Fiscal and Monetary Regime Identification for Price Stability in Case of Pakistan's Economy

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The study examines the relative importance of fiscal and monetary determinants of inflation for Pakistan during 1960-2011. By analyzing the impulse response functions, the relationship linking liabilities to GDP with surpluses to GDP, verify monetary regime. The study finds that the incident of wealth effects of adjustment in nominal public debt may pass through to prices by escalating inflation variability as predicted by the fiscal theory of price determination. The results do not support the perception that monetary authorities acted consistently with monetary dominant regime in Pakistani case to accommodate the fiscal shocks. A positive shock in inflation leads to the negative response of reserve money growth which is consistent with monetary dominant regime. However discount rate that responds negatively to inflation shock is in line with fiscal dominant regime. The different set of analysis leads to implication that nominal public liabilities, as revealing either in money growth or in nominal public debt, influence price stability in case of Pakistan. The authorities may be following different regimes for different time periods during the 1960-2011.

1 .Introduction

Fiscal deficit is a well debated issue in macroeconomic literature for its effects on the indicators of macroeconomic performance such as inflation, growth, financing and proceeding debt dynamics. The government's intertemporal budget constraint is satisfied when the current value of the net liabilities is equal to the discounted present value of the future primary surpluses (tax revenue minus non-interest expenditures). The current fiscal policy is considered to be sustainable if the government's intertemporal budget constraint is satisfied without

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adjustment in either policy or the price level. However government's adjustment in primary deficit to restrict debt accumulation coupled with non monetization of debt by the central bank leads to monetary dominant (MD) or Ricardian regime. On the other hand, independence of primary deficits from real liabilities leads to fiscal dominant (FD) or non-Ricardian regime (Sargent and Wallace 1981).

In fiscal theory of price level, dominant characteristics of policy determine the results of fiscal and monetary policy with policy outcome depending on active and passive attributes of policy. If monetary policy is active and fiscal policy is passive then fiscal policy accommodates monetary policy and are defined as dominant monetary policy or Recardian regime (Aiyagari and Gertler,1985; Sims, 1994; Sargent and Wallace, 1981 and Woodford, 1994, 1995; Cochrane, 1999, 2003). On the other hand if monetary policy is passive and fiscal policy is active then monetary policy accommodates fiscal policy and is defined as dominant fiscal policy and non-Ricardian regime (Sargent and Wallace, 1981 and Woodford, 1994, 1995; Cochrane (1999,2005).

Fiscal deficit results in inflation because governments that face continual fiscal deficits find money creation a solution to finance the deficits leading to inflation as a monetary phenomenon. The fiscal theory of price level [Leeper (1991), Woodford (1994,1995) and Sims (1994)] postulates that a fiscal dominant or non-Ricardian regime may occur when fiscal policy is not sustainable and government bonds are deemed as net wealth. These wealth effects could make it difficult to meet the goal of price stability without taking into account the central bank's commitment to low inflation (Woodford, 1994 and 1998; Leeper, 1991; Sims, 1994 and Cochrane, 1998 and 1999). The implication is that in fiscal regime the government's fiscal policy is sustainable through debt deflation. That is, an increase in prices that corrode the real value of public debt and in turn the real value of financial wealth until demand equals supply and a new equilibrium is reached. Therefore, prices are determined by fiscal policy, and inflation becomes a fiscal phenomenon.

According to Quantity Theory of Money (QTM), whenever the solvency condition violates, the government is required to make adjustments in revenue or expenditure, or both fulfill the solvency condition. However, the fiscal theory of price level takes the same intertemporal budget

equation as an equilibrium condition including the determination of the price level. Whenever the solvency condition violates, the market-clearing mechanism will adjust the price level to re-establish equilibrium. This implies that, if there is an increase in the nominal stock of liabilities coupled with market anticipating a fall in future primary surpluses then to reach a new equilibrium the real value of government debt would need to fall. Ultimately, with no alteration in primary surpluses, a new equilibrium could only be achieved with increase in prices. As a result, the fiscal theory of price level implies that if primary surpluses tend to be arbitrary and weakly correlated or uncorrelated with public liabilities, prices will have to adjust to guarantee the fiscal solvency, and a fiscally dominant (FD) regime would exist, even if monetary policy is not accommodative of fiscal needs. This situation would then lead fiscal policy to become the nominal anchor to determine the price level. On the other hand, if primary surpluses adjust promptly to limit or condense the growth of public liabilities, fiscal solvency is ensured for any price level. That is, monetary dominant (MD) regime would prevail and monetary policy is conducted independent of government financing requirements and becomes the nominal anchor for economic stability.

The current study is an extension of earlier work in which the test of fiscal theory of price level (FTPL) is conducted for Pakistan's economy by applying the Canzoneri, Cumby and Diba CCD (2001) approach. The evidence does not support that authorities are following a certain type of regime during the sample period 1970-2007 (Javid, Arif and Sattar, 2009). In this study the model is extended by adding discount rate in CCD original model to check the robustness of the model. The relative importance of fiscal policy and monetary policy for price stability is examined by investigating main fiscal and monetary determinants of inflationary process in Pakistan. Further, as a robustness check it is investigated that the monetary authorities have tried more actively to relieve shocks in inflation. The motivation comes from the fact that State Bank of Pakistan is committed to low inflation. Increasing inflation raises concerns that persistent budget deficits and large stock of nominal public debt increase the possibility of creating inflation out of fiscal imbalances. Therefore considering the relevance of the issue in recent economic scenario, it is important to explore that price level depends on which regime. In monetary regime price level is determined

by the demand for liquidity and the way it evolves over time. In fiscal regime, it is the total supply of outside assets (base money plus government bonds) that matters. In addition, in fiscal regimes, monetary policy has to work through seigniorage, and the government's budget constraint, if it is to control the price level; in monetary regimes, monetary policy works through conventional channels. Canzoneri *et al.* (2001) approach does not give a clear picture of which regime is dominant. Thus it necessitate to look for evidence that wealth effect could be jeopardizing the objective of price stability. To achieve price stability it is necessary to have appropriate fiscal policy and also an adequate monetary policy. This motivates to identify whether Pakistan's economy is dominated by a fiscal or monetary regime and to examine the main fiscal and monetary determinants of the inflationary process. To distinguish between these two regimes, the intertemporal budget constraint (IBC) approach initiated by Hamilton and Flavin (1986) is used. The intertemporal budget constraint imposes restrictions on the long run relationship between primary surplus and public liabilities which implies that these two series move with each other. Therefore, the time-series techniques are more appropriate in providing testing procedures on the issue of price stability through the intertemporal budget balance (Trehan and Ramos, 2002).

The plan of rest of study is as follows: Section 2 reviews briefly the empirical literature on the relative importance of fiscal and monetary policies for price stability. The empirical methodology to differentiate between monetary and fiscal dominance and data are discussed in section 3. The empirical results are provided in section 4 and the last section offers conclusion.

2. Literature Review

Several studies have strived to evaluate the interaction of monetary and fiscal policy and policy regime identification subsequent to Sargent and Wallace (1981) influential work. Melitz (1997, 2002) finds that monetary and fiscal policy have a tendency to move in opposite directions while estimating the reaction functions of the monetary and fiscal authorities on a pool of nineteen OECD countries over the period 1960–95. Favero (2002) concludes that stabilization of inflation has

been realized autonomously in Europe from the lack of fiscal discipline. Hence sustaining the inspiration that the monetary authorities in the European area have been capable to affect inflation rates. Favero and Monacelli (2003) find some facts of fiscal dominance in the United States for limited periods of time spanning over 1960 to 87. They conclude that there is potential to recognize time windows where an empirical model consisting of both monetary and fiscal regime is capable to follow the dynamics of inflation much better than a system based on a monetary rule only. Erdogdu (2002), Creel and Sterdyniak (2002), and Mikek (1999) obtain Ricardian results for the US economy by using VAR approaches. The aim was to investigate the responses of primary surpluses to domestic debt and they finally conclude that the dominant monetary policy has been accommodated by Ricardian policies in the U.S.

The introduction of the fiscal theory of the price level has recognized another channel through which the central bank can lose control of inflation. This is even in the case of an independent monetary authority that need not accept seignorage targets stated by the fiscal authority. Cochrane (1988, 1999), Auernheimer and Contreras (1990), Leeper (1991), Woodford (1994, 1995, 1996, 1998, 2000), Sims (1994, 1995, 1997, 1998), Canzoneri and Diba (1998), Canzoneri et al (2001, 2002, 2006), Dupor (1997), Bergin (2000), Christiano and Fitzgerald (2000), Schmitt-Grohe and Uribe (2000) and Benhabib et al (2001) are some studies done on this issue. This theory has found mixed empirical support. Canzoneri *et al.* (2001), for example, conclude that post-war US data are more consistent with a regime where monetary policy, and not fiscal policy, determines the price level and reach similar results to those of Bohn (1998). On the other hand, Cochrane (1998) argues that the US data from 1960 are consistent with the fiscal theory of the price level determination. Also Sala (2003) finds that the fiscal theory of the price level illustrates at least one phase of the post-war US history, in particular the period 1960–79. Afonso (2002) finds that the fiscal theory of the price level does not hold in case of fifteen European economies.

Very little empirical work is accomplished on emerging market countries including Tanner and Ramos (2002), who assess whether the policy regime in Brazil during the 1990s can be better illustrated as fiscal dominant. IMF (2003), while, approximating a separate fiscal

policy reaction function for a group of developed economies and a set of emerging markets explores that primary surpluses respond strongly to public debt in the developed countries. For Brazil the study by Loyo (2000) presents result consistent with the fiscal theory of the price level where a tight monetary policy along with lose fiscal policy leads to hyperinflation even without seignorage increase. Blanchard (2004) and Favero and Giavazzi (2004) find that in 2002 Brazil has huge public debt, the cost of debt service raised via an increase in interest rates to keep inflation within the target level. The debt level, the default probability and the country premium, prompting capital outflows leading to a depreciation of the exchange rate affects inflation prospects and eventually, inflation itself. Baldini and Ribineiro (2008) find in case of Sub-Saharan Africa for the period 1980-2005 a mixed finding as some countries are dominated by fiscal regime other by monetary regime and some countries have no clear outcome. Bildrici and Ersin (2007) scrutinize the relation between the price level and domestic debt for the period 1989-2004 and find Turkish political authorities are in general found to be following non-Ricardian fiscal rules. Cashin *et al.* (2003) and Tufail (2008) have examined the fiscal policy sustainability for Pakistan. The results of these studies seem to suggest   that fiscal dominance might be an issue for emerging economies more than for developed ones. This motivates to distinguish between fiscal dominant and monetary dominant regime in case of Pakistan.

3. **Methodological Framework and Data**

The difference between the conventional view that is Quantity Theory of Money (QTM) and fiscal theory of price level (FTPL) lies basically in their dealing with government intertemporal budget constraint. The budget constraint explains that the value of government debt is equal to the present discounted value of future government revenues net of expenditures (deducing the interest payments) called primary surpluses. Following Canzoneri *et al.* (2001) the government budget constraint in nominal terms for period j is given below:

$$B_j = (T_j - G_j) + (M_{j+1} - M_j) + B_{j+1}/(1+i_j) \tag{1}$$

Where M_j and B_j are the stocks of base money and government debt at the beginning of the period j, T_j-G_j is the primary surplus during the period j and i_t is the interest payments for the period j. This constraint says that the existing debt has to be paid off, monetized or refinanced. The budget constraint takes both surpluses and liabilities in terms of GDP. After few manipulations Canzoneri *et al.* (2001) rewrite the budget constraint as follows

$$\frac{M_j + B_j}{P_j y_j} = \left[\frac{T_j - G_j}{P_j y_j} + \left(\frac{M_{j+1}}{P_j y_j} \right)\left(\frac{i_j}{1+i_j} \right) \right] + \left(\frac{y_{j+1}/y_j}{(1+i_j)(P_j/P_{j+1})} \right)\left(\frac{M_{j+1} + B_{j+1}}{P_{j+1} y_{j+1}} \right) \quad (2)$$

The equation (2) states that the ratio of the total government liabilities to GDP has to be equal to the primary surpluses (including central bank transfers) to GDP ratio plus the discounted value of next period liabilities to GDP ratio. The discount factor is the ratio of real growth in GDP to the real interest rate. With further simplified notation and equation (2) can be rewritten as

$$w_j = s_j + \alpha_j w_{j+1} \quad (3)$$

Where w_j is liabilities-to-GDP ratio, s_j is surplus-to-GDP ratio and α_t is discount factor. Following Woodford (1995) iterating equation (3) one period ahead from the current period t and taking expectations conditional on information available in period t. The present value budget constraint becomes:

$$w_t = s_t + E_t \sum_{j=t+1}^{+\infty} \left(\prod_{k=t}^{j-1} \alpha_k \right) s_j \Leftrightarrow \lim_{T \to +\infty} E_t \left(\prod_{k=t}^{T+t-1} \alpha_k \right) w_{t+T} = 0 \quad (4)$$

The fiscal theory of price determination treats equation (4) as equilibrium condition that must be satisfied. The Hamilton and Flavin (1986) procedure is adopted to empirically test equation (4) and is tested as a government solvency condition. In this case, if primary surpluses are determined by an arbitrary process unrelated to primary debt, then nominal income and/or discount factor must jump in equilibrium to satisfy (4), called non-Ricardian or fiscal dominant regime. If on the

other hand, primary surpluses are determined in such a way that (4) is always satisfied no matter what nominal income and discount factor are determined elsewhere in the model, called the Ricardian or monetary dominant regime. Canzoneri *et al.* (2001) further suggest many fiscal policy rules lead to Ricardian regime. Let the sequence s_t is expected to follow the rule:

$$s_j = c_j w_j + \varepsilon_j \tag{5}$$

Where c_j is time varying response parameter ε_j is random variable which represents political factors and/or economic conditions.

Canzoneri *et al.* (2001) propose the following method to distinguish between monetary dominant or Ricardian regime and fiscal dominant or non-Ricardian regime. Considering, first, the temporal relationship running from current liabilities to future primary surpluses, a monetary dominant regime is ruled out if future primary surpluses respond negatively to increases in current liabilities, or if there is no relationship between the two variables, indicative of primary surpluses being exogenous. A positive connection between current primary surpluses innovations and future liabilities indicate that higher primary balances are generated to compensate positive changes in liabilities in order to bound debt accumulation, which would be consistent with a monetary dominant regime. However, according to the fiscal theory of the price level, such positive relationship could arise also under a fiscal dominant regime, in which the price level falls, and the real value of liabilities increases, in anticipation of future higher primary surpluses. Next consider the temporal relationship running from current primary surplus to future liabilities. Under a monetary dominant regime, current innovations to primary surpluses should be negatively related to future government liabilities, because rises in the primary surpluses would be used to pay the debt. On the other hand, under fiscal dominant regime, there would be no association between shocks to current primary surplus and future government liabilities.

To discriminate between MD and FD regime the analysis is done by estimating the VAR model over primary surpluses and liabilities. To account for possible lags in the variable response, impulse responses

functions are used to trace the effect over time of current innovations in the primary surplus on future liabilities and of current innovations in liabilities on future primary surplus.

For inflation variability an assessment has been made as which of the two policy variables: money growth or nominal debt growth can best explains inflation variability in Pakistan, after controlling for the aggregate demand measured by real output gap. Under a fiscal dominant regime, the main source of changes in the price level could be explained primarily by the associated wealth effects upon private consumption (Woodford, 1998)[3]. To test for the existence of these wealth effects, a VAR is estimated with the following ordering: nominal domestic debt growth, growth rate of reserve money, real output gap, inflation rate. Thereafter, the variance error decompositions for inflation are computed. These decompositions separate the variation in inflation into component shocks to the VAR, thus providing information about the relative importance of each random innovation in affecting inflation. If the forecast error is explained by shocks to nominal debt growth, it would imply that changes in the price level could be explained by the wealth effects of nominal debt growth, which would support the fiscal dominance by the fiscal theory of price level. If instead the forecast error is explained by shocks to money growth, it is an indication that monetary policy is passive and has accommodated shocks in debt through debt monetization, ultimately causing inflation. The quantity theory of money says that this inflation channel would be associated with a fiscal dominant regime[4].

To examine, whether the monetary authority has tried more actively (using reserve money or discount rate) to alleviate shocks in inflation during the sample period, the VAR is estimated with the following ordering: real output gap, inflation, reserve money growth (or the discount rate). Then the impulse responses are estimated to investigate how the monetary instrument responds to an innovation in inflation. To

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[3]. This is because, with a fiscal dominant regime, a positive shock in domestic debt makes households perceive they can afford more lifetime consumption, leading to higher demand for goods, which drives up domestic prices.

[4] However, the increase in domestic debt could also be caused by an abrupt fall in output due to a shock exogenous or endogenous to the country increasing the need to finance the government deficits by increasing domestic debt.

test whether an a ctive monetary policy is working, money growth rates should respond negatively or discount rates respond positively to a positive innovation in current inflation.

Robustness Analysis

To prove the robustness of the results the cointegration approach suggested by Johansen 1991 is carried out using the full information maximum likelihood framework. The robustness analysis is based on two models. First model investigates feedback rules between primary surplus/GDP (*s*) and domestic debt/GDP (*w*) by following cointegration process and expands the model into VEC model. The second model estimates inflationary effects of debt in accordance with VEC model

Table 3 in appendix shows the result of the cointegration analysis based on testing the restriction of no more than r cointegration vectors against the alternative of r+1 such vectors, the trace statistics test restriction of no more than r cointegration vectors against the alternative of r=0. The hypothesis cannot be rejected by both the maximum eigen value and the trace statistic values at the 95 % level. Following Cochrane (1998), feedback rules between primary surplus/GDP (*s*) and primary liabilities/GDP (*w*) are analyzed. [Canzoneri, *et. al*. (2001)]. Since both variables are cointegrated suggesting that, if fiscal policies react to liabilities accordingly, primary surpluses are expected to increase in order to satisfy the intertemporal budget constraint. Accordingly, primary surplus as a function of liabilities/GDP expected to follow a positive response. The estimation of feedback rules given by Ricardian regimes is expected to range between $0 \leq c_j < 1$; consequently, an increase in domestic debt ought to be financed by an increase in primary surplus. On the other hand, primary surpluses might follow a positive path in Non-Ricardian regimes as well as Ricardian regimes; however, increases in primary surpluses might fail to compensate debt shocks, hence, prices has to increase to equate intertemporal budget constraint by lowering real value of debt.

As a result, empirical studies mentioned above propose a second feedback rule to be estimated, as *w* is a function of primary surplus *s* and expected to follow a decreasing path in Ricardian regimes. Hence, coefficient

captures the response in domestic debt resulting from an innovation in primary surplus and expected to range between −1 to 0 (Canzoneri, *et al.*: 2001).

Data

The data series for this study are extracted from International Financial Statistics (IFS) CD-ROM.(2009) issued by International Monetary Fund, Pakistan Statistical Year Book 2010, Pakistan Economic Survey (various issues). The data set includes government expenditure, government revenues, consumer price index, reserve money, discount rate, and gross domestic product for the period 1960-2009. All data series are converted in to year 2000 rupees. Primary surplus is difference in overall public revenues and public expenditures (deducing the interest payments) all divided by nominal GDP. Public liabilities are defined as debt plus money base divided by nominal GDP. The real output gap is measured as deviation of actual GDP from potential GDP, where potential GDP is the fitted values of the quadratic trend on GDP series.

4. Empirical Results

The difference between monetary dominant (MD) regime and fiscal dominant (FD) regime is presented in this section. To empirically distinguish between these two regimes first, the methodology suggested by Canzoneri *et al.* (2001), and Tanner and Ramos (2002) is adopted using the Pakistani data. To estimate the relative importance of wealth effect of public debt and monetary growth in inflation pass through analysis approach is used. The relationship between inflation, aggregate demand and monetary policy instruments is investigated to test how State Bank responds to mitigate shocks in inflation. These three approaches use an unrestricted Vector Autoregressive Model (VAR) model to assess whether primary balances are set exogenous or dependent on public liabilities. The advantage of this methodology is that it only requires the estimation of a relatively small number of parameters and it does not impose any restrictions on the economy.

For estimation, first step is to test the stationarity of each variable. The Augmented Dickey-Fuller (ADF) unit root test is applied on primary surpluses, public liabilities, debt, inflation, reserve money, seigniorage and output gap including a constant and a trend. The ADF test results show the acceptance of the unit root in all series, that is, all the series are

non-stationary at level, which is indicative of I(1) process, therefore all the variables are taken in first difference for further analysis.

The methodology of Canzoneri *et al.* (2001) is applied based on unrestricted VAR analysis which allows identifying monetary or fiscal dominant regimes by estimating the impulse response functions and variance decomposition. This test is based on impulse-responses analysis of future liabilities to GDP to a shock in surplus to GDP, conditional on the persistence of the surplus to GDP, estimated by its autocorrelation. A surplus to GDP with a positive autocorrelation up to 5 lags[5] is considered positive and persistent; otherwise the surplus is considered negatively autocorrelated, indicating low persistence[6].

The two possible ordering of the surplus to GDP and liabilities to GDP are used in the model because the VAR methodology discloses possible inconsistency in the results due to the ordering adopted in the model. The order in which the surplus to GDP comes first allows for contemprenous effect to innovation on liabilities to GDP, which is consistent with non-Ricardian or FD regime (where the nominal GDP should jump in equilibrium to cause the existing liabilities to equal the present discounted value from the surpluses). The order in which liabilities to GDP come first does not allow the contemprenous effect on the liabilities, which makes more sense in the Ricardian regime.

The VAR is estimated with two lags and a constant. Figure1 represents the plots of impulse response function estimated for both ordering of variables. In the first ordering where surplus to GDP comes first, the

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[5] There is no consensus in the literature of fiscal theory of price level on the minimum number of lags to measure a high persistence of surplus. Canzoneri *et al.* (2001) find positive autocorrelation at lag up to 9 years for US. For emerging market economies Zoli (2005) and Baldini and Ribeiro (2001) argue that the fiscal policy is more volatile than developed markets and they use 5 lags. The average length for developing countries to complete business cycle is three years (Rand and Tarp (2002).

[6] Assessing how public liabilities respond to a shock in the surplus to GDP, conditional on surpluses being positively and persistently autocorrelated, in a monetary dominant regime, an increase (or positive shock in the current surplus leads to a fall in future liabilities to guarantee fiscal solvency. As a result, a monetary dominant regime is identified by a negative relationship between current surpluses and future liabilities. Under a fiscal dominant regime, however, the fiscal surpluses are assumed to be exogenous, and therefore future liabilities should be either unresponsive to a current increase in surpluses or lead to an increase. The other possibilities do not allow identifying any of these two regimes, therefore unidentified or ambiguous results.

response of liabilities to an innovation in surplus to GDP is negative. In fact, the response of liabilities to GDP is negative for 10 years, regardless of the ordering used. The univariate autocorrelations and the corresponding Q-statistics for surplus reported in Table 1 indicate that there is significant positive autocorrelation for all first lags of surplus to GDP ratio. If the surpluses to GDP are positively correlated and liabilities to GDP in period t+1 onwards decreases, the results are in conformity with Ricardian or MD regime

To confirm the result, following Canzoneri *et al.* (2001) analysis has been done by assessing the behavior of GDP. According to Ricardian equivalence, changes in the government budget and public liabilities do not exert an effect on aggregate demand. In contrast, in non-Ricardian regime in the presence of nominal rigidity, it is believed that the aggregate demand variations resulting from fiscal shocks cause variation in the level of real economic activity and in real interest rate, as well as fluctuation in the inflation rate. To examine whether a positive innovation in the surplus to GDP reduces the nominal income in the same period and increases government liabilities, VAR is estimated with surplus to GDP, natural logarithm of liabilities and natural logarithm of GDP. As nominal GDP is expected to respond to the innovation in surplus in case of non-Ricardian regime, the impulses response functions are analyzed with ordering ln(liabilities), surplus to GDP, ln(GDP). The results of impulse response in Figure 2 indicate that the innovation in the surplus to GDP reduces not only the nominal income but also decreases the level of liabilities in the subsequent period. This suggests that these findings confirm the existence of Ricardian regime. This analysis indicates that there is commitment in the authorities towards surplus generating polices in order to reduce liabilities.

In the next stage, VAR is estimated involving surplus to GDP, liabilities to GDP and discount rate as proposed by Canzoneri *et al.* (2001) to examine whether or not impulse responses survive after controlling for discount rate. Figure 3 shows impulse responses to an innovation in surplus to GDP. In the top panel the ordering goes from surplus to GDP, liabilities to GDP, discount rate in line with non-Ricardian regime. In the bottom panel the ordering is liabilities to GDP, surplus to GDP and discount rate consistent with Ricardian regime. The response of liabilities/GDP to surplus shock is negative for four periods following

the shock. The response of discount rate is positive and insignificant. The response of surplus to GDP and liabilities to GDP is as persistent as obtained without including discount rate, that is basic results are robust to controlling for discount rate implying that non-Ricardian regime is not working. These results are consistent with emerging market results for example by Fialho and Partugal (2005) for Brazil, Baldini and Ribeiro (2008) for some Sub-Saharan African countries: Cameroon, Keynia, Nigeria, Rewanda and South Africa.

The wealth effect pass through analysis on price is done by decomposition of inflation variability reported in Table 2 for ten periods. The analysis is undertaken to check which of the two policy variables, reserve money growth or nominal debt growth better explains the inflation variability in case of Pakistan after controlling for aggregate demand channel captured by real output gap. The VAR is estimated following the ordering debt growth, reserve money, real output gap and inflation rate. The results suggest that in case of Pakistan, inflation variability is mostly explained by the debt growth (10.92 percent), followed by the reserve money growth (1.16 percent). Canzoneri *et al.* (2001) approach identifies MD regime in Pakistani case. The average percentage of inflation variability explained by debt growth is more than what is explained by reserve money growth suggesting that the type of MD regime seems to be explained by fiscal theory of price level. Baldini and Ribeiro (2008) come up with same findings in case of Ethopia, Lesotho, Mauritius, Uganda and Zambia where the pass through analysis indicates that inflation variability is more closely associated with nominal debt, while analyzing Sub-Saharan African countries. The results indicates that the forecast error is more explained by shocks in debt growth and suggest that changes in price level are explained by wealth effect of debt growth supporting the prediction of fiscal dominance. However, in case of Pakistan the increase in the domestic debt may be caused by several other factors, exogenous shocks and due to endogenous shocks for example political instability, 2005 earthquake or war on terror etc., causing imbalances in the supply and demand for goods increasing need for government deficit financing increasing domestic debt.

The results of active monetary policy test are reported in Figure 4. The results reject that the monetary authorities acted consistently with MD

regime in Pakistani case to accommodate the fiscal shocks. A positive shock in inflation has a negative response on reserve money growth which is consistent with MD regime. In contrast discount rate is responding negatively to a shock is in line with FD regime. These results seem to indicate that inflation variability could be associated with the changes in the in nominal public debt variability (as suggested by pass through results) which could be detrimental to price stability. Zoli (2005) in case of emerging markets come up with mix results for Colombia, Mexico, Thailand and Poland during 1990s and early 2000s. Only in the case of Argentina and Brazil does the evidence point clearly to a regime of fiscal dominance. Baldini and Riberio (2008) find in number of African countries lack of clear monetary or fiscal regime for the period 1980-2005. However some African countries are following strongly fiscal dominant regime, or consistently adopting monetary dominant regime.

Robustness check: Primary Surplus-Domestic Debt Models

Since both variables primary surplus/GDP s and primary liabilities/GDP (w) are integrated of I(1), the following Johansen test results are obtained to investigate the long run cointegration between s and w series. According to the trace and maximum eigen value statistics, the hypothesis that there is one cointegration relation is accepted.

The results indicate that that, one percent increase in primary liabilities/GDP lead primary surplus/GDP to increase by 0.12 percent as reported by long run normalized cointegrating relationship in Table 3. On the other hand, since a positive relationship might occur even in non-Ricardian regimes, increasing budget surpluses fail to satisfy continuing increase in primary liabilities especially in economies, where cost of debt increases accordingly; leading intertemporal budget constraint to be satisfied through increases in the price level. Lag length is calculated as 2 by SBC information criteria. At the first VEC, 28% of the short run deviations are corrected in one period, hence, the correction of disequilibrium occurs in 4 periods. According to the second VEC regression results, 25% of the divergence from the equilibrium is corrected in one period; the correction of the short run deviations lasts 4 periods.

According to the long run regression results, one percent increase in primary surplus/GDP lead domestic primary liabilitues/GDP to increase by 4.62 percent. As the empirical studies mentioned above suggests, a positive response is expected in Non-Ricardian regimes. In the first VEC, where Δw is the dependent variable, 3 percent of short run divergence from the equilibrium is corrected in one period; the error correction takes 34 periods. On the other hand, the second VEC results suggest that a 4 percent disequilibrium is corrected within one period and convergence to the long run equilibrium lasts 25 periods.

Now considering inflation-primary liabilities, VEC models are given in Table 4. The long run regression results obtained from VEC estimates are one percentage point increase in primary liabilities leads to 3 percentage point increase in inflation level in Pakistan. VECM estimates suggest that 18% of deviations from the long run equilibrium are corrected within one period, whereas disequilibrium is corrected in 6 periods.

5. Conclusion

The present study provides quantitative evidence for the relative importance of fiscal and monetary sources of inflation and traces out the dynamic response of inflation to different shocks, including the nominal public debt. For Pakistan, the evidence is less clear to infer that authorities are following a certain type of regime during the sample period 1960-2009. The liabilities respond negatively to the innovation in surpluses, that is in the subsequent period the liabilities decrease in the face of increase in surplus. This characterizes MD regime, the events that give rise to surplus innovation are likely to persist causing the rise in the future surpluses and surpluses pay-off some of the debt causing the fall in the liabilities. By analyzing the behavior of nominal GDP, an innovation in surplus reduces nominal income and decreases the level of debt in the subsequent periods; this analysis does not confirm the non-Ricardian analysis. On the other hand, the study finds that, as predicted by the fiscal theory of price determination, the occurrence of wealth effects of changes in nominal public debt may pass through to prices by increasing inflation variability in case of Pakistan. In addition, the results show that as predicted by fiscal theory of price determination the discount rate is decreasing in response to positive shock in inflation. The

reverse also happens as the reserve money growth also responds negatively as predicted by the MD regime. These findings imply that nominal public liabilities, as reflected either in money growth or in nominal public debt, matter for price stability in case of Pakistan. The authorities may be following different regimes for different time periods during the 1960-2010.

There are certain limitations of the unrestricted VAR approach. For instance, it does not allow to identify a predominant regime if both FD and MD regimes are alternating during the sample period covered. This may result in having positively correlated surpluses but inconclusive impulse-response analysis. It would be appropriate to apply VAR techniques that allow identifying when regimes are switching [Leeper and Troy (2006) for a general model and for an application to Brazil (Fialho and Portugal, (2005)]. The use of alternate approach of cointegration and error correction model to check the robustness of result further confirm that inflationary behavior in Pakistan is influenced by fiscal dominance, where the impact of the high cost domestic debt on the price level cannot be disregarded. On the other hand, Non-Ricardian policies affect the results of anti-inflationary policies and accessibility of price stability is seriously damaged unless stability policies are backed by fiscal commitment

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Figure 1: VAR in Surplus to GDP and Liabilities to GDP
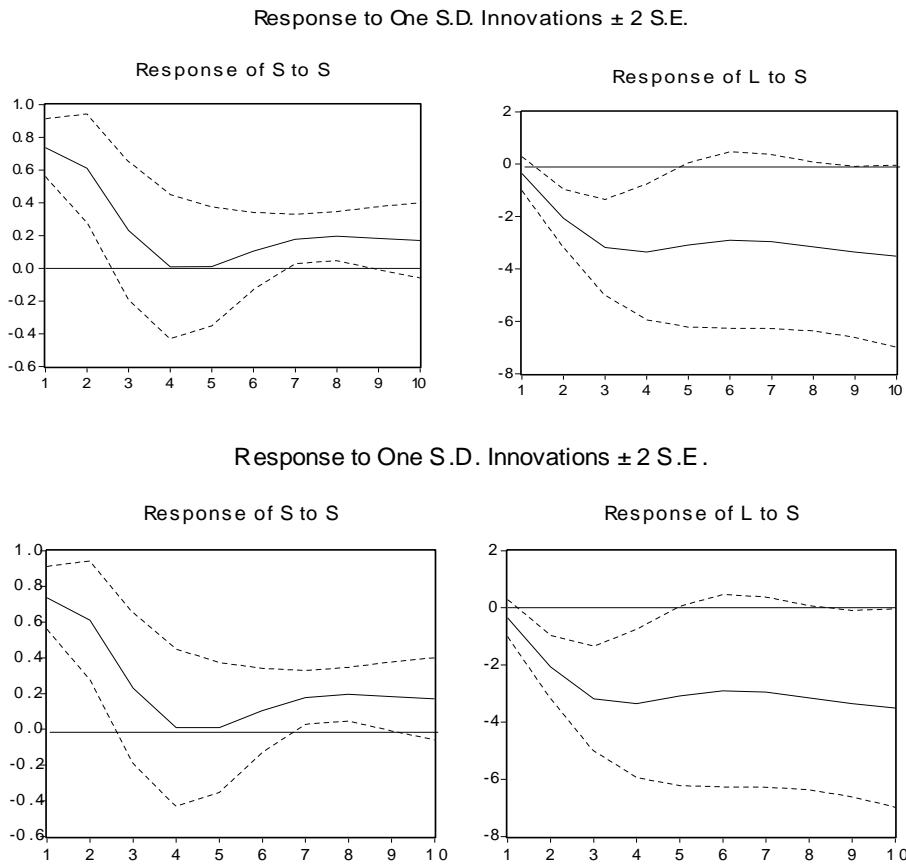
Response to One S.D. Innovations ± 2 S.E.

Response of S to S   Response of L to S

Response to One S.D. Innovations ± 2 S.E.

Response of S to S   Response of L to S

Note: The VAR model is estimated with two lags and a constant.
The top panel ordering is Surplus to GDP (S) $\rightarrow$ Liabilities to GDP (L)
The bottom panel ordering Liabilities to GDP (L) $\rightarrow$ Surplus to GDP (S).

Figure 2: VAR ln(liabilities), Surplus to GDP, Ln(GDP)

Response to One S.D Innovations ± 2 S.E

| Response of D(PS) to D(PS) | Response of D(LTD) to D(PS) | Response of D(GDP) to D(PS) |
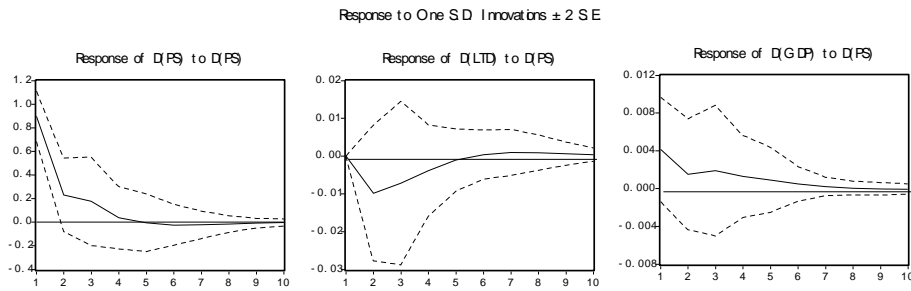
Note: The VAR model is estimated with two lags and a constant.
The causal ordering is ln(Liabilities) → Surplus to GDP→ ln(GDP)

Figure 3: Surplus to GDP, Liabilities to GDP, Discount Rate

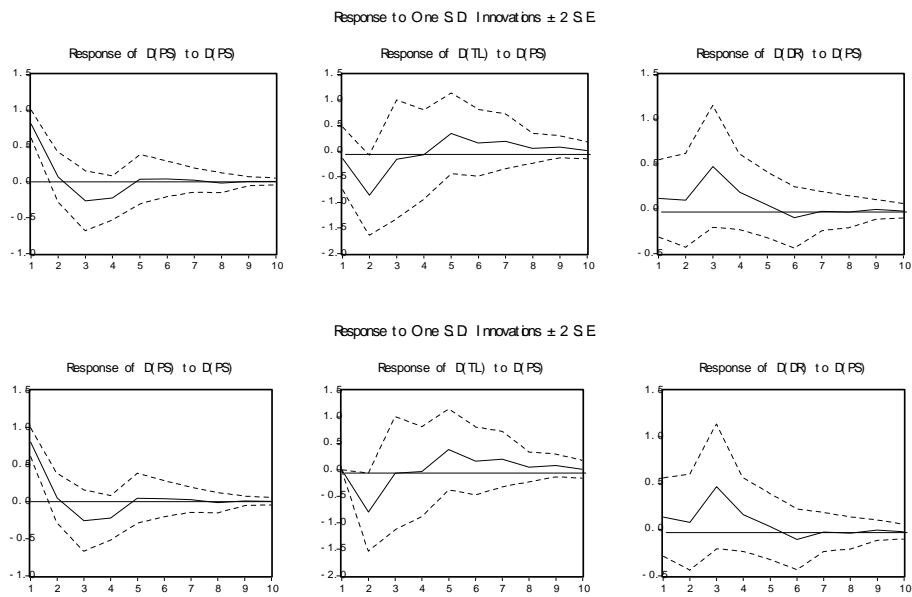Response to One S.D Innovations ± 2 S.E

| Response of D(PS) to D(PS) | Response of D(TL) to D(PS) | Response of D(DR) to D(PS) |

Response to One S.D Innovations ± 2 S.E

| Response of D(PS) to D(PS) | Response of D(TL) to D(PS) | Response of D(DR) to D(PS) |

Note: The VAR model is estimated with two lags and a constant.
The top panel ordering is Surplus to GDP (PS) → Liabilities to GDP (TL)→ Discount factor (DF)

The bottom panel ordering is Liabilities to GDP → Surplus to GDP → Discount factor

Figure 4: Inflation Responses to Shock in Reserve Money Growth and Domestic Public Debt
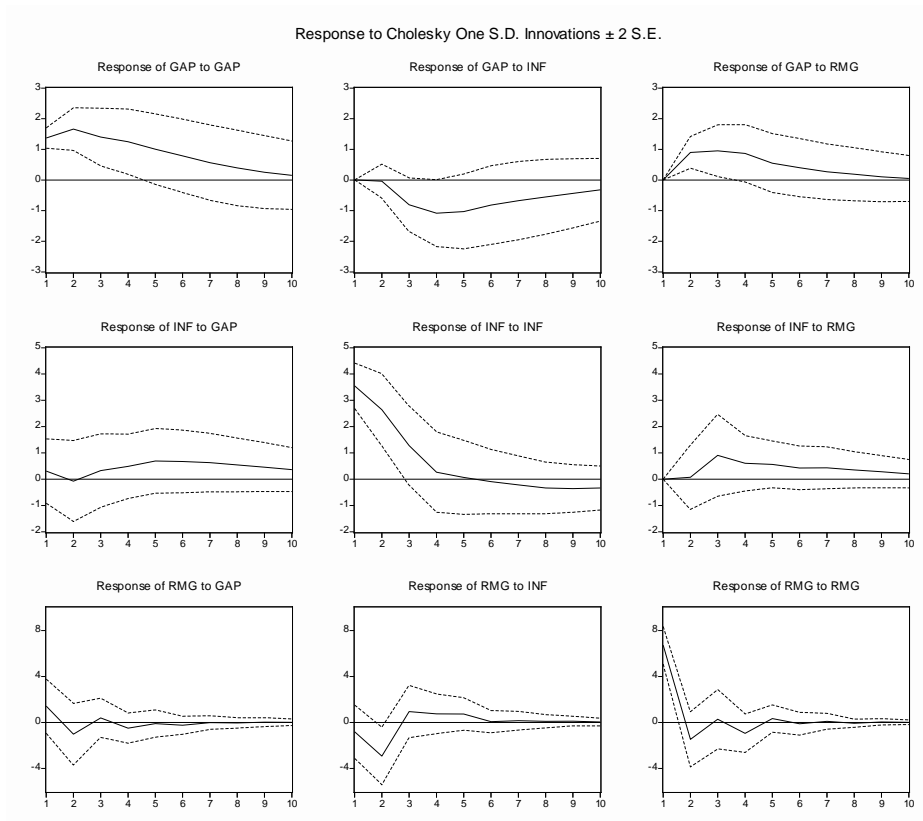
Note: The VAR for causal ordering Output Gap (GAP)→inflation (INF)→Reserve money growth RMG) (or Discount Rate) with two and a constant.

Table 1: Autocorrelation of Primary Surplus/GDP

Lag	Autocorrelatio	Q-Stat	P-value
1	0.73	21.75	0.00
2	0.50	32.31	0.00
3	0.37	38.16	0.00
4	0.35	43.78	0.00
5	0.41	51.67	0.00
6	0.37	58.21	0.00
7	0.35	64.34	0.00
8	0.33	69.78	0.00
9	0.28	73.85	0.00
10	0.25	77.31	0.00
11	0.15	78.52	0.00
12	0.08	78.87	0.00
13	0.02	78.89	0.00
14	-0.01	78.89	0.00
15	-0.02	78.91	0.00
16	-0.07	79.27	0.00

Table 2: Variance Decomposition of INF

Variance Decomposition of INF:				
Period	S.E.	TD	RMG	GAP	INF
1	3.622000	2.828269	6.410895	0.036414	90.72442
2	4.557845	8.129574	5.995868	0.856532	85.01803
3	4.773789	9.085645	5.929916	0.787413	84.19703
4	4.848207	11.10081	6.402905	0.833709	81.66257
5	4.905158	11.94281	6.857647	1.317685	79.88186
6	4.966387	12.95595	7.125952	1.568167	78.34993
7	5.017416	13.57980	7.360034	1.698986	77.36118
8	5.056073	13.99127	7.446559	1.703622	76.85855
9	5.076649	14.17347	7.443538	1.690049	76.69294
10	5.085825	14.23960	7.417234	1.728435	76.61473
Cholesky Ordering: TD RMG GAP INF					

Table 3a: Johansen Co-integration Test Results between w and s

Null Hypothesis	Trace Statistics	5% Critical Value	Prob	Maximal Eigen Value Statistics	5% Critical Value	Prob
0=r	21.34*	15.49	0.005	21.22*	15.89	0.02
1≤r	0.11	3.84	0.73	6.47	9.16	0.16

Note: Both tests indicate no co-integration at 5 percent level.

Table 3b: Johansen Co-integration Test Results between PL and PS

Null Hypothesis	Trace Statistics	5% Critical Value	Prob	Maximal Eigen Value Statistics	5% Critical Value	Prob
0=r	21.34*	15.49	0.005	18.25*	13.80	0.02
1≤r	0.11	3.84	0.73	6.47	9.16	0.16

Notes for the above tables: The * indicates the number of co integrating equations corresponding to that row of the Table// Both the tests show that there is one co-integrating vector at 5 percent level Two lags included in the vector auto regressions are determined using the Swartz Basian Creteria.

Table 3c: Results of Primary Surplus Feedback

Long run relationship: $s_t = 0.03 + 0.12 * w_t$

Short Run relationship and error adjustment

	EC	Δs	Δw	D(PL(-1))	D(LIBOR(-2))
Δs	-0.25 [-1.369]	0.214 [1.784]	-0.378 [-3.444]	-0.170 [-4.562]	0.109 [2.231]
Δw	-1.554 [-3.384]	-1.088 [-1.458]	0.087 [0.621]	0.386 [5.705]	0.126 [1.855]

Results of Primary Surplus Feedback

Long run relationship: $w_t = 0.47 + 4.62*s_t$

Short Run relationship and error adjustment

	EC	Δw	Δw	S	D(LIBOR(-2))
Δw	-0.07 [-3.34]	-0.16 [0.07]	-0.49 [-1.77]	-1.08 [-1.45]	0.01 [0.02]
Δs	0.05 [1.36]	-0.17 [-4.50]	-0.10 [-2.32]	0.21 [1.74]	-0.37 [-3.44]

Table 4a: Johansen Co-integration Test Results between INF and PL

Null Hypothesis	Trace Statistics	5% Critical Value	Prob	Maximal Eigen Value Statistics	5% Critical Value	Prob
0=r	17.02*	15.49	0.02	14.28*	15.89	0.02
1≤r	3.24	3.84	0.07	6.47	9.16	0.16

Notes for the above tables: The * indicates the number of co integrating equations corresponding to that row of the Table// Both the tests show that there is one co-integrating vector at 5 percent level Two lags included in the vector auto regressions are determined using the Swartz Basian Creteria.

Table 4b: Inflationary Effect of Primary Liabilities

Long run relationship Inf = 0.01 + 0.03*w

	EC	Δw	Δw	S	D(LIBOR(-2))
Δinf	-0.18 [-3.88]	0.11 [0.64]	-0.01 [-1.49]	0.01 [0.94]	0.08 [1.40]
Δw	0.05 [0.31]	-0.35 [-0.78]	0.54 [3.34]	0.71 [2.20]	0.54 [3.34]

	EC	ΔINF	Δw
ΔINF	-0.16 (-2.46)	0.07 [1.78]	0.19 [-1.19]
Δw	-0.40 [-1.64)]	-0.01 [-1.45]	-0.08 [-0.05]