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

ABSTRACT

A government's choice of a source for 'deficit financing' has both economic and political consequences. In recent decades, academics and policymakers have leaned more in favor of bond financing as opposed to monetization. The reasons for this shift, in the latter, range from being politically motivated and inflationary to counter-productive, while the former, as a market-based solution to fiscal discipline and stability. The objective of this paper is to investigate whether different sources of finance for the government's deficit spending have any bearing on the macroeconomic outcomes i.e., inflation and output growth in the case of Pakistan. A structural vector autoregressive (SVAR) model is built with key economic variables, to calculate impulse responses to monetized and bond-financed deficit spending. The evidence shows that, although both monetized and bond-financed deficit spending have inflationary consequences, they improve output growth. Moreover, to fund the government's deficit spending, picking either monetization or bond financing over the other does not provide substantial benefits in terms of macroeconomic outcomes. The robustness of these results is substantiated by the evidence from the QQ approach as well.

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1. INTRODUCTION

Even though the fiscal view of inflation and output growth is highly contested in academic discourse, it holds special importance in the case of developing countries. This is because developing countries, generally, are weak at raising taxes and foreign assistance (Alesina & Drazen, 1989; Cukierman et al., 1992) to finance their spending and thus keep engaging in deficit financing to meet their expenses.

There are two ways a government can finance its deficits i.e., either through monetization1 or bond financing2. From a monetarist point of view, there is a consensus in the literature that excessive monetization of a government's debt by its central bank is inflationary because it creates high-powered money and inflation is always and everywhere a monetary phenomenon (Friedman, 1989). But a similar argument is not made when a government borrows from the private funds market i.e., mainly banks. The explanation for this behavior is in the orthodox understanding of the way money supply is created in the economy through a multiplier model and the way banks behave as financial intermediaries in an economy. A government borrowing from a private bank is not assumed to be inflationary because it "crowds out" the private funds market the possibility of a buildup of excessive money stock, and consequently inflation, is very low. However, the argument that governments running deficits persistently will eventually have to finance them through monetization, even if they are initially bond-financed weakens the premise along with the argument that the money supply is not exogenous but endogenous to the financial requirements of the fiscal authorities (Sargent & Wallace, 1981). As far as output growth is concerned, excessive borrowing by the government can severely crowd out private borrowing to the level that it hurts private investment plans and thus output growth in the economy, however, negative impacts on output growth can be mitigated with a growth-oriented deficit spending. Therefore, the choice of the source of financing deficit spending is material to macroeconomic outcomes and policy formation.

Pakistan is a developing economy and has faced moderately high inflation and low output growth for the past two decades. Historically, the government has maintained a substantial footprint, and consequently, sizable deficit spending, financed both through the central bank and the private funds market to support the economy. Motivation for this study comes from the recent central bank independence, essentially putting an end to the monetization of deficits. This move is aimed at providing a market-based solution to discipline deficit spending. The present literature, in the case of Pakistan, does not provide information as to either the impact or relative importance of the sources of deficit financing on macroeconomic outcomes such as inflation and output growth.

The main objective and contribution of this study is to investigate how monetization and bond-financing of government deficits affect inflation and output growth 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 discusses whether measures such as central bank independence, in hopes of subjecting deficit spending to 'market discipline' prove to be effective or not. This study proceeds by building a context for the analysis by elaborating on the theoretical background of the problem and then uses the structural vector autoregressive (SVAR) modeling approach to find the impacts. The robustness of the results is established through the QQ method.

2. CONCEPTUAL FRAMEWORK

Theoretical arguments both in classical and Keynesian traditions have historically advocated in favor of monetization e.g., during the Great Depression the argument by the early classicists that money should be

[1] Monetization is the term used when government borrows directly through its central bank.

[2] Bond-finance is the term used when government borrows from the funds market.

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' (MMT) (Wray, 2012) which argues that the 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 the government stands to earn, as profit, whatever interest it pays to its central bank (Turner, 2014; Johnston & Pugh, 2014). Monetization over time, however, is increasingly been seen as synonymous with inflation in the economics literature.

With the emergence of the "New Macroeconomic Consensus", its prescriptions around monetary policy make targeting a certain inflation rate the key objective and views operational independence of the central bank as a means of achieving the credibility necessary to complete that objective. Monetization was thus stopped because if the government were to demand that the 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", 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 power and influence (Goodman, 1991; Werner, 2003).

The question that presents itself is how money creation by the government or its central bank comes to be seen as inflationary. Or if we look at the question from the perspective of the government's sources of finance for its deficit, we can say how monetization came to be seen as inflationary and how the shift toward bond financing occurred.

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

There was never any dispute among economists on the valid options available to a government in terms of financing its deficits i.e., monetization and bond finance. Even the classical pro-market economists e.g., (Fischer, 1936; Simons, 1941) have preferred monetization over bond financing for the former is 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 prescriptions, although much debated, were never actually implemented in their original essence yet the period between the Great Depression and 1970s, which can arguably be termed as the era of Keynesian "fiscal dominance", saw a growth in private bank money creation constrained by a set of various regulations.

The causes of "great inflations" in the 1970s are much contested even today but are often attributed to 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 by tinkering with the 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 the neoclassical paradigm made up of rational agents with perfect foresight and choices leading to a demand-supply equilibrium and long-term neutrality of money (Sargent & Wallace, 1975; Lucas, 1972) once again opens the debate on the mode of financing of government's deficits. In these rational expectation models, both modes of deficit financing are taken under consideration i.e., money financing and bond financing. In the case of bond financing, the government is assumed to be competing with the private sector in the money market for loanable funds thus raising interest rates and 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 the case of money-financing, all money is assumed to be printed by the central bank, and the 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 for 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 growth potential the rational agent can expect it and re-negotiate contracts, and a government that is looking to exploit this dynamic will either have to exceed the agent's expectation or revert to a rule for optimal monetary policy. This argument flows naturally towards central bank independence and hence the prohibition of money financing of government deficits. The question of the source of funding deficits, thus, becomes important as whether a growth-targeted government spending will bear fruit or whether it will prove only inflationary in the end. There have been some studies that have empirically tested the correlation between fiscal deficits and inflation (King & Plosser, 1985; Barnhart & Darrat, 1988; Lin & Chu, 2013) but have failed to establish a significant connection between the two regardless of the deficit being funded through money or bond financing.

The sources of finance for government's deficits have received renewed attention in the past two decades especially during post-GFC and post-Covid times with some economists even going as far as drawing comparisons with the post-war period (Draghi, 2020). Today, we see money financing coming up in the discussions as a valid tool for macro-management (Agur et al., 2022; Buetzer, 2022) of aggregate demand and the price level while stabilizing financial markets (Constancio, 2018) and ensuring smooth functioning of capital markets (Gabor, 2021; Hauser, 2021) at a time when bond-financing is not a pretty option for governments due to high debt levels and a possibility of a potential crowding out. The relevance of this discussion in Pakistan's context highlights that present conditions have exerted a very high cost of bond financing on the government's deficit but since the recent independence legislation, it has been legally barred from having its debt monetized which hampers its ability to make necessary expenditures in a time of crisis.

In the case of Pakistan, inflation has been studied mainly as a monetary phenomenon (Kemal, 2006; Khan & Schimmelpfennig, 2006; Qayyum, 2006). Output has also been similarly linked to monetary growth (Malik & Khawaja, 2006; Qayyum, 2006) but these studies do not analyze the impact of fiscal development on inflation and output growth. There are, however, few studies (Shabbir et al., 1994; Chaudhary et al., 1995; Agha & Khan, 2006; Jalil et al., 2014; Iqbal et al., 2017) that do look at inflation and output growth from the perspective of fiscal developments. However, these studies tend to pick fiscal deficits in the aggregate and do not take deficit spending and money creation from the perspective of the sources of these deficits and their impacts on macroeconomic outcomes. In this study, we intend to fill this gap from a policy perspective.

3. ECONOMETRIC METHODOLOGY

Policy analysis in the 80's took a turn from the standard axiomatic-deductive approach towards a-theoretical approach such as vector autoregressive (VAR) models (Sims, 1980). The reason for this shift, as Lucas (1976) points out, is the failure, of economic models and their assumptions regarding exogeneity and endogeneity of variables, in predicting the future. Sims' proposed solution to this problem is to drop all structural as well as exogeneity assumptions. The study intends 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 impulse responses (IR). IR, simply, is the response of a system to the shock in one of its variables. But, in principle, this is a causal question requiring causal sequencing. The absence of causal sequencing is the weakness that becomes the source of initial criticism of VAR analysis for not being able to answer policy-related questions (Leamer, 1985; Sargent, 1984). To tackle this weakness, more sophisticated approaches have been developed, since, Sims (1986), Bernanke (1986), and Blanchard & Watson (1986) to answer this criticism. More than three decades of innovations have brought VAR analysis many steps further ahead from its ability to merely forecast.

This study constructs a six-variable structural vector autoregressive (SVAR) model with the objective the objective of answering policy-related questions on the impact of monetized and bond-financed deficit spending on inflation and output growth.

$$BX_t = B_0 + \sum_{i=1}^{P} C_i X_{t-i} + \grave{o}_t \quad (1)$$

the set of contemporaneous coefficients is represented by the matrix$B$, a vector of constants by B_0, lagged coefficients of i^{th} order by C_i, and vector of variables by X i.e., $X_t = [\pi_t, y_t, fbcb_t, fbpb_t, er_t]$. The index of consumer prices is represented by π_t, output by y_t, market interest rate by i_t, monetized deficit spending by $fbcb_t$, bond-financed deficit spending by $fbpb_t$, and exchange rate by er_t. $\grave{o}_t$ is the vector of exogenous structural shocks that are contemporaneously and serially uncorrelated with constant variance and a zero mean.

The SVAR model in Equation (1) is transformed into a reduced-form VAR in Equation (2) to make it empirically testable:

$$X_t = A_0 + \sum A_i X_{t-i} + e_t \quad (2)$$

The elements of e_t are one step ahead of forecast errors. These forecast errors may be contemporaneously correlated but are serially uncorrelated with constant variance and zero mean. A more convenient representation of reduced-form VAR in Equation (2) is given in Equation (3) with moving averages using lag operators:

$$X_t = B(L)e_t \quad (3)$$

The resultant vector moving average (VMA) model in Equation (3), can then be written in terms of structural shocks in Equations (4) and (5) as:

$$X_t = B(L)S\grave{o}_t \quad (4)$$

$$X_t = \phi(L)\grave{o}_t \quad (5)$$

ϕ in Equation (5), is the representation of impulse response functions (IRF).

3.1 Identifying Restrictions

The standard way to estimate a reduced-form VAR model e.g. in Equation (2) is through the use of the ordinary least squares (OLS) method. The issue, however, with estimating such a model, is that the problem of identification must be resolved ahead of estimation. 'Identification' necessitates the imposition of a minimum number of restrictions on the structural parameters. One way of achieving that, among others, is through the use of the 'Cholesky decomposition' method for structural model identification (Enders, 2004). The exact identification of the SVAR model in this study requires $(n^2 - n)/2$ restrictions to be placed, where, n is the number of variables in the SVAR model. With $n = 6$, a minimum of 15 restrictions must be placed on structural parameters.

For contemporaneous responses, output is allowed to respond only to its shock. The reason is that the response in output is lagged in response to shocks in other variables (Christiano et al., 1999; Kim & Roubini, 2000). Exchange rate is allowed to respond to all variables in the model as it adjusts promptly to any economic developments. The inflation rate responds contemporaneously to all other variables in our model except the exchange rate. The reason is that the domestic prices eventually adjust to changes in the exchange rate but not in the same period (Goldberg & Knetter, 1996). Moreover, (Choudhary et al., 2016) and (Malik et al., 2008) present evidence for less than sticky prices in Pakistan that indicates a rather prompt response to economic developments. Market interest rate is used to represent market conditions as it responds to the movement in government securities in the secondary market and even the issue of new government debt in the market in liquidity management operations. Market interest rate is allowed to respond to monetized and bond-financed deficit spending and its lag but not to inflation and exchange rate movements.

Monetized deficit spending is allowed to respond to its shock and output while bond-financed deficit spending is allowed to respond to monetized deficit spending besides its shock and output. The reason for this setup is that government spending is budgeted in advance and is directed towards expenditures 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 in the current period. Our analysis takes deficit spending by the government as a policy variable in the Keynesian fashion a government may choose to spend more in a recession and less in a boom making perfect sense for the budgetary spending to respond contemporaneously to output. Lastly, bond-financed deficit spending is allowed to respond contemporaneously to monetized deficit spending because, in countries where central banks have not been fully independent in the past (such as Pakistan), governments have monetized deficits rather easily. This completes the identification requirements for our VAR model and its final representation in matrix form is given by Equation (6).

$$\begin{bmatrix} e_{y_t} \\ e_{FBCB_t} \\ e_{FBPB_t} \\ e_{i_t} \\ e_{\pi_t} \\ e_{ER_t} \end{bmatrix} = \begin{bmatrix} c_{11} & 0 & 0 & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 & 0 & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} & 0 & 0 \\ c_{51} & c_{52} & c_{53} & c_{54} & c_{55} & 0 \\ c_{61} & c_{62} & c_{63} & c_{64} & c_{65} & c_{66} \end{bmatrix} \begin{bmatrix} \grave{o}_{y_t} \\ \grave{o}_{FBCB_t} \\ \grave{o}_{FBPB_t} \\ \grave{o}_{i_t} \\ e_{\pi_t} \\ e_{ER_t} \end{bmatrix} \quad (6)$$

3.2 Data & Construction of Variables

Quarterly data on all variables is used in the empirical analysis for the period 2005:3 to 2020:2 for Pakistan3. Real gross domestic product (RGDP) is used as a measure of output and broadly as a measure of overall economic activity. RGDP in annual frequency is converted into quarterly frequency by applying estimated quarterly weights from Kemal & Arby (2004)[4]. The same weights are used in this study following the Nasir & Malik (2011) arguments highlighting negligible variability in quarterly weights to justify their use. Furthermore, necessary seasonal adjustments are made with the X12 method. Quarterly RGDP is converted into its year-on-year percentage form to construct the series for output growth in quarterly frequency.

Quarterly data on monetized deficit spending (FBCB) and bond-financed deficit spending (FBPB) is taken in quarterly frequency as 'quarter-end stocks'. This data is subsequently converted into year-on-year percentages to construct the series of growth rates in monetized deficit spending and growth rates in bond-financed deficit spending. Moreover, data on consumer prices is taken in the form of a consumer price index (CPI) at a quarterly frequency. CPI is converted into inflation (INFCPI) by taking the year-on-year percentage change.

Karachi-interbank-offered-rate (KIBOR) is used as the market interest rate as the representative rate for the price of money in the economy in the quarterly frequency as well. Although evidence in the literature suggests the use of money market rates (Bernanke & Mihov, 1998; Clarida et al., 1999; Svensson, 2002; Taylor, 1993; Thorbecke, 1997) and even discount rates for policy analysis, to the extent of this study the interest rate is not the concern of policy but the representation of the overall market behavior as a response to changing economic conditions. Therefore, using a 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 a money market rate that does respond to economic developments. The exchange rate (ER) is also used at a quarterly frequency in its year-on-year percentage change form to represent appreciation and depreciation in the exchange rate.

Data on RGDP, CPI, and ER is sourced from the Pakistan Bureau of Statistics (PBS) and that of FBCB, FBCP, and KIBOR from quarterly reports of the SBP. KIBOR along with year-on-year percentage change in RGDP, CPI, FBCB, FBPB, and ER are non-stationary at level but stationary at first difference. 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 leveled by (Sims, 1980; Sims et al., 1990) against using variables in different forms.

4. RESULTS AND DISCUSSION

The direction of impact of FBCB and FBPB on inflation and output growth is calculated through impulse response functions (IRF) with variable sequencing developed in section 0. These IRFs are presented in Figure 1. The bottom panel of Figure 1 shows that both FBCB and FBPB have inflationary consequences. In the case of FBCB, results find support in the standard theory in terms of its inflationary impact. However, in the case of FBPB, the evidence challenges the standard explanation of a resource transfer from the private to the public sector. This result also raises questions on the orthodox understanding of the creation and dynamics of money in the modern banking setup. This is because the inflationary consequence of FBPB may very well be due to additional high-powered money being created in the banking system. This money created is not destroyed by a subsequent bond sale to the banking sector.

[3] 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-19.
[4] Estimated for the period 1974-2004.

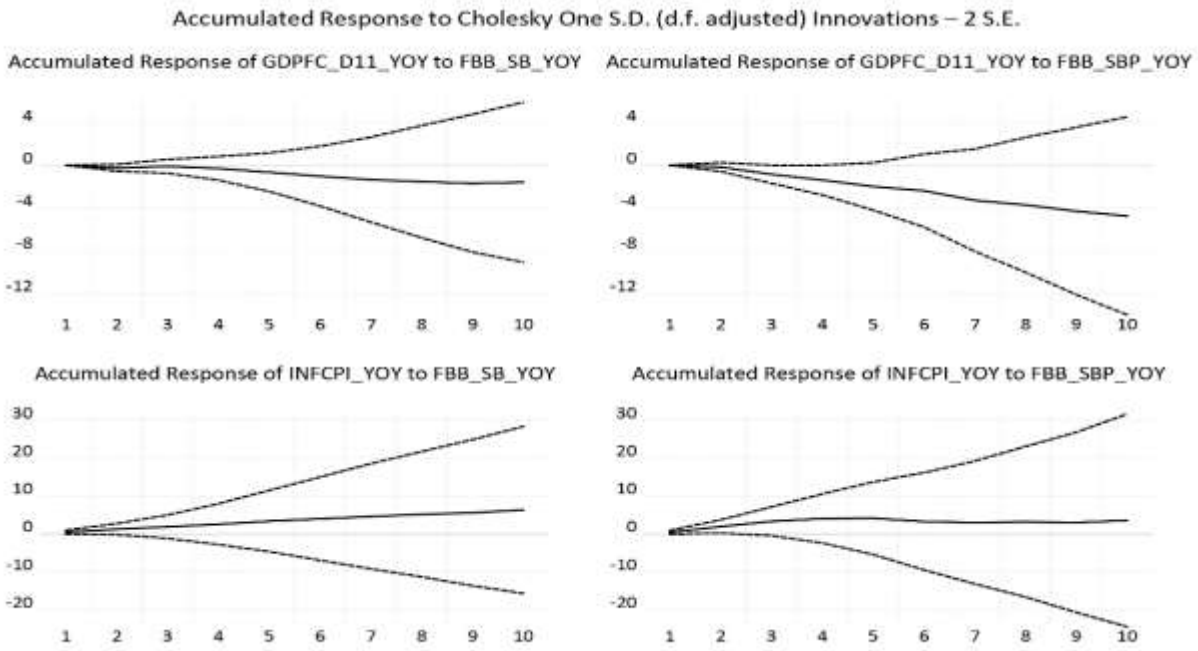

Figure 1: *Impact of FBPB on output growth (top-left) and inflation (bottom-left) & Impact of FBCB on output growth (top-right) and inflation (bottom-right). Source: Author's Estimations [Cholesky Ordering: Output Growth, FBCB, FBPB, Interest Rate, Inflation, and Exchange Rate]*

The top panel of Figure 1 shows a negative contemporaneous movement in output to FBCB as well as FBPB however in the case of FBCB, negative response is found to be significant. These results of a negative response in output to deficit spending are not plausible for the simple fact that, theoretically, the government budget multiplier is non-negative. Data suggests that, in the case of Pakistan, these results should strictly be seen in the context of the relationship between deficit spending and output growth, which shows a counter-cyclical trend (Iqbal & Zahid, 1998; Iqbal et al., 2017) and a pro-cyclical trend only when the business cycle is in the boom phase.

However, in light of the counter-cyclical trend (see Appendix A1) between deficit spending and output growth, IRFs are re-estimated with a control variable that accounts for the state of the economy. The results are presented in Figure 2. The top panel from Figure 2 shows that the state of the economy is accounted for, both FBCB and FBPB carry a positive impact on output growth while its inflationary characteristics stay intact. Thus, results from Figure 2 present a better understanding of the facts compared to results from Figure 1.

Variance decomposition is calculated to see how much variability is caused in output growth and inflation over time due to changes in FBCB and FBPB. The results are presented in **Error! Reference source not found.**. FBPB carries a larger initial impact on inflation compared to FBCB. However, the impact of FBCB has a larger but comparable impact on inflation over longer horizons compared to FBPB. Over a time horizon of ten quarters, the impact of FBPB tends to die down by fifty percent but the impact of FBCB first shows a rising trend but then falls towards the end of the horizon.

As already discussed, in Pakistan, the relationship between deficit spending to output growth is counter-cyclical in that most of this spending comes at a time when the economy is in the downturn part of the cycle. When we control for this behavior with the introduction of a control variable that accommodates this dynamic, the pattern becomes clear. FBCB carries a larger impact on output growth compared to FBPB.

Table 1 shows that on a time horizon of ten quarters, the impact on output growth tends to rise for both FBCB and FBPB, however, the former carries a stronger impact than the latter. See (Appendix A2) for more details on IRFs.

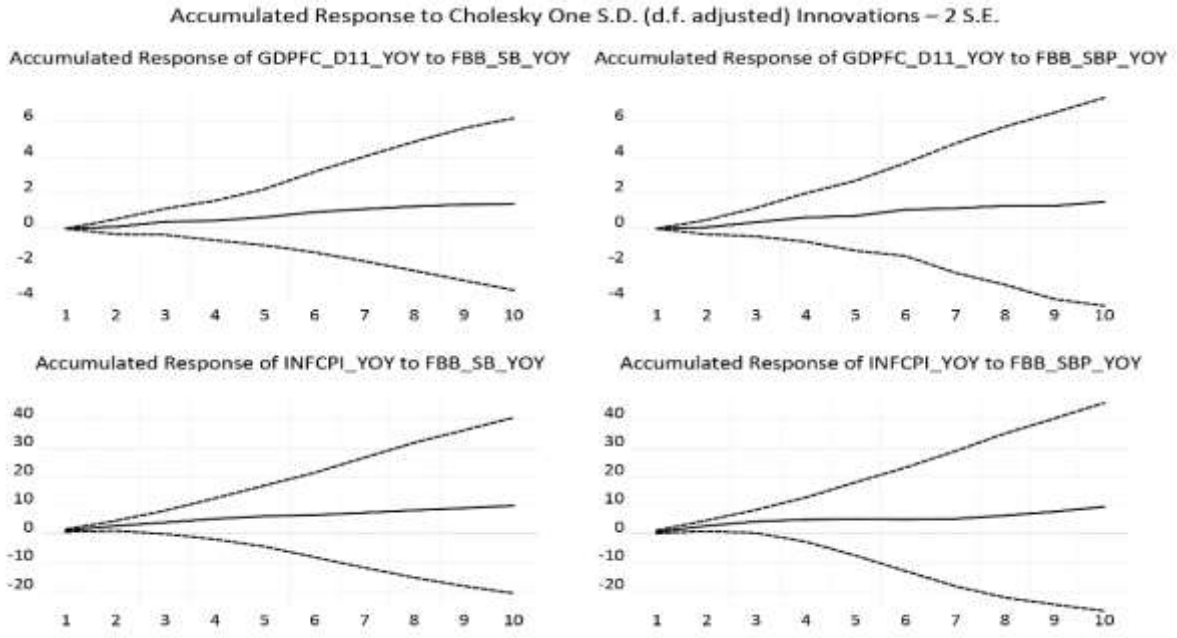

Figure 2*: Impact of FBPB on output growth (top-left) and inflation (bottom-left) & Impact of FBCB on output growth (top-right) and inflation (bottom-right). Source: Author's Estimations [Cholesky Ordering: Output Growth, FBCB, FBPB, Interest Rate, Inflation, and Exchange Rate]*

Table 1*: Variance Decomposition of the Impact of FBPB and FBCB on output growth and inflation.*

	RGDP			INFCPI		
Horizon	S.E.	FBPB	FBCB	S.E.	FBPB	FBCB
1	0.618	0.000	0.000	18.340	29.304	9.651
4	0.956	9.993	17.265	36.950	20.549	22.400
7	1.332	13.607	16.680	66.681	18.009	16.063
10	1.418	13.680	18.160	78.848	15.115	19.181

Note: full form of the abbreviations used in the table: output growth (RGDP), inflation (INFCPI), bond-financed deficit spending growth (FBPB), monetized-deficit spending growth (FBCB)

Results in our model are not specific to a particular Cholesky ordering. In an alternate ordering, we allow output to contemporaneously respond to FBCB and FBPB and we also assume that the funds market adjusts fully to any changes in the economic variables. We find that results from our alternate ordering (see Appendix 0) are consistent with results from our original model.

4.1 Robustness Check

To establish the robustness of the results presented in **Error! Reference source not found.** section 4, we employ a non-parametric approach called the quantile-on-quantile (QQ) method developed by Sim & Zhou (2015) to study the relationship between FBCB and FBPB on inflation and output growth.

4.1.1 QQ Method

The basic quantile regression equation that models the effect of an independent variable (X) i.e., FBCB and FBPB on a dependent variable (Y) i.e., inflation and output growth under the QQ approach is given as:

$$Y_t = \beta^{\theta}(X_t) + u_t^{\theta} \tag{7}$$

where t represents the time and θ represents the θ^{th} quantile of the conditional distribution of the dependent variable and u_t^{θ} the quantile residual term. As we lack prior information as to the relationship between our independent and dependent variables thus the function $\beta^{\theta}(\cdot)$ is unknown. To estimate Equation 7, we use a local linear regression in the neighborhood of X^t to establish a relationship between θ^{th} quantile of Y and τ^{th} quantile of X. We use first-order Taylor expansion to define a regression function around X^t because we know that $\beta^{\theta}(\cdot)$ is unknown to us, as follows:

$$\beta^{\theta} X_t \approx \beta^{\theta} X^t + \beta^{\theta}(X^t)(X_t - X^t) \tag{8}$$

β^{θ} is the partial derivative of the independent variable and has an interpretation like the slope coefficient in linear regression. It follows from Equation (8) that θ and τ both are dual indexed parameters and that $\beta^{\theta}(X^t)$ and $\beta^{\acute{\theta}}(X^t)$ are functions of τ and θ thus we can write:

$$\beta^{\theta}(X^t) \approx \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(X_t - X^{\tau}) \tag{9}$$

where β^{θ} and $\beta^{\acute{\theta}}$ are written as $\beta_0(\theta, \tau)$ and $\beta_1(\theta, \tau)$ respectively. Substituting Eq (9) into Eq (7) gives us Eq (10).

$$Y_t = \beta_0(\theta, \tau) + \beta_1(\theta, \tau)(X_t - X^{\tau}) + u_t^{\theta} \tag{10}$$

Eq (10) represents the relationship between θ^{th} quantile of Y with τ^{th} 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:

$$min_{b_0 - b_1} \sum_{i=1}^{n} \rho_0 \left[Y_t - b_0 - b_1(X_t - X^{\tau}) K\left(\frac{F_n(X_t) - \tau}{h}\right) \right. \tag{11}$$

where ρ_0 represents the quantile loss function, $K(\cdot)$ 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.

4.1.2 Data & Variables

Key variables in this part of the analysis are the same as the ones provided in section 3.2 i.e., RGDP, INFCPI, FBCB, and FBPB (re-named FBSB) except for market interest rate and exchange rate which have not been taken. Data on all the variables have been taken on a monthly frequency for the period 2005:1 to 2019:12. Monthly data for the large manufacturing index (LSMI) has been used in place of RGDP. All variables are used in the form of year-on-year growth rates.

4.1.3 Results

FBCB and FBPB act as policy variables 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 FBCB and FBPB affect inflation and output growth in the economy. Results are presented in Fig 3 and Fig 4.

Results from Fig 3 show that as we move from lower to higher quantiles of FBCB the resultant impact on inflation remains strong and positive. A very similar pattern emerges with the quantiles of FBPB and their impact on inflation. We conclude from this pattern that deficit spending, be it monetized or bond-financed has inflationary consequences in Pakistan. Results from Fig 3 are interesting in the sense that a positive relationship between FBPB 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 FBCB, 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 respond positively to all quantiles of FBPB.

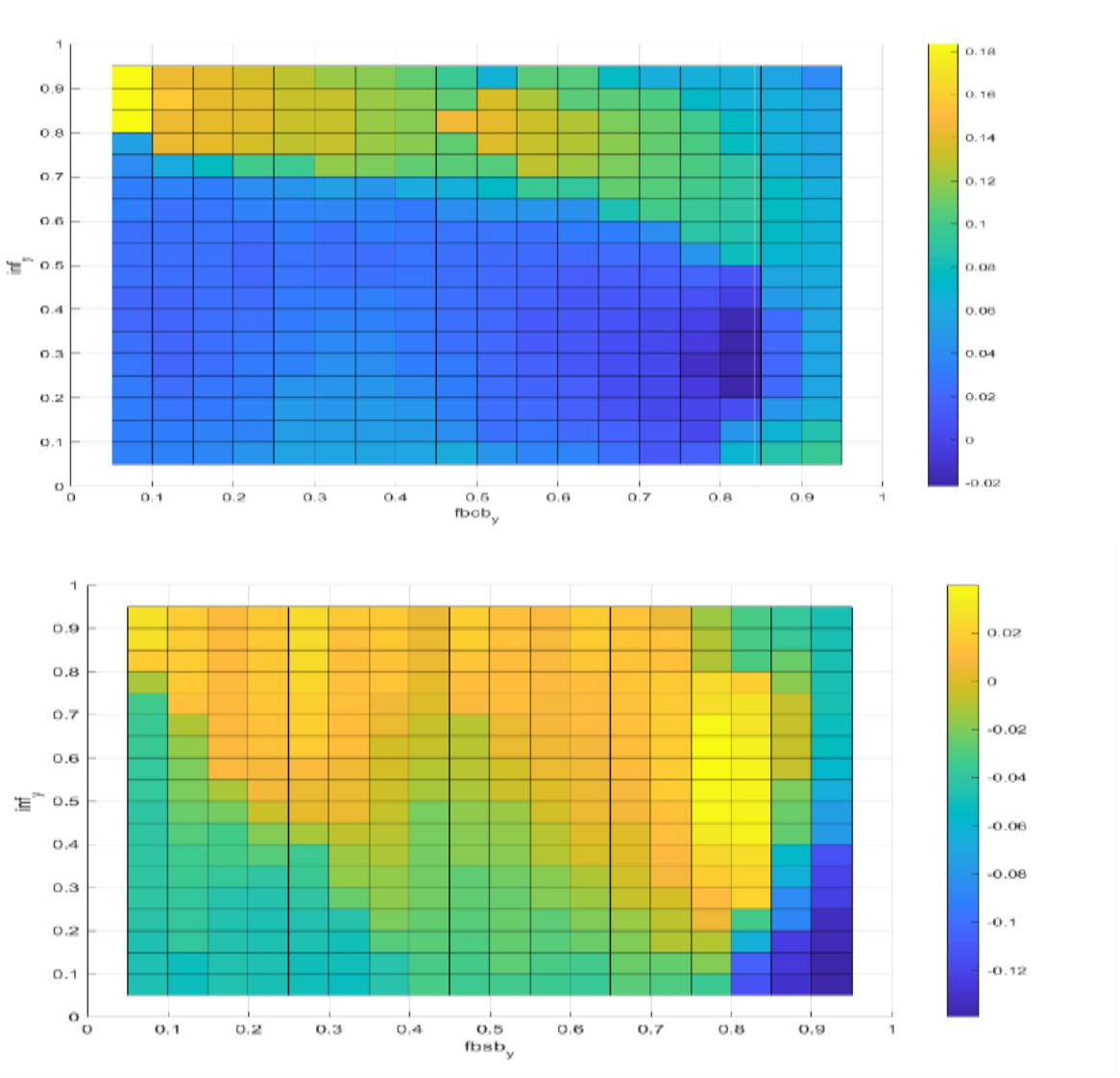

***Fig 3**: Impact of FBCB (top) and FBSB (bottom) on Inflation. (Source: Author's Estimations)*

Results presented in Fig 4 show that there is a predominantly negative relationship between FBPB and output growth but there is a positive relationship between lower to middle quantiles of LSMI (0.1 – 0.5) and middle to higher quantiles of FBCB (0.5 – 0.9). This result also supports our result and argument from our previous analysis that in times of recession or low output growth, there is a higher level of FBCB to boost economic activity. It is important to note here that we cannot control the state of the economy and hence are unable to separate the business cycle impact from the impact of deficit spending.

In summary, the consistency of the results from the QQ method establishes the robustness of the results from the SVAR analysis presented in section 4.

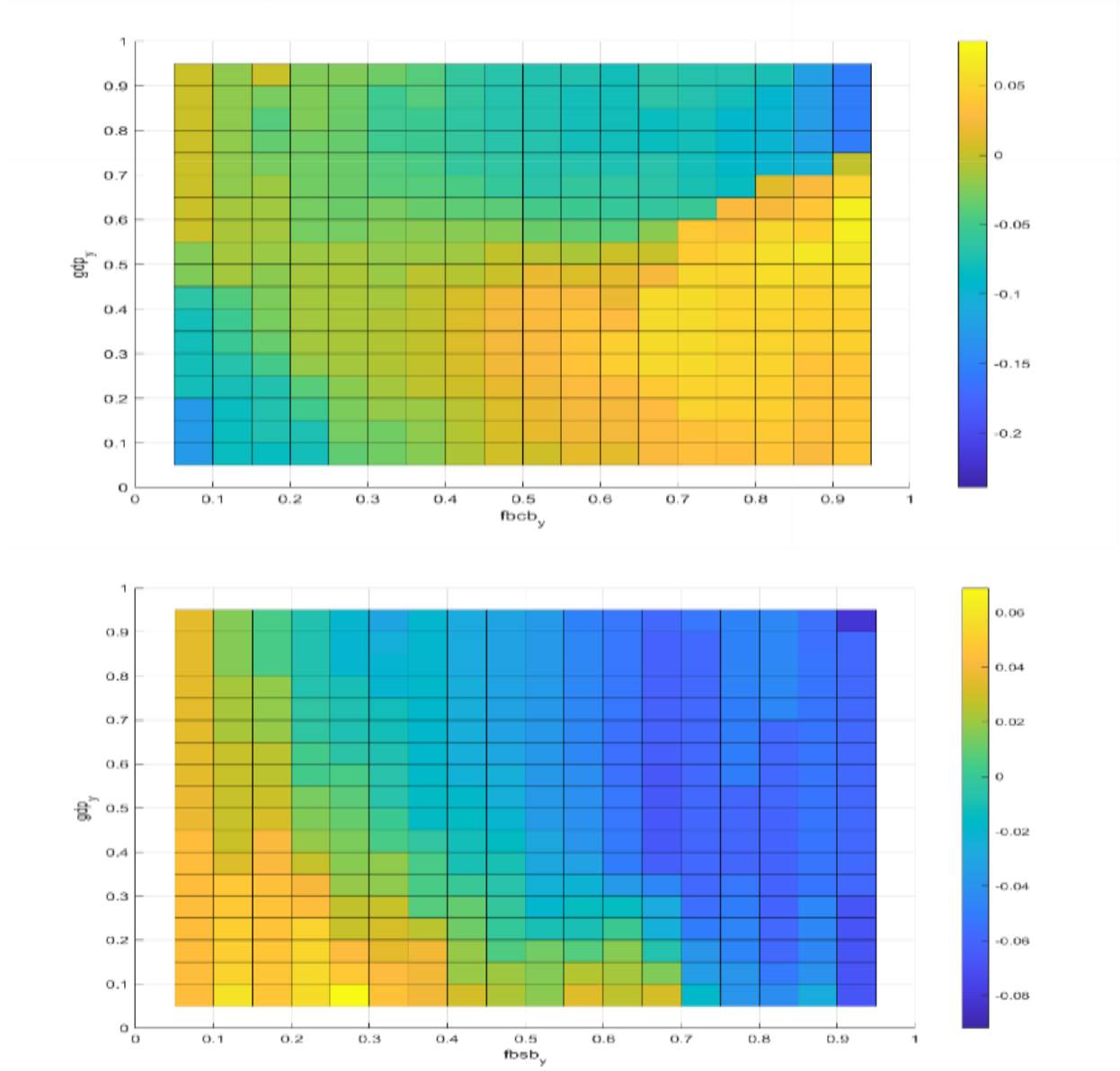

***Fig 4**: Impact of FBCB (top) and FBSB (bottom) on Output Growth. (Source: Author's Estimations)*

5. CONCLUSION AND POLICY IMPLICATIONS

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 government's deficit spending is monetized or bond-financed because, eventually, both lead to the creation of high-powered money and are therefore, inflationary. Also, the 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 is constructed to represent the linkages in the economy. Data on output growth, monetized and bond-financed deficit spending, interest rate, inflation, and exchange rate are used in quarterly frequency as well in monthly frequency for the period 2005:3 to 2020:4.

This study initially finds a negative impact of both monetized and bond-financed deficit spending on output growth. However, data shows that GoP has historically engaged in deficit spending more heavily at times when the economy is at the lower end of the business cycle. To have a clearer understanding of the relationship between deficit spending and output growth, an appropriate variable control variable is introduced to account for this pattern. Subsequent analysis shows that deficit spending from both sources has a positive relationship with output growth, supporting the theoretical understanding. Also, both monetized and bond-financed spending are found to have inflationary consequences. This study finds that, in the case of Pakistan, bond financing does not offer any substantial benefits over monetization of deficit spending in terms of macroeconomic outcomes i.e., inflation and output.

A host of studies in the 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 and aggregate budget deficits with somewhat similar results. However, the hazard of using an aggregate measure such as M2 or budget deficit is that it becomes very difficult to answer policy-related questions, especially the type that this study endeavors to answer. This study traces monetary growth back to one of its sources i.e., deficit spending, and divides it further into its sub-sources i.e., monetization and bond-financing.

The results of this study provide policy-relevant insights into Pakistan's current context. GoP has recently passed legislation in favor of the independence of SBP. This move essentially cuts off one of the two sources for the government to finance deficits. The idea behind this move is to discourage political business cycles, subject the government to a degree of fiscal discipline to achieve lower inflation, and higher output growth, and control monetary growth by clamping down on the creation of high-powered money. The implied assumption, however, is two-fold: one, that bond financing leads to resource transfer from the private to the public sector, and two, deficit spending ends up in the productive real sector. The results of this study indicate that these assumptions do not fit, at least in Pakistan's context. Results also hint that if bond-financing of government deficits does not result in any substantial benefits over monetization in terms of macroeconomic outcomes, then it warrants an investigation perhaps into the makeup of the spending rather than its source.

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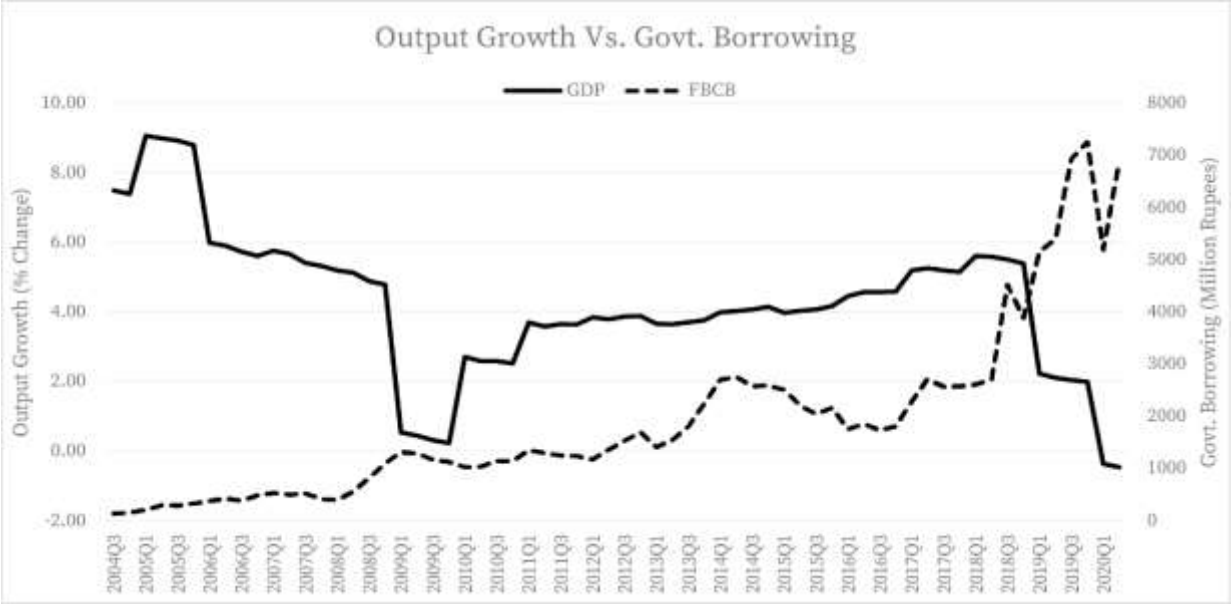
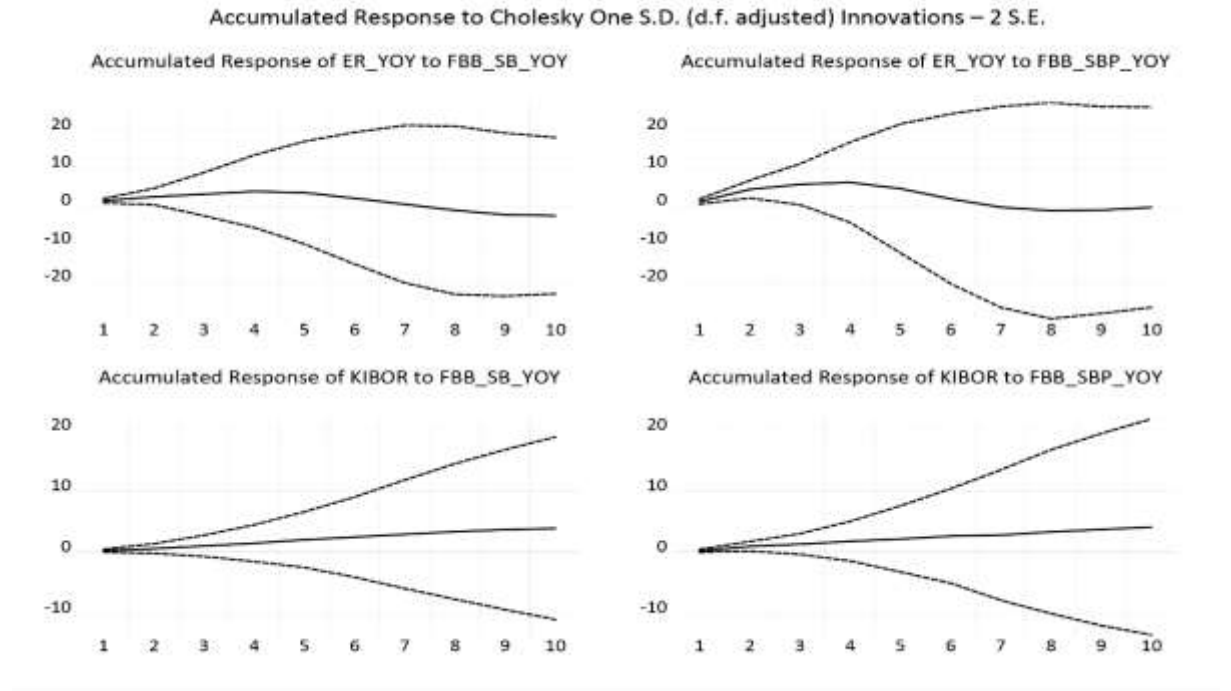
Appendix A1: *Quarterly Trend of Output Growth & Deficit Spending*



Appendix A2: *Impact of FBPB on the exchange rate (top-left) and interest rate (bottom-left) & Impact of FBCB on the exchange rate (top-right) and interest rate (bottom-right). Source: Author's Estimations - Base Cholesky Ordering (Output Growth, FBCB, FBPB, Interest Rate, Inflation Rate, Exchange Rate)*



Appendix A3: *Impact of FBPB on output growth (top-left) and inflation (bottom-left) & Impact of FBCB on output growth (top-right) and inflation (bottom-right).Source: Author's Estimations – Alternate Cholesky Ordering (FBCB, FBPB, Output Growth, Inflation Rate, Exchange Rate & Interest Rate)*