Effects of Money on Output and Inflation: Does Source of Money Creation Matter?

by

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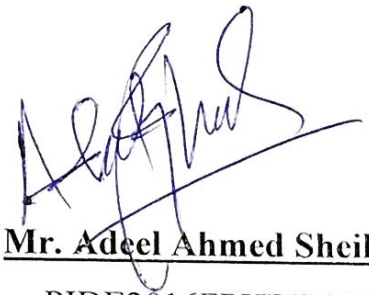

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To my mother, for her unwavering support and belief in me.

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ABSTRACT

Keynesian theories of the post Great Depression era turned orthodox classical understanding of the economy over its head. Governments, since then, have actively used fiscal policy for managing demand — maintaining surpluses in boom and deficits in recessions. With time, fiscal policy has evolved more as a tool of economic management though deficit spending than being limited to managing crisis. Fiscal deficits, therefore, continue to be relatively common compared to surpluses and thus importance of a government's ability to finance these deficits then cannot be overstated. These deficits are financed mainly through two avenues: central bank and private banks. The choice of the avenue, over the years, have attracted much debate due to its intended consequences for major economic variables such as employment, output, inflation etc. Economists have been convinced for quite some time that government borrowing through central bank is damaging from the economy because it erodes fiscal discipline, encourages political business cycles and causes inflation money creation but, borrowing from private banks is seen as a resource transfer where no new money gets created and interest rate serves both as a market measure of discipline and control. This view led to the central bank independence movement of the 70s curbing government ability to pressuring banks into financing excessive spending. In some cases, this movement has shown promising results by bringing inflation down and output up but, in other cases there have also been mixed or negative results. Pakistan has also recently passed the law that makes it central bank autonomous and therefore not bound to finance government's deficit.

Government has in the past borrowed money both from the central bank as well as private banks to cover deficits. The intent of this study is to investigate whether it makes any difference in terms of direction and magnitude for output and inflation whether government borrows from central bank or private banks?

Our analysis shows that, it makes little to no difference in impact of inflation or output as far as the choice of the borrowing source is concerned. What our results elude to is that for a developing economy such as Pakistan, making a central bank autonomous may not provide the benefits that are intended from this legislation rather may prove to be a hurdle in managing possible future crisis by the government by restricting essential financing.

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Chapter 1

1 Introduction

The role that money plays in an economy is well contested among the established schools of thought in economics and its impact on the economy has been the subject of academic debate for long. While orthodox classicists see money as a mere tool that improves the efficiency of exchange of value among economic agents without itself ever being able to create or destroy it, Keynesians have held views to the contrary - money being the object that is not only centrally responsible for the creation and destruction of value but also the main driver of the economic activity. Classicist and Keynesian views on money, being materially different from each other, have bearing on its creation, dynamics and policy maker's problem for its management towards attaining maximum well-being for the society.

Creation of money in the economy takes place in mainly two ways i.e., either through lending by the banks or through government spending. When banks issue loans to borrowers, money is created in the economy that represents new purchasing power. When borrowers pay back their loans, the money that was created initially, gets removed from the economy along with the purchasing power that it entails. Similarly, when the government spends, it credits the accounts of its customers with money thereby creating purchasing power in the economy. In both cases, the money created becomes part of the larger money supply and has implication for the macroeconomic outcomes. In a developing country like Pakistan, government spending is often the largest contributor to the aggregate demand. With a relatively low tax-to-GDP ratio, sizeable portions of this spending is made possible through deficit financing.

Even though deficit financing has enabled developing nations to bridge the gaps between demand a supply, as it has for the developed nations in the past,

yet it has not stopped those nations from collecting huge amounts of debts that are often unmanageable and have proved to be counter-productive towards their macroeconomic outcomes. Historically, in much of the postwar period, provision of employment and growth was ensured through sizeable and continuous government spending in the US and UK, but with the passage of time this spending got increasingly identified with and related to inflation. An important aspect of the debate surrounding impacts of government spending on macroeconomic outcomes is the 'mode of financing deficits'.

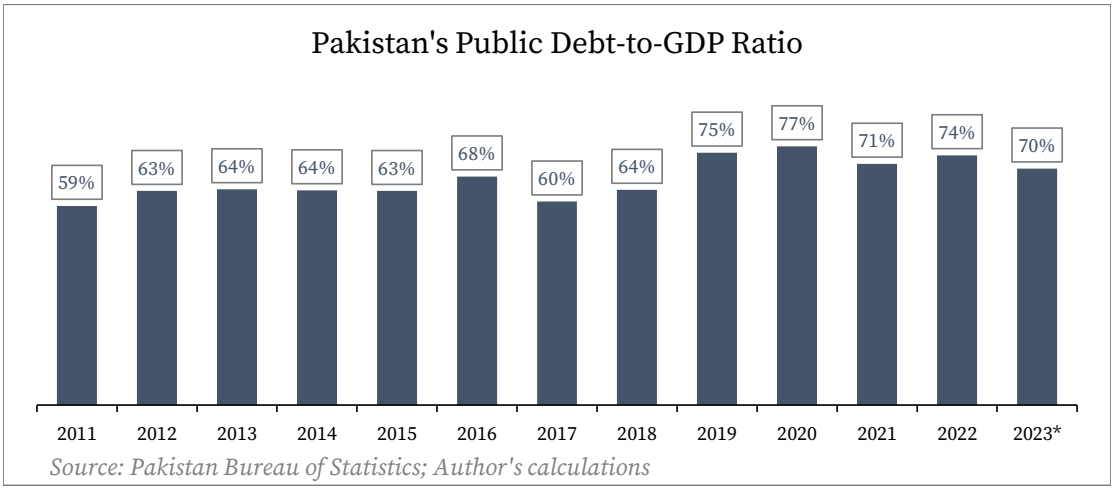


Figure 1: Total Public Debt (% GDP)

A government can finance its deficits[1] in two ways i.e., it can either borrow money from its central bank or it can borrow money from the private funds market that in developing countries constitutes commercial banks. In literature, former is termed '*money financing*' while the latter is termed '*bond financing*'. In the aftermath of soaring US inflation of the 70's, money-financed spending by the government fell out of favor, despite being more stable than in comparison to bond-financed spending, for being perceived as enabling the lack of 'discipline' in government spending. In a bid, to control rising debt-to-GDP ratio and to impose fiscal discipline, US and other central banks were gradually awarded '*independence*' in the 80's on wards in terms of monetary policy formulation,

[1]In the context of government spending, a *deficit* is the difference between government spending and its income (mainly taxes).

thereby closing the avenue for money-financing of government deficits. More than a few central banks in the developing countries have adopted such legislation since then leaving the government to finance its deficits from the funds market.

The basis of this comes from the orthodox neoclassical view of bond-financing as a 'resource transfer' i.e., government and private sector competing for a limited amount of funds rather than a 'resource creation' in case of money-financing i.e., creation of base money and eventually a larger money supply. The argument in favor of bond-financing is that the given the interest rate, resource transfer keeps government spending from being inflationary and makes the policy maker more cautious in terms of putting spending to uses that cause economic growth. On the contrary, money-financing not only expands the monetary base and the larger money supply as a consequence with a higher chance of it being politically motivated is highly inflationary and not focused on growth.

Pakistan's debt-to-GDP ratio has been substantially high for the past two decades where the amount of total outstanding public debt has been as high as 77% of its GDP while the government has only managed to get that percentage down to approx. 59% of GDP (see Figure. 1). These unusually high numbers of public debt has opened debate on two major avenues i.e., the sources through which government gets its hands on the debt and the extent to which any percentage of debt is sustainable for the economy or not.

The motivation for our study builds on the former as we make the sources of debt i.e., federal budgetary borrowings to achieve macroeconomic targets such as output growth and inflation in Pakistan the subject of our analysis in context of it recent legislation for the independence of its central bank, the State Bank of Pakistan (SBP). Government of Pakistan (GoP) borrows both for the short-term as well as long-term requirements, through auctions of treasury securities called 'Market Treasury Bills' (MTBs). The auction process has, historically,

involved primary dealers (specific banks designated for the bidding process) and the SBP. Until very recently i.e., before the independence legislation[2], SBP was a direct investor in GoP debt but with the SBP Amendment Act, SBP can no longer monetize[3] government's debt. Even though the literature prescribes funding government deficits through money creation by central bank for the fiscal policy to be effective[4], it is in recent times, becoming a rare sight to see that happening because of a paradigm shift in the institutional structures where central banks have become more and more independent citing better results with price stability and output growth in the economy. Thus, a government must align its spending options to achieve macroeconomic targets with its ability to service the deficits. The problem, however, with developing countries such as Pakistan, is that sustaining growth requires sustained government spending in sectors that are productive. A mixture of floating rate debt and soaring interest rates makes it difficult for the government to service its debts consequently approaching a possible default situation. Moreover, opportunistic behavior on part of the government to gain votes through provision of jobs can also lead to higher expenditures in the public sector and therefore create political business cycles. This begs the question whether it is reasonable in case of developing countries such as Pakistan to restrict its financing options to only market based sources?

There is a vast body of literature on central bank independence that talks about budgetary borrowings in the context of political business cycles. It is noted that a government that is keen on gaining votes has an inflationary bias i.e., they have an interest in setting a lower interest rate to facilitate borrowings and subsequently use that money to create jobs to lower the unemployment rate below the natural rate of inflation. This eventually leads to much higher levels of inflation while the employment reverts back to its natural rate. Thus, central

[2]The State Bank of Pakistan has been declared 'independent' through a legislation from the parliament in 2021.

[3]monetization is the term used ex-changeably for money-financing of government debt

[4](Blinder *et al.*, 1973)

bank independence tends to close the door on this manipulation by the government and also its ability to monetize deficits in a bid to eliminate political business cycle and to keep the debts at a sustainable level. The developments in this body of literature shows that government's have gradually handed over operational control of the monetary policy to the central banks and only holds the role of target setting. The literature also notes that countries that have independent central banks have performed much better at keeping the inflation low and stable than those who have not in the developed economies. However, this evidence is not so clear in the case of developing nations, moreover, the evidence for output growth have been somewhat mixed.

The literature indicates that, with an independent SBP, the intention is to eliminate political business cycles, keep debt sustainable, eliminate monetization and deliver on inflation targets and growth. In the context of our motivation we intend to proceed with two distinct objectives in our study: First, this study intends to find out how different sources of financing fiscal deficits or government's budgetary borrowing i.e., from central bank (monetization) and through private banks (bond financing), impacts the macroeconomic outcomes, namely, the output growth and inflation. We hypothesize that while there can be difference in the magnitude of impact of monetization as opposed to bond-financing of government deficits on output and inflation but, the direction of impact is not dependent on the choice of the source of financing. The results from our analysis affirm our hypothesis that different sources of government borrowing carry the same effect in terms of the direction of their impact, however, borrowing from one source carry a relatively stronger impact than the other in terms of the magnitude. The results from our analysis of our first objective indicates that our results are not partly consistent with the standard arguments in case of money-financing vs bond-financing. With this understanding, explore the reason why that is in the second objective.

Second, this study intends to explore how money moves through different

sectors of a monetary economy. By laying out the inter-linkages and mechanics of how different sectors of the economy are connected to each other in an accounting framework, this study will shed some light on the how deficit spending impacts macroeconomic outcomes when that money is spent on different sectors of the economy. The study argues that it does not matter whether government deficits are money-financed or deficit-financed because in both cases it will lead to creation of base money leading to expansion in the larger money supply contrary to the belief that bond-financing results in a resource transfer from private sector to the public sector. Also, bond-financing of government deficits does not reduce spending potential of the economy. To show that, we begin by setting up an accounting based framework of an economy consisting of five sectors and develop the inter-linkages between these sectors (transactions) through the balance sheets approach in a stock-flow consistent manner. The results from our analysis provide justifications that are consistent with our argument and support our result from our first objective that money and bond-financing of government deficits both lead to expansion of monetary base and larger money supply while the magnitude of the output growth in dependent mainly on the makeup of the deficit spending.

In summary, the study argues that the money or bond-financing of government deficits carry the same effect for output and inflation in terms of its direction but not in terms of its magnitude where the former carries a larger impact than the latter. For the trend in inflation, our analysis concludes that base money expansion happens in both modes of financing and for growth, our analysis concludes that makeup of spending holds more importance than the mode of financing.

Chapter 2

2 Review of Literature

2.1 Deficit Financing: Perspectives

2.1.1 Background

A government's budget deficit i.e., excess of its spending over its income, can either be money-finance or debt-financed.[5]. Debt financing of government's deficit means that it borrows from the private funds market that includes private entities, banks etc but money financing of this deficit means that either a government can print its own money or borrow from its central bank.

In the 20th century, most government have delegated the power to issue legal tenders to their central banks while some have retained the power with themselves. The instances where governments have used the right to print their own money can be found not too far in history e.g., the issuance of 'Greenbacks' in the US (Carruthers and Babb, 1996) and 'Bradbury Bills' in the UK (Davies, 1994), however, they have since fallen out of favor for the resultant spending being 'too inflationary' for the economy (Huber and Robertson, 2000). Thus, 'money financing' of government debt has since been limited to its monetization by the central bank.

With the arrival of the arguments in favor of the independence of central banks in 1970's (Kydland and Prescott, 1977; Barro and Gordon, 1983) many governments have legislated against monetization of debt citing the sacrificing price stability for temporary gains in output and employment as a problem. In those economies, where government has legislated in a similar manner have their options limited to bond-financing of their deficits while central bank can

[5]Dornbusch and Fischer (1987) make a distinction between sale of treasury debt to the public and to the central bank and terms the later as *monetization of debt*. He calls it an essential distinction because monetization of debt by central bank creates high-powered money

independently decide how it chooses to operate in the open market in terms of sale and purchase of the treasury bonds.

2.1.2 Fiscal Finance vs. Functional Finance

It is apparent that government has the ability to spend more in the economy than it can collect in revenues in terms of taxes. More often than not, government spends more than it takes away from the economy. But the question is how much should a government spend? and the question that follows naturally is how to finance this spending if it is even necessary? The debate over size of government spending, especially in excess of taxes and debt levels as a result of it has divided the debate among two distinct perspectives i.e., 'fiscal finance' and 'functional finance'.

The fiscal finance perspective on management of government spending is predicated on the idea that a government's budget is no different from a household budget (Fischer and Easterly, 1990) in that government needs to finance whatever spending it needs to make either through taxes of borrowing but the extent of borrowing needs to be limited. The assumptions ruling the economy underlying this balanced-budget view is that of a self-regulating one, thus the need of the policy maker to drive it towards a certain outcome is unnecessary and potentially harmful. The use of monetary policy, however, is touted as the potential solution in promoting growth and price stability (Friedman, 1995). Keynes (1936), Friedman (1995) and Barro (1990) among others such as Friedrich Hayek and James Buchanan are proponents of this view of management of government budget and spending. In terms of sources of finance, taxes serve the purpose of raising revenues for the government to spend out of them for public goods such as education, defense, health care etc. Bonds are considered only when government's revenues from taxes are insufficient to meet its spending needs. The express desire is to keep fund public projects but keep the debt at a manageable low level so as to avert negative effects such as inflation

and default.

The Functional finance perspective, on the other hand, advocates the active use of government spending to achieve price stability and growth as well as full employment in the economy (Kelton, 2020). The idea behind this view is that sovereign governments that print their own money can run deficits to stimulate the economy by creating jobs and promoting long term growth in the economy because they do not necessarily have to worry about paying off the debt denominated in their own currency. However, there are limitations to government spending in this manner i.e., government spending can promote growth as long as economy operates below full employment level and expenditures are directed towards productive sectors in the economy. In terms of the sources of finance, the role that taxes play in this view is to manage aggregate demand and stabilize prices i.e., if there is too much growth in the economy or in particular sector, government will impose higher taxes to slow it down and vice versa. The role of bonds in terms of deficit spending is directed at money and interest rate management. With the sale an purchase of bonds, government can control the supply of money in the economy as well as keep the interest rate at the desired level. Proponents of functional finance view of managing government's expenses are Lerner (1943), Mitchell and Mosler (2005), Minsky (1978) among other such as Geoffrey Ingham, James Galbraith etc.

2.2 Government Spending & Policy

2.2.1 Background

The standard understanding prior to the 'Keynesian-revolution' of economic theory in 1930's, on the effectiveness of fiscal policy is best described, even by today's classical textbook models, as 'ineffective' in changing the level of aggregate income and employment in the economy because:

Before Keynes, it was commonplace that government spending and taxa-

> *tion are powerless to affect the aggregate level of spending and employment in the economy; they could only redirect resources from the private sector to the public sector... The Keynesian demonstration... changed all this... The old view that government spending simply crowded out private spending was banished.* Blinder *et al.* (1973)

Much of that understanding was based on the 'crowding-out' theory more than any philosophical perspective on the role of government intervention in the economy. In earlier works on this issue, we find arguments against bond-financed government spending in Smith (1776) for it being unproductive and unnecessary in that private saving is to be utilized by private investment to ensure full employment. In Say (1836) framework, with competitive markets and hedonistic agents we see the crowding-out in action in its basic form, where any corrective actions in the shape of government spending towards imperfections, say deficient demand, in the markets results only in change in relative prices such as interest rates.

Keynes himself believed in the 'crowding-out' phenomenon which shows in the persistence of his arguments, in favor of the government spending to be accompanied by an expansionary monetary policy, leading up to the publication of *The General Theory*. Keynes (1932) believed that government spending had the potential to stimulate the economy but any negative fallout from such expansion (in terms of higher interest rates) could be defeated by appropriate central bank action (expansionary monetary policy). In Keynes (1936), however, Keynes changes his standing on the crowding-out issue and shifts from an 'interest-based crowding-out' to 'quantity-based crowding-out' shifting the focus away from the monetary policy aspect of his argument.

The development of the 'multiplier-concept' i.e., a resultant increase in aggregate income equal to k (multiplier) times the increase in aggregate investment, was key in establishing his changed views but he was aware that influences from the monetary side were substantial enough to neutralize any

gains from the multiplier effect so he shifts the discussion discussion from the limitation of the 'multiplier effect' to the substitutability between government and private spending as well as the slope of IS and LM curves in his analysis.incomplete

2.2.2 Fiscalism vs. Monetarism

Ever since the publication of 'The General Theory' (Keynes, 1936), government spending and its potential impacts on the state of the economy has been topic of much debate. As previously mentioned, before Keynes, the standard understanding on the impact of government spending on economic outcome was that it was ineffective but Keynes argued that in an economy where employment was at a level much lower than 'full-employment', government spending can spur economic growth without causing inflation. These arguments had a much needed paradigm-shifting effect on economic literature as well. As the literature on this issue progresses, we get two extremes on the issue, that requires mentioning, where one extreme argues strongly in favor of government spending for it being effective, while the other extreme argues strongly against government spending for it being ineffective for the economic outcomes. Those strongly in favor are called 'Fiscalists' while those strongly against it are regarded as 'monetarists'.

Arguments against the overall effectiveness of government spending in the Keynesian 'multiplier' context i.e., its positive effects being out-weighted by the negative effects for the need to fund it from different sources, can be divided into two broad categories: One, 'Ricardian Equivalence' – argues that increase in fiscal spending increases the interest rates in the economy which induces people to save more and thus overall propensity to consume in the economy falls down and two, 'Crowding-Out' – argues that an increase in government spending increase the interest rate that crowds out private sector's investment in the economy. But before we move ahead to discuss these argu-

ments it worth mentioning that these arguments are predominantly monetarist arguments against government spending arguing that tax or debt-financed government spending is merely a resource transfer from public sector to the government sector and had no real effect on the total spending i.e., public and private, in the economy. However, monetary policy, that may or may not be accompanied by a fiscal policy, had a better chance at achieving the desired net spending goals.

1. ***Crowding-Out:*** From the perspective of its source of finance, Lerner (1943) makes a distinction among tax, money and bond-financed deficit spending by the government. A tax-financed deficit spending is the case where government raises taxes to pay for its spending leaving the public with a lesser stock of money and a bond-financed deficit spending is the case where government sells treasury bonds to the public to raise funds for its expenditure again leaving public with a lesser money stock to fund their expenditures. A money-financed deficit spending, however, is the case where the government borrows directly from the central bank rather than the public thus increasing the monetary stock of the public rather than decreasing it. Lerner argues that tax and bond financed government spending does not serve the purpose of government spending because they raise the interest rate in the process and have a negative impact on the private sector investment. The empirical examination of this argument by Hansen (1973), Blinder *et al.* (1973) and various other researchers confirms that initial impact of government spending is substantially reduced by the subsequent rise in interest rates due to funding deficits through bond issue.

   Interestingly, this notion of the 'ineffectiveness' of the fiscal policy due to interest-based crowding out is common to the classical Friedman (1956); Meltzer (1976) and Keynesian analysis.

2. ***Ricardian Equivalence:*** Under the assumption of a perfectly competitive market with rational agents optimizing their inter-temporal outcomes it is plausible to argue that they exercise a belief similar to Barro (1974) in that they believe that any debt-financed government spending will require for the government to impose higher taxes in future to be able to fully pay that debt back. Under this assumption a rational consumer would increase his savings rather than spend it so that it is able to pay it back to the government. This argument, however, is simplistic in the sense that raising individual taxes is neither the only way for the government to increase its revenues nor the only way to finance its debt.

2.2.3 Sources of Finance

As mentioned before, the debate around the choice of source of finance of government spending at the most basic level revolves around its potential effectiveness in the economic process. The argument in favor of effectiveness of government spending that starts from Keynesian 'demand-management' actions by the government in a less-than-full-employment economy and then carried on by the Fiscalists, while the arguments against government are mostly from a classical perspective carried on by the monetarist tradition. With the Keynesian argument becoming the orthodox understanding post Keynes (1936), from the arguments against government spending, the debate on the crowding-out effects have been the liveliest. There have been a few basic framework that have been developed to test the effects of whether different sources of financing government expenditures have crowding-out effects on private spending or not. One such framework is Musgrave (1959) among others e.g., Hansen (1949) and Lerner (1948).

Although these frameworks are much different from each other but the commonality between them is that they tend to inspect the crowding-out effects. We present the arguments here from Musgrave (1959) perspective whose frame-

work perhaps is the simplest in that it comprises of only three sectors: government, consumer and investor with three effects influencing the decisions i.e., substitution, wealth and income effects but it deals with not only the crowding-out perspective but also the 'Ricardian-equivalence' perspective. In Musgrave's framework, consumption is assumed to be affected by income or wealth effect or both and investment investment is affected by income or changing levels of claims. In this framework, various policy actions can be seen in the context of wealth and income effects that is summarized in Table 1 that gives combination of money supply and government debt supply directed at achieving stabilization in the economy.

Table 1: **Supply of government debt vs. supply of money**

Δ Debt Supply	Δ Money Supply		
	+	*zero*	−
+	Deficit financed by debt & money mix	Deficit financed by debt	Borrowing financed money retirement
zero	Deficit financed by new money	Equal Δ in tax expense	Current surplus financed money retirement
−	Debt retirement financed by new money	Debt retirement financed by current surplus	Current surplus financed retirement of money and debt

By assuming that an increase in money supply or increase in supply of government debt increases consumption in relation to income and investment rises as a result of increasing money supply but falling government debt supply, it is then possible to whether a policy is expansionary or contractionary.

1. **Tax-financed spending:** Tax-financed government spending is the most obvious example of crowding-out that involves an involuntary resource

transfer from the private sector to the government. In this situation, the total amount of spending by the government cannot exceed a maximum of the amount of collected taxes in the economy.

2. **Alternatives:** Financing government spending through taxes and deficits through an issue of government debt has become the standard in economies all over the world. Even though this standard practice is observed frequently, has not stopped the academia from coming up with radical solutions for financing government spending. It is not difficult to understand that for a government to raise revenue through taxes, it requires the cooperation of its subjects and to raise debt through bonds it requires the cooperation of the monetary system. Deficits are more important in this regard because the objective at the end is the welfare of the people. However, what options does a government have if the monetary authority does not cooperate? There could be two options - one slightly more radical than the other.

   If a government is eyeing expansion of the economy, it can issue its own currency as suggested in Werner (2000) because a bond-financed spending without the cooperation of a central bank i.e., to expand the money supply, crowds out the private spending and thus the net multiplier of this spending has a zero effect. In addition to the zero, effect the interest payments will have to be borne by generations to come in the form of taxes. When a government creates its own money there is no debt issued anywhere in the economy and therefore no interest payments while the individuals upon whom the expenditures is made get a net increase in purchasing power. This method, which has fallen out of favor since the 40's, is believed to be quite inflationary.

   Government can also consider financing its spending through credit from the private banks. If we allow the idea that banks do not operate as financial intermediaries and can in fact create purchasing power without

withdrawing it elsewhere from the economy, it is possible for the banks to create the same purchasing power for the government. Government, then, can spend the same purchasing power which gets transferred to individuals and businesses. This has an impact of increased credit creation by the banking system in the economy.

2.3 Key Government Spending Targets

2.3.1 Inflation

Inflation is generally defined as the 'persistent increase in prices' over a number of periods of time and this increase can either be constant, increasing, or decreasing. From a policy perspective, understanding on inflation is one of those avenues in macroeconomics that has eluded a consensus among economists for the past century or so which is why we can find several competing theories of inflation in the academic literature. These theories span from the quantity theory of money (QTM) and Phillips curve trade-off to expectations-augmented Phillips curve and concludes at a hysteresis-based theory of inflation.

In order to understand inflation from the classicist QTM perspective it is essential to first consider their understanding on the employment issue. The standard classicist understanding argues that all real variables in the economy e.g. output, employment, real wages, productivity etc are determined in the market for labor via forces of demand and supply. The demand and supply of labor determines the real wage in the market as well as the employment level that in turn determines the aggregate output given the available level of technology. Disturbances in the overall equilibrium in the economy i.e., between aggregate supply and demand is assumed away adjustments in the funds market through movements in the interest rate. These two relative prices i.e., interest rate and real wage ensures full employment equilibrium and thus knowledge of the general price level is not material to the explanation of the economic condition.

This irrelevance of the general price level in explaining the real economy

came to be known as 'classical dichotomy' (Patinkin, 1965) which implies that doubling the supply of money will double the price level rather than having any real impact on the economy. Since classicists are mainly concerned with explanations of output and employment, the development of classical monetary theory has a sole purpose of explaining the movements in the price level of the economy. With classical dichotomy in the backdrop, the quantity theory of money emerges as the theory of general price level for the classics.

The quantity theory of money is based upon a simple accounting identity known as the 'equation of exchange' that can be written as:

$$MV = PY \tag{1}$$

Where M is the money in circulation, V is the velocity of circulation and PY is the nominal output in the economy (where Y is the real output and P is the price level). Classicists further believed that velocity of money was dependent not upon economic circumstances but customs and payment habits as well as the output in the economy was always at the full employment level as the flexible real-wage ensures it. With this understanding Equation 1 transforms to:

$$\begin{aligned} M\bar{V} &= P\bar{Y} \\ \therefore M &\rightarrow P \end{aligned} \tag{2}$$

It follows that M only impacts P. It is important to note here is that several economists (Keynes, 1936; Friedman, 1956, 1987; Patinkin, 1965, 1972; Samuelson, 1967; Lucas, 1980) have explained QTM in slightly different ways. Fact of the matter, however, is that money in classical economy remains a tool for the exchange of real goods and services with the underlying belief that individuals hold money stocks exclusively for this purpose. It then follows that rising money stock in the economy is identical to higher spending. From Equation 2 as the economy is producing at its maximum level, monetary growth leads to rise

in price level with a stable velocity of circulation. Keynes (1936) however, finds that it is not necessarily the case that changes in money supply correlates to changes in general price level which also lead him to reject the quantity theory of money. Even though Keynes tends to reject the correlation but the prescription that comes out of the classical QTM paradigm is that a higher quantity of monetary stock leads to higher level prices and given that the quantity of monetary stock in an economy is exogenously determined by the central bank, it is thus domain of monetary policy to bring inflation under control by managing the overall money supply.

Contrary to the idea of management of price level from the monetary side, there is also established economic theory that suggests that it is the fiscal operations of the government that primarily decide the dynamics of price level in an economy. This theory is often termed as 'Fiscal Theory of Price Level' (FTPL) put forward by Leeper (1991). In the FTPL framework, the dynamics of price level are affected by the present and future fiscal policy stance as well as sustainability of government's debt. This framework also argues that it is for the government's stance to consistently raise debt to finance deficits that ultimately inflates the money and reduces the real value of the overall debt it has. Thus, Woodford (1994, 2001); Sims (1994) highlight the importance of sustainability of fiscal balances for the stability in the price level because there lies a consensus among economists that persistent deficits are inflationary.

On a basic level FTPL argues that the decisions at the level of an individual economic agent are shaped by their expectations regarding fiscal policy stance and sustainability of the government's debt. As government issues more and more debt to finance its deficit, an individual agent may change his decisions in anticipation of future inflation such as setting price of products as well as wages in the economy. Also, given that fiscal policy is more dominant compared to the monetary policy, central bank may be forced to act in favor of fiscal policy rather than keep the price level stable i.e., to either try and keep interest rates low so

as to manage government's debt sustainability or even monetize government's debt itself.

The proponents to monetarism and FTPL do not differ in term of their stance for achieving price stability i.e., the right mix of fiscal and monetary policy. Monetarist argue, given that money is exogenously controlled, a strong central bank can induce induce the government to choose its deficits and levels of debt carefully, thus subjecting it to a degree of fiscal discipline. FTPL, on the other hand, argues that money is endogenous Sargent *et al.* (1981) rather than exogenous and the overall level of money supply in the economy is a consequence of financing and spending decisions of fiscal policy.

This debate is an interesting test case for a developing country like Pakistan from a policy perspective in that the choice of policy tool to achieve price stability becomes crucial. If we place price stability exclusively in the domain of monetary policy, then every instance of inflation is met with an upward rate adjustment leading to slowing down of the overall economy. However, if we look at inflation through the lens of FTPL, then looking at a country with limited external funds and domestic taxes as well as political instability and other structural bottlenecks can give some useful insights on how to approach the problem (Alesina and Drazen, 1989; Calvo and Végh, 1999; Cukierman *et al.*, 1992). Given that, there is a high economic cost of debt servicing and a high political cost of imposition of taxes, makes it easy to choose inflation tax over reforms (Catao and Terrones, 2005). As State Bank of Pakistan (SBP), post its independence legislation, planes to implement flexible inflation targeting as a means to achieving price stability will require a degree of fiscal discipline from the government in terms of its overall deficits and also in terms of its choice of a source to finance those deficits.

2.3.2 Economic Growth

The literature on the linkages of money creation through government spending has largely been empirical in nature, however, the basis of that analysis can be found in general prescriptions of the various schools of thoughts in economics literature.

The hallmark of neoclassical growth theory is the work of Solow (1956), Ramsey (1928); Cass (1965); Koopmans (1965) and Diamond (1965). An element that is common across these models in terms of their formulation is that they these models center around savings to channelize economic growth. Government spending, or more specifically deficit spending, can be considered 'dis-saving' by the government and if that dis-saving is not met by an equal saving in the private sector, then in the neoclassical setup, is detrimental towards growth. In this paradigm, since we have optimal allocation of resources in every period, an attempt to increase consumption in any period through deficits will lead to shifting of taxes for subsequent time periods and the given that individuals can borrow and lend at the going interest rate, their consumption level will be determined as a solution to an inter-temporal budget constraint.

In the Keynesian paradigm (Keynes, 1936), the basic difference with the neoclassical setup lies with the resource allocation where the former argues that economy is seldom at the level where we have a full and optimal employment of resources, therefore, it remains possible to increase, through borrowing, consumption or investment in the economy that eventually impacts output growth through a multiplier process. Keynesian analysis, however, does not incorporate any explicit treatment of a budget constraint nor does it draw any differences between various sources of financing of government deficits but it does argue that bond-financed spending from the private sector in a fixed money supply framework will have the effect of raising interest rate that can somewhat decrease the gains from multiplier effect. But, the effect of increased employment of resources and the profits flowing thereof, will neutralize any negative

impacts of the rising interest rates. In case, where there are already full employment of resources in the economy, even in Keynesian analysis, increased government spending leads to crowding out of private investment.

In the Ricardian perspective, any attempt by the government to increase output growth through deficit spending has a neutral impact for the simple reason that any dis-saving on part of the government today results in increased taxes for subsequent time periods. The critical point of this debate is that if households have perfect foresight then they are aware that increased government deficits will result in higher taxes in the subsequent periods, then those deficits will not have result in raising aggregate demand and subsequently output growth.

2.4 Review of Empirical Evidence

In this section, we'll briefly gather the empirical work that has been done on the impact of government spending in the context of crowding-out, growth, and inflation and then attempt to summarize our findings from the empirical evidence in light of the theoretical underpinnings.

2.4.1 Government Spending & Crowding-Out

Decades after the origination of the idea of crowding-out of private investment and consumption as a result of government spending, in the short as well as the long time horizon, there has been a lack of empirical consensus whether government spending in fact 'crowds-out' or 'crowds-in' private spending.

In terms of private consumption, the prediction of the IS-LM model is that a positive government spending shock increases it since individual consumption, in a non-Ricardian way, is a function of disposable income in a and government spending increases that disposable income (Blanchard, 2003). One the contrary, Real Business Cycle (RBC) models argue for a decline in private consumption owing to government spending lowering the present value of an infinitely-lived

Ricardian household's after-tax income, and as a result lowering consumption due to a negative wealth effect. (Christiano *et al.*, 1999; Baxter and King, 1993)

In term of private investment, the IS-LM model argues that in response to a positive government spending shock, investment should decline if it is not complimented by an expansionary monetary policy because government and the private sector both compete in the funds market for a limited sum of money and government claiming a substantial portion of it raises interest rates and therefore, leads to a decrease in private investment. The RBC model, however, argues that government spending should have a positive impact on private spending through a rise in employment leading to rise in expected returns to capital.

The evidence from the OECD region by Argimon *et al.* (1997) suggests that government spending has a positive impact on private investment, while cross-country analysis of a panel of developed and developing countries by Barro (1991) finds the effect of government spending on private investment to be negative. Again, where Aschauer (1989), Burnside *et al.* (2004) and Blanchard and Perotti (2002) find a positive impact of a government spending shock on private investment for the US economy, Mountford and Uhlig (2009) finds the impact in the opposite direction. For a panel of developed and developing economies, Grier and Tullock (1989) finds evidence for a positive impact on private investment and Karras (1994) finds a positive impact on private consumption as a result of government spending.

In terms of impact on private consumption the evidence is also mixed i.e., Biau and Girard (2005), Blanchard and Perotti (2002) and Fatás and Mihov (2001) find a positive impact of government spending Coenen and Straub (2005), Edelberg *et al.* (1999) and Ramey and Shapiro (1998) finds a negative impact of government spending in various parts of the world. Even in the case of Pakistan there is mixed evidence available on the impact on private investment as a result of government spending shocks. While Haque and Montiel (1991,

1993), Burney *et al.* (1989) and Naqvi (2002) find evidence against 'crowding-out', Hussain *et al.* (2009) and Zaheer *et al.* (2017) finds evidence in its favor.

2.4.2 Government Spending & Output Growth

A government budget is composed of a host of expenditures that differ in their nature and purpose – a composition that is known to have historically, and still does vary across space and time (Chen *et al.*, 2019; Devarajan *et al.*, 1996). Among other expenditures a sizable portion of this budgetary spending includes development expenditures that drive GDP growth thus, the connection between these expenditures and GDP growth have remained the subject of research, both empirically and theoretically over the past few decades e.g. for a empirical linkages of government spending and growth debate see (Barro, 1990; Aschauer, 1989; Tanzi and Zee, 1997; Kolluri *et al.*, 2000; Lahirushan and Gunasekara, 2015) for a more empirical debate on the causal direction of the relationship between government spending and GDP growth debate while see (Barro, 1990; Ram, 1986; Levitt and Joyce, 1987; Palamalai, 2014) for theoretical underpinnings of the causal relationship between government spending and GDP growth. Thus it is important to elaborate on both the empirical as well as theoretical and causal part of the literature on this matter.

Empirical evidence on the relationship among GDP growth and government spending has been mixed in the sense that a different studies on this topic have found this relationship to be either positive (Lahirushan and Gunasekara, 2015; Njoku *et al.*, 2020; Oni *et al.*, 2014), or negative (Grier and Tullock, 1989; Barro, 1990; Aschauer and Greenwood, 1985; Devarajan *et al.*, 1996; Iqbal and Zahid, 1998; Iqbal *et al.*, 2017) or in some cases inconclusive (Ansari *et al.*, 1997; Al-Faris, 2002).

Besides looking at the direction of impact of government spending on to GDP growth, literature has also looked into whether the impact government spending and GDP growth on one another i.e., positive or negative flows from

government spending to GDP growth or the other way around. Existing literature in on this question can be divided into two strands – Keynesian argument and Wagner's law – where Wagner's law argues in favor of causal relationship from GDP growth to government spending while the Keynesian argument is built around the discretionary power of the government to spend and thus arguing for government spending causing GDP growth.

Wagner, in 1893, argued that government spending and growth are positively related to each other and the cause-effect relationship between the two exists in such a way that higher growth leads to higher government spending (Henrekson, 1993). The reason for the existence of this specific causal relationship can be categorized in three ways: One, as society becomes more modernized and industrialized more of the functions that were originally part of public activity will be substituted by private sector thus leaving the government with more space to take active role in the society. Two, government will be able to efficiently take on projects that are that are income-elastic in nature for the private sector. Three, with the development of new technologies and markets, government has to take a much larger role in management of monopolies for the society to be efficient as a whole. In summary, with economies becoming more and more developed, measured in terms of growth and living standards, government has to strive more to provide the appropriate level of social protection and has to keep up with the development expenditures thus, visualizing government expenditures as endogenous to GDP growth (Levitt and Joyce, 1987).

Empirical studies checking validity of the Wagner's law finds result that change from one economy to another and even form one study to another for the same economy. Some studies in case of UK (Ashworth *et al.*, 1995), Sweden (Henrekson, 1993) and (Nomura *et al.*, 1995), to name a few, have found evidence in support of Wagner's law which led to some famous panel studies by Anwar *et al.* (1996), for G-7 economies by Bohl (1996). In case of Pakistan,

this relationship has been tested by where some minor studies find evidence is support for this relationship, however, overwhelming evidence points towards Wagner's law not holding in case of Pakistan's economy as we find in the studies of Afzal and Abbas (2010) and Rauf *et al.* (2012).

Contrary to Wagner's law, Keynes (1936) proposes government spending to stimulate growth in the economy as a part of fiscal policy decision. Keynesian argument revolves around the use of government spending in the economy to recoup people's ability to spend thus stimulating aggregate demand. The rise in aggregate demand raises the employment level in the stagnant economy, gradually and eventually moving towards a higher output level bridging the gap between actual and potential output (Fazzari, 1994).

In case of Pakistan, the evidence suggests that the relationship between government spending and economic growth runs in both directions. However, the evidence in favor of the the impact running from government spending to economic growth is more pronounced. For the purpose of our thesis, we make this Keynesian style understanding of the relationship between government spending and growth, the basis of our modeling and analysis.

2.4.3 Government Spending & Inflation

Sims (1994); Leeper (1991); Christiano and Fitzgerald (2000) and Woodford (2001), to name a few, have investigated the interaction between government spending and generally the government's fiscal policy response and have found that government's fiscal stance does play a role in determination of price level. A host of studies have been carried out all over the world to establish the relationship between government spending and inflation, however, the evidence suggests that response in inflation to rising government expenditures may not always be positive. For the purpose of this study we collect present evidence from some notable studies.

In case of US and UK economies, Han *et al.* (2008) find a positive relationship

between the size of the government expenditures and the rate of inflation in respective economies and a similar evidence can be found in Nguyen (2019) for emerging Asian economies (India, Indonesia, & China) where government spending is co-integrated with inflation in all of economies under study and it is also established that the causality flows from government spending to inflation and not the other way around. This behavior is indicative of the fact that the difference of institutional structures across-countries is no important towards determination of the relationship between inflation and government spending.

On the other hand, there is also evidence in e.g, Kandil (2006) that investigates the relationship between government spending and inflation rate in a panel of industrial economies and finds that, contrary to the existing evidence, a negative and significant impact of spending on inflation is present in all of these economies. This means that in these industrial economies a high inflation rate is caused by shrinking/contracting government expenditures. Similar evidence can be found in the case of Nigeria e.g., (Olayungbo, 2013) where government spending and inflation are inversely related to each other. There are various other studies e.g., (Cukierman *et al.*, 1992; Becker and Mulligan, 2003) that find the same negative relationship. In the Mediterranean countries case, Magazzino *et al.* (2011) finds the relationship between government spending and inflation rate to be inconclusive as to the direction of its impact.

In case of Pakistan, evidence suggests, at the very least, not a short-run but a long-run relationship between government spending and inflation rate Attari and Javed (2013) while other, more detailed, studies on the similar topics have been conducted e.g., Serfraz and Anwar (2009), Jalil *et al.* (2014), and Agha *et al.* (2006) that establish that deficit spending in Pakistan causes inflation rate to rise and fiscal deficits are generally inflationary even over longer time horizons.

2.5 Summary

The standard literature tells us that a government can finance the fiscal deficit by issuing debt to the private sector or the central bank or a mixture of both. As to the effectiveness of both sources of finance, there is a consensus among economists that government spending financed only through a central bank can be effective while the spending financed through the private sector cannot. Despite this consensus, deficit financing through central bank money creation has fell out of favor in developed economies and is becoming a growing trend in developing economies. This argument on effectiveness of the sources of finance is based on the assumptions of crowding-out and Ricardian-equivalence which are empirically tested with mixed results.

As central bank's grow more independent with the passage of time owing to the argument that an independent central bank is in a better position to achieve price stability, has brought the matter of government's debt monetization to the fore-front. A central bank's financed deficit spending has been identified with inflation more than it is identified with economic growth. On the other hand, the private source of deficit financing believed to have no net effect on the economy is preferred in the name of fiscal discipline.

2.5.1 The Gap

In the case of Pakistan, there are more than a few studies that have been conducted in the fashion of 'money-inflation-output' modelling. All of these studies use an aggregate measure of money, such as broad money (M2) to represent monetary growth. The problem with representing money in this way limits the possibility of a policy relevant analysis. This study identifies this gap and takes a dis-aggregated measure of money creation through monetized and bond-financed deficit spending by the government to answer pertinent policy questions in the context of central bank independence and fiscal discipline.

2.5.2 The Objectives

In light of the literature gap and motivation of this study we narrow down the following two objectives:

- To measure the direction and magnitude of the impact of bond-financed and money-financed borrowing on inflation and output in the case of Pakistan.
- To explain the empirical evidence in light of the mechanics of how money moves through different sectors of the economy.

Chapter 3

3 Deficit Financing, Inflation & Output Growth: Does Source of Financing Matter?

3.1 Introduction

Deficit spending from government's perspective simply means that its accumulated spending has exceeded its accumulated income from taxes and other sources in a certain time period. In order to achieve a balance between the two, the difference - the 'deficit', has to be financed mainly, one of two ways: by 'issuing government money' or 'government borrowing'.

Even though the precedence of government money creation exists not too far back in history, as we have seen in the case of 'Greenbacks' and 'Bradbury Bills' during World War I by the Unites States Carruthers and Babb (1996) and the United Kingdom Davies (1994) respectively, yet this avenue has not been explored since the end of World War II. The reason why that has been the case is that the government spending it enabled was thought of as inflationary. This stance, however, has been argued against by Huber and Robertson (2000) for not necessarily be the case, if monetary expansion is limited to growth potential of the economy. That being said, the bulk of spending by the governments since WWII have been financed through borrowing using treasury securities either through monetization or bond-financing by leveraging the public's perception of the government as the safest borrower of their funds. Even though the creation of government money fell out of favor, yet the direct monetization of government's debt maintained the inflationary perception of its spending.

Developing economies, particularly in Asia, are often plagued with high inflation and low productivity coupled with low desire to implement reforms and effective policies. Governments of these economies are perpetually engaging in

large deficit spending Asian Development Bank (2022) for their inability to raise sufficient revenues and output growth. Financing these deficits with poor economic fundamentals e.g., saving rate, population growth, productivity in the workplace remains a challenge. Central banks of these economies play a key role in this regard. Unlike more developed and advanced economies, role of the state and its bank in developing countries is intertwined and geared towards providing jobs and growth rather than keeping inflation in check. Governments find it easier and cheaper to get their debt monetized rather than raising it from the market for reasons that range from uncertainty in the economic sphere to borrowing costs but has consequences for price stability in the economy.

If a government wants to borrow it can sell treasury securities to its central bank or to the private market. There is a consensus in the literature that excessive monetization of government's debt by it's central bank is inflationary but a similar point is not argued in case of bond-financing government's deficits. The reason for this consensus lies upon the orthodox understanding of the way money supply is created through a multiplier model and the way banks behave as financial intermediaries in an economy. The argument is that the monetization of government's debt leads to creation of monetary base or high powered money which subsequently fuels credit creation. On the contrary, bond-financing is not assumed to be inflationary because the assumption is that it '*crowds-out* the private funds market as government competes for limited (loanable) funds with private borrowers. Thus, the possibility of a buildup of excessive money stock, and consequently inflation, is close to none. As far as productivity is concerned, excessive borrowing by government can severely crowd-out private borrowing to the level that it hurts private investment plans and thus overall output. However, same money if productively spent by the government can boost output growth in the economy.

Therefore, for inflation and output, the avenues of financing government's deficits are material to the discussion on direction and magnitude of their im-

pact. The centrality of government debt in the argument, especially from the funds market, asks for an analysis of the banking sector's participation as well. Contrary to the mainstream orthodox standing on the issue, heterodox literature (Moore, 1979; Schumpeter, 1934), and some from the orthodox side as well McLeay *et al.* (2014a), consider banks not as strict financial intermediaries. Technically, what the heterodox argue is that, banks do not need 'savers' to deposit money into the bank before they can make 'loans' to businesses or the government. A private bank can borrow reserves in the inter-bank market or from the central bank or the act of deficit spending itself, which means that new reserves are potentially created and consequently high-powered money. It is then necessary to investigate the inflationary properties of bond-financing and its impact on output as well.

The sources of deficit financing also have relevance to policy debate around central bank independence. It is argued that an operationally independent central bank that can internally choose the policy instrument and does not monetize government's debt has a better chance at delivering stable prices and output growth. A host of developed and developing nations have adopted this stance and the apparent evidence confirms the original claim[6]. Pakistan is a developing economy and faces similar problems. Historically, there are instances where government has its debt monetized and generally, also, conducts bond-financing to meet its fiscal needs but has suffered continually from high inflation and low output growth. Under the 22nd IMF "Extended Fund Facility" program has legislated in favor of the independence of its central bank - the state bank of Pakistan (SBP). The State Bank of Pakistan is not obligated anymore to monetize the debt of Government of Pakistan. There are, however, no restrictions on the government to the extent of debt it can raise from the money

[6]Eurozone among many other economies agreed upon the independence of the central bank in Maastricht Treaty that has rules to ensure the independence of central banks from their governing parliaments and effectively prohibits the government to directly finance its spending through nation's central bank including any credit schemes or overdrafts such as 'Ways and Means'.

market at the going rate. In other words, the amount of debt that can be raised depends not only on the size of the government's deficit but the ability of the government to pay it back and the confidence of the market in such ability thus subjecting the whole process raising debt to the 'market discipline'.

The main objective and contribution of this study is to investigate how monetization and bond-financing of government deficits affects inflation and output in the economy. The discussion over respective impacts carries over to the argument of whether it makes 'a difference' for the macroeconomic outcomes if one source of deficit financing is picked over the other. This study then argues that measures such as central bank independence in hopes of subjecting deficit spending to 'market discipline' prove to be ineffective. This study proceeds by building a context for our analysis by elaborating on the theoretical background of the problem and then use the structural vector autoregressive (SVAR) modeling approach to find the impacts. We subsequently we check the robustness of our result by employing the quantile-on-quantile (QQ) approach.

3.2 Theoretical Background

We use an the non-linear model of public debt by Bacchiocchi *et al.* (2024) in its extended form. Equation (3) represents the output equation:

$$Y_t = \alpha Y_{t-1} + \beta r_{t-1} + \epsilon_t \tag{3}$$

Y_t represents the output in time t that is dependent upon its own lag Y_{t-1} and lagged real interest rate r_{t-1}. From inter-temporal budget constraint of the government we get:

$$D_t = (G_t - T_t) + rB_{t-1}$$

This expression represents the government's deficit D_t at time t.G_t represents spending by the government and T_t represents taxes collected from public at

time t while r represents the real interest rate. B_{t-1} is the overall debt held by the government at the end of period $t-1$ and rB_{t-1} is the interest payments owed by the government on outstanding debt. Therefore, total deficit (commonly called fiscal deficit) is the sum of interest payments on outstanding government debt and the difference between government spending and collected taxes (commonly called primary deficit).

Government finances its deficits by issuing debt in the form of new bonds (B_t). In that case $\Delta B_t = B_t - B_{t-1} > 0$ and this process is called *bond-financing*. However, central bank can also buy a share of these government issued bonds in exchange for money (M_t) - also called reserves. In that case $\Delta M_t = M_t - M_{t-1} > 0$ and this process is called *money-financing* or *monetization*. We can then write our expression of deficit resources and sources of finance as:

$$\Delta B_t + \Delta M_t = (G_t - T_t) + rB_{t-1} \tag{4}$$

Equation (4) represents the sources of finances available to the government and that actual financing is dependent mainly upon the primary deficit that implicitly represent the output excess or shortage.

$$\pi_t = \pi_{t-1} + \gamma(Y_t - Y_{t-1}) + \delta b_t \tag{5}$$

Equation (5) represents the inflation (π_{t+1}) in the economy that is dependent upon its own lag (π_t), output gap ($Y_t - Y_{t-1}$) and debt issued by the government financed through bonds and/or money (b_t).

$$r_t = \gamma(\pi_t - \bar{\pi}) + \delta(b_t - \bar{b}) \tag{6}$$

and, lastly Equation (6) represents the real interest rate (r_t) that is dependent upon difference of current inflation from target ($\pi_t - \bar{\pi}$) as well as the financing gap ($b_t - \bar{b}$).

Discussion:

Theoretical arguments both in Classical and Keynesian traditions have historically advocated in favor of monetization[7] e.g., during Great Depression the argument by the early classicists that money should be created under a policy of "full-reserve banking" by the government or the central bank (Fischer, 1936). A variant of the monetization argument has recently been revived under the Modern Monetary Theory (Wray, 2012) which argues that sovereign currency issuing state or its central bank is the ultimate creator of the money and hence there are no limits to their power to spend for full employment. The added benefit of the monetization arrangement is that governments own their central banks to whom they issue their debt therefore, no liability to the public exists and government stands to earn, as profit, whatever interest it pays to its central bank (Turner, 2014; Johnston and Pugh, 2014). Monetization, with the passage of time, however, is increasingly being seen synonymous to inflation in economics literature.

With the emergence of the "New Macroeconomic Consensus", its prescriptions around monetary policy makes targeting a certain inflation rate the key objective and views operational independence of the central bank as a means of achieving credibility necessary to complete that objective. Monetization was thus stopped because if government were to demand that central bank keep monetizing its deficits, it would not have been possible for the central bank to be independent. Even though, post 1970s, central banks have become more and more "independent", yet there have been critiques that central banks instead of becoming truly independent, have worked either in favor of the financial sector over the productive sector (Epstein, 1992; Posen, 1998; Ingham, 2004) or towards its own power and influence (Goodman, 1991; Werner, 2003). The question that presents itself is that how did money creation by the government or its central bank came to be seen as inflationary? or if we look at the question

[7] *Monetization* refers to the financing of government's deficit by the it's central bank.

in the perspective of sources of deficit financing, we can say how did monetization came to be seen as inflationary and how did the shift towards the market occur?

Historically, instances where large amounts of money has been created as a result of monetization, parallel with a drop in productivity levels are seen during war-times (Pigou, 1941; Davies, 2002) that persists in post war times as well. In a bid to attract similar action from the government during Great Depression, Keynes tries to draw similarities between the war-time needs and an economy in depression to justify monetization based spending. Lerner (1943) draws attention towards the ability of sovereign state, with its own fiat currency, to manage levels of money to create employment. And same state can use tax to withdraw money from different sectors of the economy to control inflation. But, eventualities of monetization based spending, especially in terms of inflation, didn't become mainstream economic theory until the monetarist counterrevolution.

Even the classical pro-market economists e.g., Fischer (1936); Simons (1941) have preferred monetization over bond-financing for former being more stable than the latter. Classical economists in the 'Chicago Plan' went as far as branding credit creation by private banks to be damaging and unstable for the economy and to be completely abolished with a 100% reserve ratio Douglas *et al.* (1939). These prescription, although much debated, were never actually implemented in their original essence. Meanwhile between Great Depression and the 70's, that can arguably be termed as the era of Keynesian 'fiscal dominance' saw a growth in private bank money creation, although constrained with regulations. The causes of "great inflations" in the 1970's are much contested even today but is often attributed by the inability of the Keynesian paradigm to explain them and the re-emergence of the monetarist paradigm for simply sighting the correlation between money supply and inflation as its evidence (Friedman, 1963). Friedman (1962) thus marks, in a manner, the beginning of

the movement away from monetization towards the public sector bond-finance by arguing in favor of a fixed rate of growth for money because of the ability of the government to cause inflationary episodes as a result of tinkering with monetary policy and generating business cycles. This stance was well received by the politicians as well as the economists at that time.

The rise of neo-classical paradigm made up of rational agents with perfect foresight and choices leading to a demand-supply equilibrium and long-term neutrality of money (Sargent and Wallace, 1975; Lucas Jr, 1972) once again opens the debate on the mode of financing on government's deficits. In these rational expectations models, both modes of deficit financing i.e., monetization and bond-financing are taken under consideration. In case of bond-financing, government is assumed to be competing with the private sector in the money market for loanable funds thus raising interest rates slowing down economic activity i.e., crowding out but since that ends in net resource transfer from the private sector to the public sector it is considered less inflationary in the sense that private sector has a decreased ability to create demand. In case of monetization, all money is assumed to be printed by the central bank and change in money supply is directly proportional to the base money and hence inflation because there is no resource transfer involved.

More specifically, Cagan (1956) and Dornbusch (1992) argue that under the assumption of rationality, there would be a need to do more and more inflationary financing of monetized deficits because agents, for higher returns, will keep preferring non-monetary assets over real money balances. Even if those deficits are bond financed, expanding deficits will eventually have to be serviced through monetization because of the exploding interest cost Sargent *et al.* (1981). The problem, however, is that even though mild inflation has a potential for growth yet the rational agent is able to expect it and re-negotiate contracts. A government that is looking to exploit this dynamic, will either have to exceed agent's expectation or revert to a rule for optimal monetary policy. This

argument flows naturally towards central bank independence and hence prohibition of monetization. The question on the source of funding deficits, thus, becomes important if a growth targeted government spending will bear fruit or whether it will prove only inflationary in the end. There have some studies that have empirically tested correlations between fiscal deficits and inflation e.g., (King and Plosser, 1985; Barnhart and Darrat, 1988; Lin and Chu, 2013) but have failed to establish a significant connection between the two regardless of deficit being funded through money or bond financing.

More recenlty, the theory that has seen large success in term of explaining the theoretical foundations of inflationary as well as deflationary episodes in varying economic circumstances is the 'Fiscal Theory of Price Level' (FTPL) attributed mainly to Cochrane (2023). FTPL, at the most basic level argues that inflation is not always the by product of a monetary policy but sometimes fiscal policy is also to be blamed for this outcome. In reality, governments have a tendency to take massive amounts of debt as a fiscal policy stance. Conventional theory assumes automatic surpluses after deficits that pays down debt but, FTPL does not. FTPL argues that governments can keep creating deficits one after another which can be either smaller or larger than the previous one. In this scenario, the possibility of an inflationary episode arises out of the ability to manage the nexus between surpluses, deficits and debt. If there is a failure on part of the government in managing public expectations that the debt will be repaid, people will anticipate inflation and price level rises.

FTPL also argues that a simple demand-supply based framework cannot sufficiently explain the data because inflation can be found to correlate positively to periods with higher deficits as well as low deficits. It if the dynamics of debt that plays a key role in determining inflationary outcomes or not. This theory also predicts that if surplus processes are autocorrelated, then inflation and deficits are strongly correlated because persistent deficits are being financed primarily by inflating away outstanding debt.

3.3 Econometric Methodology

A new era in economic modeling dawned on academics and policy making alike with the introduction of Vector Autoregressive (VAR) model by Sims (1980). Sims, building on Lucas (1976), points out the axiomatic approach and assumptions regarding exogeneity and endogeneity of variables as source of failure of economic models before him. Sims argues in favor of dropping all structural as well as exogeneity assumptions to make the model truly empirical in the sense that patterns emerge purely out of data rather than any economic prejudice.

The way patterns emerge out of a VAR model is through calculation of impulse responses which simply is the response by a system to shock in one of its variables. This, in principle is a causal question, that requires causal sequencing - the absence of which becomes weakness of the analysis and thus the source of initial criticism for VAR-analysis not being able to answer policy related questions (Sargent, 1984; Learner, 1985). More sophisticated approaches have been developed by (Sims, 1986), Bernanke (1986), and Blanchard and Watson (1986) since, to answer this criticism and bring VAR-analysis a step further ahead from its ability to merely forecast.

The reason for using SVAR modeling approach over other competing approaches such as Auto-regressive distributed lag (ARDL) modeling is two-fold: one, the objective is to identify, separately, the shocks in government borrowing with respect to its sources i.e., central bank and private banks and then calculate the dynamic response of output and goods prices to these shocks and not exact parameter values, and two, we do no assume government spending as weakly exogenous and allow it to respond contemporaneously to output but do not look for long-run relationships. Both these reasons make SVAR a more appropriate approach in this case. Moreover, while we estimate dynamic responses, it is inherent in the understanding of impulse response functions that when a response in a variable is estimated by an innovation in another the reverse effect is accounted for which gives us a true estimation of the effect. Nature of

our analysis makes us not overly concerned about the order of integration in variables, nonetheless, all variables, except money market rate, are taken in the form of annualized percentage growth rate and are thus unlikely to be integrated of order greater than zero.

We build a structural VAR model with six variables to estimate the effect of government borrowing on inflation and output[8]:

$$BX_t = B_0 + \sum_{i=1}^{p} C^i X_{t-i} + \epsilon_t \tag{7}$$

the set of contemporaneous coefficients are represented by the matrix B, the vector of constants by B_0, lagged coefficients of i^{th} order by C^i, and $X_t = [\pi_t\, y_t\, i_t\, fbcb_t\, fbpb_t\, er_t]$ represents the vector of variables X. π_t, here, represents inflation, y_t represents output, i_t represents market interest rate, $fbcb_t$ and $fbpb_t$ represents monetization (federal budgetary borrowing from central bank) and bond-financing (federal budgetary borrowing from private banks) of government deficits respectively, and er_t represents exchange rate.. Also, ϵ is a vector of exogenous structural shocks that are contemporaneously and serially uncorrelated with constant variance and a zero mean.

We can transform the structural exposition given in Equation (7) to construct a reduced form VAR given below [9]:

$$X_t = A_0 + \sum A_i X_{t-i} + e_t \tag{8}$$

The elements in e_t , that are simply one step ahead forecast errors, might be contemporaneously correlated but they are serially uncorrelated with a constant variance and zero mean. A more convenient representation of VAR in Equation (8) can be given in the form of moving average using lag operators:

$$X_t = B(L)e_t \tag{9}$$

[8] see a detailed example in Appendix 7.1.1 for understanding of Eq (7)
[9] see a detailed example in Appendix 7.1.1 for understanding of Eq (8)

Then, VMA can formally be written in terms of structural shocks as:

$$X_t = B(L)S\epsilon_t \tag{10}$$

$$X_t = \phi(L)\epsilon_t \tag{11}$$

Here, ϕ represents the impulse response functions [10]. After calculating impulse responses we move on to calculating variance decomposition in our variable of interest to see how much of the variation is caused in our variable of choice due to our targeted impulse (also explained in Appendix 7.1.2)

3.3.1 Identifying Restrictions

The standard method to estimate VAR model is through Ordinary Least Square (OLS) method in its reduced form. The problem with estimating a reduced form VAR model, as in Equation (8), is that the identification problem has to be resolved ahead of estimation. This necessitates the imposition a minimum number of restrictions on the structural parameters - and one way of achieving that is through the use of Choleski decomposition method for a structural model identification (Enders, 2004). For an exact identification of our SVAR model, $(n^2 - n)/2$ restrictions have to be placed where n is the number of variables in VAR model and since we have a 6 variable in our analysis, it translates to a minimum of 15 restrictions on structural parameters [11].

In terms of contemporaneous responses, we have two extremes: The output has been restricted to respond to its own shock. This is generally considered a reasonable restriction because output is a variable that has high level of persistence i.e., it current values are highly dependent upon its lag. Also, any response in output due to shocks in monetary or non-monetary variables is generally lagged (Christiano *et al.*, 1999; Kim and Roubini, 2000). On the other hand, exchange rate is allowed to respond to all variables in the model as it

[10] see a detailed example in Appendix 7.1.2 for understanding of Eq (9), (10), and (11)
[11] see a detailed example in Appendix 7.1.3 for more explanation.

adjusts promptly to any and all economic developments. Even though this an established pattern, we investigate this pattern in the case of Pakistan. Chishti *et al.* (1993) reports that real exchange rate in Pakistan, responds rather quickly to monetary (inflation and interest rate) as well as to real variables (output). In our model, we have placed real exchange rate such that it responds contemporaneously to all variables.

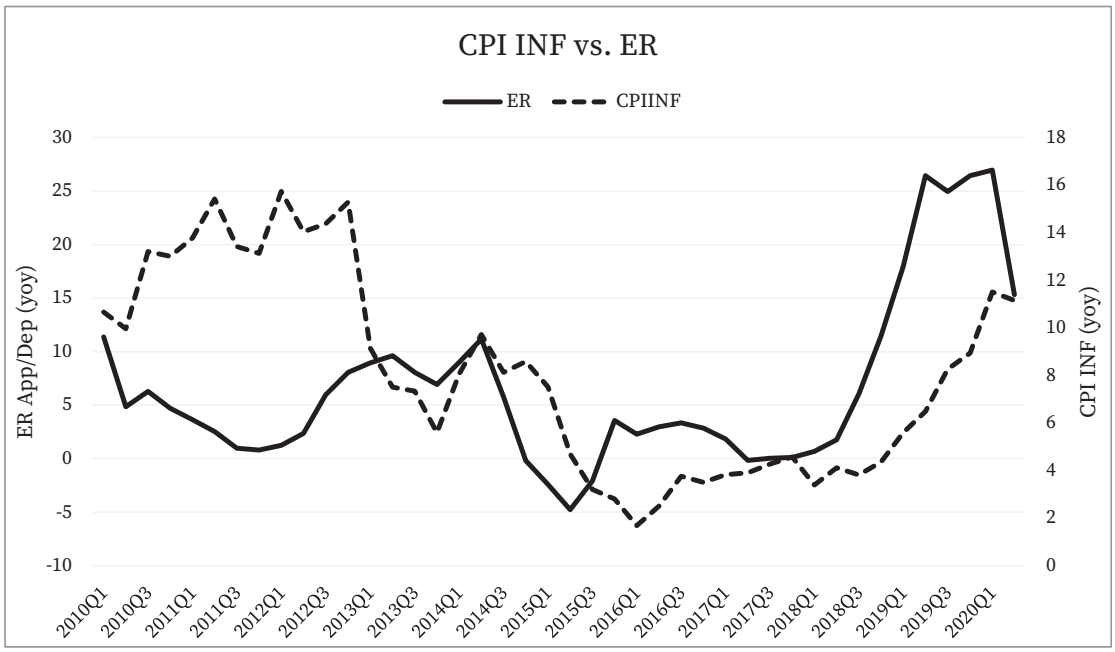


Figure 2: Relationship b/w Inflation & Real Exchange Rate

Moving forward, inflation rate is allowed to respond contemporaneously to all other variables in our model except exchange rate because we take the position that inflation responds to changes in exchange rate with an at least one period lag. For the most part, this pattern is also visible from Fig 2 (above). On a global level this evidence is provided by (Goldberg and Knetter, 1996). In case of Pakistan, Hyder and Shah (2005) provides evidence of pass-through of exchange rate to inflation and notes that inflation does not respond contemporaneously to changes in real exchange rate, however, prices adjust eventually in the following 12 month period. This, evidence also indicates towards a possible stickiness of prices in Pakistan that could be either severe or mild. In this context, Choudhary *et al.* (2016) and Malik *et al.* (2008) present evidence for less

than sticky prices in Pakistan that prices do not remain sticky in response to all economic developments e.g., prices are prone to adjust in response to changes in economic variables such as interest rates and output etc.

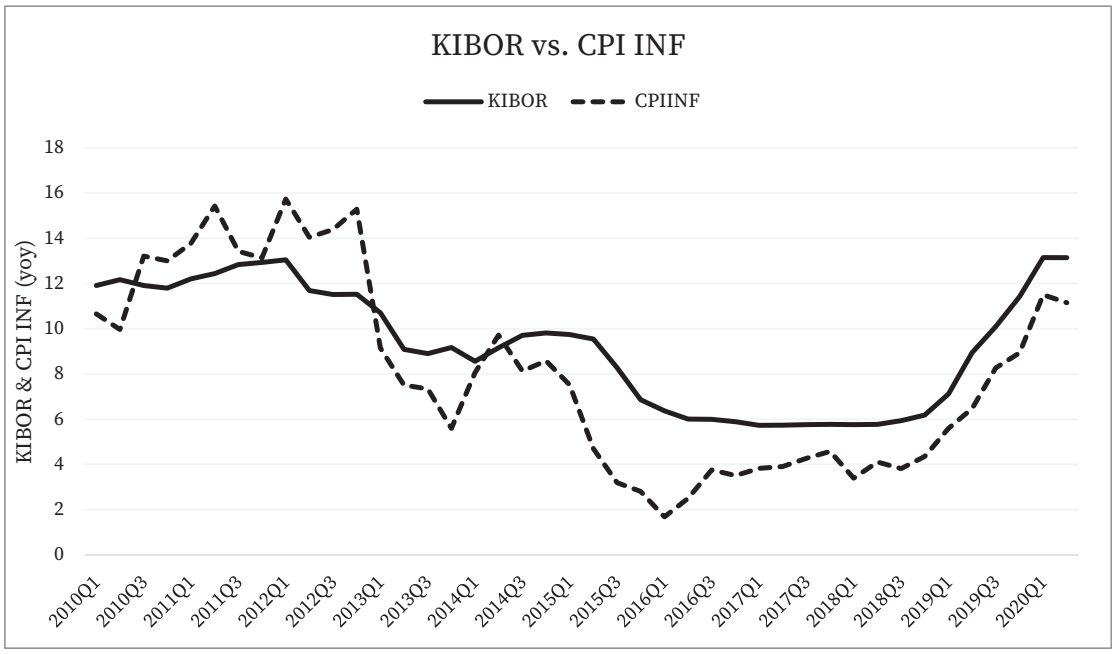


Figure 3: Relationship b/w Interest Rate & Inflation

Central banks all over the world to set a policy rate that corresponds to economic fundamentals like rate of output growth, inflation, etc. Policy rate of a central bank is not prone to changes on a high frequency and acts as a benchmark for the funds market rate. In pursuit of an effective monetary policy, central bank actively intervenes in the funds market through short-term interest rate to keep the funds market rate close of the policy rate. Thus, funds market rate, although responsive to market conditions, is not fully independent in responding to variables such as inflation or interest rate rather it moves with the same pattern as the policy overall as the policy rate. In the context of monetary policy conduct, central banks responds primarily to changes in inflation with changes in policy rate as the monetary policy tool. These rates are revised in scheduled meetings of the MPC. Therefore, in our model inflation is allowed to respond contemporaneously to interest rate but interest rate are not allowed to respond to changes in inflation in the same period. We take the position that in-

terest rate changes occur in response to inflation at least with one-period lag as it is evident from Figure 3 as well. Funds market rate, however, does respond to movement of government securities in the secondary market and even the issue of new government debt in the market in liquidity management operations. Therefore, in our model, we allow for the funds market rate to respond to federal budgetary borrowing from central bank and private banks and to its own lag but do not allow it to respond to inflation and exchange rate movements.

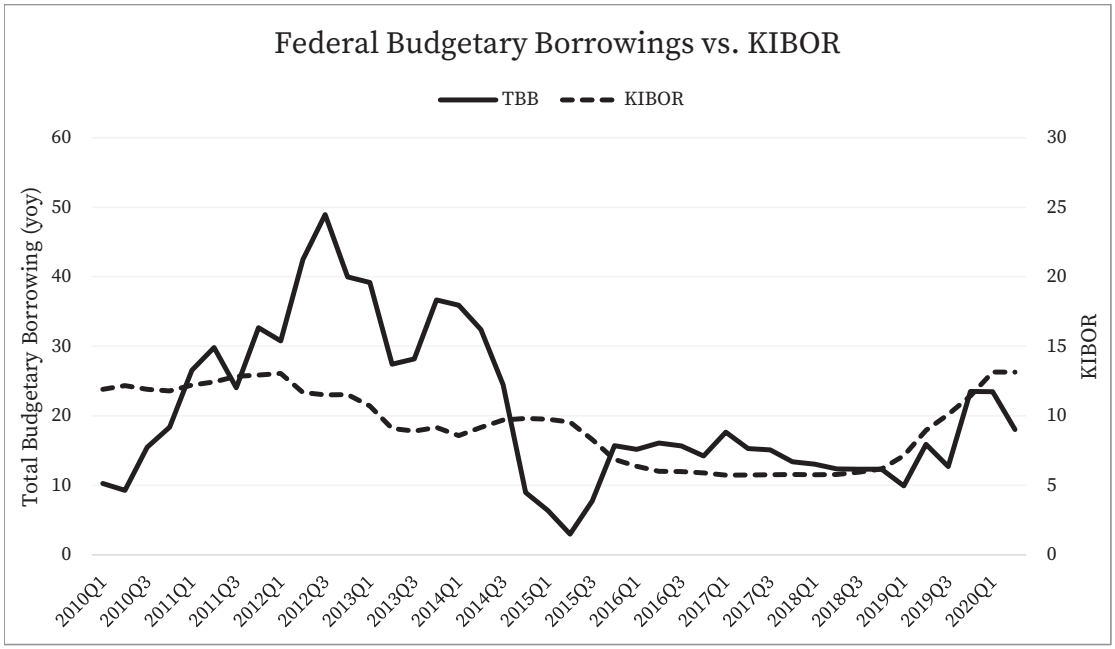


Figure 4: Relationship b/w Federal Budgetary Borrowing & Interest Rate

Finally, we allow federal budgetary borrowing from central banks to respond to its own shock and output while we let federal budgetary borrowing from private banks to respond to borrowing from central bank besides its own shock and output. The reason is for this setup is government spending is budgeted in advance and is directed towards expenditure that are related to development expenditures or government operations therefore, it doesn't make sense for it to contemporaneously respond to interest rate, inflation or exchange rate. However, budgetary spending is sensitive to output growth in a country. A government may choose to spend more in a recession and less in a boom thus it makes perfect sense for the budgetary spending to respond

contemporaneously to output. Lastly, we allow federal budgetary borrowing from private banks to respond contemporaneously to federal budgetary borrowing from central bank because in countries where central bank have not been fully independent in the past (such as Pakistan), governments have monetized deficits rather easily through them as compared to funds market especially in circumstances when funds market has been less than willing lend. This completes the identification requirements for our VAR model and its final representation in matrix form is given by Equation (12).

$$\begin{bmatrix} e_{y_t} \\ e_{FBCB_t} \\ e_{FBPB_t} \\ e_{i_t} \\ e_{\pi_t} \\ e_{ER_t} \end{bmatrix} = \begin{bmatrix} c_{11} & 0 & 0 & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 & 0 & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} & 0 & 0 \\ c_{51} & c_{52} & c_{53} & c_{54} & c_{55} & 0 \\ c_{61} & c_{62} & c_{63} & c_{64} & c_{65} & c_{66} \end{bmatrix} \begin{bmatrix} \epsilon_{y_t} \\ \epsilon_{FBCB_t} \\ \epsilon_{FBPB_t} \\ \epsilon_{i_t} \\ e_{\pi_t} \\ e_{ER_t} \end{bmatrix} \tag{12}$$

3.3.2 Data and Construction of Variables

We use quarterly data on all variables for the period 2005:3 to 2020:2 for Pakistan[12]. Real gross domestic product (RGDP) is used as a measure of output and broadly as a measure of overall economic activity. The data on gross domestic product at constant prices is used to represent RGDP for Pakistan. We construct the series of quarterly RGDP by applying estimated quarterly weights from Kemal and Arby (2004)[13] and argue, in a similar manner as Nasir and Malik (2011), in favor of negligible variability in quarterly weights to justify their use. Furthermore, we make necessary seasonal adjustments with the X12 method.

It is of central importance to our analysis to separately analyze separately the impacts and dynamics of monetized and bond-financed government deficits.

[12]Period is not extended before 2005 for data limitation on interest rate and beyond 2020 for large exogenous shocks to economic variables due to CoVID

[13]Estimated for the period 1974-2004

We construct two separate variables, federal budgetary borrowing from central bank (FBCB) and federal budgetary borrowing from private banks (FBPB) to represent monetization of government deficits and bond-financing of government deficits respectively. Deficit financing serves as a good proxy for its spending because expenditures for future quarters are budgeted and financed in advance of its spending. Thus we use FBCB and FBPB as '*monetized deficit spending*' and '*bond-financed deficit spending*'. The data on FBCB and FBPB is taken from SBP in the form of quarter-end-stocks. Inflation is calculated as the year-on-year percentage change of the consumer price index.

There are a few candidate measures of interest rates in the economy such as money market rate, call money rate and discount rate. We use Karachi Interbank Offered Rate (KIBOR) - money market rate - as the representative rate in the economy. Although there is ample evidence in literature on the use of money market rate in the policy realm (Taylor, 1993; Thorbecke, 1997; Bernanke and Mihov, 1998; Svensson, 1999; Clarida *et al.*, 1999) and even discount rate (Romer and Romer, 2004), yet to the extent of this study the instrument of policy is not the concern of the analysis rather the representation of the overall market behavior as a response to changing economic conditions. Therefore, using discount rate, which is set by the central bank and is susceptible to prolonged rigidity or fixation, is not an appropriate measure to be used in this analysis as opposed to money market rate that does respond to economic developments. Exchange rate (ER) is also used in its year-on-year (YoY) percentage change form to represent appreciation and depreciation in it.

Data on RGDP, CPI, and ER is sourced from Pakistan Bureau of Statistics (PBS) and that of FBCB, FBCP and KIBOR from quarterly reports of the State Bank of Pakistan (SBP).

3.4 Results & Discussion

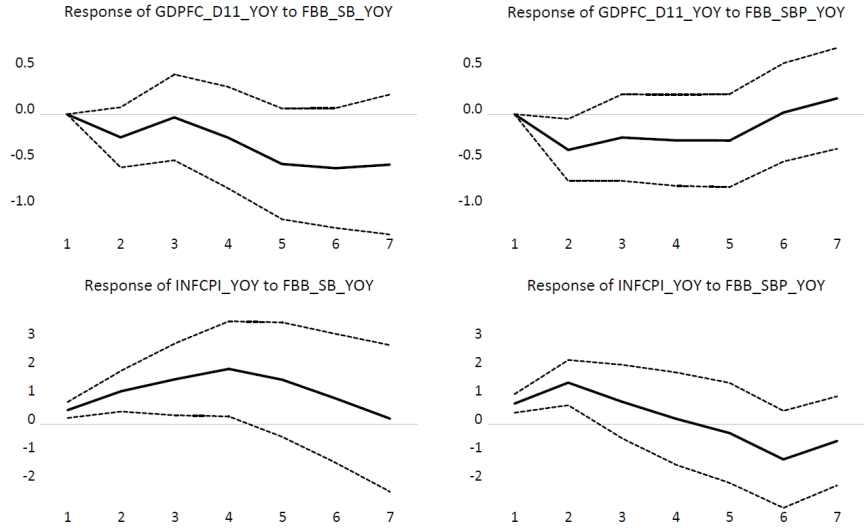
The main objective of this paper is to estimate how inflation and output growth responds to changes in monetized and bond-financed deficits. For this purpose we construct a six variable VAR model incorporating up to six lags using the AIC criterion. All variables in this study are used in their YoY percentage change form with the exception of interest rate. Interest rate along with real gross domestic product, inflation, and federal budgetary borrowings from private banks are non-stationary at level but stationary at first difference (see Appendix 7.2). We are, thus, confronted with a choice to use the non-stationary variables either at level or at first difference. Non-stationary variables are used in the level form owing to the caution against using variables in the difference form by Sims (1980); Sims *et al.* (1990). Using quarterly data with abundant set of values allows us to reasonably incorporate six lags while also taking care of the order of integration issue in the analysis.

3.4.1 Impulse Response Functions (IRFs)

To check the direction of effects of monetized and bond-financed deficits on inflation and output growth, impulse response functions (IRF) are calculated with variable sequencing developed in section 3.3.1. The IRFs presented in Figure 5 present the short-run effects of monetized and bond-financed deficits on output growth and inflation. The bottom panel of 5 shows that both monetized and bond-financed government spending have inflationary consequences. For monetized deficits, results find support in the standard theory in terms of its inflationary impacts. However, in case of bond-financed deficits, the evidence challenges the standard explanation of a resource transfer from private to the public sector. This result also raises question on the orthodox understanding on creation and dynamics of money in the modern banking setup because inflationary consequence of bond-financed deficit spending may very well be due to additional money being created in the retail banking system. This money

created is not destroyed by a subsequent bond sale to the banking sector.

Figure 5: ***Short-run Effects of Deficit Financing on Output & Inflation***



Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Cholesky one S.D. innovations.*

Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

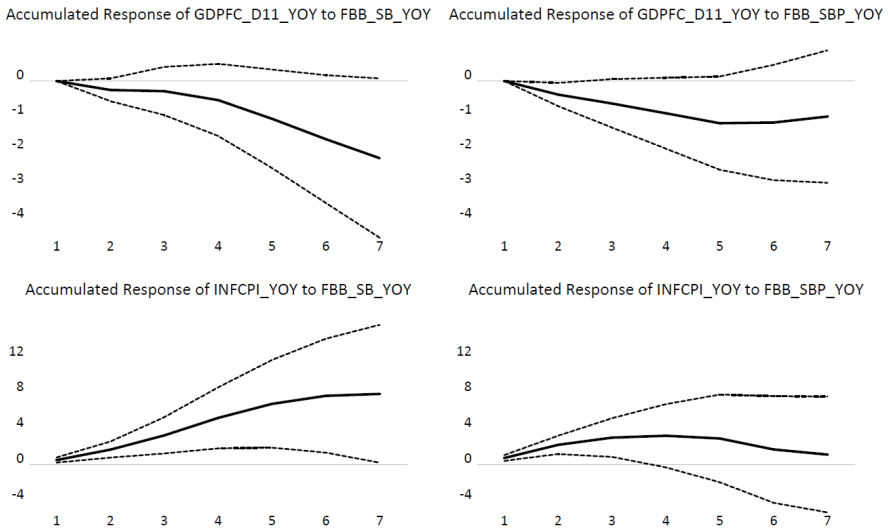
The top panel of 5 shows a negative contemporaneous movement in output growth to monetized as well as bond-financed deficits, however, in both cases results remain largely insignificant and uncertain except for a brief instance in case of monetized deficits. Having said that, these results of negative response in output growth to deficit spending are not plausible for the simple fact that, theoretically, government budget multiplier is non-negative. The evidence in case of Pakistan suggests that these results should be seen in terms of relationship between deficit financing and output growth, which shows a counter-cyclical trend (Iqbal *et al.*, 2017; Iqbal and Zahid, 1998) and a pro-cyclical trend only when the business cycle is in the boom phase (Khalid *et al.*, 2007). The persistence of negative response of output to government spending are supported by the 'Expansionary Fiscal Contraction' (EFC) hypothesis by Giavazzi and Pagano (1990). This hypothesis argues that higher current government spending changes consumer's expectation regarding future taxes and government spending and thus contracts private consumption and results in economic

contraction. In our case this spending is reflected in government spending and thus the results indicate that decrease in private consumption does contribute to overall decline in GDP. Our results are also in line with the predictions of FTPL. The arguments is that given:

$$\Delta E_{t+1}\pi_{t+1} = -a(\rho)\Delta E_{t+1}s_{t+1} \tag{13}$$

the with autocorrelated deficits with high values of $a(\rho)$, the deficits of recessions correspond to inflation, otherwise there is little correlation between the two. In case of Pakistan, for the last two decades we can see deficits to be persistent and highly correlated (see Appendix 7.2). Figure 6 show us the long run effects of the money and bond financed deficits, which essentially show the same patterns as the short-run effects in Figure 5.

Figure 6: ***Long-run Effects of Deficit Financing on Output & Inflation*** ***(±2 S.E.)***



Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Cholesky one S.D. innovations.*

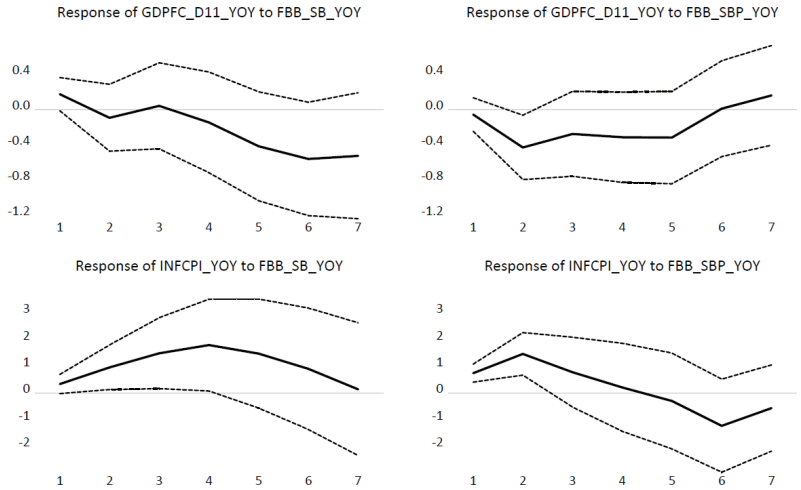
Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

The decomposition of prediction error from Equation (8) into fundamental innovations that carry economic meaning has overtime attracted disputes. Much of these disputes arise from the use of perhaps the most famous decom-

position technique i.e., the Choleski decomposition. These disputes arising out of the use of this technique can be put into two broad categories: one, results being particular to specific variable ordering and two, use of strong restrictions. In pursuit of our analysis we have also started with Choleski decomposition but to make sure that our results are not particular to a certain ordering of variables, we estimate generalized impulse responses to show that our results from Choleski ordering are consistent.

The results presented in Figure 7 establish the robustness of the short-run effects of monetized and bond-financed deficits on output growth and inflation in terms of the ordering argument in Figure 5.

Figure 7: ***Short-run Effects of Deficit Financing on Output & Inflation*** ***(±2 S.E.)***

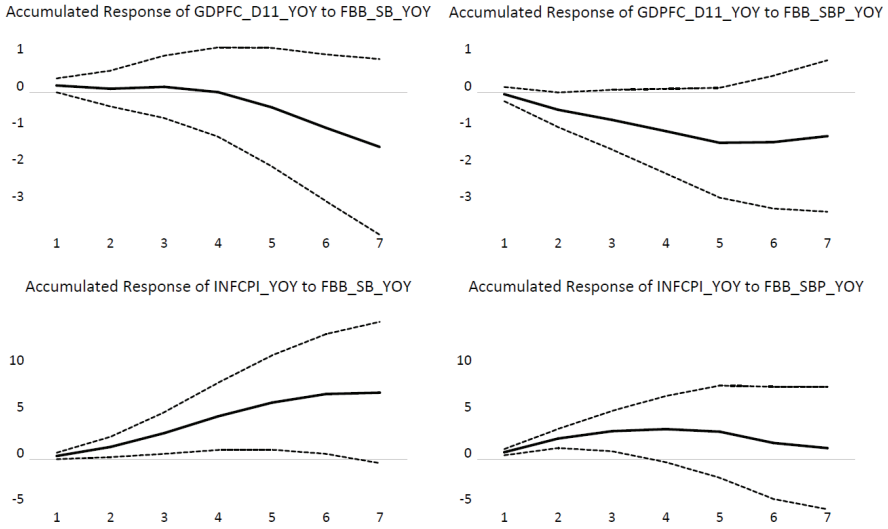


Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Generalized one S.D. innovations.*

Long-run effects of money and bond financed deficits on output growth and inflation are also calculated and IRFs are presented in Figure 8. This establishes the robustness of the long-run effects of money and bond financed deficits on output growth and inflation presented in Figure 6.

Figure 8: ***Long-run Effects of Deficit Financing on Output & Inflation (±2 S.E.)***



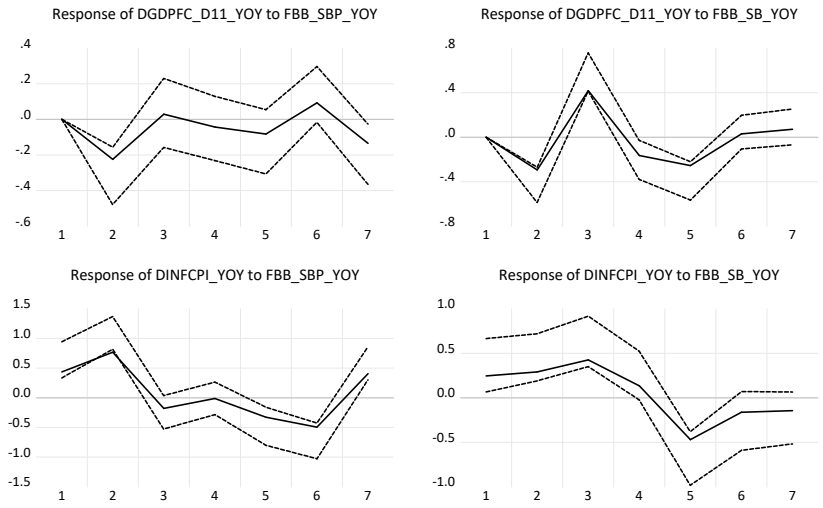
Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Generalized one S.D. innovations.*

A. Treating Non-stationarity

Even though the argument exists in favor of not differencing variables that are integrated of order greater than one due to potential loss of information (as mentioned earlier) yet it causes confusion as to the validity of the results as the standard VAR requires all variables to be stationary. To tackle this problem, we apply appropriate differencing such that non-stationary variables (also mentioned earlier) are stationary and then use them to see if our results hold. We do not run a VECM VAR because even though it does match the requirement of I(0) and I(1) variables, however, it did not meet the requirement of co-integration between I(1) variables.

Figure 9: ***Short-run Effects of Deficit Financing on Output & Inflation*** ***(±2 S.E.)***



Source: Author's Estimations

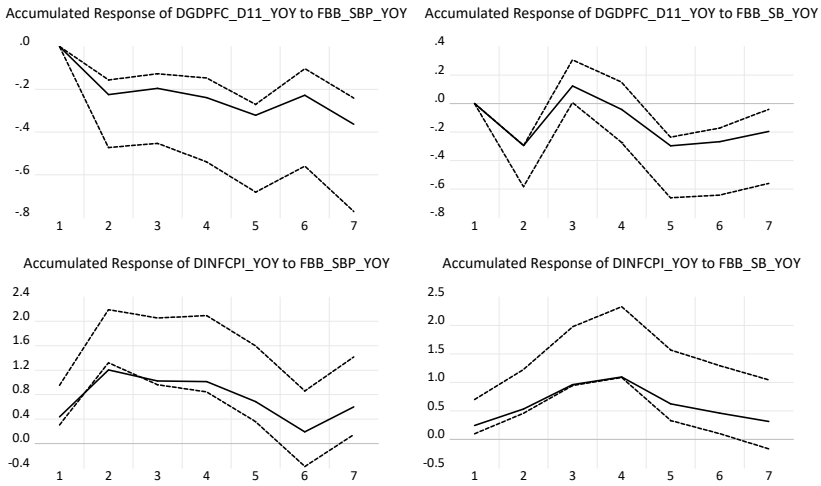
Note: *Dotted line represents ±2 standard error interval around response to Cholesky one S.D. innovations.*

Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

The IRFs presented in Figure 9 carry the same pattern and significance as presented in figure Figure 5 and Figure 7 and make our results more reliable as the differenced variables shows the similar responses to shocks.

The long-run of money and bond-financed deficits, shown in the IRFs from Figure 10 show a minor deviation in pattern. The impact of money financed deficits have a clear negative impact on output growth while the impact of bond financed deficits on output growth still remains largely insignificant and undefined. As far as the impact of money and bond financed deficits on inflation is concerned, they both repeat the patters that are presented in Figure 6 and Figure 8.

Figure 10: ***Long-run Effects of Deficit Financing on Output & Inflation (±2 S.E.)***



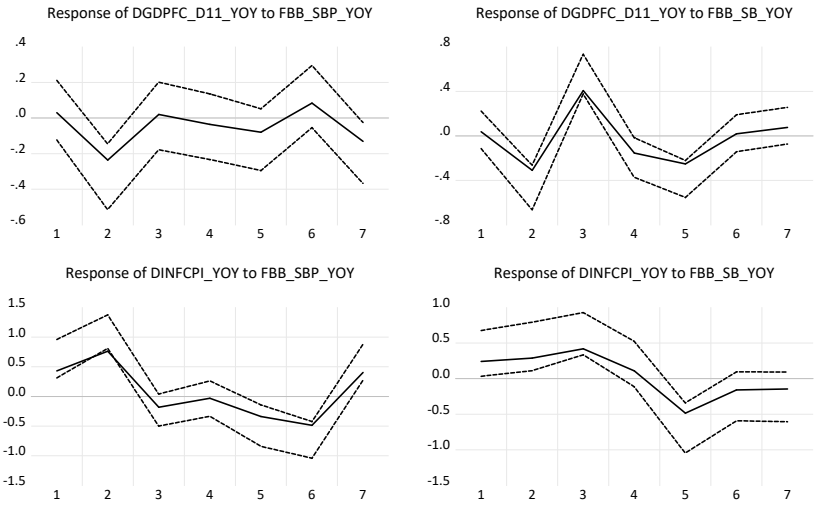
Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Cholesky one S.D. innovations.*

Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

To show that our results are not particular to a specific ordering of variables, we calculate the generalized IRFs to check robustness of our IRFs from Choleski ordering. The results presented in Figure 11 establishes the same pattern as presented in Figure 9

Figure 11: ***Short-run Effects of Deficit Financing on Output & Inflation (±2 S.E.)***

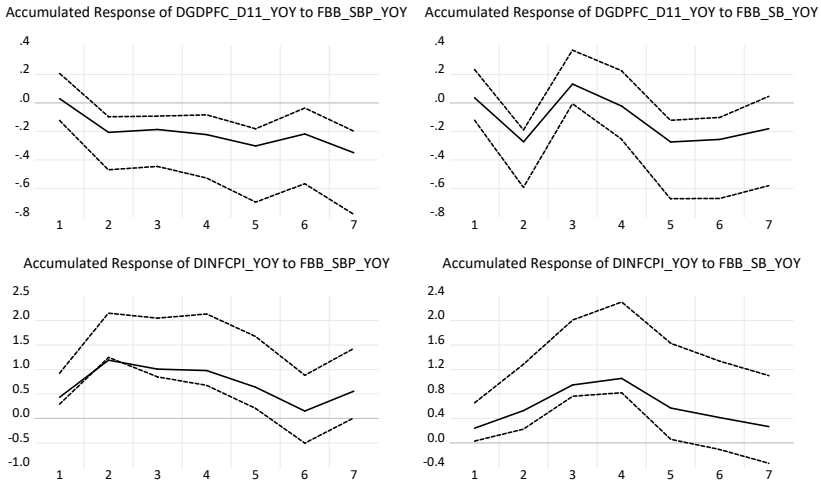


Source: Author's Estimations

Note: *Dotted line represents ±2 standard error interval around response to Generalized one S.D. innovations.*

In case of long-run accumulated responses, results presented in Figure 12 establishes the same pattern as presented in Figure 10.

Figure 12: ***Long-run Effects of Deficit Financing on Output & Inflation (±2 S.E.)***



Source: Author's Estimations
Note: *Dotted line represents ±2 standard error interval around response to Generalized one S.D. innovations.*

B. Treating Strong Assumptions with Sign-Restricted VAR

To deal with the other broader dispute, the use of strong restrictions, we have estimated the 'Sign-Restricted VAR', that incorporates weak restrictions that are more acceptable among academics.

There are mainly two ways in which sign restrictions are imposed: first, for a unique identification of shocks, sign restrictions are imposed on cross-correlations among variables arising in response to shocks (Canova and De Nicolo, 2002) and second, where imposition on sign restriction is through impulse responses rather than cross-correlations (Uhlig, 2005). The latter technique is often preferred for its tendency not to eliminate candidate orthogonalizations by imposing stricter restrictions than the former. The aim is to identify one shock rather than fully decomposing the forecast error from the underlying structural shocks into its components.

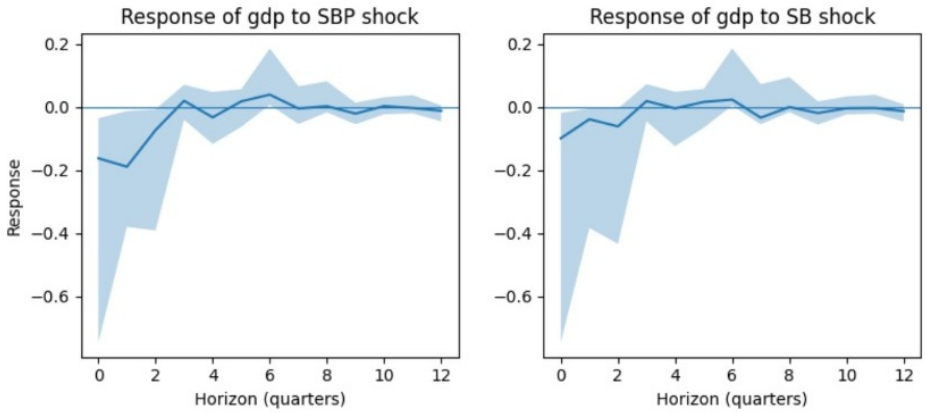
In our study, our goal is also not to identify all structural disturbances rather make use of least possible restrictions. Since our goal in this study is to extract

evidence on how borrowing shocks effect inflation and output growth over time. We, therefore, identify the borrowing shocks and quantify how much inflation and output growth change in response to these shocks. We believe Uhlig (2005) method is more suited for this purpose. The sign restrictions imposed on impulse responses are as follows:

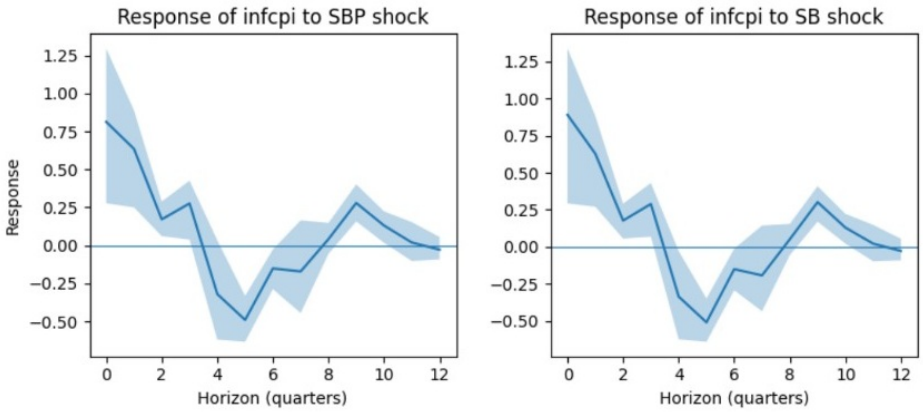
- The output growth will not increase (≤ 0) in response to positive money financing shock.
- Inflation will not decrease (≥ 0) in response to positive money financing shock.
- Output growth will not increase (≤ 0) in response to positive bond-financing shock.
- Inflation will not decrease (≥ 0) in response to positive bond-financing shock.

To estimate, we use Wolf (2022) method which is inspired by the framework of Uhlig (2005) that does not use Bayesian priors rather implements a frequentist rejection sampling method for sign-restricted VARs. The idea here is to check sign restrictions at short horizons by picking random rotations of choleski decompositions and accepting draws accordingly.

The results from our estimation here are also consistent with our previous results e.g., in case of a money-financing or bond-financing of deficits, the output growth shows no clear pattern. As we have already shows in our previous arguments, most of the borrowing has taken place in Pakistan in times of economic distress and recovery in such episodes have been very weak, therefore, we do see insignificant impact of these borrowings on output growth as shown in the figure below.



On the other hand, in case of money-financing or bond-financing of deficits, inflation shows a clear pattern i.e., inflation rises significantly to both money-financing and bond-financing shocks. With a historically, lower growth numbers and government spending creates massive amounts of money in the economy that leads to inflationary episodes (see Figure below).



C. Testing Long-run Restrictions

With the advent of the VAR analysis, Choleski decomposition was one of the very first methods of finding impacts of innovations but was quickly criticized. The main reasons for the criticism were:

- *Contemporaneous restrictions:* The aim of the recursive structure of the Choleski distribution focused on short-run contemporaneous movements rather than long-run relationships.
- *Lack of economic meaning:* With this structure it was difficult to identify

shocks as structural that corresponded to plausible economic relationships making it more of a statistical tool rather than a policy tool.

- *Arbitrary ordering:* The ordering in this method dictates the direction of contemporaneous relationships, however, it makes less sense to allow one direction but deny the opposite especially if relationship is contemporaneous.

Since SVAR models are primarily used for policy analysis it is necessary that innovations have direct economic interpretation and therefore long-run identifying restrictions are required e.g., nominal shocks have no permanent impact on real variables is a classical long-run macroeconomic hypothesis, as we shall also set in our analysis requiring money-financing and bond-financing to not permanently impact output and also with the 'fischer effect' that inflation rate has no long-run impact on the real interest rate.

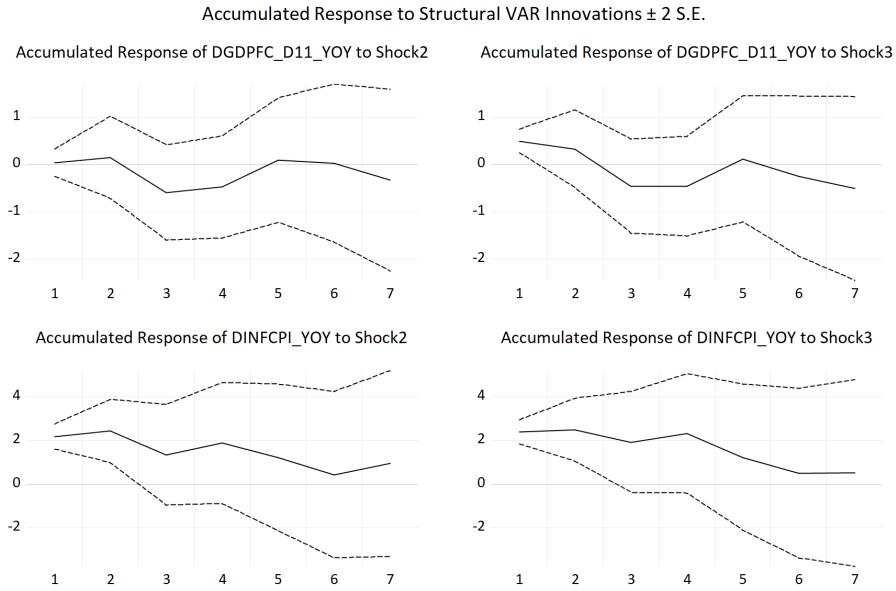
To implement this type of restrictions, Blanchard and Quah (1988) introduced the method for imposition of long-run restrictions that was later on used by the likes of Enders and Lee (1997), King and Watson (1992) and Crowder *et al.* (1999). Among other restrictions, the restrictions that are central to our analysis are:

- money and bond-financing of deficits have no permanent impact on output in the long run. This is a classical restriction.

- money and bond-financing of deficits have inflationary consequences and close to inflation being a monetary phenomenon.

The rest of the long-run restrictions are applied based on theoretical and empirical evidence that has been presented in the previous section of identifying restrictions. The figure, below presents the accumulated responses in output growth and inflation in response to money-financed deficits (shock 2) and bond-financed deficits (shock 3). The results are, again consistent with the pattern that has emerged in previous analysis i.e., money and bond-financed

deficits appear to not have any long-run impact on output growth, however, they do have a significant and a positive impact on inflation.



Source: Author's Estimations
Note: *Dotted line represents ±2 standard error interval around response to Cholesky one S.D. innovations.*

3.4.2 Variance Decompositions (VDs)

Variance decomposition is calculated to see how much variability is caused in output growth and inflation over-time due to changes in monetized and bond-financed deficits. The results are presented in Table 2 for a variables at level and in Table 3 for stationary variables.

Table 2: ***Variance Decomposition of Output Growth & Inflation***

Horizon	**RGDP_YoY**			**INFCPI_YoY**		
	S.E	FBPB_YoY	FBCB_YoY	S.E	FBPB_YoY	FBCB_YoY
1	0.730	0.000	0.000	25.179	13.35	28.206
3	1.175	4.741	15.675	38.143	32.714	26.473
5	1.539	17.992	16.069	46.918	43.469	14.513
7	1.816	32.575	12.458	53.868	41.130	19.363

Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

Table 3: ***Variance Decomposition of Output Growth & Inflation***

Horizon	**D_RGDP_YoY**			**D_INFCPI_YoY**		
	S.E	FBPB_YoY	FBCB_YoY	S.E	FBPB_YoY	FBCB_YoY
1	0.662	0.000	0.000	23040	4.066	12.847
3	0.969	27.747	5.454	35.383	11.964	29.862
5	1.075	30.519	5.183	42.692	14.196	23.075
7	1.134	27,885	6.744	45.001	13.285	28.807

Choleski Ordering: *Output growth, Federal budgetary borrowing from central bank, Federal budgetary borrowing from private banks, Interest rate, Inflation rate & Exchange rate.*

3.5 Quantile on Quantile (QQ) Approach

In order to establish the robustness the results presented in section 3.4, we make use of a sophisticated non-parametric Quantile-on-Quantile (QQ) approach.

3.5.1 QQ Methodology:

The quantile-on-quantile (QQ) approach of Sim and Zhou (2015) is employed to study the relationship between monetized and bond-financed deficit spending on inflation and output growth. The results of the QQ-method are then compared with the results in section 3.4 to see if they are consistent.

The basic quantile regression equation that models the effect of an independent variable (X) i.e., federal budgetary borrowing from central bank and private banks on a dependent variable (Y) i.e., inflation and output growth, under QQ approach is given as:

$$Y_t = \beta^{\theta}(X_t) + u_t^{\theta} \tag{14}$$

where t represents the time period and θ represents the θth quantile of the conditional distribution of the dependent variable and u_t^{θ} in the quantile residual term. As we lack prior information as to the relationship between our independent and dependent variables thus the function $\beta^{\theta}(.)$ is unknown. In order to estimate (30), we use a local linear regression in the neighborhood of X^{τ} to establish a relationship between θth quantile of Y and τth quantile of X. We use first order Taylor expansion to define a regression function around X^{τ}, because we know that $\beta^{\theta}(.)$ is unknown to us, as follows:

$$\beta^{\theta} X_t \approx \beta^{\theta} X^{\tau} + \beta^{\theta'}(X^{\tau})(X_t - X^{\tau}) \tag{15}$$

$\beta^{\theta'}$ is the partial derivative with respect to the independent variable and has an interpretation similar to the slope coefficient in a linear regression. It follows from (15) that θ and τ both are dual indexed parameters and that $\beta^{\theta}(X^{\tau})$ and

$\beta^{\theta'}(X^{\tau})$ are functions of τ and θ thus we can write:

$$\beta^{\theta}(X_t) \approx \beta_0(\theta,\tau) + \beta_1(\theta,\tau)(X_t - X^{\tau}) \tag{16}$$

where β^{θ} and $\beta^{\theta'}$ are written as $\beta_0(\theta,\tau)$ and $\beta_1(\theta,\tau)$ respectively. Substituting (16) into (30) gives us (17)

$$Y_t = \beta_0(\theta,\tau) + \beta_1(\theta,\tau)(X_t - X^{\tau}) + u_t^{\theta} \tag{17}$$

(17) represents the relationship between θth quantile of Y with τth quantile of X because both β_0 and β_1 are indexed in θ and τ at the same time which may vary as quantiles, both of Y and X changes. As distributions of both Y and X are linked to each other it establishes for us the dependence structure as well.

In the end we estimate the following minimization problem:

$$min_{b_0,b_1} \sum_{i=1}^{n} \rho_0 \left[Y_t - b_0 - b_1\left(\hat{X}_t - \hat{X}^{\tau}\right)\right] K\left(\frac{F_n(\hat{X}_t) - \tau}{h}\right) \tag{18}$$

where ρ_0 represents the quantile loss function, $K(.)$ represents the kernel function and h represents the bandwidth parameter. This minimization problem estimates the local estimates for β_0 and β_1 as b_0 and b_1.

3.5.2 Data & Variables:

Key variables in this study are inflation (INF), real gross domestic product (RGDP), monetized deficits (FBCB) and bond-financed deficits (FBSB). Data on all these variables with the exception of real gross domestic product has been taken on monthly frequency for the period 2005:1 to 2019:12. Data on all these variables have been used in the form of year-on-year growth rates. As monthly data for RGDP is not available in case of Pakistan, we have used monthly data of large-scale manufacturing index as its proxy as it is a major portion of the RGDP and it preserves important information in terms of its seasonality and

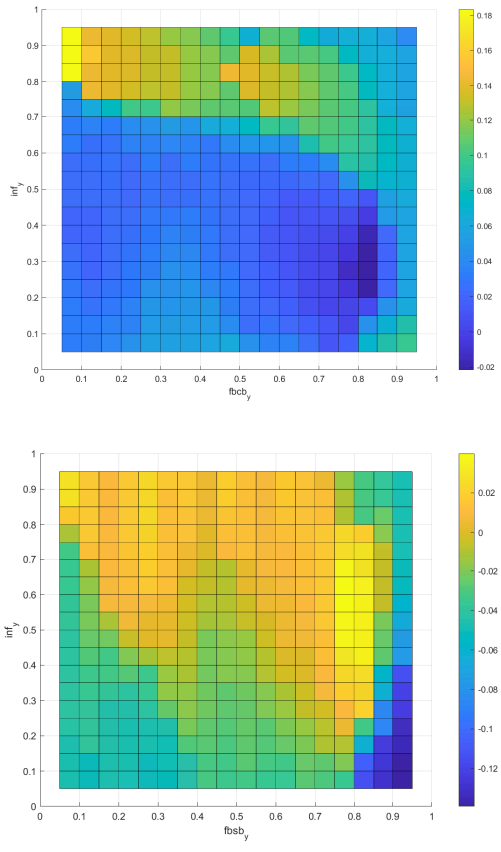
trend in it.

3.5.3 Results

FBSB and FBCB act as a policy variable because it is eventually the government's decision to respond to any economic scenario. The intention of this analysis with this approach is to see how monetized and bond-financed deficits affects inflation and output growth in the economy. Results are presented in Figures 13 and 14.

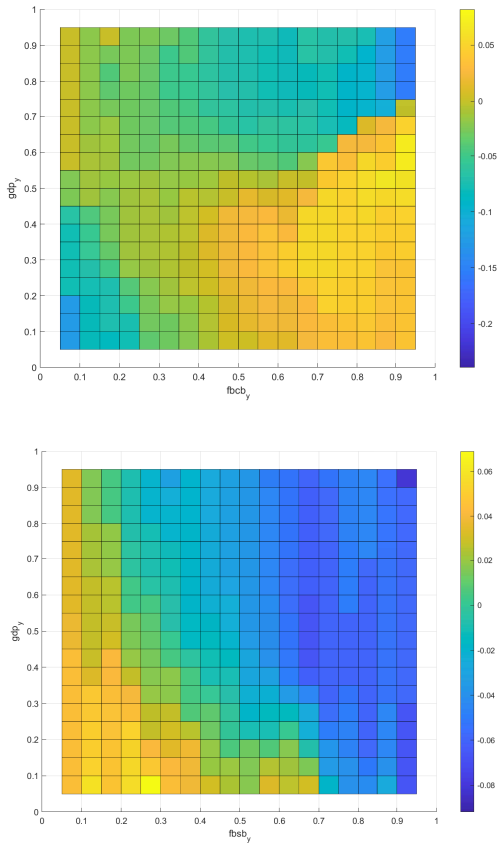
Figure 13 shows that as we move from lower quantiles of monetized deficit spending to higher quantiles, the resultant impact on inflation remains strong and positive. A very similar pattern emerges with the quantiles of bond-financed deficit spending and their impact on inflation. We conclude from this pattern that deficit spending, be it monetized or bond-financed has inflationary consequences.

Figure 13: ***Impact of Deficit Financing on CPI Inflation***



Results presented in Figure 13 are interesting in the sense that a positive relationship between bond-financed deficit spending and inflation is seen. Middle to high quantiles of inflation (0.4 - 0.9) show a strong and positive relationship with low to high quantiles of deficit spending (0.1 - 0.8). Unlike the case of monetized deficit spending the impact doesn't have a secular positive impact i.e., for lower quantiles of inflation the effect tends to go in the opposite direction. However, middle to higher quantiles of inflation largely respond positively to all quantiles of bond-financed deficit spending.

Figure 14: ***Impact of Deficit Financing on Output Growth***



3.6 Conclusion & Policy Implication

The objective of this study is to find how monetized and bond-financed deficit spending impacts macroeconomic outcomes i.e., inflation and output growth in Pakistan. The main hypothesis is that it should not matter whether a gov-

ernment's deficit is monetized or bond financed because, eventually, both leads to creation of money and should therefore be inflationary. Also, government sector being a substantial part of aggregate demand, deficit spending by the government should generally raise output growth. To test these hypotheses, a six-variable SVAR model along with a Sign-Restricted VAR model as well as long-run restrictions is used to represent the linkages in the economy. Data on output growth, monetized and debt-financed deficit spending, KIBOR, inflation and exchange rate are used in quarterly frequency as well as in monthly frequency for the period 2005:3 to 2020:4.

In case of Pakistan, this study finds a negative but insignificant impact of both monetized and bond-financed deficits on output growth. However, data shows that government has historically engaged in deficit spending more heavily at times when economy is at the lower end of the business cycle. This study also finds that both monetized and debt-financed deficit spending have significant inflationary consequences. In the context of our motivation (see Section 3.1) and objective of the study, we conclude that, in case of Pakistan, bond-financing of deficits do not offer any benefits over monetization of deficits in terms of macroeconomic outcomes i.e., inflation and output contrary to what the standard economic theory suggests.

A host of studies in this fashion of '*money-inflation-output*' modeling has been done in Pakistan that use an aggregate measure of money such as 'broad money' (M2) to represent monetary growth with somewhat similar results. However, the hazard of using an aggregate measure such as M2 is that it becomes very difficult to answer policy related question especially the type that this study endeavors to answer. In this study we trace monetary growth back to one of its sources i.e., government's deficits and divide it further into its sources of financing i.e., monetized and bond-financed deficits.

Results of this study provide policy relevant insights in the current context. GoP has passed legislation in favor of the independence of its central bank i.e.,

(SBP). This move, essentially, cuts-off one of the two sources for the government to finance deficits. The idea behind this move[14] is to discourage political business cycles, subject government spending to a degree of fiscal discipline in order to achieve lower inflation and higher output growth, and control monetary growth by clamping down on creation of high powered money. The implied assumption, however, is two-fold i.e., one, that bond-financed deficit spending leads to a resource transfer from private to the public sector and two, government spending is ends up in the real sector. The results of this study indicate that these assumptions do not fit, at least in Pakistan's context as deficit spending in both cases have inflationary consequences while the real growth stays sub-optimal. This study also hints that if bond-financing of government deficits does not result in any substantial benefits over monetization of government deficits in terms of macroeconomic outcome, then it warrants an investigation into the makeup of deficit spending rather than source of the spending.

[14]We discuss the idea of central bank independence and its literature in detail in the following chapters

Chapter 4

4 Dynamics of Bond & Money Financed Spending: An Accounting Approach

4.1 Introduction

In standard economic theory, banks are considered largely as 'financial intermediaries' i.e., they intermediate funds between savers and borrowers without ever being in a position to either control or create money. This specific view of banking is perfectly compatible with the 'loanable funds' theory where supply of savings and demand for loans in the money market compete with each other to find an equilibrium in terms of the rate of interest. Recent studies have, however, showed that thinking of banks as intermediaries is not the correct way to look at them rather banks are the creators of money and they do not need any savers to be able to lend money in the first place.

When banks are thought of as just intermediaries of funds, it makes the explanation a whole lot easier in terms of a view of money movements that is more consistent with the neoclassical arrangement i.e., neutrality of money. The downside of this view is that it borderline eliminates the actual role of the banking sector in an economy and tends to overlook all the intricate transactions that are representative of a complex financial system. A modern economy can be best described as a monetary economy where different sectors interact with each other not in terms of barter but rather in terms of monetary values. In this system, governments spends on economic agents to boost productivity and create demand and then taxes the same agents to redistribute the wealth that has been created as a result of it. What a government spends into the economy, normally exceeds what it removes in the form of taxes and the deficit is either money-financed or bond-financed. These spending and financing transactions

of the government involves a complex movement of reserves throughout the banking system and connects all sectors of the economy.

A government, either spending into the economy or taxing economic agents, almost exclusively operate through a banking system i.e., when a government spends, say, on firms for their produce it starts a chain or transactions that start with movements of reserves and ends with a certain amount being credit into the bank accounts of firms and in the same way, when a government taxes, the process starts with a debit transaction from the account of the economic agent and ends with reserves being credit into the treasury account. So, in order to gain a deeper understanding of the dynamics of money through different sectors of the economy it is imperative to look at these transactions from an accounting perspective rather than just the statistical perspective.

In this chapter we begin with the express objective of finding out how money moves into the system and for that we setup a five sector economy i.e., private banks, central bank, treasury, firms and labor. In order to look at them from the accounting perspective, we use the "double entry bookkeeping" (DEB) with the stock-flow consistent approach to model transactions between these sectors. We then use this setup to draw conclusions on how different sources of government finances impact major macroeconomic variables i.e., inflation and output growth. We hypothesize that bond-financed and money-financed spending by the government carry similar impacts in terms of the direction of their impact because it makes no difference as to the source of government spending that how it enters into the economy. We also hypothesize, that even though the direction of impact is not different but the magnitude of the impact is different in both cases because the bond-financed spending concentrates unproductive spending into the economy relatively more than the money-financed spending. Our accounting-based balance sheet approach provides evidence in favor of our hypothesis.

4.2 Theoretical Framework

The orthodox classical understanding on money sees it as a tool that improves exchange efficiency in transactions among agents i.e., money, be it a unit representing value in things, has no role in the creation or destruction of it but its redistribution throughout the economy Ryan-Collins *et al.* (2012). This redistribution[15], of value through money, takes place with the help of a banking system that is viewed strictly as a financial intermediary, conforming with the view of money being neutral. This view of banking is often reiterated e.g., Krugman (2009, 2013), where banks intermediate between borrowers and savers for funds while keeping the aggregate stock of money unchanged in the economy.

In this setup, if banks can only redistribute, a more logical question arises - how then is money created in the economy? The answer is that creation of money is the prerogative of the government where spending by it creates money while its quantity is determined through the 'money multiplier' process i.e., for every $1 of money spent in the economy, government can target an exact quantity of money that will eventually be created in the economy by managing the reserve requirements through its central bank. This is, obviously, true depending upon how private banks choose to lend and in what form citizens choose to hold their money [16]. The standard implication of this setup, however, is that banks on their own are not able to create money and have to wait for a saver to deposit money to be able to lend it to borrowers.

This orthodox understanding of banks working as financial intermediaries in a loanable funds paradigm has been thoroughly challenged, particularly in context of modern banking practices Werner (2014b,a); Keen (1995); Graziani (1989); Moore (1997); Hudson (2004); Fullwiler (2013). The implication of this

[15]Ex-Federal Reserve Chairman Ben Bernanke while commenting on Fisher's 'Debt Deflation', views banks as redistributing value among borrowers and savers, terming it 'pure redistribution' which effectively sees banking as mere financial intermediaries. Bernanke *et al.* (2004)

[16]See Mankiw *et al.* (2016) for explanation on the choice of banks to hold money as reserves or as debt and choice of citizens to hold money as bank deposits or cash

argument is two-fold: one, banks are creators of money i.e., banks do not need to wait for deposits to make loans rather bank lending creates deposits and two, quantity of money circulating in the economy is not determined by the central bank or 'multiplied' into deposits [17]. Ever since the global financial crisis occurred, central banks have slowly come out in support of this argument (Kumhof *et al.* (2015); McLeay *et al.* (2014a)).

> It suffices to look at the creation of money as a set of straight forward accounting entries to grasp that money and credit are created as the result of complex interactions between banks, non-banks and the central bank. And a bank's ability to grant loans and create money has nothing to do with whether it already has access reserves or deposits at its disposal. Bundesbank (2017)

Money in the neoclassical economics is treated as a 'veil over barter' and is discussed mainly in the context of inflation. Government, that is the main creator of money, is often blamed for fast paced monetary growth that is much more than the pace at which the real economy grows, referred to as 'helicopter money', causing inflation Friedman and Schwartz (1969). This phenomenon is generalized by Friedman (1963) as "inflation is always and everywhere a monetary phenomenon'. A logical result that flows from these dynamics is that a government that spends by getting its debt monetized by the central bank will end up creating a much larger money supply than the original quantity of debt and, therefore, inflation. The standard prescription, thus, is to bring down growth rate of money to control inflation in an economy where economic activity has been pushed superficially high on the back of excessive government spending. On the contrary, if government borrows from the funds market, as it is advised in the literature, it tends to crowd out private borrowing because private banks are left with a decreased ability to make loans to the public and, therefore, borrowing this way are believed not to be inflationary.

[17] See McLeay *et al.* (2014a,b)

The question, however, is that does government need to borrow from the existing stock of funds to cover its deficit? The answer lies in the dynamics of modern fiat money. Most money in today's banking system exists in the form of customer deposits with private banks and private banks reserves held with the central bank. When government spends, be it for the goods or services from the non-bank private sector, it increases the deposits in the banking system by exactly the same amount of spending (assuming no taxes). and reserves to match that rise in deposits. As money is the sum of cash in circulation and accumulated liabilities of the banking sector, this increase in deposits due to government spending has created *additional* money in the economy. Private bank's reserves held with central bank are its assets, which under normal circumstances, do no earn profits in the form of interest. A government's offer to sell debt to the banking sector provides them with the opportunity to convert their non-profit earning assets (reserves) into profit earning assets (treasury bills). This is one of the reasons why government's debt is readily bought up by the primary dealers besides it being one of the most secure debt instruments. It will not be wise to overlook the most important function that central banks play in the modern economy i.e., the *'lender of last resort'* which means that it is the duty of the central bank to make sure that the payments system in the economy doesn't crash due to lack of or excess of liquidity in the banking system. Thus, in a sense central bank also makes sure that there is enough liquidity in the market for a successful sale of government's debt by managing the debt and reserves holding of the private banks that it regulates. However, a central bank's move to inject liquidity in the banking system by buying the bonds off of the private banks subsequent to the sale of government bonds to the private banks cannot be seen as de-facto monetization of government's debt by the central bank because even if central bank doesn't buy the bonds the debt has already been paid for by the government spending that preceded it.

The only scenario in which a government spending doesn't create additional

money in the economy is when the debt is subsequently issued to the non-bank sector instead of the banking sector to cover the deficit. An important detail to remember is that the money with which the non-bank sector buys the government's debt comes from the government's spending in the first place. When the non-bank sector makes that transaction, it decreases the amount of deposits in the banking system as well as their stock of government's debt. This effectively destroys money - as the non-bank sector has traded their money for a less liquid interest-bearing asset.

The implication of this discussion for inflationary effects on the economy is that government spending creates '*additional*' money in the system, and it doesn't matter whether the deficit is subsequently financed through the private funds market or the central bank itself because if central bank's monetization of government's debt creates additional money in the economy so does the borrowings from the private funds market since government spending has effectively created the additional reserves and deposits in the economy that it subsequently borrows. Therefore, the ability of the funds market to loan to the private sector is not diminished in any way and consequently the spending power of the general population.

With this conceptual understanding, we set out to test that if monetary growth is the outcome of government spending irrespective of the fact that it is financed from the central bank or the funds market, does it also hold similar implications for inflation? Standard theory claims only the central bank financed spending to be inflationary, however, we hypothesize that since government spending creates '*additional*' money in the economy irrespective of its source of finance, then for inflation considerations it should also hold similar pattern for two sources as well.

4.3 Model Economy

Godley Tables make use of the double-entry bookkeeping system to maintain records of the accounts of different entities. Each record entry must be classified either as a 'liability'[18] or an 'asset'[19]. 'Equity'[20] is the recorded as the difference between assets and liabilities. Every transaction that is recorded as an asset or a liability for an entity in one Godley Table must also be recorded, respectively as a liability or an asset in another Godley Table for the other entity. Each transaction, therefore is the record of accounting transaction.

Record entries of entities in a Godley Table is arranged in rows and columns, where columns represent 'stocks' or different accounts in a balance sheet and rows represent 'flows' from one stock or one account to another stock or account. Each specific transaction must have entries in two separate account to ensure that asset in one account is a matching liability in another such that the assets net of liabilities and equity comes out to zero i.e., $A - L - E = 0$. The zero net-sum of a transaction ensures the consistency of the model i.e., it ensures that all money in the system has been accounted for.

The aim of this chapter is to present a simple accounting based monetary-model and use the inferences from this model to explain the data in case of Pakistan. It is thus essential to represent all the basic transacting elements in our economy. We build a five-sector model i.e., Private Banks, Central Bank/State Bank of Pakistan, Treasury/Federal Consolidated Fund (FCF), Labor, and Firm. Using the stock-flow consistent approach we build the 'Godley Tables' for all five sectors and define transactions between them that are purely monetary in nature.

[18] A liability is a legal obligation on an entity that is owed from one party to another in the form of an expense.

[19] An asset is something that is owned an controlled by one party and is expected to make an income from it.

[20] Equity is defined as entity's stake net of all liabilities.

4.3.1 Accounting Framework

Before we start modeling the economy there are a few simplifying assumptions that we make in the process: One, we assume a pure-credit closed economy i.e., all transactions in this economy takes place through the banking channel and the economy as a whole does not interact with any other economy which means that no trade is possible. All transactions in the economy are modeled from the bank's perspective. To keep things simple, we build a purely credit-based economy where transactions occur through banks, therefore, the whole system is setup from the perspective of the banks.

- **Private Banks** A bank's balance sheet contains assets, liabilities and the difference is represented as equity. Assets of the banking sector in our model contains treasury bonds owned by private banks $(Bonds_{P.B})$, private bank's reserves $(Reserves)$ held at the central bank (SBP) and loans awarded to firms in the private sector $(Loans)$. On the liability side, banks hold the account of the firms $(FirmA/C)$ as well as the account of labor $(Labor)$. Finally the equity of the bank $(Equity_{P.B})$ is the net of the assets and liabilities. The column is a check column that shows the sum of each row i.e., $A - L - E$ which should come out to be zero for consistency.

  Let us now look at, in our context, the transactions in these accounts.

  - One of the main purpose of a bank is to lend money to businesses in order to enable production in the economy. In our model we model that by banks lending to firms. Since banks make loans to firms regularly and firms pay them back, we make record of the transaction in term of $Net\ Lending_{Firms}$ i.e., loans to firms less the loans that are paid back by the firms, assuming the size of lending to firms is bigger than the loans that are paid back to the bank. When banks makes the loan it increases its assets i.e., $Loans$ and liabilities $FirmA/C$ by the same amount (NL_F) respectively noting that by issuing the loan the

amount is receivable by the bank at a later date and the same amount is available in the firm's account to be spent.

- Loans are issued by banks for some positive interest rate and that becomes the bank's basic income. When firm pays back the interest on the loan, it is recorded as $Int\ on\ Lending_{Firms}$. A bank records this transaction by decreasing the $FirmA/C$ and increasing the $Equity_{P.B}$ which means that amount that is paid back as interest (INT_{L_F})has been transferred from the firms account into private bank's equity marking it as bank's income.
- Banks in the normal course of business also make investments and a big chunk of that investment is in treasury or government bonds. These bonds are usually bought by banks characterized as 'primary dealer' in an auction through a bidding process. When bank buys these bonds it records the transaction as an 'asset swap' between $(Bonds_{P.B})$ and *Reserves* where the amount of bonds held in the asset increase by the corresponding amount $(BUY_{B_{P.B}})$ with which reserves decrease.
- The treasury bonds in which banks invest carry a guaranteed return according to a rate of interest. When interest on these bonds are paid to the bank, it increases its assets *Reserves* and equity $Equity_{P.B}$ by the corresponding amount $INT_{B_{P.B}}$. The reason the reserve held by the banks increase is because the transactions between private bank, central bank and treasury are carried out in terms of reserves.
- Treasury bonds held by the bank also mature after the stipulated time period and when they do, the principal amount of those bonds is also paid back to the bank. Bank records this transaction as an asset swap i.e., decreasing one asset $Bonds_{P.B}$ and increasing the other *Reserves* by the corresponding amount $M_{B_{P.B}}$.
- Banks being part of the economy, also spend on the output of firms

and that spending is enabled by the equity that the bank has. The bank records the transaction of this spending by decreasing its equity $Equity_{P.B}$ and increasing its liabilities $FirmA/C$ by the corresponding amount $SPEND_{F_B}$.

- The income that a bank earns and records as equity is subject to taxation by the state and as we mentioned earlier that all transactions between banks, central bank and the government occur in terms of reserves, the bank records the payment of tax transaction by decreasing its equity $Equity_{P.B}$ and assets *Reserves* by the corresponding amount since reserves equal to the tax amount $TAX_{P.B}$ are transferred out of the bank's assets to treasury assets.
- Private banks also facilitate the firms with payment of salaries to the labor. Bank records this transaction with the help of a liability swap as it holds the accounts of firm as well as the labor so increase in one liability is offset by the decrease in the other liability. Thus, when the salary is paid to the labor by the firm, the bank increases the $LaborA/C$ and decreases the $FirmA/C$ by the corresponding amount PAY_L.
- Labor spending happens in our economy also through the banking channel and the record of the spending transaction by labor is recorded by the bank also as a liability swap where one liability $LaborA/C$ is decreased by the corresponding with which the other liability $FirmA/C$ is increased. This means that the amount of the spending by labor on the firm's product i.e., $SPEND_L$ is transferred from labor towards the firm.
- Labor income is also taxable by the state and when state taxes labor income the transaction is recorded by the banks as an decrease in both liability $LaborA/C$ as well as assets *Reserves* of the banking system by the corresponding amount TAX_L.

- In our economy, labor is also allowed to invest in government/treasury bonds and when the do that, the transaction occurs through the banking channel and is recorded as a decrease in bank's assets $Bonds_{P.B}$ and a corresponding decrease in liabilities $LaborA/C$ by the amount BUY_{B_L}. The reason why there is a decrease in the bank owned bonds is because labor cannot directly purchase treasury bonds from the auction rather they have to buy it from the banks.
- Just like bank is entitled to interest on bonds, labor is also entitled to interest. When government pays the labor interest on bonds held by them, the transaction is recorded as a increase in bank's assets *Reserves* and a matching increase in bank's liabilities $LaborA/C$ by the amount INT_{B_L}.
- Bonds held by the labor also mature after a certain time period and upon maturity the principal amount on the bond is returned to the labor. This transaction is recorded by the bank by increasing its assets *Reserves* and liabilities $LaborA/C$ by the matching amount M_{B_L}.
- Government in our economy spends by buying the products produced by the firms. When the government spends it does that by crediting the accounts of firms at the private bank. The transaction is recorded by the bank by increasing its assets *Reserves* and liabilities $FirmA/C$ by an identical amount $SPEND_G$.
- Profits form production by the firms that is its income is liable for taxation by the government and when government taxes firm's profits it does that by debiting the account of the firm as well. This transaction is recorded by the private bank by decreasing its assets *Reserves* and its liabilities $FirmA/C$ by the corresponding amount TAX_F.
- The central bank (SBP) engages with private bank for the purchase and sales of bonds and these are generally termed 'open market operations'. When a central bank sells bonds to the private bank to

mop-up liquidity, it is called a 'repo' transaction and this transaction is denoted by OMO_Sell in our private bank sector where the record shows an asset swap i.e., an increase in $Bonds_{P.B}$ and a corresponding decrease in *Reserves* by the amount $Sell_B$.

– On the other hand when SBP aims to inject liquidity i.e., reserves into private banks, it conducts 'reverse repo' transactions that are denoted as OMO_{Sell} in our private bank sector and the record shows a corresponding decrease in $Bonds_{P.B}$ and an increase in *Reserves* by the amount BUY_B. A concise form of the above mentioned transaction in the form of an account representing Private Banks is give in Figure 15.

Figure 15: **Construction of Private Banking Sector**

P. Banks							
	Assets			**Liabilities**		**Equity**	**A-L-E**
Flow ↓ / Stocks →	*Bonds P.B*	*Reserves*	*Loans*	*Firm A/C*	*Labor A/C*	*Equity P.B*	
Initial Conditions	**5**	**50**	**0**	**25**	**4**	**26**	**0**
Net Lending Firms			NL F	NL F			0
Int on Lending Firms				- INT LF		INT LF	0
Buy Bonds P.Banks	BUY B_P.B	- BUY B_P.B					0
Int on Bonds P.Banks		INT B_P.B				INT B_P.B	0
Bonds Mature P. Banks	- M B_P.B	M B_P.B					0
Spending P.Banks				SPEND P.B		- SPEND P.B	0
Tax P.Banks		- TAX P.B				- TAX P.B	0
Salary Labor				- PAY L	PAY L		0
Spending Labor				SPEND L	- SPEND L		0
Tax Labor		- TAX L			- TAX L		0
Buy Bonds Labor	- BUY B_L				- BUY B_L		0
Int on Bonds Labor		INT B_L			INT B_L		0
Bonds Mature Labor		M B_L			M B_L		0
Spending Govt		SPEND G		SPEND G			0
Tax Profit Firms		- TAX F		- TAX F			0
OMO Sell	SELL B	- SELL B					0
OMO Buy	- BUY B	BUY B					0

- **The Central Bank - SBP** Central bank acts as the banker's bank as well as the government's bank thus on its balance sheet it keeps the reserves of the private banks to settle transactions between them also, it is tasked with holding and maintaining the treasury's account that controls government revenue receipts and expenditure outflows. Apart from these

transactions, central bank is also tasked with forming and implementing the monetary policy and take regulatory actions in the market for which it makes transactions in the inter-bank market as well. We will attempt to model all these stocks and transactions in this section.

- When a private bank buys bonds, this transaction is recorded as a liability swap on the State Bank of Pakistan (SBP) balance sheet where it decreases one liability *Reserves* and increases another liability Treasury/Federal Consolidated Fund FCF by the corresponding amount $BUY_{B_{P.B}}$. This happens because when a private bank buys bonds the reserves from its accounts are transferred to the treasury account and the bonds of equal valuation are transferred back from the treasury to the private bank.
- When the interest on bonds held by private bank is paid by the treasury, SBP records this transaction again as a liability swap where it increases the *Reserves* and decreases the FCF by the amount $INT_{B_{P.B}}$.
- The earnings of the private banks are liable for taxation and when government taxes the income of private banks the transaction recorded by SBP is another liability swap where it decreases the *Reserves* and increases the FCF by the amount of tax deducted i.e., $TAX_{P.B}$.
- On maturity of bonds held by private bank, the value on those bonds is transferred back from treasury to the private bank and this transaction is recorded by the SBP as a liability swap as well where it decreases the FCF and increases the *Reserves* of private banks of the SBP's balance sheet by the amount $M_{B_{P.B}}$.
- When labor buys bonds, these bonds are purchased through private bank but interest on those bonds is transferred through the treasury. This transaction of transferring interest is recorded by the central bank as a liability swap between *Reserves* (decreased) and FCF (in-

creased) as tax payment amount TAX_L is transferred from the labor's bank to the treasury in the form of reserves.

- Just like private bank, when bonds held by labor matures, the amount is similarly paid back to the labor from the treasury. This transaction is recorded by the SBP as a liability swap where *Reserves* increase and *FCF* decreases by the amount of the value of the bonds matured i.e., M_{B_L}.
- Again just like Private Bank income is taxable so are the profits of firms and when treasury collects taxes from firms, SBP records the transaction as a liability swap where it increases one liability *FCF* and decreases another *Reserves* by the amount of the tax collected i.e., TAX_F.
- As mentioned in the previous section, OMOs' by the SBP are conducted to manage liquidity in the market as a monetary policy tool and when SBP wishes to increase liquidity in the market, it buys bonds from the private banks in exchange for reserves. SBP records this transaction by increasing its assets $Bonds_{SBP}$ and liabilities *Reserves* by the amount of the injected liquidity BUY_B.
- Similarly if the desire is to remove liquidity from the market, SBP sells bonds to the private bank in exchange for reserves. This transaction is recorded as a decrease in assets $Bonds_{SBP}$ and increase in liabilities *Reserves* of the SBP by the amount of the reduction in liquidity or the amount of bonds sold i.e., $SELL_B$.
- Government spending essentially is a transfer of reserves out of the treasury *FCF* into the private bank where it is transferred tot he account of a customer from whom government buys goods or services. This transaction is recorded by the SBP as a liability swap were it increases the *Reserves* and decreases the *FCF* by the amount of the spending i.e., $SPEND_G$.

– Treasury/FCF also pays back the SBP for upon the maturity of the bonds held by the SBP. This transaction is recorded by the SBP by decreasing its assets $Bonds_{SBP}$ and liabilities FCF by the amount of the bonds matured i.e., $M_{B_{SBP}}$.

– SBP also have the option to buy bonds directly from the treasury which is knows as the direct monetization of government's debt. If that happens, SBP records the transaction by increasing its assets $Bonds_{SBP}$ and its liabilities FCF by the amount of the bonds purchased $BUY_{B_{SBP}}$.

– In event where government falls into severe short-term liquidity problems, it can get a loan from the SBP called 'ways and means' to cover its liquidity issues. This transaction is recorded by the SBP as an increase in its assets $Loans_{SBP}$ and liabilities FCF by the amount of the loan WM_{SBP}.

The summary balance sheet of the SBP with stocks and transactions is shown in Figure 16.

Figure 16: **Construction of Central Bank Sector - SBP**

SBP						
	Assets		**Liabilities**		**Equity**	**A-L-E**
Flow ↓ / Stocks →	*Bonds SBP*	*Loans SBP*	*Reserves*	*FCF*	*Equity SBP*	
Initial Conditions	**56**	**0**	**50**	**6**	**0**	**0**
Buy Bonds P.Banks			-BUY B_P.B	BUY B_P.B		0
Int on Bonds P.Banks			INT B_P.B	-INT B_P.B		0
Tax P.Banks			-TAX P.B	TAX P.B		0
Bonds Mature P.Banks			M B_P.B	-M B_P.B		0
Int on Bonds Labor			INT B_L	-INT B_L		0
Tax Labor			-TAX L	TAX L		0
Bonds Mature Labor			M B_L	-M B_L		0
Tax Profit Firm			-TAX F	TAX F		0
OMO Buy	BUY B		BUY B			0
OMO Sell	-SELL B		-SELL B			0
Spending Govt			SPEND G	-SPEND G		0
Bonds Mature SBP	-M B_SBP			-M B_SBP		0
Buy Bonds SBP	BUY B_SBP			BUY B_SBP		0
Ways & Means SBP		WM SBP		WM SBP		0

- **Federal Consolidated Fund (FCF)/Treasury** Treasury/Federal Consolidated Fund (FCF) is the account that keeps track of all of government's finances in that it keep records of all revenue receipts and expenses paid. This account is managed by the central bank/SBP. The transaction in this account range from issuance and servicing of government debt, collection of taxes and expenditures on goods and services by the government. Let us now see how these transactions are recorded in the FCF.

  - Transactions related to government debt, issuance, servicing and maturity originate at the treasury/FCF. It is also important to note that most transactions in the FCF are mirror image of transactions in the SBP. When government sells bonds to the private bank, the reserves from the private bank is transferred to the FCF and bonds to the private bank. This transaction is recorded in the FCF as an increase in assets FCF and liabilities $Bonds_{P.B}$ by the amount $BUY_{B_{P.B}}$.
  - Interest payments to bond holders is also made out of the FCF and in case the interest on bonds held by the private bank is paid the transaction is recorded by the FCF as a decrease in assets FCF and a decrease in $Equity_{FCF}$ by the amount $INT_{B_{P.B}}$. The reason why there is a decrease in the equity of the FCF is because by definition interest is paid out of the treasury's net income.
  - Upon maturity, bonds held by the private bank are repaid in full and the transaction is recorded in the FCF by decreasing the assets FCF and decreasing the liabilities $Bonds_{P.B}$ by the amount $M_{B_{P.B}}$.
  - Tax generally and more specifically tax on bank profits is an income/revenues for the government. Treasury records the taxation of private bank profit by increasing its assets FCF and $Equity_{FCF}$ by the amount $TAX_{P.B}$.
  - As mentioned before, when labor buys bonds it doesn't buy them directly from the government rather they buy the bonds usually in

the secondary market i.e., from private bank. Since all transactions related to government debt are recorded in the FCF, this transaction of a sale of government bonds to labor by private bank is recorded as a liability swap i.e., an increase in $Bonds_L$ with a matching decrease in $Bonds_{P.B}$ by the amount BUY_{B_L}.

- Interest on bonds held by labor is paid by treasury out of its net earnings i.e., equity. FCF records this transaction by decreasing its assets FCF and $Equity_{FCF}$ by the amount of the interest payment i.e., INT_{B_L}.
- Upon maturity treasury also pays back in full against the bonds held by labor. This transaction is recorded by the FCF as decrease in assets FCF and a corresponding decrease in liabilities $Bonds_L$ by the amount M_{BL}.
- Labor income in taxable by the government and when the government taxes that income it records the transaction in FCF by increasing its assets FCF and $Equity_{FCF}$ by the corresponding amount i.e., TAX_F.
- Bonds held by the central bank/SBP are the government bond that have a certain maturity period. At the end of that period the value against those bonds is paid back to the SBP. Treasury records this transaction by decreasing its assets FCF and its liabilities $Bonds_{SBP}$ by the amount equal to matured bonds i.e., $M_{B_{SBP}}$.
- Government also taxes firm's income/profits and when it does that, this transaction is recorded in the treasury by increasing the assets FCF and $Equity_{FCF}$ by the amount i.e., TAX_F.
- Government spending is a transfer of reserves from the FCF account to the private banks because when a government spends it essentially credits the accounts of its customers. This transaction is recorded in the treasury account by decreasing the assets FCF and $Equity_{FCF}$

by the amount of government spending i.e., $SPEND_G$.

- When the central bank engages in open market operations, the purpose is to target the amount of reserves in the banking system by altering the distribution of treasury bonds between the central bank and private bank. When central bank engages in reverse repo transactions, FCF records this transaction as a liability swap that shows movement of bonds from $Bonds_{P.B}$ to $Bonds_SBP$ by the amount of the transfer i.e., BUY_B.
- Similarly, when central bank/SBP engages in repo transactions, the FCF records this transaction again as a liability swap showing movements of bonds from $Bonds_{SBP}$ to $Bonds_{P.B}$ by the amount of the transfer i.e., $SELL_B$.
- Central bank/SBP have themselves been a direct investor in government bonds, however, more recently this is becoming less and less popular in practice. But, when SBP buys bonds directly from the treasury, the FCF records the transaction by increasing its assets FCF and liabilities $Bonds_{SBP}$ by the amount of the value invested i.e., $BUY_{B_{SBP}}$.
- Ways and means is another way for treasury to cover its short term liquidity problems without issuing treasury debt where it can get loans from the SBP. This avenue has been explored less and less in recent times. However, if government chooses to do so, the FCF records the transaction by increasing its assets FCF and liabilities $Loans_{SBP}$ by the amount of the borrowing i.e, WM_{SBP}.

The summary of the balance sheet of treasury/FCF is provided in Figure 17.

Figure 17: **Construction of Treasury/FCF Sector**

FCF							
	Assets	**Liabilities**				**Equity**	**A-L-E**
Flow ↓ / Stocks →	*FCF*	*Bonds P.B*	*Bonds SBP*	*Bonds L*	*Loans SBP*	*Equity FCF*	
Initial Conditions	**6**	**5**	**56**	**1**	**0**	**-56**	**0**
Buy Bonds P.B	BUY B_P.B	BUY B_P.B					0
Int on Bonds P.B	-INT B_P.B					-INT B_P.B	0
Bonds Mature P.B	-M B_P.B	-M B_P.B					0
Tax P.B	TAX P.B					TAX P.B	0
Buy Bonds L		-BUY B_L		BUY B_L			0
Int on Bonds L	-INT B_L					-INT B_L	0
Bonds Mature L	-M B_L			-M B_L			0
Tax L	TAX L					TAX L	0
Bonds Mature SBP	-M B_SBP		-M B_SBP				0
Tax Profit Firm	TAX F					TAX F	0
Spending Govt	-SPEND G					-SPEND G	0
OMO Buy		-BUY B	BUY B				0
OMO Sell		SELL B	-SELL B				0
Buy Bonds SBP	BUY B_SBP		BUY B_SBP				
Ways & Means SBP	WM SBP				WM SBP		0

- **Labor** Labor earns its wages working for the Firm. In this model, we build the labor sector in a way that company hires labor for its work and pays them salaries in return for the work done. The amount that labor earns as wages becomes their income and they spend out of that income for the product that is produced by the company. Labor, however, does not incur any personal liabilities. Let us look at the balance sheet of labor and see how the transactions are recorded there.

  - When labor invests in treasury bonds, it accesses them through the private bank. The transaction in this respect recorded in the Labor account as a asset swap where its assets $Labor\,A/C$ is decreased and the other asset $Bonds_L$ is increased by the amount of the bonds bought i.e., BUY_{B_L}.
  - Interest earnings on bonds held by labor are recorded in the labor account as an increase in assets $Labor\,A/C$ and an increase in $Equity_{Labor}$ by the amount $INTB_L$. This amount becomes part of labor equity because it is net income for the labor.

– Treasury bonds held by the labor matures after a certain period and on that point treasury/FCF has to pay back the amount to labor equal to the value of the matured bonds. This transaction is recorded in the labor account as an asset swap between $Labor A/C$ (increase) and $Bonds_L$ (decrease) by the amount equal to the value of the bonds i.e., M_{B_L}.

– Labor is paid salary for their work that they do for the firm. When the firm pays labor salaries, this transaction is recorded in the labor account as an increase in assets $Labor A/C$ and $Equity_L$ by the amount of the salary i.e., PAY_L.

– Labor also spends from their income and when they do they spend it on the produce of the firm. This transaction is recorded as a decrease in assets of labor $Labor A/C$ and $Equity_L$ by the amount of spending $SPEND_L$.

– Government, like other sectors, also taxes the labor and this transaction is recorded with a decrease in assets $Labor A/C$ and $Equity_L$ by the amount of the tax i.e., TAX_L.

The summary of transactions in the labor sector is given in the Figure 18.

Figure 18: **Construction of Labor Sector**

Labor					
	Assets		**Liabilities**	**Equity**	**A-L-E**
Flow ↓ / Stocks →	*Labor A/C*	*Bonds L*		*Equity L*	
Initial Conditions	**4**	**1**		**0**	**5**
Buy Bonds L	-BUY B_L	BUY B_L			0
Int on Bonds L	INT B_L			INT B_L	0
Bonds Mature L	M B_L	-M B_L			0
Salary L	PAY L			PAY L	0
Spending L	-SPEND L			-SPEND L	0
Tax L	-TAX L			-TAX L	0

- **Firm** The firm sector performs the function of production in the economy.

In the process of production, firm interacts with labor and the government. When a firm engages with labor it hires it as a factor of production and pays them wages/salaries for the work done towards production. On the other hand, when a firm engages with the government it is usually in the form of either government spending on firm's products or firm buying treasury securities. In this section we model all these transactions to see how firm interacts with different sectors.

- Net lending to firms is the amount of loans that firms have taken less the loans that have been paid back to private bank. This transaction in the net form is recorded in the firm sector as an increase in assets $FirmA/C$ and increase in liabilities $Loans_{P.B}$ by the amount N_{L_F}.
- Firms pay back interest on loans that they have taken from private bank and this payment comes out of the net income of the firm. This transaction is recorded in the firm sector by decreasing the assets $FirmA/C$ and $Equity_F$ by the amount of the interest paid i.e., INT_{L_F} as the funds flow out of the firm's account at the private bank to private bank's equity.
- Firms also pay salaries to the labor hired for the production activities. These salaries also come out of the net income of the firm that it has earned as profits. When the firm sector records this transaction it decreases its assets $FirmA/C$ and $Equity_F$ by the amount of the salary transferred to the labor i.e., PAY_L.
- Firm produces products and those products are bought up by different agents in the economy. One of those agents is government. When government buys the products of the firm the transaction of this purchase is recorded in the firm sector by increasing the assets of the firm $FirmA/C$ and $Equity_F$ with the amount of the spending $SPEND_G$.

– Labor also buys firm's produce and when it does this transaction is recorded by the firm sector by increasing he assets $FirmA/C$ and $Equity_F$ by the amount of the spending i.e., $SPEND_L$.

– Firm's output is also bought by the private bank. This transaction is recorded in much the same way as the government spending and labor spending on firm's products i.e., the transaction is recorded by the firm sector as an increase in assets $FirmA/C$ and $Equity_F$ by the amount of the spending by private bank $SPEND_{P.B}$.

– Firm's profits are also taxable and when the government taxes firm's profits, this transaction is recorded by the firm sector as a decrease in assets $FirmA/C$ and $Equity_F$ by the amount of tax deducted from the firm i.e., TAX_F.

The summary of transactions in the firm sector is given in Figure 19.

Figure 19: **Constructing of Firm Sector**

Firm						
	Assets		**Liabilities**	**Equity**		**A-L-E**
Flow ↓ / Stocks →	*Firm A/C*	*R.Asset F*	*Loans P.B*	*Equity F*	*N.F.Assets F*	
Initial Conditions	**25**	**0**	**0**	**0**	**0**	**25**
Net Lending F	NL F		NL F			0
Int on Lending F	-INT LF			-INT LF		0
Salary L	-PAY L			-PAY L		0
Spending Govt	SPEND G			SPEND G		0
Spending L	SPEND L			SPEND L		0
Spending P.B	SPEND P.B			SPEND P.B		0
Tax Profit F	-TAX F			-TAX F		0
Investment F		I N_F			I N_F	0

4.4 Analysis & Discussion

1. **Dynamics of Deficit Spending:** The objective of the study is to see, from an accounting perspective how, monetized and bond-financed spending impacts output and inflation in the economy. Our focus for this remains on the Treasury/FCF account and its linkages with the rest of the economy.

Movement in the stock of equity that the FCF has at any point in time is defined by the inward and outward flows to and from the account as shows in Figure 17. We can write it in the form of an equation as follows:

$$Equity\ FCF = TAX_L + TAX_F + TAX_{P.B} - SPEND_G - INT_{B_{P.B}} - INT_{B_L} \tag{19}$$

This equation shows that taxes are incoming receipts into the treasury account and spending by the government is a payment out of the account. The difference between tax receipts and government spending is known as the primary balance. Since government borrows to finance its deficits, it pays interest on the debt represented, by the interest payments. The difference between taxes, government spending and interest on debt is called the fiscal balance. Normally, fiscal balance is negative i.e., the amount of taxes taken out of the economy is smaller than the sum of government spending and interest payments paid on debt and this called fiscal deficit. Fiscal deficit also represents the 'negative equity' of the treasury account.

From the FCF account in Figure 17; spending by the government falls under two main heads i.e., $SPEND_G$ for the real sector and interest payments to the financial sector represented by $INT_{B_{P.B}}$ and INT_{B_L} as shown by Equation (19). In order to show how government spending gets into the economy Figure 16 and Figure 19 can be used to write down equations for movement in equity of the Private Banks and Firm Sector respectively:

$$Equity\ P.Banks = INT_{L_F} + INT_{B_{P.B}} - SPEND_{P.B} - TAX_{P.B} \tag{20}$$

$$Equity\ F = SPEND_G + SPEND_L + SPEND_{P.B} - INT_{L_F} - PAY_L - TAX_F \tag{21}$$

From Equation (20) and Equation (21) it is abundantly clear that government spending becomes part of the equity of private sector firms and interest payments by the government becomes part of the equity of the pri-

vate banking sector. Under the assumption that government runs a deficit i.e., the amount of taxes collected from the economy is smaller than the government spending on firms and interest payments to banks then the net negative equity of the government/treasury sector is equal to the sum of net positive equity of the firm sector ($SPEND_G - TAX_F$) and the private bank sector ($INT_{B_{P.B}} - TAX_{P.B}$) in relation to the treasury. In Table 4 we show the data of federal tax collection, federal markup payments and federal public section development spending (PSDP) in case of Pakistan as a percentage of GDP for the year 2018-2023.

Reading Table 4 in conjunction with Equation (19) gives us an understanding of the problem which seems not to be with the mode of government financing rather the actual makeup of federal spending. From 2018 to 2023, tax collections as a percentage of GDP has declined that has pushed the government towards more deficit financing to meet its needs. At the same time, spending as a percentage of GDP in the financial sector (Markup Payments) increased overtime while the spending as a percentage of GDP in the real sector (PSDP) has decreased. Thus we argue, that government spending in Pakistan has led to the creation of money but bulk of that money has been created in the financial sector rather than the real sector leading to lower real growth and higher inflation.

Table 4: Tax Collections, Markup Payments & PSDP (% GDP)

Year	**Tax Collection**	**Markup Payments**	**PSDP**
2018	9.80	3.83	1.69
2019	8.74	4.77	1.28
2020	8.41	5.51	1.31
2021	8.53	4.92	1.20
2022	9.22	4.78	0.84
2023	8.53	6.78	0.88

Source: Pakistan Bureau of Statistics

2. In order to place the sources of deficit financing in a pure monetary context we can use the standard multiplier model in conjunction with balance sheet approach to provide an explanation of why different sources of financing for deficit spending does not a bearing on the outcome. We take a simple equation that for the larger money supply in the economy.

$$M^s = m \times H \tag{22}$$

where M^s represents larger money supply in the economy and H represents the high-powered money or monetary base and m represents the money multiplier. Since M^s is the sum of cash (C) and deposits (D) and H is the sum of cash (C) and reserves (D), we can define:

$$M^s = C + D$$
$$H = C + R$$

Let's introduce two ratios i.e., cash-to-deposit ratio ($C/D = \alpha$) and reserves-to-deposit ratio ($R/D = \beta$). With these ratios we can write the above equations as:

$$M^s = \alpha D + D = (\alpha + 1)D$$
$$H = \alpha D + \beta D = (\alpha + \beta)D$$

Now, since $m = M^s/H$, we can write

$$m = \frac{M^s}{H} = \frac{\alpha + 1}{\alpha + \beta}$$

This can be further simplified as:

$$m = \frac{1 + C/D}{C/D + R/D} \tag{23}$$

We know that deficit spending creates money in the economy. Since this money is part of the larger money supply, we know that larger money supply M^s can only be changed either by changing the high-powered money (H) or the money multiplier (m).

When a government gets its debt monetized through its central bank, H is directly created i.e., if Pakistan's government borrows directly from the SBP, then SBP will create reserves directly in to the treasury (FCF) account of the government thus directly creating high-powered money which is then available for the government to make payments. But, when governments borrows from the market (scheduled banks), high-powered money is not (directly) created rather a movement in the reserves-to-deposit ratio takes place. Therefore, financing government's deficit spending through the market is preferred because it doesn't create high-powered money and hence thought of as non-inflationary.

Merging the money multiplier with the accounting framework can now help us understand why that is not the case. Starting with our methodology in section (4.3), we assume that the private market for funds in Pakistan is represented by scheduled banks that hold only the required level of reserves as mandated by the regulator i.e., the SBP. In this context, let us consider the case where government finances its deficit worth Rs.100 by issuing bonds to the private funds market.

Table 5: **Fiscal Consolidated Fund Balance Sheet (1)**

Assets	ΔRs.	**Liabilities**	ΔRs.
Reserves from Scheduled Banks	+100	Bonds Issued to Scheduled Banks	+100

Table 6: **State Bank of Pakistan Balance Sheet (1)**

Assets	ΔRs.	**Liabilities**	ΔRs.
		Reserves of Scheduled Banks	−100
		Reserves in FCF/Treasury	+100

Table 7: **Scheudled Banks Balance Sheet (1)**

Assets	ΔRs.	**Liabilities**	ΔRs.
Reserves of Scheduled Banks	−100		
Bonds Issued to Scheduled Banks	+100		

This transaction causes a shortage of available reserves in the inter-bank market. The shortage of reserves in the inter-bank market tends to put upward pressure on the inter-bank offer rates. Since it is the mandate and standard practice of the central banks all over the world to keep the inter-bank offer rate as close as possible to the policy rate for effective policy transmission, they move to inject reserves into the inter-bank market in exchange for government securities to cover the shortfall, mostly through open-market-operations that happens in the shape of reverse-repo transactions. The balance sheet position of the FCF, SBP and the scheduled banks will be as follows:

Table 8: **Fiscal Consolidated Fund Balance Sheet (2)**

Assets	ΔRs.	**Liabilities**	Δ Rs.
Reserves from Scheduled Banks	+100	Bonds Issued to Scheduled Banks	+100

Table 9: **State Bank of Pakistan Balance Sheet (2)**

Assets	ΔRs.	**Liabilities**	ΔRs.
Bonds Issued to Scheduled Banks (OMO)	+100	Reserves of Scheduled Banks (OMO)	+100
		Reserves in FCF/Treasury	+100

Table 10: **Scheudled Banks Balance Sheet (2)**

Assets	ΔRs.	**Liabilities**	ΔRs.
Reserves of Scheduled Banks (OMO)	+100		
Bonds Issued to Scheduled Banks (OMO)	−100		

These set of transactions in Table 9 and 10 shows us that with banks holding required reserves, the move by government to bond-finance in deficit spending leads to creation of high-powered money. Therefore, in essence, from a money creation standpoint in the context of sources of finance for government's deficit spending, it does not matter how the government wishes to proceed i.e., to monetize it's debt from the central bank or the private banks, high-powered money will eventually be created. Table 11 below we show data of OMOs and T.Bill Auction from Pakistan. The data on OMO operations by the central bank and government's T.Bill auctions show a recurring trend in that after every instance of bond-financed deficit deficit spending there is a recurring round of reverse repo operations undertaken by the central bank to maintain a level of liquidity in the economy and the banking system.

Table 11: **Deficit Financing & Central Bank OMOs in Pakistan**

Rs. millions

November 2023				
Sr.	**Date**	**Tenor (Days)**	**Transaction Type**	**Amount**
1	1-Nov-23	-	T.Bill Auction	982,900
2	3-Nov-23	7	Reverse Repo	2,869,550
3	10-Nov-23	7	Reverse Repo	1,249,500
3	10-Nov-23	14	Reverse Repo	632,000
5	10-Nov-23	-	PIB Auction	252,301
3	10-Nov-23	28	Reverse Repo	2,772,150
4	14-Nov-23	3	Reverse Repo	250,550
5	15-Nov-23	-	T.Bill Auction	1,025,088
6	17-Nov-23	7	Reverse Repo	283,000
6	17-Nov-23	14	Reverse Repo	241,700
6	17-Nov-23	28	Reverse Repo	1,014,050
7	24-Nov-23	7	Reverse Repo	581,350
7	24-Nov-23	14	Reverse Repo	394,500
7	24-Nov-23	28	Reverse Repo	947,250
7	29-Dec-23	-	T.Bill Auction	1,015,313
9	30-Nov-23	1	Reverse Repo	759,800
December 2023				
Sr.	**Date**	**Tenor (Days)**	**Transaction Type**	**Amount**
1	1-Dec-23	7	Reverse Repo	580,750
1	1-Dec-23	14	Reverse Repo	516,200
1	1-Dec-23	28	Reverse Repo	121,800
2	5-Dec-23	3	Reverse Repo	434,600
3	8-Dec-23	7	Reverse Repo	3,711,550
4	13-Dec-23	-	T.Bill Auction	1,802,080
5	15-Dec-23	7	Reverse Repo	318,000
5	15-Dec-23	14	Reverse Repo	107,500
5	15-Dec-23	28	Reverse Repo	4,973,250
6	21-Dec-23	-	PIB Auction	396,572
7	22-Dec-23	7	Reverse Repo	689,450
7	22-Dec-23	14	Reverse Repo	242,500
7	22-Dec-23	28	Reverse Repo	1,732,600
8	27-Dec-23	-	T.Bill Auction	1,678,913
9	28-Dec-23	1	Reverse Repo	1,802,550
10	29-Dec-23	4	Reverse Repo	281,000
10	29-Dec-23	14	Reverse Repo	367,050
10	29-Dec-23	28	Reverse Repo	1,295,950

1. Data for OMO Transactions is taken from the SBP Website https://www.sbp.org.pk/ecodata/OMO-Inject-Hist.pdf
2. Data for T.Bill Auction is taken from the SBP website https://www.sbp.org.pk/ecodata/tb.xlsx
3. Data for Pakistan Investment Bonds (PIB) is taken from the SBP website https://www.sbp.org.pk/ecodata/Pakinvestbonds.pdf

4.5 Conclusion

In the modern economic setup, different sectors of the economy have interlinked balance sheets and transactions between them are of monetary nature. The best way to record and keep track of these linkages and transactions is through accounts using double-entry-bookkeeping (DEB). DEB is a flawless way of keeping track of transactions where transactions originating from one sector of the economy can be tracked as it moves through different sectors of the economy. This provides us with a unique opportunity to identify and study the cause and macroeconomic impact of a policy by looking at the transactions (flows) and accounts (stocks) of different sectors.

The analysis presented in the previous section shows two key results from our approach: one, when a government engages in bond-financing or monetization it always occurs at some positive rate of interest for a certain period of time. Once that stipulated period of time has passed, government has to 'service the debt' which means either payment of interest to the source or payment of interest or principal amount both. In case of bond-financing, interest paid to the private banks becomes part of their equity and therefore stay in the banking system becoming part of the larger money supply. As increase in equity raises the capacity of the private banks to make more loans, it has the potential to further expand the money supply and cause inflation. On the contrary, servicing money-financed loans by the government pays interest to its central bank. This interest paid to the central bank is considered as the central bank's profit and becomes part of its equity, however, unlike private banks, this profit is turned over in part or fully to the treasury's account as receipts. Thus, these interest payments do not become part of the larger money supply in the economy neither present a possibility for a second round expansionary effects. Recent data from Pakistan shows that government, post central bank independence, exclusively bond-finances its spending and due to high rates has paid increasing interest payments over the past few years that may very well explain part

of the inflation that occurred in the same period.

Two, the analysis presented in conjunction with the data shows that in case of Pakistan, bond-financing doesn't not result in resource transfers from private to the public sector. The reason is that even though the government cannot borrow directly from the SBP and SBP is not required by law to oblige any requests by the government for financing, the SBP independence legislation doesn't stop the it from supporting the government in the secondary market. The data suggests that SBP engages regularly in the inter-bank market to inject liquidity through reverse-repo operations around the same time as government approaches the banks for funds. This sort of operations tend to have an impact where government has uncontested access to funds and banks makes the most out of this favorable position to make interest earnings resulting in ever expanding money supply and possible inflationary consequences. This study also makes a note that bond-financing tends to limit government's budgetary options to spend on productive avenues as the overall debt mounts and the interest payments along with it. However, the impact in terms of output is mainly dependent more upon the government's choice of avenues to spend on productively rather the sources that it finances its spending from.

Chapter 5

5 Deficit Financing, Money Creation & Central Bank Independence: A Policy Viewpoint

5.1 Introduction

Central bank independence is a topic that is at the heart of the debate when it comes to monetary policy conduct and regulation of financial bodies in an economy post 1970's. Backed by theory and evidence a great many central banks have pushed for more independence and a greater autonomy with which they can exercise their power to stabilize prices. With more independence there has also been a shift in the way monetary policy used to be conducted i.e., interest rate targeting to more recently inflation targeting. Even though the evidence for the success of central bank independence and its inflation targeting regime is, at best, mixed in the sense that for both developing and developed economies, we can find weak as well as strong evidence of a negative relationship between a central bank's independence and price stability yet standard theory advocates strongly in favor of an independent central bank for theoretical reasons that span over a few decade of arguments on this topic.

The State Bank of Pakistan (SBP) has recently been given autonomy by the parliament under the 22nd IMF Extended Funding Program, in that, it is free from any political influences as well as administrative influences and thus can form and conduct its own policy freely, prioritizing its core objective. This legislation calls for the SBP to implement a rule based policy and in the process build its credibility to effectively conduct and communicate monetary policy using forward guidance and as a result keep inflation expectations in the economy anchored. It also intends to impart fiscal discipline on the government by allowing it to borrow only from the private funds market and not directly

through its own bank, thereby, abating inflationary pressures as well.

In the next sections, we discuss some of the theoretical underpinnings of the autonomy narrative along with a summary evidence to its effect that is followed by statistical outlook on relevant economic variables, a little history of the amendment to the SBP Act with the most recent one, expert opinions on the amendment legislation and finally conclude.

5.2 Theoretical Background

Debate on central bank independence dates back to the original issue of 'time inconsistent monetary policy' (Kydland and Prescott, 1977; Barro and Gordon, 1983) that there exists an incentive for the government to sacrifice long-term price stability for a temporary gain in employment and output (Rogoff, 1985; Walsh, 1995). In order to protect an economy's purchasing power from this sort of discretionary actions a rule based policy coming out of an independent central bank has a better chance at stabilizing the overall prices and to reduce inflation (Buchanan and Tullock, 1977; Sargent *et al.*, 1981). This theory has not been without its criticism because democratic governments being the supreme authority has the power to change the terms of delegation of power to an independent central bank when it wants (McCallum, 1995).

The evidence from advanced, emerging and even developing economies for about 30 years post 1970s that there does exist a negative relationship between central bank independence and inflation and price stability. In case of advanced economies, Bade and Parkin (1982) put forward evidence in favor of this negative relationship[21] followed by work of Alesina (1988) and Grilli *et al.* (1991). As far as emerging economies are concerned, evidence point to a strong negative relationship among central bank independence and inflation(Banaian *et al.*, 1998; Froyen and Waud, 1995; Berger *et al.*, 2001). Also, for developing

[21] In case of some advanced economies where this relationship was not evident, De Haan and Van't Hag (1995); Havrilesky (1994) argue that more robust estimation techniques do solve this issue.

economies central bank is related to lower inflation (De Haan and Sturm, 2000) but not to economic growth (De Haan and Kooi, 2000).

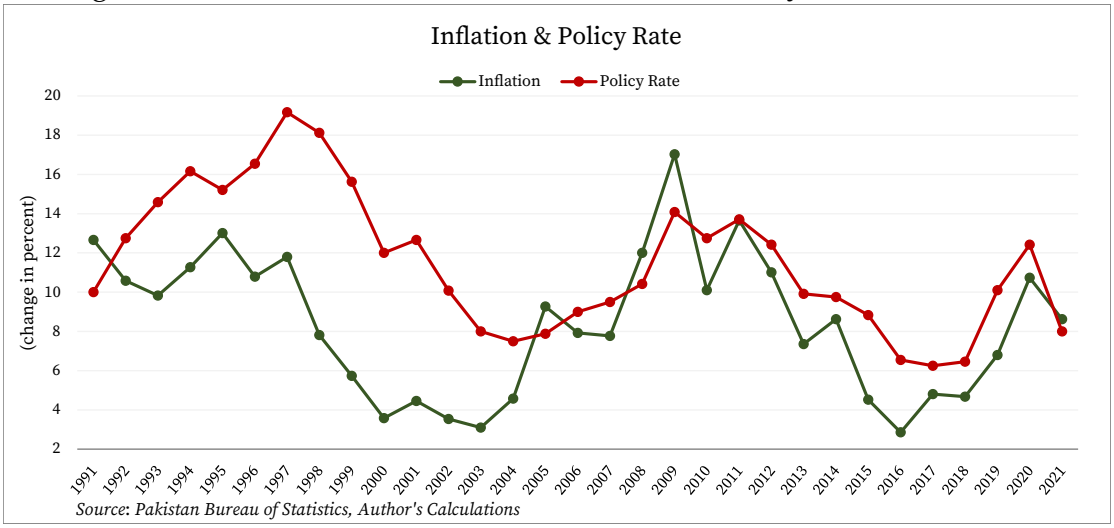
More recent data on this relationship (Balls *et al.*, 2018) doesn't strictly show this negative relationship among more advanced economies. One of the reason that is so is because most of the literature on this subject focuses on a composite measure of central bank independence but when we make a distinction between operational and political independence it shows a different picture e.g., Debelle *et al.* (1994) argue for operational independence to be the important for advanced economies. Today, most central banks in the advanced economies have greater operational independence compared to political independence.

This distinction between the relative effectiveness of political and operational independence forces us to find out which is more relevant for the monetary policy and it also asks the question how should a central bank be structured. Moving forward, it is important that we begin by putting in perspective what is meant by operational and political independence.

5.3 Inflation & Growth in Numbers

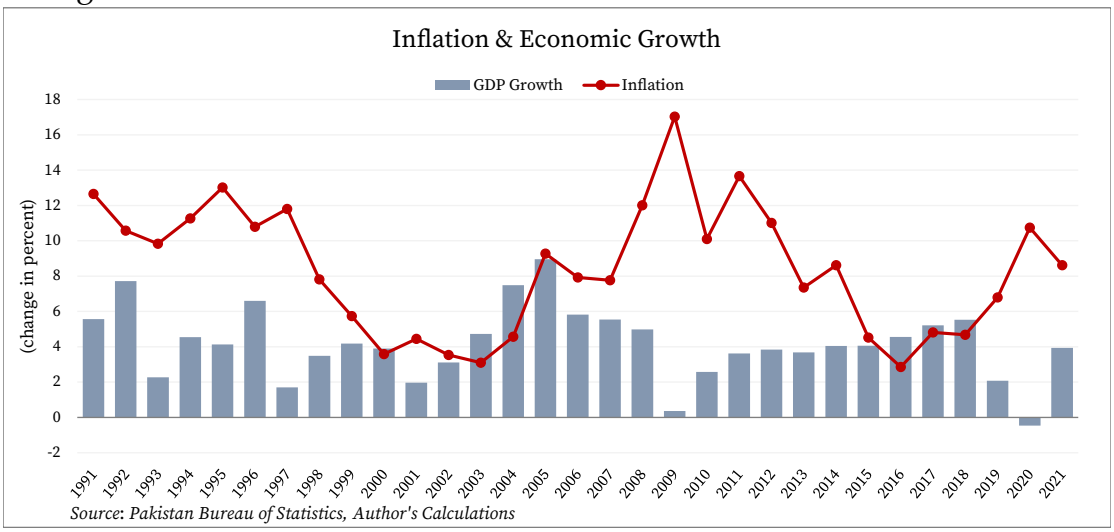
Inflation in Pakistan has, by no means, remained stable for the past three decades as we can see from the graph of consumer price index (CPI) inflation in Figure 20. During 1990 - 2020, inflation has fluctuated anywhere between a low of 3% and a peak of 17% on a year-on-year basis. Policy rate, which is the main tool available to the SBP to control inflation and set expectations regarding its future level in the market, has been between a low of approx. 7% and 20% on a year-on-year basis. The pattern of policy rate increase and decrease tends to closely follow the pattern that emerges out of inflation in Pakistan which shows that the SBP relies heavily on demand management policies when it comes to the overall inflation management strategy in Pakistan.

Figure 20: **Historical Data of CPI-Inflation & Policy Rate in Pakistan**



A similar pattern can be seen in the numbers of GDP growth over the same period from Figure 21 that has fluctuated between a low of less than 1% and a peak of 8% on a year-on-year basis during 1990 - 2020.

Figure 21: **Historical Data of CPI-Inflation & GDP Growth in Pakistan**



In this section, we provide some historical context for the pattern that emerges from the data of inflation GDP growth from Pakistan.

5.3.1 FY 1991 - 2000

During 1991 - 2000, Pakistan's economic growth slowed down showing a decade-on-decade GDP growth of 4.4% compared to 6.4% during 1981 - 1990. In the FY

92, GDP growth rate climbed to a high of 7.6% but gradually declined to a low of 1.7% in FY 97 due to a mix of questionable policies and political instability. An expansionary monetary policy in the start of the decade is considered to be mainly responsible for a double-digit inflation from 1991 - 1997 that averages approx. to 11.4% followed by contractionary monetary policy that gradually brought the inflation down from a high of approx. 11.8% in 1997 down to approx. 3.5% in 2000. Pakistan's exchange rate also depreciated substantially during that period due to the difficulty in maintaining its current account deficit (CAD) with mounting external debt and requirements for its servicing. With the help of an IMF program, the economy showed signs of recovery towards the end of the decade and various policies of this recovery continued into the next decade.

5.3.2 FY 2001 - 2010

During 2001 - 2010, economic growth in Pakistan improves on a decade-on-decade rate of 4.6% compared to 4.4% during 1991 - 2000. During this period, GDP growth in Pakistan starts at a low of 2% in FY 2001 and peaks at 9% in FY 2005 only to decline to 0.4% in FY 2009. This incredible movement is perhaps due to one of the most 'happening' decades of the recent economic history of Pakistan and perhaps the whole world in terms of domestic and global events. In the first half of the decade, economy showed impressive improvement on the back of growing industrial and services sector, however, that could not be sustained due to a sharp rise in global prices of oil and raw material also termed as the 'China factor'[22] Also, demand contraction policy through strict fiscal discipline, that continued in some shape and form till FY 2003 was then changed and demand was allowed to rise in conjunction with rising GDP growth.

But, demand expansion and rise in global energy and commodity prices proved too much to handle for the recovering economy and inflation rises to a

[22]Global commodity and oil prices sharply rise due to China's decision to import in huge quantities during this period.

high of approx. 9.2% and peaks at approx. 17% in 2009. Once again, this resulted in economic difficulties for Pakistan in on the external front followed by an IMF program and depreciation of rupee against the dollar. This time around, however, demand side factors proved to be less of a problem rather than the supply-side factors that caused high inflation numbers and since much of Pakistan's industry is dependent upon import of raw materials, thus expensive imports along with a depreciating exchange rate resulted in domestic supply shortages as well. SBP in a bid to counter this inflation raised policy rates to approx. 14% to curb the demand component of the inflationary pressure.

5.3.3 FY 2011 - 2020

During 2011 - 2020, economic growth in Pakistan declines and GDP growth comes down to a decade-on-decade growth rate of 3.5% compared to 4.6% in during FY 2001 - 2010. Pakistan's economy manages to maintain, for the most part during this decade, to maintain its GDP growth rate, albeit low but, at an average of approx. 4%. Monetary tightening by the SBP that started in the last decade continues into this one as well.

However, as soon as the global commodity prices start to come down, domestic inflation starts follow its trend even when when Pakistan faced supply disruptions due to floods in the country. The fall in global energy and commodity prices continues to FY 2016 and inflation trend follows suit in Pakistan as CPI inflation hits an decade low of approx. 2.8%. After FY 2016, a sharp rise in global energy prices impacts domestic prices in Pakistan and inflation rises from a low of approx 2.8% FY 2016 to a high of 10.7% in FY 2020. This happened partly because of mounting fiscal deficit and a loose monetary policy as well.

From three decades of pattern and events we see that, inflation is Pakistan is a mixture of global conditions and domestic monetary as well as fiscal policy stances where the supply side component may have a higher impact on domestic prices than the demand side component. GDP growth on the other hand

seems to be suffering due to due to very high inflation making the economy as a whole non-competitive with the global producers. SBP, with its mandate of price stability uses interest rate to manage demand in the economy and has been successful at that if not completely, then upto manageable levels.

5.4 SBP Act and Ammendments

The State Bank of Pakistan (SBP) operates under the State Bank of Pakistan Act 1956 that provides the central body of law for the purpose of matters pertaining to regulation of financial institutions with the express objective to *"regulate the monetary and credit system of Pakistan and to foster its growth in the best national interest with a view to securing monetary stability and fuller utilization of the country's productive resources"*[23] . It pursuance of its supplementary functions, it also assumes powers and operates under Banking Companies Ordinance 1962, Foreign Exchange Regulations Act 1947 and Payment System and Electronic Fund Transfer Act 2007. In order to keep the structure and operations of the SBP in line with the international best practices, the State Bank of Pakistan Act 1956 has been amended four times in the past prior to the amendment legislation as of 2021 to establish and strengthen SBP's autonomy. First amendment to the SBP Act 1956 was brought in 1994 under financial sector reforms that provided for SBP's autonomy to grant it exclusive rights to regulate the financial sector and issue monetary policy without external influence. It was further strengthened with multiple amendments in 1997 and 2012. In 2015, another amendment allowed for the incorporation of a monetary policy committee that could independently take decisions regarding monetary operations and policy rates. The highlight of the SBP Act 2021 is the clarity with which its objectives have been defined to ensure transparency in its operations, accountability in terms of its objectives and a drive to make it financially independent. A financially independent SBP will not be dependent upon the state for its expenses and with its

[23]https://www.sbp.org.pk/about/Lf.asp

administrative and functional autonomy it doesn't have to meet debt or policy demands of the state. This amendment act also boosts administrative autonomy of the SBP by expanding its oversight functions.

It is also important to note that in terms of monetary policy regimes, from 1972-2006, SBP adopted 'monetary aggregate targeting' with a managed exchange rate regime but post 2006-2021 SBP has moved on to 'flexible inflation targeting' which, in post amendment scenario, is expected to continue in an improved form.

5.5 Analysis & Recommendations

As previously discussed, inflation in Pakistan is a contentious issue because of its implications for investment and growth in the long-run as well as the short run and for economic policy. It is, therefore, important to see how this amendment in the SBP Act has implications for financing of government deficits from a policy perspective. In order to find that out, interviews from professionals at Ministry of Finance (Govt. of Pakistan)[24] and State Bank of Pakistan as well as prominent academicians[25] from the field of economics were conducted. In the next sections to follow, we present their expert opinions in separate themes built around the actual policy relevant questions[26] in conjuction with our analysis.

[24]We are thankful to the Dr. Imtiaz Ahmad (Economic Advisor, MoF), Dr. Hasan Mohsin (Joint Economic Advisor, MoF), Mr. Shoaib (Deputy Economic Advisor, MoF), Mr. Abdullah (Debt Management Office, MoF) and Mr. Hafiz Azeem Syed (Assistant Economic Advisor, MoF) for their views on the amendment legislation and its policy implications.

[25]We are also thankful to Dr. Wasim Shahid Malik (SBP Chair, UoP), Dr. Abdul Jalil (SBP Chair, PIDE), Dr. Mahmood Khalid (Associate Professor, PIDE), Dr. Atiq-ur-Rehman (Director Economics Department, AJKU), and Dr. Arshad Khan for their views on the amendment legislation and its policy implications

[26]Keeping in view that this a policy matter still under consideration, we have decided no to name specific individuals of quote any specific responses

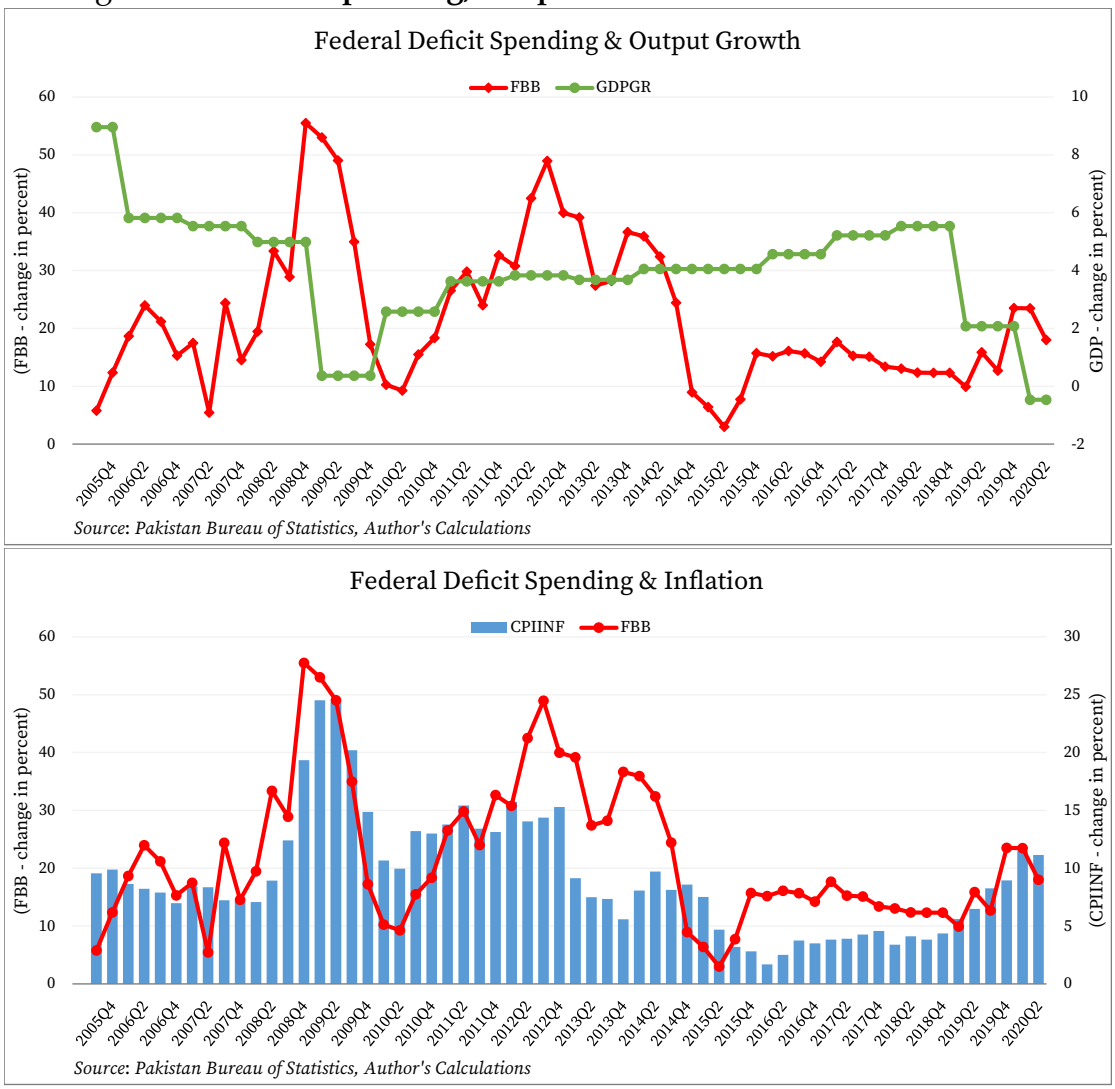
5.5.1 Central Bank Independence & Fiscal Discipline

One of the core duties of a central bank is to function as a government's banker in the capacity of managing its finances and providing guidance on matters related to financing as well. Pakistan in the past have both bond-financed as well as had its debt monetized. It has been argued that the ability of the governments to do the latter has allowed it to put the economy though 'political business cycles'. [27] The gains out of these cycles are limited for the simple reasons that these expenditures are not necessarily directed towards a growth in productivity and long-term economic prospects of the country. Thus, often these actions by the state result in higher fiscal deficits, inflation and overall economic imbalances.

Historically, SBP, working under the Ministry of Finance, has obliged all but few requests by the state to monetize its debt resulting in a growth in money supply and inflation in the country beyond what was targeted. After the amendment, SBP is not legally bound to oblige any requests for financing of government expenditure. The essence of this move is to curb these 'political business cycles' and subject government spending to the market discipline i.e., if the government wants to spend it is up to the market to decide at what rate and volume does it want to lend to the government keeping in view the economic conditions. This move, arguably, improves the operational autonomy of the SBP, because it tends to insulates its policy from government intervention. Technically, SBP can still garner favorable conditions in the funds market for the government to gather funds for its spending by setting the interest rate and engaging in open market operations but the choice whether SBP wants to do that given its policy stance remains with it.

[27] Kalecki (2021) argues that politicians in a bid to gain votes make use of the fiscal and monetary policy to apparently put the economy into a high gear during election the election years.

Figure 22: **Deficit Spending, Output Growth & Inflation in Pakistan**

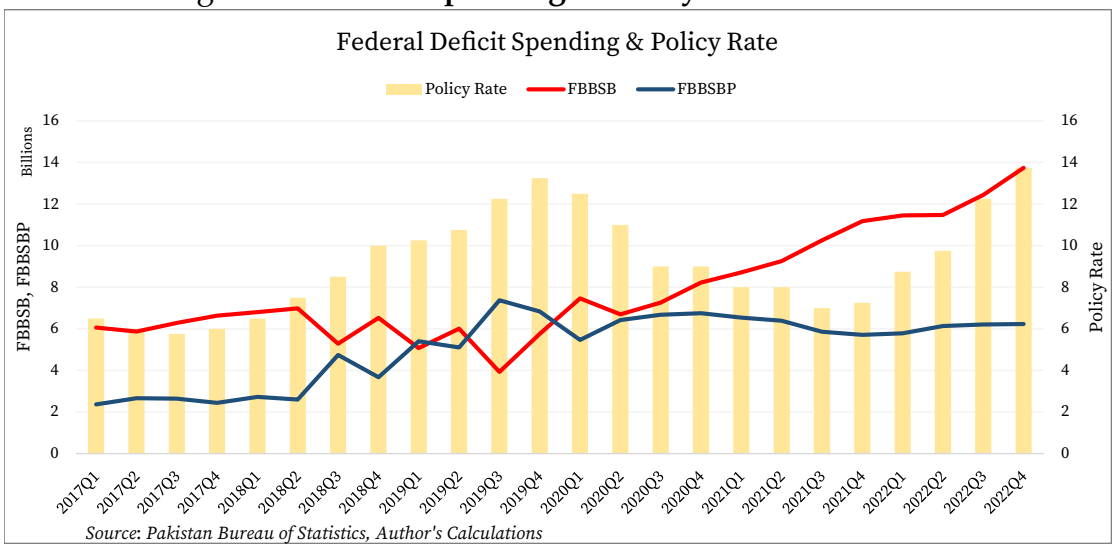


Given that, Pakistan is a developing country and needs the government to step in more often than it would like to for the purposes of stabilizing the economy, academics remain skeptical whether such an autonomy given to the state bank will bring any positive outcomes for the economy in the long-run. While some academics opposed SBP's operational autonomy, other have supported it for the simple reasons that the component of political business cycles in Pakistan economy has been pronounced in the recent decades and often become a huge problem for the public at large.

From Figures 22 and it is clear that deficit financing in the case of Pakistan does bear some fruits in the real sector which can be seen from a weak but

positive relationship between federal deficit spending and output growth in Pakistan. On the other hand, there is a very strong and clear relationship between federal deficit spending and consumer price inflation. This is where the importance of the fiscal discipline comes in i.e., deficit spending by the government is inflationary and it does not matter how the government comes up with the funds to do this spending. But has the central bank independence been successful in imparting that discipline?

Figure 23: **Deficit Spending & Policy Rate In Pakistan**



Source: Pakistan Bureau of Statistics, Author's Calculations

The trends from Figure 23 shows that deficit spending in Pakistan is far from any sort of fiscal discipline. One of the reasons why that is that even though GoP can not have its debt monetized from SBP, yet there is no limit to how much SBP can buy or sell government securities in the secondary market. Analysis from the last chapter shows that there has been a clear trend of liquidity injections into the banking sector by the SBP to honor needs for finances by the government. Any possibility of a fiscal discipline is dependent upon the SBP's ability to place a quantity constraint on liquidity injection in the inter-bank market and stop the indirect creation of high-powered money.

5.5.2 Policy Coordination & Macro Reforms

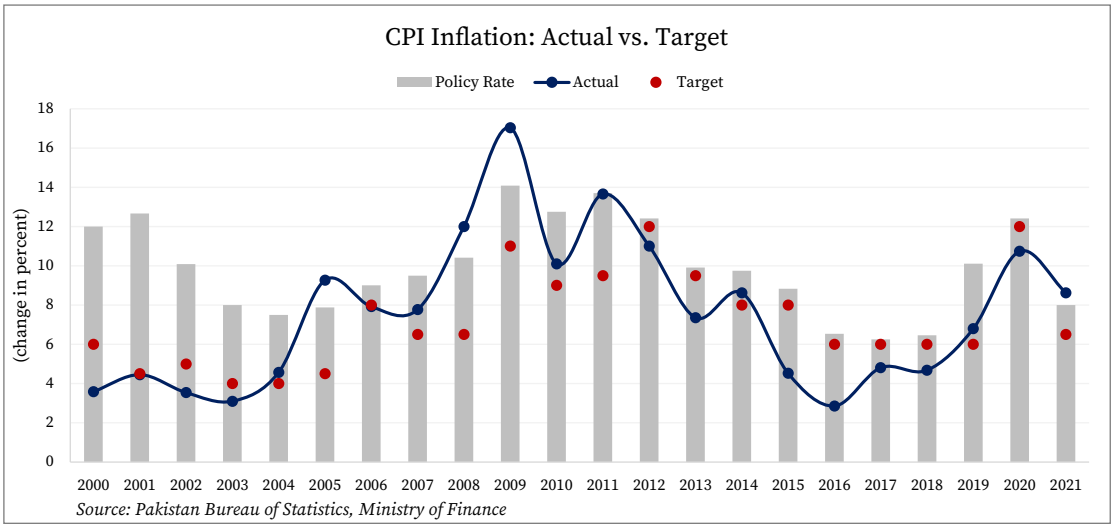
With the onset of this amendment, government has dissolved the Monetary and Fiscal Policies Coordination Board (MFPBC) that was setup under section 9(B) of the SBP Act 1956. This board comprised of 5 members i.e., Federal Minister for Finance, Federal Minister for Commerce, Deputy Chairman Planning Commission, The Governor SBP and Secretary Finance Division. At some point, two independent representatives (economists) have also been taken on board. Since the inception of MFPBC in 1996 and in the more recent past from 2008-18, the SBP did not have complete administrative autonomy over monetary operations or policy design. Even though the monetary policy committee at the SBP is tasked with coming up with an overall monetary policy stance in Pakistan, with majority vote lying inside the SBP, yet it has historically been subjected to advice by the MFPBC for considerations other than the SBP's core objective i.e., delivering low and stable inflation.

The problem, however with this new arrangement is the lack of coordination between the monetary and the fiscal policy. In a perfect world with no imbalances, a central bank setting the overall price of credit in the economy is a viable tool to achieve the stated targets. But in a developing economy like Pakistan, imposing a one-sided autonomy with no coordination is bound to create more problems than solutions. SBP in a bid to clamp down inflation has recently raised policy rate to historic high levels yet deficit spending by the government shows no sign of slowing down. This points towards a coordination failure and asks for macro-reforms at the policy level to bring both GoP and SBP on the same page.

5.5.3 Inflation Targeting & Stability of the Financial System

SBP's core objective to deliver a target low and stable inflation brings up yet another important question: How will the target be determined, who will determine it? As standard practice, Annual Plan Coordination Committee (APCC)

has been tasked with setting targets on various macroeconomic variables in Pakistan with the help of concerned ministries such as ministries of finance, commerce etc. This process of coming up with targets for the next fiscal year starts around the third quarter of the current fiscal year with the budget preparation and preparation for Medium-Term Macroeconomic Framework that eventually gives shape to the Budget Strategy Paper. Targets that are finalized in the APCC are then forwarded to the NEC, which upon approval, become part of the annual plan for next fiscal year. Inflation is one of the targets set.



Government of Pakistan is still tasked with coming up with a target inflation for the economy under the amendment legislation; a target that SBP has to deliver and be answerable for it. It can also be, historically, determined that SBP has never been able to meet a target inflation rate due to reason that are argued mostly in the realm of fiscal slippages.

Post central bank independence legislation, even though SBP's core objective is to target a certain level of inflation, yet the operational tool for its actions remains to be the policy rate. In term of SBP's ability to successfully conduct an inflation targeting regime it has to establish a whole range of necessary initial requirements such as credibility, nominal anchor, effective transmission channels etc. Researches in the past have commented on whether SBP should take up inflation targeting or not. Where some have gone against it (ur Rehman,

2021) others have favored such a regime (Uddin, 2007; Saleem, 2010).

It is also SBP's mandate to ensure the stability of the financial system of Pakistan. Keeping that in mind, the standard understanding from economics literature is that the central bank must do everything it can to keep the inter-bank funds rate as close as possible to the policy rate for effective monetary policy transmission. A bond-financed deficit spending almost forces the central bank to inject liquidity in the banking system through OMOs to keep the inter-bank rate from moving away. In this context, with policy rate being the operational target, any sort of quantity constraint on liquidity injection also becomes very tricky.

5.5.4 Deficit Financing & Nature of Spending

Any hope for a discipline in fiscal spending has to come from both policies. If the SBP is to clamp down on the expansion of monetary base, then government also has to reign in its spending. In Pakistan's case, however, it is easier said than done. Table 12 shows that in the past six years, charged expenditures[28], with only a single exception, have remained over 80% of total treasury expenditures while the rest are voted[29] Since most of the expenditure out of the FCF is charged it leaves little wiggle room for the government to cut down on fiscal spending. Most of that charged expenditure represents repayments of principle and interest on public debt.

[28]Charged expenditures are those expenditures that are known and unavoidable.
[29]Voted expenditures are those that are avoidable.

Table 12: **Voted vs. Charged Expenditures from FCF In Pakistan** *(Rs.Billions)*

Year	Total Expenditure (FCF)	Voted (% Total)	Charged (% Total)
2018-19	41,190,801	8.18	91.84
2019-20	23,567,486	17.24	82.76
2020-21	23,207,895	36.53	63.47
2021-22	31,546,389	15.06	84.94
2022-23	40,093,620	15.17	84.83
2023-24*	48,459,437	16.64	85.36

1. The data has been obtained from the budget tab of the website of Ministry of Finance (MoF) Pakistan at http://www.finance.gov.pk/
2. * Budgeted Estimates

Now, if it is difficult for the government to cut down on spending, then any spending beyond taxes must be financed. Therefore, any move by SBP to unilaterally take measures to restrict expansion of monetary base to restrict bond-financed deficit spending can potentially lead to debt defaults by the government. The circumstances of the situation indicate, again, towards macro reforms with an emphasis on government spending to boost productivity and growth so as expand the size of the economic pie.

Chapter 6

6 Conclusion & Recommendations

When it comes to the role of money in the economy, there does not exist a consensus among economists whether it is an active or a passive one. While one school advocates its potency for growth and claims a central position for it in dynamics of it, the other school treats its as a mere tool for transactions carrying no impact for the real economy. However, if there is any consensus, it is that one of the major ways in which money is created in the economy is when government spends, even though its impact has been a subject of debate. Much has been said in both its favor and against, still governments have sizable budgets, much larger in size comparative to what they were a few decades ago.

The arguments from both sides of the isle with respect to government spending and the resultant money creation becomes particularly important when government's expenditures begins to exceed its revenues. As a government steps into the realm of 'deficit spending' it also has to deal with the problem of 'deficit financing' i.e., it has to either bond-finance its deficits or have them monetized. What makes the problem of financing government expenditures particularly interesting is that there is no doubt that taxes are a resource transfer from the private sector to the government sector. But, the same is argued in favor of only one of the two sources of deficit financing i.e., bond-finance. As government taxes to spend, it increases its own demand but it also decrease the private sector demand and the net impact is negligible if not zero. However, as we have seen, the case with the financing of government deficit, through monetization and bond-financing is a not straight forward one.

The motivation for this study comes from a recent move by the GoP to discontinue monetization of its deficit spending under the central bank independence legislation. The objective of the move is to establish autonomy of the

SBP to choose an independent monetary policy, subject deficit spending by the government to market discipline and to curtail business cycle based monetary growth in Pakistan. This study sets out to find whether it makes any difference in terms of macroeconomic outcomes if one source of financing deficits is picked over another and does picking one source over the other offer any substantial benefits? This then debates on the possible reasons for the presence of patterns between sources of money creation and macroeconomic outcomes. In the end, this study also discusses the policy related question that it starts with.

This study finds that bond-financed deficit spending does not offer any substantial benefits over monetized deficit spending in that monetized deficit spending carries more relative impact for output growth while bond-financed deficit spending has more impact on inflation. Moreover, it does not matter which source is picked to finance deficits because even though deficit spending from both sources causes positive trend in output growth yet both sources also have inflationary consequences. The fact that government is one of the largest contributor to aggregate demand in Pakistan is implied by the results from this study on output growth. For inflation, this study hints at the possible absence of a resource transfer from private to public sector.

This study also finds that bond-financing of government deficits in the current context has no benefits in terms of macroeconomic outcomes primarily because bond-financing of deficits leads to creation of high powered money just as the creation of high powered money in the case of monetization. The reason why that happens is because of policy rate being the SBP's operational tool. In order to keep the inter-bank rate close to the policy rate and to provide favorable conditions for government auctions it tends to create high-powered money all the same. Secondly, study also indicates that more than the source of financing, it is the makeup of the government's budget that has implications for the macroeconomic outcomes.

In the policy context, this study finds that fiscal discipline for the govern-

ment will remain a distant dream unless SBP moves to stop providing a favorable environment for the government to borrow from the private market in terms of quantity. However, imposition of any quantity constraint by the SBP in terms of available liquidity in the private market can have unwanted consequences for the government. This study discusses that in case of quantity constraints government may head towards default as the bulk of budget remains in terms of charged expenditures most of which represent debt servicing. This study also discusses that placing quantity constraints may also be detrimental to the health of the financial system as a whole. In the end, study argues that one-sided autonomy is not the solution to the problem rather macro-reforms in the context of coordination between monetary and fiscal policy is the only hope that can impart some fiscal discipline while also maintaining autonomy of the central bank and sustainable and posistive outcomes for the economy.

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7 Appendix

7.1 SVAR Construction

7.1.1 From Structural to Reduced-form VAR

Consider the following example of an autoregressive model:

$$x_t = A_0 + A_1 x_{t-1} + e_t \tag{24}$$

If x_t is one variable, we have a uni-variate model and if x_t represents two variables then we have bi-variate model. Generally, if x_t represents a vector of any number of variables, we have a 'vector autoregressive model'. If we assume that x_t in Eq(24) represents a vector of variables then the model is question is a VAR(1) model because it incorporates only the first lag of the vector of variables in x_t. Before moving forward, there are two issues that need to be addressed:

- *Stationarity:* With uni-variate analysis, stationarity is a pre-condition, however, in multivariate models it is not a pre-condition because when we are dealing with a vector of variables and their lags this problem gets resolved.

- *Endogeneity:* Prior to solving a simultaneous equation system, identification has to be made in terms of the variables being endogenous or exogenous. Such identification may be theoretically obvious at times but at other times it may prove to be challenging. Moreover, the search of valid and effective instruments can also prove to be a challenge.

Since this process has a bigger chance of error, Sims introduced VAR modeling to bypass all the issues posed by the theoretical approach. He argues that while differentiating between endogenous and exogenous variables, if the theory is weak and cannot ascertain with confidence which variables are exogenous and

which aren't, then we must assume all variables to be endogenous. Let's take a look at formulation of the Sim's VAR model. Consider the following equations:

$$y_t = b_{10} + b_{12}z_t + \gamma_{11}y_{t-1} + \gamma_{12}z_{t-1} + \epsilon_{y_t} \tag{25}$$

$$z_t = b_{20} + b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \epsilon_{y_t} \tag{26}$$

Each variable i.e., x_t and y_t, is dependent upon their own lag, other variable and the other variables lag. The reason for introducing lags in the equations is to capture the dynamics (short-run relationships). More than one lag(s) can be introduced in the model which will subsequently decide the order of the VAR. In these equations we have eight *structural parameters* i.e., $b_{10}, b_{12}, \gamma_{11}, \gamma_{12}, b_{20}, b_{21}, \gamma_{21}, \gamma_{22}$ and two structural (or primitive) *shock parameters*k ϵ_{y_t} and ϵ_{z_t} or innovations. These shocks have economic interpretations e.g., money supply shock is a structural shock which has the interpretation that central bank has either increased or decreased it. Out of these structural parameters, b_{12} and b_{21} are contemporaneous response coefficients while $\gamma_{11}, \gamma_{12}, \gamma_{21}, \gamma_{22}$ are lagged effect coefficients. This system of two equations is formally known as structural (or primitive) VAR model.

We make the following assumptions for our model:

- $E(y_t) = E(z_t) = 0$
- $E(y_t)^2 = \sigma_y^2; \quad E(z_t)^2 = \sigma_Z^2$. Both y and z have constant variance.
- $E(y_t, z_t) = 0$. Both shocks are primitive thus both of them have their own unique determinants. This simply means that both these shocks are unrelated. However, at the same time we can say that even though these shocks are independent of each other yet y and z can depend upon each other.
- $E(y_t, y_{t-i}) = E(z_t, z_{t-1}) = 0$. The structural shocks, essentially, are white noise processes, thus auto-covariance between them is also zero.

Because of the obvious endogeneity problem, we cannot solve this system of equation using OLS because our estimates in this case will be biased. To be able to make the solution process easy we can write the simultaneous equation system in the matrix form as:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix} \begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix} + \begin{bmatrix} \epsilon_{y_t} \\ \epsilon_{z_t} \end{bmatrix} \tag{27}$$

From Eq(27), if we take x_t to be a vector of y_t and z_t we can write a generalized equation form as:

$$Bx_t = B_0 + \gamma x_{t-1} + \epsilon_t \tag{28}$$

This can be further simplified as

$$x_t = B^{-1}B_0 + B^{-1}\gamma x_{t-1} + B^{-1}\epsilon_t \tag{29}$$

Substituting $B^{-1}B_0 = A_0, B^{-1}\gamma = A_1$ and $B^{-1}\epsilon_t = e_t$ we get:

$$x_t = A_0 + A_1 x_{t-1} + e_t \tag{30}$$

This is the same equation that we started out with and called it the VAR model. Before we expand on Eq(30), it essential that we understand the nature of the

substitutions that we have made.

$$A_0 = B^{-1}B_0 = \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix} = \frac{1}{1 - b_{21}b_{12}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix}$$

$$a_{10} = \frac{b_{10} - b_{12}b_{20}}{1 - b_{12}b_{21}}$$

$$a_{20} = \frac{b_{20} - b_{21}b_{10}}{1 - b_{12}b_{21}}$$

$$A_1 = B^{-1}\gamma = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = \frac{1}{1 - b_{12}b_{21}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}$$

$$a_{11} = \frac{\gamma_{11} - b_{12}\gamma_{21}}{1 - b_{12}b_{21}}$$

$$a_{12} = \frac{\gamma_{12} - b_{12}\gamma_{22}}{1 - b_{12}b_{21}}$$

$$a_{21} = \frac{\gamma_{21} - b_{21}\gamma_{11}}{1 - b_{12}b_{21}}$$

$$a_{22} = \frac{\gamma_{22} - b_{21}\gamma_{12}}{1 - b_{12}b_{21}}$$

$$e_t = B^{-1}\epsilon_t = \begin{bmatrix} e_{y_t} \\ e_{z_t} \end{bmatrix} = \frac{1}{1 - b_{21}b_{12}} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} e_{y_t} \\ e_{z_t} \end{bmatrix}$$

$$e_{y_t} = \frac{\epsilon_{y_t} - b_{12}e_{z_t}}{1 - b_{12}b_{21}}$$

$$e_{z_t} = \frac{\epsilon_{z_t} - b_{21}e_{t_t}}{1 - b_{12}b_{21}}$$

Now, if we expand Eq(30) we get the following set of equations:

$$y_t = a_{10} + a_{11}y_{t-1} + a_{12}z_{t-1} + e_{y_t} \tag{31}$$

$$z_t = a_{20} + a_{21}y_{t-1} + a_{22}z_{t-1} + e_{z_t} \tag{32}$$

There are no endogenous variables on the right hand side of our system of equations anymore i.e., all variables are exogenous or pre-determined. This system of equation is known as *reduced form VAR* or standard VAR.

Our reduced form VAR has the following properties:

$$E(e_{y_t}) = \frac{E(\epsilon_{y_t}) - b_{12}E(e_{z_t})}{1 - b_{12}b_{21}} = 0$$
$$E(e_{z_t}) = \frac{E(\epsilon_{z_t}) - b_{21}E(e_{t_t})}{1 - b_{12}b_{21}} = 0$$
$$E(e_{y_t})^2 = \frac{\sigma_y^2 - b_{12}^2\sigma_z^2}{(1 - b_{12}b_{21})^2}$$
$$E(e_{z_t})^2 = \frac{\sigma_z^2 - b_{21}^2\sigma_y^2}{(1 - b_{12}b_{21})^2}$$
$$E(e_{y_t}, e_{z_t}) = \frac{-b_{12}\sigma_z^2 - b_{21}\sigma_y^2}{1 - b_{12}b_{21}}$$

Unlike structural parameters, these reduced form parameters that we just calculated (as a combination of structural parameters of two equations) have no economic interpretation. Also, reduced form errors are the combination of the two structural shocks and thus cannot be interpreted in the same was as structural shocks are interpreted. However, in terms of statistics we can interpret them as one step ahead forecast errors.

$$E(e_{y_t}, e_{y_{t-i}}) = E(\epsilon_{y_t}\epsilon_{y_{t-i}}) - b_{12}E(y_t\epsilon_{y_{t-i}}) + b_{12}^2E(\epsilon_{z_t}\epsilon_{z_{t-i}} - b_{12}E(z_t\epsilon_{y_{t-i}}) = 0$$

From the properties that we have established i.e., both structural shocks and reduced form shocks have zero mean, constant covariance and zero auto-covariance, however, contemporaneous correlation between two reduced form errors is not zero unlike structural errors.

7.1.2 VAR to VMA Representation

We can convert a vector autoregressive model into its moving average representation. Consider the VAR in Eq(30)

$$x_t = A_0 + A_1x_{t-1} + e_t$$

We can write this equation for one lag period as

$$x_{t-1} = A_0 + A_1 x_{t-2} + e_{t-1}$$

Substituting this back in the original model gives us

$$\begin{aligned} x_t &= A_0 + A_1(A_0 + A_1 x_{t-2} + e_{t-1}) + e_t \\ x_t &= A_0 + A_1 A_0 + A_1^2 x_{t-2} + A_1 e_{t-1} + e_t \\ x_t &= A_0(I - A_1) + A_1^2 x_{t-2} + A_1 e_{t-1} + e_t \end{aligned}$$

For n periods, we can write this as

$$x_t = (I + A_2 + A_1^2 + ... + A_1^n)A_0 + \sum_{i=1}^{n} A_1^i \epsilon_{t-i} + A_1^{n+1} x_{t-n-1}$$

On the assumption that $n \to \infty$

$$\begin{aligned} x_t &= (I + A_2 + A_1^2 + ... + A_1^n)A_0 + \sum_{i=1}^{n} A_1^i \epsilon_{t-i} \\ x_t &= \frac{A_0}{1 - A_1} + \sum_{i=1}^{n} A_1^i \epsilon_{t-i} \\ x_t &= (I - A_1)^{-1} A_0 + \sum_{i=1}^{n} A_1^i e_{t-i} \end{aligned}$$

Lets solve for the value for the expression $(I - A_1)^{-1}A_0$

$$I - A_1 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} = \begin{bmatrix} 1 - a_{11} & -a_{12} \\ -a_{21} & 1 - a_{22} \end{bmatrix}$$

$$(I - A_1)^{-1} = \frac{1}{(1 - a_{11})(1 - a_{22}) - a_{12}a_{21}} \begin{bmatrix} 1 - a_{22} & -a_{12} \\ -a_{21} & 1 - a_{11} \end{bmatrix}$$

$$(I - A_1)^{-1}A_0 = \frac{1}{(1 - a_{11})(1 - a_{22}) - a_{12}a_{21}} \begin{bmatrix} 1 - a_{22} & -a_{12} \\ -a_{21} & 1 - a_{11} \end{bmatrix} \begin{bmatrix} a_{10} \\ a_{20} \end{bmatrix}$$

$$(I - A_1)^{-1}A_0 = \frac{1}{D} \begin{bmatrix} a_{10}(1 - a_{22}) & a_{12}a_{20} \\ a_{21}a_{10} & a_{20}(1 - a_{11}) \end{bmatrix}$$

Now we can write the expression for x_t as

$$x_t = \frac{1}{D} \begin{bmatrix} a_{10}(1 - a_{22}) & a_{12}a_{20} \\ a_{21}a_{10} & a_{20}(1 - a_{11}) \end{bmatrix} + \sum_{i=1}^{n} A_1^i e_{t-i}$$

Impulse Response Functions:

As x_t is a vector containing y_t and z_t we can write the deviations from mean in the following manner as well:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} e_{y_{t-i}} \\ e_{z_{t-i}} \end{bmatrix}$$

As $e_t = B^{-1}\epsilon_t$, we can write

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \frac{1}{1 - b_{12}b_{21}} \sum_{i=0}^{\infty} \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \begin{bmatrix} 1 & -b_{12} \\ -b_{21} & 1 \end{bmatrix} \begin{bmatrix} \epsilon_{y_{t-i}} \\ \epsilon_{z_{t-i}} \end{bmatrix}$$

This can be further simplified as

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} \epsilon_{y_{t-i}} \\ \epsilon_{z_{t-i}} \end{bmatrix}$$

In order to write x_t in this manner, we must have ϵ_t. $\phi_{11}(i)$ represents the impact of shock in y on series of y. In the same manner, $\phi_{12}(i)$ represents the impact of shock in z on series of y. If we plot ϕ_{ii} against i then they are called impulse response functions. If we consider $\phi_{12}(0)$ it is the impact of shock in z on series of y in the current period and is called the impact period multiplier. Long-run multiplier is the sum $\sum_{i=0}^{\infty} \phi_{12}(i)$.

Variance Decomposition:

Consider the VMA representation as:

$$\begin{bmatrix} y_t \\ z_t \end{bmatrix} = \begin{bmatrix} \bar{y} \\ \bar{z} \end{bmatrix} + \sum_{i=0}^{\infty} \begin{bmatrix} \phi_{11}(i) & \phi_{12}(i) \\ \phi_{21}(i) & \phi_{22}(i) \end{bmatrix} \begin{bmatrix} \epsilon_{y_{t-i}} \\ \epsilon_{z_{t-i}} \end{bmatrix}$$

This can be written in the generalized form as:

$$x_t = \mu + \sum_{i=0}^{\infty} \phi(i)\epsilon_{t-i}$$

for n periods ahead we can write

$$x_{t+n} = \mu + \sum_{i=0}^{\infty} \phi(i)\epsilon_{t+n-i}$$

The expected value of this expression is

$$E_t x_{t+n} = \mu + \sum_{i=0}^{\infty} \phi(i)\epsilon_{t+n-i}$$

Subtracting this expression from the original representation gives us the fore-

cast error

$$x_{t+n} - E_t x_{t+n} = \sum_{i=0}^{n-1} \phi(i)\epsilon_{t+n-i}$$

Since x is a vector containing yk and z, for simplification purposes we are only considering y. The forecast error in y can be written as:

$$\begin{aligned} y_{t+n} - E_t y_{t+n} =& \phi_{11}(0)\epsilon_{y_{t+n}} + \phi_{11}(1)\epsilon_{y_{t+n-1}} + ... + \phi_{11}(n-1)\epsilon_{y_{t+1}} + \phi_{21}(0)\epsilon_{z_{t+n}} \\ &+ \phi_{21}(0)\epsilon_{z_{t+n-1}} + ... + \phi_{21}(n-1)\epsilon_{y_{t+1}} \end{aligned}$$

The expectation of the square of the forecast error gives us the measure of variance in y

$$\begin{aligned} E_t(y_{t+n} - E_t y_{t+n})^2 =& \sigma_y^2(n) = (\phi_{11}(0)^2 + \phi_{11}(1)^2 + ... + \phi_{11}(n-1)^2)\sigma_y^2 \\ &+ (\phi_{21}(0)^2 + \phi_{21}(1)^2 + ... + \phi_{11}(n=1)^2)\sigma_z^2 \end{aligned}$$

N-step ahead forecast error variance of y has only two sources that is variance of y and variance of z. To change the above expression into proportion form we can re-write the it as:

$$1 = \frac{(\phi_{11}(0)^2 + \phi_{11}(1)^2 + ... + \phi_{11}(n-1)^2)\sigma_y^2}{\sigma_y^2(n)} + \frac{(\phi_{21}(0)^2 + \phi_{21}(1)^2 + ... + \phi_{11}(n=1)^2)\sigma_z^2}{\sigma_y^2(n)}$$

This expression shows the decomposition of variance in y caused by y and z.

7.1.3 Identifying Restrictions

Since we have four unknown structural parameters, one possibility towards identifying the VAR is to restrict one of the structural variables. Suppose $b_{12} = 0$. Since b_{12} is the coefficient of z_t, then assuming it equals zero means that z doesn't contemporaneously cause y but y contemporaneously causes z. The question here is that how can we assume this? To understand this phenomenon,

consider a system of equations where prices are dependent upon money and money is dependent upon prices. We can thus argue that whenever prices change central bank can alter money in the market but the effect of change in money on prices can only be observed in long-run. Thus it is reasonable to assume the restriction that the coefficient of current money supply on prices can be zero (because the effects will be lagged).

Now, if we argue that in our model placing restriction $b_{12} = 0$ is reasonable then we have three structural variables to estimate from three independent equations. If we venture further into the restriction imposition, we can see that the selection of number of restriction to be imposed depends upon the model under consideration e.g., if we have two variable VAR, then we have to put restriction on one parameter but if we have more than two variable VAR then we have to put restrictions on more than one structural variables to make the system identified. Assume that we have a three variable VAR, then Eq(17) can be re-written as:

$$\begin{bmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{13} \\ \sigma_{21} & \sigma_2^2 & \sigma_{23} \\ \sigma_{31} & \sigma_{32} & \sigma_3^2 \end{bmatrix} = \begin{bmatrix} 1 & b_{12} & b_{13} \\ b_{21} & 1 & b_{23} \\ b_{31} & b_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} var(\epsilon_1) & 0 & 0 \\ 0 & var(\epsilon_2) & 0 \\ 0 & 0 & var(\epsilon_3) \end{bmatrix} \begin{bmatrix} 1 & b_{12} & b_{13} \\ b_{21} & 1 & b_{23} \\ b_{31} & b_{32} & 1 \end{bmatrix}^{-1} \tag{33}$$

We can see that in this case we will have only six out of nine independent equations. The unknown parameters to be estimated are $var(\epsilon_1), var(\epsilon_2), var(\epsilon_3), b_{12}, b_{13}, b_{21}, b23, b$ and b_{32}. Now restrictions we have to impose are three to make the system exactly identified. If we head on to four by four system then the number of restrictions will be different. We have to look towards a formula the can tell us in any system, the number of parameter restrictions that has to be imposed. If we look at the matrices, we can see that the coefficients of the B matrix will always be $n^2 - n$ whereas coefficients of sigma matrix will be n^2 and coefficient of the variance covariance matrix will be n. In any case the number of parameters that have to be recovered are n^2 and the number of parameters that go into equality

will be $(n^2 - n)/2$ which is also the number of restrictions to be placed.

Choleski Decomposition Method:

The focus of the discussion is how to impose restrictions. Consider the following B matrix:

$$\begin{bmatrix} 1 & b_{12} & b_{13} \\ b_{21} & 1 & b_{21} \\ b_{31} & b_{32} & 1 \end{bmatrix}$$

On the diagonal we have same value and on the top and bottom of the diagonal we have coefficients in the form of triangle. The coefficients in each triangle are similar to coefficients on the other triangle suggesting a linear correspondence between them. So what we do is to put zero restrictions on coefficient on B matrix which are in the upper triangle. The important point to remember is that the number of coefficient given in the upper triangle will always be given by $(n^2 - n)/2$. Since the number of coefficients of variance covariance matrix is given by n so the number of coefficients that have to be recovered are given by $(n^2 + n)/2$. Thus after *Choleski Decomposition* VAR becomes exactly identified. The arrangement of the coefficients in the upper triangle, however, should be such that the coefficients that we are restricting to zero area actually zero in contemporaneous correlation.

There can be a few possibilities regarding choleski decomposition. One, that the restrictions we are imposing on the parameter are not holding in each case i.e., one or more than one of the restrictions isn't holding. Of course we take the help of theory while arranging the parameters in triangles to capture as many coefficients in upper triangle as we can on which the restriction holds but still it is possible that one or more coefficient is zero from another triangle. In that case problems can arise because we are moving in a triangular fashion. Consider the

definition of the reduced form error:

$$e_t = B^{-1}\epsilon_t$$

$$e_t = c\epsilon_t$$

$$\begin{bmatrix} e_{1_t} \\ e_{2_t} \\ e_{3_t} \end{bmatrix} = \begin{bmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{bmatrix} \begin{bmatrix} \epsilon_{1_t} \\ \epsilon_{2_t} \\ \epsilon_{3_t} \end{bmatrix}$$

$$e_{1_t} = c_{11}\epsilon_{1_t} + c_{12}\epsilon_{2_t} + c_{13}\epsilon_{3_t}$$

$$e_{2_t} = c_{21}\epsilon_{1_t} + c_{22}\epsilon_{2_t} + c_{23}\epsilon_{3_t}$$

$$e_{3_t} = c_{31}\epsilon_{1_t} + c_{32}\epsilon_{2_t} + c_{33}\epsilon_{3_t}$$

Since $B^{-1} = c$ then placing restriction on $b_{12} = b_{13} = b_{23} = 0$ will also mean that $c_{12} = c_{13} = c_{23} = 0$. Then according to choleski decomposition we get:

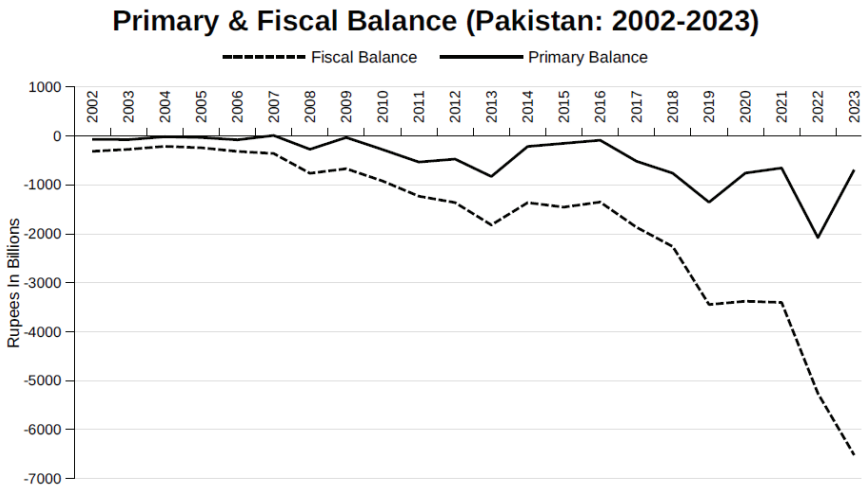
$$e_{1_t} = c_{11}\epsilon_{1_t}$$

$$e_{2_t} = c_{21}\epsilon_{1_t} + c_{22}\epsilon_{2_t}$$

$$e_{3_t} = c_{31}\epsilon_{1_t} + c_{32}\epsilon_{2_t} + c_{33}\epsilon_{3_t}$$

7.2 Unit Root Test

Variables	**ADF**		**Phillip-Perron**	
	Level	1^{st}**Difference**	**Level**	1^{st}**Difference**
Output	0.5878	0.000	0.5317	0.000
FBCB	0.0039	-	0.0028	-
FBPB	0.2986	0.0000	0.0296	-
Inflation	0.5064	0.0035	0.1798	0.0001
KIBOR	0.1474	0.0003	0.1675	0.0003
ER	0.0031	-	0.0389	-


Primary & Fiscal Balance (Pakistan: 2002-2023)
Fiscal Balance
Primary Balance
Rupees In Billions
1000
0
-1000
-2000
-3000
-4000
-5000
-6000
-7000
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023