC and contemporaneous GC is the inclusion of current values of regressors with their lags. In the testing procedure of standard GC is assumed that the cause

appears before the consequence. However contemporaneous GC assumes that the current values of cause variable also effect the dependent variable. Therefore, the procedure is as follows:

- Regress BD on previous values of BD, current value and previous values of DR, and current values and previous of Xi (other regressors).
- Regress DD on previous values of DD, current value and previous values of DR, and current values and previous values of Yi (other independent variables).
- Regress π on previous values of π, current value and previous values of i, and current values and previous values of Zi (other explanatory variables).
- Apply restrictions of all previous values of DR via standard long run test.
- If restriction is significant then previous values of DR play no role to determine BD & DR, DD &DR and π & DR do not cause BD, DD and π respectively.

3.6 Estimation of Static Long Run Solution:

The third step to check the impact of DR on Bd, DD and π is to calculate the Static LRR between IR & BD, DR & DD and IR and π. For this purpose, ARDL model will be estimated and then static long run solution will be calculated. The long run solution can calculated by setting

$DR_t = DR_{t-1} \ldots.$, $BD_t = BD_{t-1}, \ldots.$ And $x_t = x_{t-1}, \ldots.$

$DR_t = DR_{t-1}, \ldots.$ $D_t = DD_{t-1}, \ldots.$ And $y_t = y_{t-1}, \ldots \ldots$

$DR_t = DR_{t-1} \ldots \ldots \pi_t = \pi_{t-1}, \ldots.$ And $z_t = z_{t-1}, \ldots \ldots$

CHAPTER 4

EMPIRICAL RESULTS AND DISCUSSIONS:

In this study we want to examine the impact of policy rate on different macroeconomic variables like DD, BD and π in case of Pakistan. This chapter covers the following sections. 4.1.1 deals with descriptive statistics analysis of domestic debt model, 4.1.2 deals with the descriptive statistics analysis of BD model, 4.1.3 deals with the descriptive statistics analysis of π model, 4.2.1, 4.2.2 & 4.2.3 are showing actual graphs of DD model, return series of DD model and ADF test summary of DD model respectively.4.3.1, 4.3.2 and 4.3.3 are showing actual graphs of BD model, return series of BD model and ADF test summary of BD model respectively. 4.4.1, 4.4.2 and 4.4.3 are showing actual graphs of inflation(π) model, return series of π model and ADF test summary of π model respectively.

4.1 Descriptive Statistics Analysis:

The descriptive statistics consists of macroeconomic variables used in this research from World Bank and Pakistan Economic Surveys data for the period 1975-2018 is presented in tables 4.1.1, 4.1.2 and 4.1.3

Table 4.1.1: Summary Statistics of Domestic Debt Model

Variable	*Observation*	*Mean*	*Std. dev*	*Min*	*Max*
LDD	*44*	*27.5*	*1.85*	*24*	*30.3*

DR	*44*	*10.7*	*3*	*6.3*	*20*
LCE	*44*	*26.6*	*1.7*	*23.2*	*29.4*
Inflation (π)	*44*	*8.36*	*4.1*	*2.5*	*21*
GPDG	*44*	*5*	*2*	*1.014*	*10.2*
LBD	*44*	*25.6*	*1.62*	*22.7*	*28.4*
LTE	*44*	*27*	*1.65*	*23.7*	*29.6*
DCPS	*44*	*26.9*	*1.65*	*23.7*	*29.5*
LED	*44*	*27.5*	*1.55*	*24.7*	*30*

We have taken log of original data of above variables except discount rate and inflation rate and growth rate, to linearize the data. L indicates log of relevant variable in above table.

Table 4.1.2: Summary Statistics of Budget Deficit model

Variable	***Observation***	***Mean***	***Std. dev***	***Min***	***Max***
LBD	*44*	*25.6*	*1.62*	*22.7*	*28.4*
DR	*44*	*10.7*	*3*	*6.3*	*20*
LCE	*44*	*26.6*	*1.7*	*23.2*	*29.4*
Inflation(π)	*44*	*8.36*	*4.1*	*2.5*	*21*
LGDP	*44*	*9.7*	*1.38*	*7.4*	*12*
LTO	*44*	*27.3*	1.7	24.3	30
LTE	*44*	*27*	*1.65*	*23.7*	*29.6*
LTaxR	*44*	*26.3*	*1.67*	*22.8*	*29.1*

LED	*44*	*27.5*	*1.55*	*24.7*	*30*
LTR	*44*	*26.5*	*1.68*	*23.3*	*29.2*

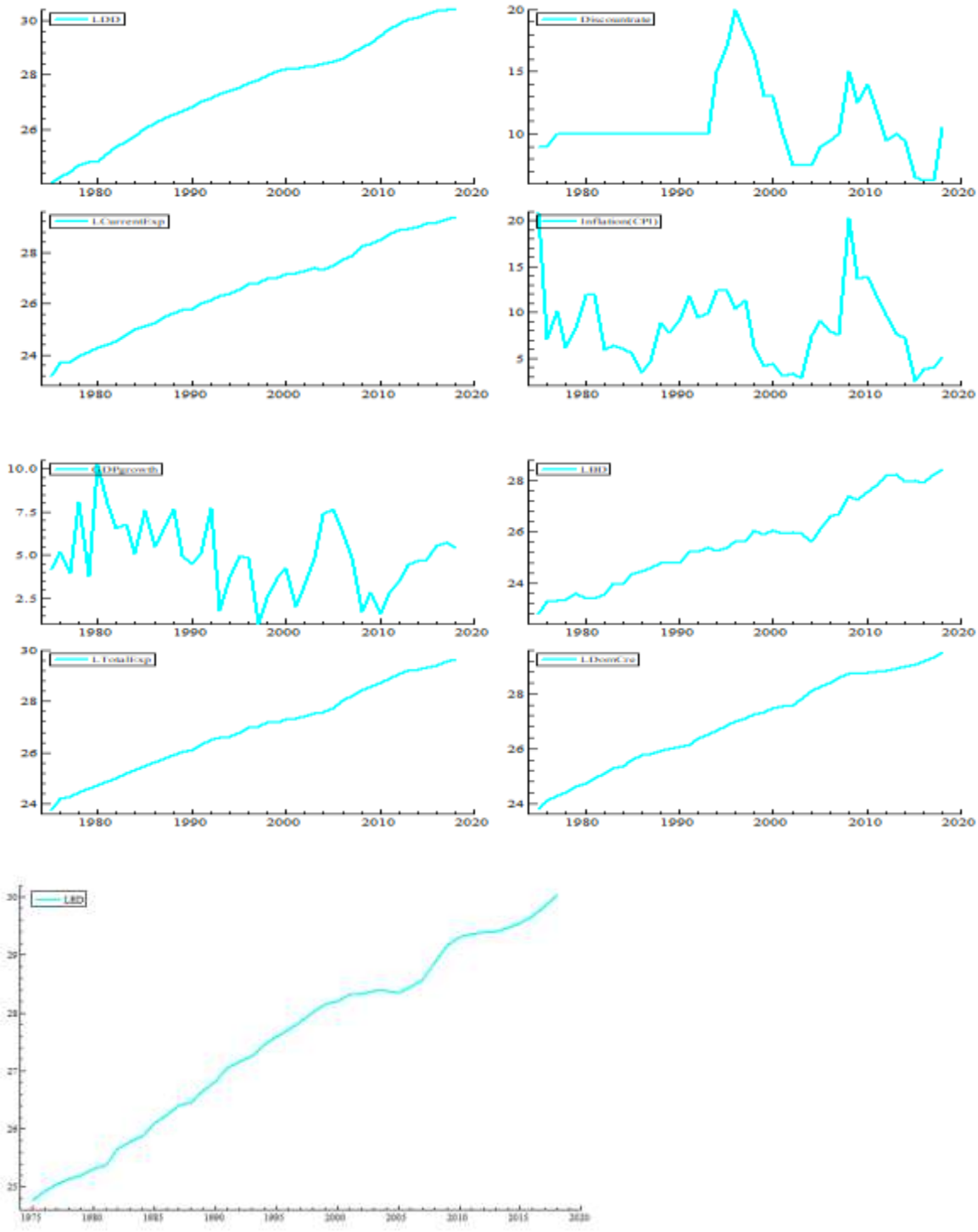
We have taken log of original data of above variables except discount rate and inflation rate, to linearize the data. L indicates log of relevant variable in above table.

Table 4.1.3: Summary Statistics of Inflation Model

Variable	***Observation***	***Mean***	***Std. dev***	***Min***	***Max***
Inflation (π)	*44*	*8.36*	*4.1*	*2.5*	*21*
DR	*44*	*10.7*	*3*	*6.3*	*20*
LIVI	*44*	*4.8*	*0.83*	*3.9*	*6.3*
LEVI	*44*	*4.48*	*0.81*	*3.3*	*5.64*
ER	*44*	*46.7*	*33.5*	*9.9*	*122*
LMS	*44*	*27.6*	*1.85*	*24.36*	*30.6*
LTD	*44*	*28.16*	*1.7*	*25*	*31*

We have taken log of original data of above variables except discount rate and inflation rate and exchange rate, to linearize the data. L indicates log of relevant variable in above table.

4.2.1 Diagrammatic Representation of Domestic Debt Model at Level:



In the diagram 4.1 indicates the pattern of actual series of DD, DR, CE, π, GDPG, TE, DCPS and ED at level. These graphs show that series are non-stationary except π, GDPG and DR. All the graphs except discount rate, GDPG and inflation (π) also show increasing trend of the data.

4.2.2 Plot of the log difference series of Domestic Debt Model (Return series)

The above figure 4.6 it can be noted that the series are stationary at first difference but there is mean reversion exist in the domestic debt and discount rate series.

4.2.3 Augmented Dickey Fuller (ADF) test to check stationarity of Domestic debt model:

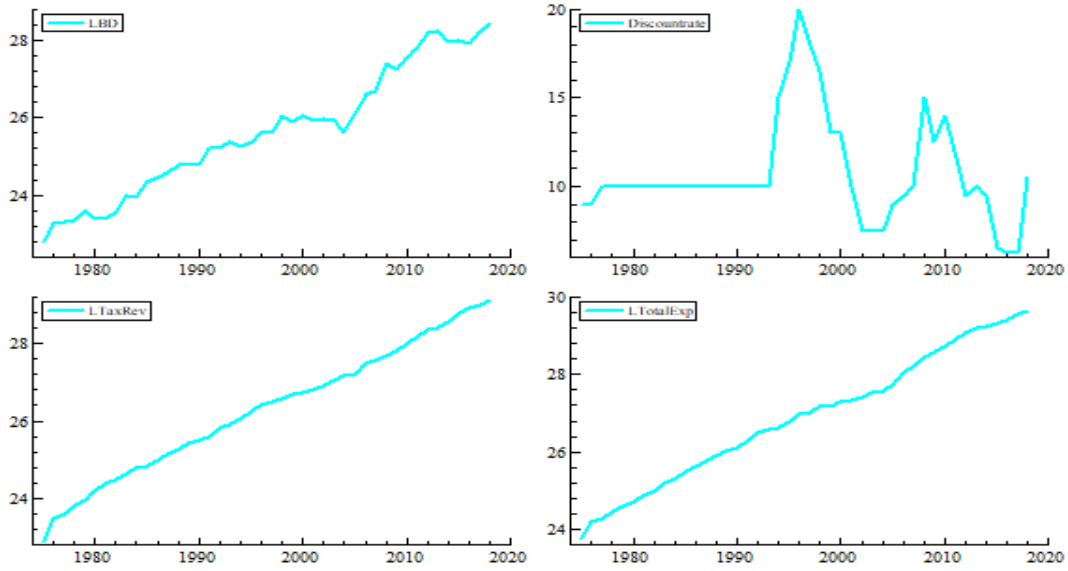
Variable	ADF Statistics	Critical Value	Decision
LDD (C, T)	*-1.42*	*-3.41*	*H_0 is accepted and series has unit root.*
DLDD (C)	*-3.74*	*-2.933*	*H_0 rejected and series is stationary*
LCE (C,T)	*-3.5*	*-3.4*	*H_0 is accepted and series has unit root.*
DLCE (C)	*-9.4*	*-2.933*	*H_0 rejected and series is stationary*
LTE (C, T)	*-3.2*	*-3.5*	*H_0 is accepted and series has unit root.*
DLTE	*-3.8*	*-1.94*	*H_0 rejected and series is stationary*
LBD (C, T)	*-2.76*	*-3.51*	*H_0 is accepted and series has unit root.*
DLBD (C)	*-7.89*	*-2.93*	*H_0 rejected and series is stationary*
LDCPS (C, T)	*-2.1*	*-3.41*	*H_0 is accepted and series has unit root.*
DLDCPS (C)	*-5.14*	*-2.93*	*H_0 rejected and series is stationary*
LED (C, T)	*-2.21*	*-3.52*	*H_0 is accepted and series has unit root.*
DLED	*-4.1*	*-2.93*	*H_0 rejected and series is stationary*
GDPG (C)	*-4.1*	*-2.93*	*H_0 rejected and series is stationary*

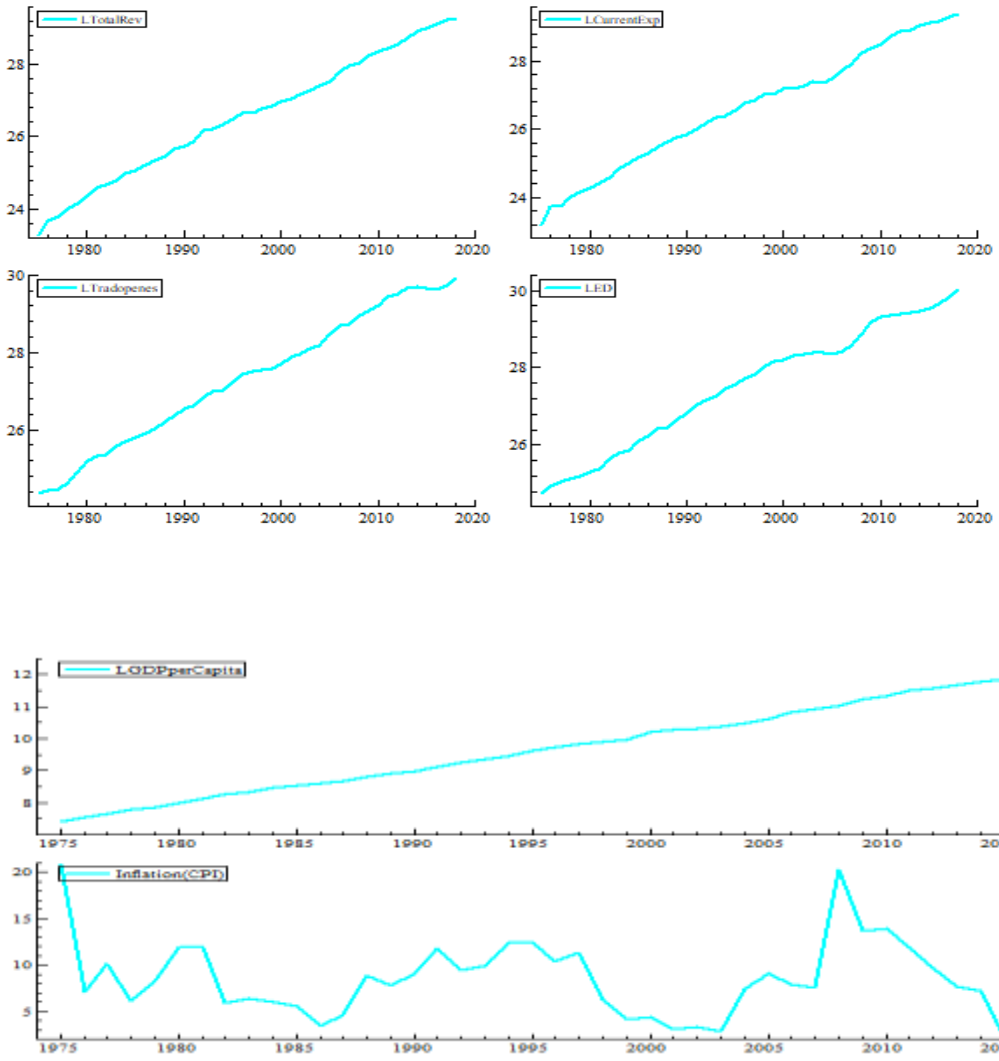
Inflation (C)	*-4.45*	*-2.93*	*H_0 rejected and series is stationary*
DR (C)	*-3.63*	*-2.93*	*H_0 rejected and series is stationary*

Letters in the brackets C, T showing drift (intercept) and time trend respectively.

We have taken first difference of non-stationary data to make it stationary. D showing first difference and DL showing log difference of data.

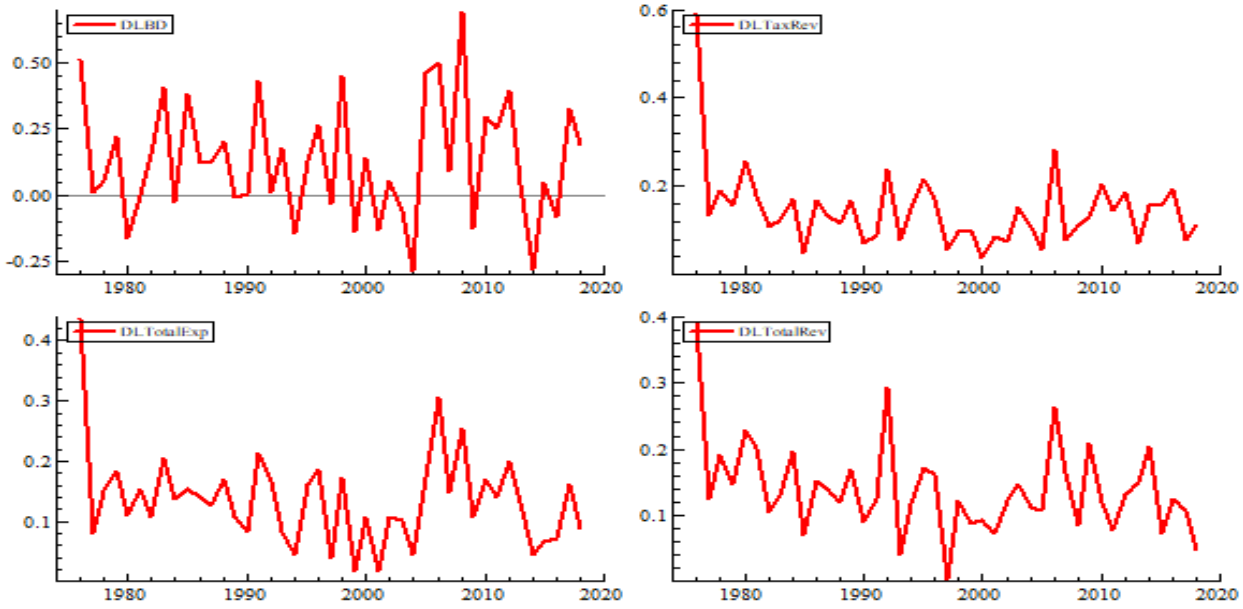
4.3.1 Plot of the actual series of Budget Deficit Model:



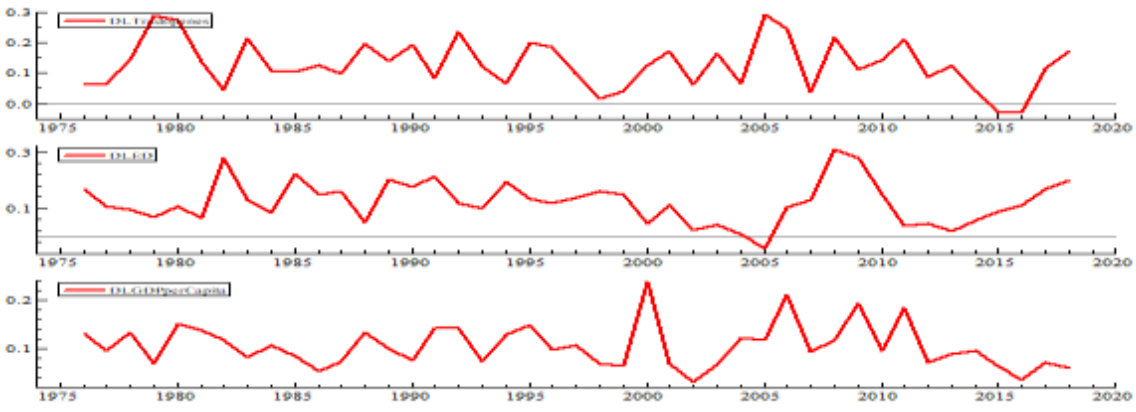


The above plots of actual series like BD, DR, TaxR, TE, TR, CE, TO, ED, GDP and π shows the pattern of series in the Figures 4.7. These graphs show that series are non-stationary except DR and π. All the graphs except discount rate and inflation also show increasing trend of the data.

4.3.2 Plot the log difference series of Budget Deficit Equation (Return series)



The graph shows that all the series are stationary at first difference.



The above figure 4.3.2 it can be noted that the series are stationary at first difference in above graphs.

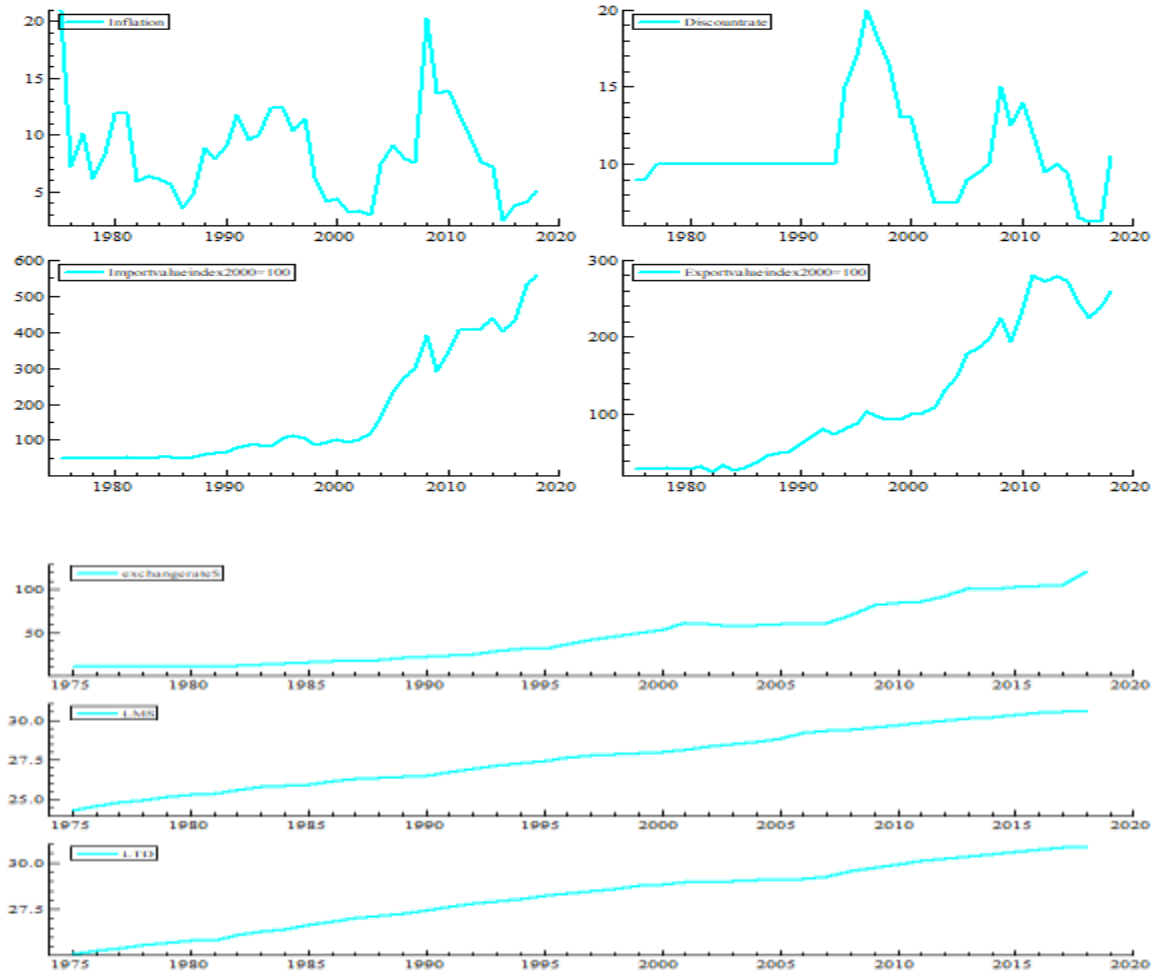
4.3.3 ADF test to check stationarity of budget deficit model

Variable (C , T)	ADF Statistics	Critical Value	Decision
LBD (C, T)	*-2.76*	*-3.52*	*H_0 is accepted and series has unit root.*
DLBD (C)	*-7.89*	*-2.93*	*H_0 rejected and series is stationary*
DR (C)	*-3.63*	*2.93*	*H_0 is rejected and series is stationary*
LTaxR (C, T)	*-2.75*	*-3.12*	*H_0 is accepted and series has unit root.*
DLTaxR	*-4.02*	*-1.94*	*H_0 rejected and series is stationary*
LTE (C, T)	*-3.25*	*-3.51*	*H_0 is accepted and series has unit root.*
DLTE (C)	*-8.16*	*-2.93*	*H_0 rejected and series is stationary*
LTR (C, T)	*-2.55*	*-3.41*	*H_0 is accepted and series has unit root.*
LDTR	*-2.98*	*-1.94*	*H_0 rejected and series is stationary*
LTO (C, T)	*-1.5*	*-3.41*	*H_0 is accepted and series has unit root.*
DLTO (C)	*-5.39*	*-2.86*	*H_0 rejected and series is stationary*
LED (C, T)	*-1.4*	*-3.41*	*H_0 is accepted and series has unit root.*
DLED (C)	*-4.08*	*-2.86*	*H_0 rejected and series is stationary*
LGDP (C, T)	*-1.94*	*-3.41*	*H_0 is accepted and series has unit root.*
DLGDP (C)	*-6.25*	*-2.86*	*H_0 rejected and series is stationary*
Inflation (C)	*-4.45*	*-2.93*	*H_0 rejected and series is stationary*
LCE (C, T)	*-3.5*	*-3.51*	*H_0 is accepted and series has unit root.*

DLCE (C)	*-9.4*	*-2.93*	*H_0 rejected and series is stationary*

We have taken first difference of non-stationary data to make it stationary. D showing first difference and DL showing log difference of data.

4.4.1 Plot of the actual series Inflation Model:



The above plots of actual series observe the pattern of series in the Figures 4.4.1. These graphs show that series are non-stationary at level except DR and π. All the five graphs except discount rate and inflation also show increasing trend of the data.

4.4.2 Plot of the log difference series of Inflation Model (Return series)

Interpretation:

The above plots indicate that all the variables are stationary at first difference and import value index and export values index series have mean reversion . The above figure it can be noted that the series are stationary at first difference.

4.4.3 ADF test to check stationarity of inflation model

Variable	ADF Statistics	Critical Value	Decision
Inflation (C)	*-4.45*	*-2.86*	*H_0 is rejected and series is stationary*

DR (C)	*-3.63*	*-2.86*	*H_0 is rejected and series is stationary*
LIVI (C,T)	*-2.04*	*-3.4*	*H_0 is accepted and series has unit root.*
DLIVI (C)	*-4.9*	*-2.86*	*H_0 is rejected and series is stationary*
LEVI (C, T)	*-2.19*	*-3.4*	*H_0 is accepted and series has unit root.*
DLEVI (C)	*-5.79*	*-2.86*	*H_0 is rejected and series is stationary*
LMS (C, T)	*-2.46*	*-3.4*	*H_0 is accepted and series has unit root.*
DLMS (C)	*-5.4*	*-2.86*	*H_0 is rejected and series is stationary*
LTD (C, T)	*-1.27*	*-3.4*	*H_0 is accepted and series has unit root.*
DLTD (C)	*-4.25*	*-2.86*	*H_0 is rejected and series is stationary*
LER (C,T)	*-1.7*	*-3.4*	*H_0 is accepted and series has unit root.*
DLER	*-4.6*	*-2.86*	*H_0 is rejected and series is stationary*

We have taken first difference of non-stationary data to make it stationary. D showing first difference and DL showing log difference of data.

4.5 Results and Discussion:

This section covers the empirical analysis of policy rate on major macroeconomics variables. This study has three models. Each model contains stationary and non-stationary variables. Therefore, we are going to use Auto regressive distributed lags (ARDL) technique for estimation.

4.5.1 Domestic Debt Model:

$$LDDD_t = \alpha_0 + \alpha_1 DR_t + \alpha_2 DR_{t-1} + \alpha_3 LDDD_{t-1} + \alpha_4 LDCE_t + \alpha_5 LDCE_{t-1} + \alpha_6 \pi_t + \alpha_7 \pi_{t-1} + \alpha_8 LDED_t + \alpha_9 LDED_{t-1} + \alpha_{10} LDTE_t + \alpha_{11} LDTE_{t-1} + \alpha_{12} GDP_t + \alpha_{13} GDPGh_{t-1} + \alpha_{14} LDBD_t + \alpha_{15} LDBD_{t-1} + \alpha_{16} LDDCPS_t + \alpha_{17} LDDCPS_{t-1} + \varepsilon_{1t}$$

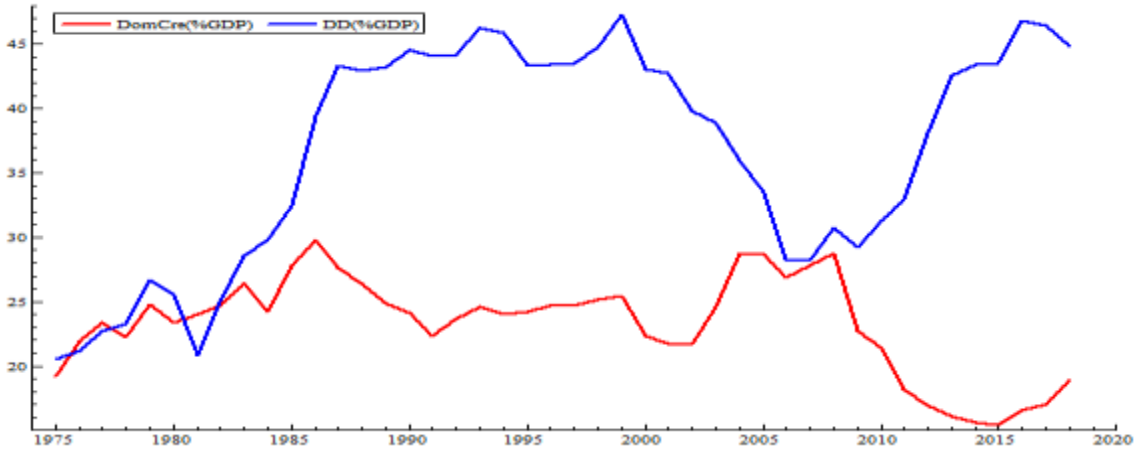
Independent Variable	**Coefficient**	**P-Value**
$DLDD_{t-1}$	0.402	0.0062
DR_{t-1}	0.0054	0.0218
$GDPG_{t-1}$	0.012	0.098
$DLDCPS_{t-1}$	-0.2644	0.100
AR 1-2 test F (2, 36) =	09377	(0.400)
H_0 = No Autocorrelation		
ARCH 1-1 test F (1, 40) =	2.79	(0.1024)
H_0 = No Heteroskedasticity		

Interpretation:

As P- value > 0.05 so we accept H_0 of no autocorrelation in the series. While the p-value of ARCH test is also more than 5% level of significance so we accept null hypothesis and conclude that no problem of heteroskedasticity in the series.

Above table shows that previous debt has positive and significant impact on current domestic debt (DD). As a result when there is 1% increase in previous domestic debt leads to increase current DD by 0.4%. Current expenditures (CE) has positive impact on DD whereas domestic

credit to private sector (DCPS) and external debt (ED) have negative impact on DD. When DCPS increases by 1 % then DD decreases 0.26% because private sector borrows and returns in time. When DCPS increases then less credit is left for government to borrow. Government borrows and borrows to pay interest of previous loan which causes rapidly increase in loan volume. When ED increases by 1 % then DD also increases by 0.33% because government has to pay interest of foreign debt so for that government borrows domestically in this way domestic debt is increasing with higher rate than external debt. Impact of previous policy rate on domestic debt is significant and positive, when 1% increase in previous policy rate then current debt is increased by 0.005%. When interest rate increases mark-up payment also increases which has to pay and will be part of loan in next year (Adetokunbo and Ebere. 2018). GDP growth has significantly (at 10% Critical Value) positive impact on domestic debt. When GDP growth is increased by 1% then domestic debt also increases by 0.012% because it may be due to investment by government in the sectors which are unproductive and inefficient which leads to increase in domestic debt (Ghani & Din 2006).



It is also seen in the diagram that there is inverse relationship between domestic credit to private sector and domestic debt.

4.5.1.1 Granger Causality between domestic debt and policy rate.

Null Hypothesis:	Obs	F-Statistic	Prob.
DISCOUNTRATE does not Granger Cause LDD	42	0.47847	0.6235
LDD does not Granger Cause DISCOUNTRATE		0.11782	0.8892

Interpretation:

Above result of Granger causality showing that neither discount rate (policy rate) granger causes domestic debt nor domestic debt granger causes discount rate.

4.5.2 Budget Deficit Model:

$$LBD_t = \alpha_0 + \alpha_1 DR_t + \alpha_2 DR_{t-1} + \alpha_3 LCE_t + \alpha_4 LCE_{t-1} + \alpha_5 \pi_t + \alpha_6 \pi_{t-1} + \alpha_7 GDP_t + \alpha_8 GDP_{t-1} + \alpha_9 LTR_t + \alpha_{10} LTR_{t-1} + \alpha_{11} LTE_t + \alpha_{12} LTE_{t-1} + \alpha_{13} LTO_t + \alpha_{14} LTO_{t-1} + \alpha_{15} LED_t + \alpha_{16} LED_{t-1} + e_t$$

Variable	**Coefficient**	**P-Value**
$DLBD_{t-1}$	0.278	0.045
DLTO	0.747	0.013
DLTE	3.58	0.000
DLTR	-2.1	0.090
DLED	0.226	0.047
AR 1-2 test F(2,36) =	0.98	(0.38)
ARCH 1-1 test F(1,39) =	1.8	(0.17)

Interpretation:

Here P-values of autocorrelation and Heteroskedasticity tests are 0.38 and 0.17 respectively. So we accept null hypothesis and conclude no autocorrelation and no heteroskedasticity in the series.

AS Lag of fiscal deficit (FD) is positive and significant at 5% level of significance which represents there is smooth budgetary process and spillover of fiscal deficit on next year. Our results are in line with (Mehmood, 2017). Lag of BD shows that when BD increases by 1% then current period BD also increases by 0.27%. Impact of policy rate (PR) on BD is insignificant because the cancellation of positive and negative effects. Tax revenue (TaxR) is inversely related to BD, as 1% increase in TaxR leads to increase 2.1% increase in BD. Further results showed that TE's are directly proportional to BD. According to results when there is 1% increase in TE leads to increase 3.5% in BD. Trade openness (TO) came to be significant and positive impact on BD. As we know that economies where export volume is greater than import then positive impact of TO on BD could be expected whereas the economies where import volume is more than export then negative impact of TO on BD could be expected. This relationship is also argued by (Javaid.et al., 2010; Agnello & Sausa 2009; and Fatas & Mahav, 2010). In our analysis the results showed that when TO increases by 1% then BD increases by 0.226%. TE is significant and directly proportional to BD and TR is significant and inversely related to budget deficit.

4.5.2.1 Granger causality between budget deficit and policy rate:

Null Hypothesis:	Obs	F-Statistic	Prob.
DISCOUNTRATE does not Granger Cause LBD	42	0.02365	0.9766
LBD does not Granger Cause DISCOUNTRATE		0.16597	0.8477

Interpretation:

P-values in above results are greater than 0.05 which leads to accept null, hypothesis and conclude that discount rate does not granger cause budget deficit and budget deficit does not granger cause discount rate(policy rate)

4.5.3 Inflation Model

$$\pi_t = \alpha_0 + \alpha_1 DR_t + \alpha_2 DR_{t-1} + \alpha_3 \pi_{t-1} + \alpha_4 LIVI_t + \alpha_5 LIVI_{t-1} + \alpha_6 LEVI_t + \alpha_7 LEVI_{t-1} + \alpha_8 ER_t + \alpha_9 ER_{t-1} + \alpha_{10} LMS_t + \alpha_{11} LMS_{t-1} + \alpha_{12} LTD_t + \alpha_{13} LTD_{t-1} + E_t$$

The Most suitable Model:

$$\pi_t = \alpha_0 + \alpha_1 DR_t - \alpha_2 DR_{t-1} + \alpha_3 ER_{t-1} + \alpha_4 EVI_{t-1} + E_t$$

Variable	Coefficient	P-Value
Lag of inflation	0.355	0.027
Constant	3.89	0.075
Discount rate	0.923	0.000
Money Supply	0.148	0.0250
1st lag of Export Value Index	0.049	0.000
AR 1-2 test F(2,34) =	0.247	(0.781)
ARCH 1-1 test F(1, 40) =	0.63	(0.431)

Interpretations:

The results indicate that there is no problem of Autocorrelation and Heteroskedasticity because p-values more than 0.05 which leads to accept the null hypothesis of both auto correlation and heteroskedasticity respectively.

From above results of inflation model we have come to know that previous period inflation (π) is 0.35% responsible for current π. When there is 1% increase in one lag period π, it lead to increase 0.35% in current π, so we can say that there is direct relationship between policy rate (PR) and inflation. Our results are also supported by (Tooke, 1992; and Rehman, 2015). When PR is increased as a result mark-up payment also increases which are directly transferred into cost of production, and when cost of production increases then overall price also increases. According to above results when policy rate (PR) increases by 1%, it will increase inflation 0.92 %. The results also highlights that 1% increase in previous π leads to 0.35% increase in current π. Here exchange rate (ER) is insignificant with inflation, when export value index (EVI) is increased by 1% then 0.05% increase in π.When there is 1% increase in MS, it leads to increase inflation by 0.15%. The same relationship is also explained by (Bhattarai & Keshab, 2011; and Sola & Peter, 2013).

4.5.3.1 Granger causality between discount rate and inflation:

Null Hypothesis:	Obs	F-Statistic	Prob.
DISCOUNTRATE does not Granger Cause INFLATION	42	1.89269	0.1650
INFLATION does not Granger Cause DISCOUNTRATE		0.76044	0.4746

Interpretation:

Above results show that the null hypothesis of neither discount rate granger cause inflation nor inflation granger cause discount rate is accepted.

Chapter 5

Conclusion:

An important goal of the central bank of any country is to control inflation(π) and to achieve the price stability. For this purpose, central banks use different variables as policy tools. In recent years, many central banks adopted strategy of increasing policy rate (PR) with the aim to prevent the economy from an increase inflation.

There are various conflicting opinions on how the policy rate affects the π. The popular opinion is that policy rate has negative impact on inflation, however many economists have quite opposite results with empirical evidences. Some evidences suggest net effect of policy rate on π is insignificant.

In our study we tried to know the impact of policy rate on inflation, domestic debt and budget deficit. To avoid missing variable bias all potential determinants of inflation, domestic debt and budget deficit suggested by earlier studies have been used and applied general to specific framework.

In our analysis we found positive and significant impact of policy rate on π and domestic debt but insignificant effect on budget deficit. These findings are also supported by the results of earlier studies including Tooke (1992), Rehman (2015) and Adetokunbo & Ebere (2018). The results presented in this study suggest that policy rate has positive effect on π. On the other hand,

high policy rate causes significantly high domestic debt and a major hurdle in investment and employment opportunities. Therefore, State Bank may reduce interest rate to control inflation and to reduce domestic debt accumulation.

Results of this study also showed that no granger causality between policy rate & domestic debt, policy rate & budget deficit and policy rate & inflation.

5.1 Policy Recommendation

Empirical results in our study and many previous literatures suggest that the increasing policy rate as policy tool is counterproductive as was expected to be negative. The positive impact of policy rate on inflation and domestic debt increases inflation and domestic debt by increasing policy rate respectively. Our results suggest that tight monetary policy may be a cause to increase in inflation and domestic debt.

So, government should avoid tight monetary policy to decrease inflation, in this way investors may get loans on easy terms, which are directly transferred into cost of production and then prices of products decrease.

On the other hand, government should control inflation by incorporating fiscal policy in place of monetary policy. Government may decrease policy rate to decrease in its own domestic debt, because when policy rate goes 6% to 12% then mark-up payment also rises to double which is major portion of debt. Further, government may reduce tax because reduction in tax can leads to decrease in inflation.

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