

Testing the Fiscal Theory of Price Level in Case of Pakistan

ATTIYA Y. JAVID, UMAIMA ARIF, and ABDUL SATTAR

1. INTRODUCTION

There are two competing views of the interaction between monetary and fiscal policy and their effects on price stability for policy-maker's point of view. In the classical view, in Ricardian regimes it is the demand for liquidity and its evolution over time that determines prices. In such a regime fiscal policy is passive, which implies that government bonds are not net wealth [Barro (1974)], and monetary policy works through the interest rate or another instrument to determine prices. In the opposite view which is more recent, a non-Ricardian regime will prevail whenever fiscal policy becomes active¹ and does not accommodate or adjust primary surpluses to guarantee fiscal solvency. As a result, the Ricardian equivalence does not hold, and the increase in nominal public debt to finance persistent budget deficits is perceived by private agents as an increase in nominal wealth. In fiscal dominant regime the government's fiscal policy becomes sustainable through debt deflation that is an increase in prices that wash away 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. In this regime prices are determined by fiscal policy, and inflation becomes a fiscal phenomenon. If, on the other hand, primary surpluses follow an arbitrary process, then the equilibrium path of prices is determined by the requirement known as fiscal solvency; that is, the price level has to jump to satisfy a present value budget constraint called non-Ricardian regime. The basic distinction between the two regimes is that in non-Ricardian regime fiscal policy plays the role where as in Ricardian regime monetary policy provides stability in prices. In FTPL, the results of fiscal and monetary policies depend on which policy has dominant characteristics. The consequences of policies differ depending on the active and passive characteristics of the policy and depending on the characteristics of the following policy. If the policy mix is such that monetary policy is active and fiscal policy is passive, fiscal policy accommodates monetary policies; these policies are called dominant monetary policy by Sargent and Wallace (1981) and Ricardian regime by Woodford (1994, 1995). In contrast

Attiya Y. Javid <attiyajaved@pide.org.pk> is Senior Research Economist, Pakistan Institute of Development Economics. Umaima Arif <umaima@pide.org.pk> is Staff Economist, Pakistan Institute of Development Economics. Abdul Sattar <asattar.n@gmail.com> is Statistical Officer, Federal Bureau of Statistics, Islamabad.

¹The fiscal theory of price level (FTPL) is developed by Woodford (1994, and 1998), Leeper (1991), Sims (1994), and Cochrane (1998, 2001), for the extension of the FTPL to an open economy [Daniel (2001); Loyo (2000); Canzoneri and Diba (2001) and Dopor (2000)].

when the policy combination is passive monetary policy and active fiscal policy, monetary policy accommodates fiscal policy by considering budget deficits as a constraint in the political decision process. This policy combination is defined by Sargent and Wallace as dominant fiscal policy and Woodford call it non-Ricardian policy.

In Pakistan like many developing economies monetary policy is under the pressure of budget deficit and fiscal policy shocks that may play role in the determination of prices [Woodford (1994) and Sims (1994)]. In this situation Ricardian policies lose their validity that can be seen commonly in developing markets² as well as most periods in developed economies³. Therefore, an anti-inflation policy followed independently by the central bank could result in deflationary or inflationary spirals depending on the active and passive characteristics of fiscal policies [Loyo (2000)].⁴ In economies with fiscal dominant regimes, where domestic debt is subject to indexation and speculation, active anti-inflationary monetary policies result in hyperinflation [Favero-Giavazzi (2002)]. In such cases Leeper (1991) favors discretionary policy. Benhabib, *et al.* (1999, 2001) propose interest rate rule under fiscal dominant regime and find that Taylor rules are destabilising and price stability can only be achieved by an active monetary policy with passive backing by fiscal policies. Woodford (2000) views that collective movement of inflation, nominal interest rates and primary surpluses also hold in Ricardian and non-Ricardian regime.

Price stability is an important goal of monetary policy in Pakistan. The present study attempts to uncover empirical evidence on the relative importance of fiscal policy and monetary policy for price stability in Pakistan. This seems interesting because firstly, data indicate that public debt and fiscal imbalances are on the rise⁵ causing concerns about fiscal sustainability. This suggests that some form of fiscal dominance become an issue for Pakistan, Therefore considering the relevance of the issue in recent economic scenario, it is important to study the application of fiscal theory of price level to Pakistan's economy. Secondly, so far, no systematic empirical work to discriminate between these two regimes monetary dominant and fiscal dominant, has been conducted. The only literature available [Hussain (1982); Massood and Ahmad (1980); and Saqib and Yasmin (1987)] investigates the relative importance of fiscal and monetary policy on aggregate economic activity. In fact, there is need to probe this issue in detail and look for evidence on fiscal dominance in Pakistan by estimating simple and parsimonious model such as autoregressive system proposed by Canzoneri, Cumby and Diba (2001).

²For Brazil the study by Loyo (2000) and Tanner and Ramos (2002) find evidence consistent with the fiscal theory of the price level. Baldirici and Erisin (2006) finds that fiscal dominance in Turkey increase after 1980s as a result of increasing cost of capital.

³Cochrane (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 characterises at least one phase of the post-war US history, specifically the period 1960–79. Favero and Monacelli (2003) also find some evidence of fiscal dominance in the United States for limited periods of time 1960–87.

⁴He argues that Brazilian economy is subject to fiscal or non-Ricardian policies combined by active monetary policy rules resulting in hyperinflations in late 1980s.

⁵In fact, public debt in has grown quite sharply over the years, 35.7 percent of GDP in 1960 to 61.3 percent in 1970s and this percent has remained the same about 61.7 percent in 1980s. The public debt went up at an unprecedented rate during 1990s and on average it was 77.6 percent of GDP. The public debt has shown an increasing trend in 2000s however as a percentage of GDP it shows a decrease which is average 66.4 percent of GDP (Economic Survey).

Thirdly, the principles of fiscal theory of price level require that it is necessary to have appropriate fiscal policy and also an adequate monetary policy to achieve price stability. Unless specific measures are taken to ensure an appropriate fiscal policy, the objective of price stability may not be achieved despite the independence of State Bank of Pakistan and its commitment to low inflation. This motivates to assess the empirical plausibility of both fiscal and monetary dominant regimes in case of Pakistan's economy. The present study distinguishes between these two regimes with Vector Autoregressive (VAR) approach following Canzoneri, *et al.* (2001). There exists long run relationship between primary surplus and public liabilities which implies that these two series cannot move away from each other [Trehan and Ramos (2002)]. This suggests that time-series techniques are useful in providing testing procedures for application of fiscal theory of price level.

The plan of rest of study is as follows: Section 2 reviews briefly the empirical literature on the relative importance of fiscal and monetary policy 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

The interaction between monetary and fiscal policy is well researched area for developed countries where the dimensions of investigation includes the issues related to the coordination of monetary and fiscal policy [Alesina and Tabellini (1987); DeBelle and Fischer (1994); Dixit and Lambertini (2001) and Buti, *et al.* (2002)]; on optimal monetary and fiscal policy [Lucas Stokey (1983); Chari, *et al.* (1991); Benigno and Woodford (2003); Beetsma and Jensen (2002); Schmitt-Grohe and Uribe (2004) and Correia, *et al.* (2003)] and the channels through which fiscal actions affect monetary variables and focuses on the constraints imposed by fiscal policy on the monetary authority [Calvo and Guidotti (1992, 1993) and Fair (1994)].

Sargent and Wallace (1981) influential study is the first attempt to show how the government intertemporal budget constraint may affect monetary policy conditions and, in particular, price dynamics. After this study a number of papers have tried to assess from an empirical perspective how monetary and fiscal policies interact and, explicitly or implicitly, have looked for evidence of fiscal dominance. Melitz (1997, 2002) jointly estimate the reaction functions of the monetary and fiscal authorities on a pool of nineteen OECD countries over the period 1960–95 and finds that monetary and fiscal policy have tended to move in opposite directions. Favero (2002) concludes that stabilisation of inflation has been achieved independently in Europe from the lack of fiscal discipline, supporting the idea that the monetary authorities in Europe have been able to affect inflation rates. A study by Favero and Monacelli (2003) also finds some evidence of fiscal dominance in the United States for limited periods of time 1960–87. They conclude that it is possible to identify time windows where an empirical model based on both monetary and fiscal regime is able to track the dynamics of inflation better than a regime based on a monetary rule only. Blanchard (2004) and Favero and Giavazzi (2004) argue that when the public debt is large, an increase in interest rates aimed at keeping inflation within the target raises the cost of debt service, the debt level, the default probability and the country premium, triggering capital outflows and

leading to a depreciation of the exchange rate, that affects inflation expectations and, eventually, inflation itself.

The fiscal theory of the price level identifies another channel through which the central bank can lose control of inflation, even in the case of an independent monetary authority that need not accept seignorage targets dictated by the fiscal authority. Cochrane (1998, 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.* (1997a,b, 2001, 2002), 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. On the other hand, Cochrane (1998) argues that the US data from 1960 are consistent with the fiscal theory of the price level determination. Sala (2003) finds that the fiscal theory of the price level characterises at least one phase of the post-war US history, specifically the period 1960–79. Afonso (2002) finds that the fiscal theory of the price level does not support in case of fifteen European economies.

Very few empirical work is conducted on emerging economies includes Tanner and Ramos (2002), who evaluate the policy regime in Brazil during the 1990s can better characterised as fiscal dominant, and IMF (2003), estimating a separate fiscal policy reaction function for a group of developed economies and a set of emerging markets finds that primary surpluses respond much more strongly to public debt in the developed countries. For Brazil the study by Loyo (2000) find evidence consistent with the fiscal theory of the price level where a tight monetary policy along with loose fiscal policy resulted in hyperinflation even without seignorage increase. 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, some by monetary regime and some have no clear result. Tufail (2008) shows that the fiscal policy in Pakistan is weakly sustainable for the period 1960 to 2006. There exists a long run relationship between government revenues and expenditures however; revenues are adjusting more than expenditures to keep the fiscal policy on the trajectory towards sustainability. 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 test the fiscal dominance in case of Pakistan.

3. METHODOLOGICAL FRAMEWORK AND DATA

To analyse the applicability of FTPL theory in accordance with the Ricardian equivalence theorem the methodology suggested by Canzoneri, *et al.* (2001), and Tanner and Ramos (2002) is adopted using the Pakistani data. The systematic relationship between public liabilities to GDP (w_i) and surplus to GDP (s_i) is estimated by 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. The VAR models are characterise with no a priori distinction between endogenous and exogenous variables and forecast performance is better than the one obtained by simultaneous equation model.

Canzoneri, *et al.* (2001) describe the relationship between liabilities to GDP w_i and surplus to GDP ratio s_i is for period i as follows:

$$w_i = s_i + \alpha_i w_{i+1} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

The Equation (1) 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. In the equation w_i is liabilities to GDP ratio, s_i is surplus to GDP ratio α_i is discount factor. Woodford (1995) iterating Equation (1) one period ahead from the current period t and taking expectations conditional on information available in period t , the relationship becomes:

$$w_t = s_t + E_t \sum_{i=t+1}^{+\infty} \left(\prod_{k=t}^{i-1} \alpha_k \right) s_i \Leftrightarrow \lim_{T \rightarrow +\infty} E_t \left(\prod_{k=t}^{T+t-1} \alpha_k \right) w_{t+T} = 0 \quad \dots \quad (2)$$

The fiscal theory of price determination treats Equation (2) as equilibrium condition that must be satisfied. The Hamilton and Flavin (1986) procedure is adopted to empirically test Equation (2) and they test 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 (2), called non-Ricardian or fiscal dominant regime. If on the other hand, primary surpluses are determined in such a way (2) 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) suggest the following fiscal policy rule lead to Ricardian regime, let the sequence s_t is expected to follow the rule:

$$s_i = c_i w_i + \varepsilon_i \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

Where c_i is time varying response parameter ε_i is random variable which represents political factors and/or economic conditions. The fiscal rule (3) implies that the relationship (1) for any arbitrary value of w_j and fiscal rule (3) results in Ricardian regime.

For empirical analysis primary surpluses s_i is affected by past and current values of other variable w_j ; in the same way public liabilities are effected by current and past values of s_i , therefore the relationship is explained by the system given below:

$$\begin{aligned} s_t &= \alpha_0 + \sum_{i=1}^2 \alpha_i s_{t-i} + \sum_{i=1}^2 \beta_i w_{t-i} + \varepsilon_t \\ w_t &= \alpha_0 + \sum_{i=1}^2 \gamma_i w_{t-i} + \sum_{i=1}^2 \delta_i s_{t-i} + \eta_t \quad \dots \quad \dots \quad \dots \quad \dots \end{aligned} \quad (4)$$

First, considering 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, indicating that primary surpluses are exogenous. A positive relationship between current primary surpluses innovations and future liabilities indicate that higher primary balances are created to compensate for positive

changes in liabilities in order to limit 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 monetary dominant regime, there would be no relationship between shocks to current primary surplus and future government liabilities.

To discriminate between monetary dominant and fiscal dominant regime the VAR model is estimated 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. According to Ricardian equivalence changes in government budget and public liabilities do not have effect on aggregate demand. The reverse is the case with non-Ricardian regime where the aggregate demand variation resulting from fiscal shocks cause variation in the real level of economic activity and in the interest rate and inflation rate. To examine the behavior of nominal GDP to the innovation in surplus VAR is estimated with order (ln (liabilities), surpluses and Ln(GDP)). In the next stage the model is extended by adding discount rate and VAR is estimate surpluses to GDP, liabilities to GDP and discount factor to make sure that the impulse responses on the original model survive after controlling for the discount factor.

According to FTPL the main source of change in the price level can be explained by the wealth effect of private consumption which increases the nominal debt growth [Woodford (1998)]. Therefore a positive shock in domestic debt makes household believe that they can afford more lifetime consumption and leads to more demand for goods which drive up the prices. To assess 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. To test for the existence of these wealth effects, a VAR is estimated with the following order (nominal debt growth, growth rate of reserve money, real output gap and inflation rate). Then 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 is argued that changes in the price level could be explained by the wealth effects of nominal debt growth, which would support the fiscal theory of price level. If instead the forecast error is explained by shocks to money growth, it is argued that monetary policy is passive and has accommodated shocks in debt through debt monetisation, ultimately causing inflation. The quantity theory of money says that this inflation channel would be associated with a fiscal dominant regime.⁶

⁶The fact is that the increase in domestic debt could also be caused by an abrupt fall in output due to a shock exogenous to the economy (nationalisation of industries during seventies) or, endogenously, by (political instability and 2005 earthquake). These types of shocks would cause imbalances in the supply and demand for goods, and in turn lead to lower taxation, thereby increasing the need to finance the government deficits by increasing domestic debt.

Data

The data series for this study are extracted from International Financial Statistics (IFS) CD-ROM.(2008) issued by International Monetary Fund, Pakistan Statistical Year Book 2008, 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 1971-2007. 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

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 to identify 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 lags⁷ is considered positive and persistent; otherwise the surplus is considered negatively autocorrelated, indicating low persistence.⁸

The two possible ordering of the surplus to GDP and liabilities to GDP are used in the model because the VAR methodology reveals 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 contemporaneous effect to innovation on liabilities/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 contemporaneous effect on the liabilities, which makes more sense in the Ricardian regime.

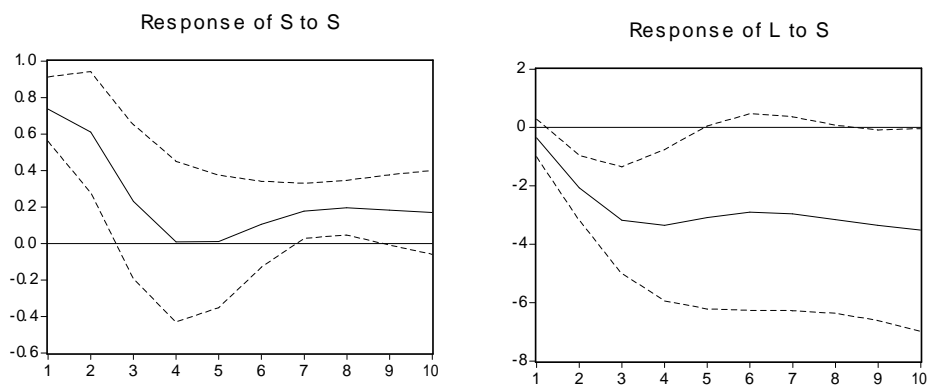
⁷There is no consensus in the literature of fiscal theory of price level on the minimum number of lags to measure a high persistence of surplus. Canzoneri, *et al.* (2001) find positive autocorrelation at lag up to 9 years for US. For emerging market economies Zoli (2005) and Baldini and Ribeiro (2001) 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)].

⁸Assessing 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.

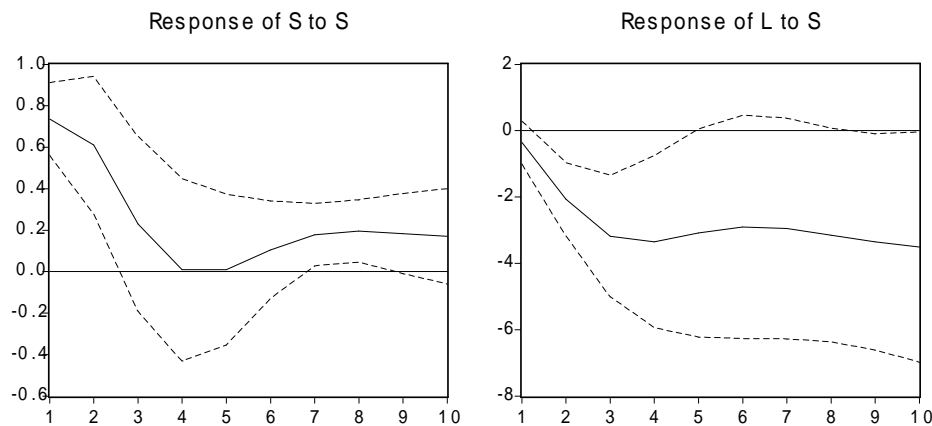
The VAR is estimated with two lags and a constant and the Figure 1 represents the plots of impulse response function estimated for both ordering of variables. In the first ordering where Surplus to GDP comes first, the response of liabilities to an innovation in surplus to GDP is negative. In fact, the 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.

Fig. 1. VAR in Surplus/GDP and Liabilities/GDP

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



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



Note: The VAR model is estimated with two lags and a constant.

The top panel ordering is Surplus/GDP \rightarrow Liabilities/GDP

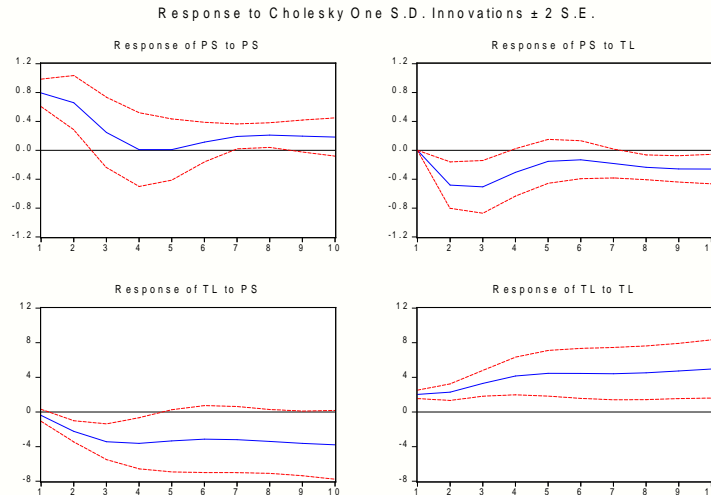
The bottom panel ordering Liabilities/GDP \rightarrow Surplus/GDP.

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

The result of impulse response functions from the VAR are given in Figure 2 which shows that an innovation in surplus to GDP in period 0 tends to produce negative responses. The liabilities to GDP response is negative but not significant confirming that this response is followed by MD regime. The liabilities to GDP is one and more periods forward to an innovation in surplus to GDP is negative, that is in the subsequent period the debt decreases again with a surplus in each period that produces another surplus and so on. This characterises the MD or Ricardian regime.

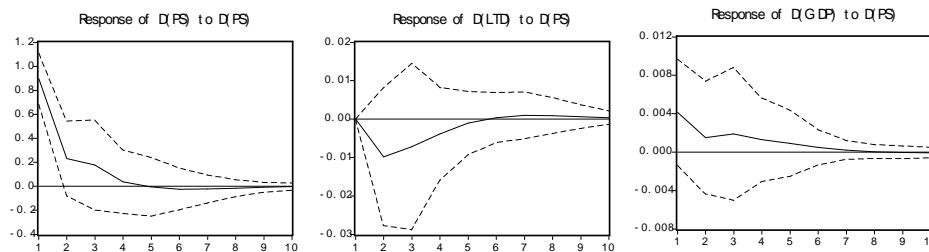
Fig. 2. VAR Model in Surplus/GDP and Liabilities/GDP

Note: The VAR model is estimated with two lags and a constant with no causal ordering.

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 causes 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 impulse response functions are analysed with ordering $\ln(\text{liabilities})$, surplus to GDP, $\ln(\text{GDP})$. The results of impulse response in Figure 3 indicate that the innovation in the surplus to GDP reduces 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 policies in order to reduce liabilities.

Fig. 3. VAR $\ln(\text{liabilities})$, Surplus/GDP, $\ln(\text{GDP})$

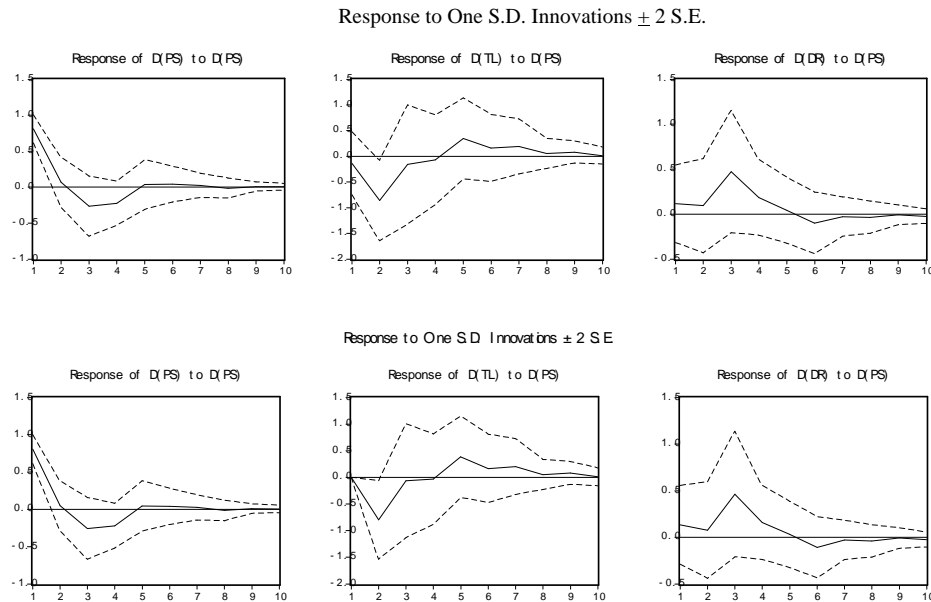
Response to One S.D. Innovations ± 2 S.E.



Note: The VAR model is estimated with two lags and a constant.

The causal ordering is $\ln(\text{Liabilities}) \rightarrow \text{Surplus/GDP} \rightarrow \ln(\text{GDP})$

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 4 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 that is non-Ricardian regime is not working. These results are consistent with emerging market results for example by Fiallo and Portugal (2005) for Brazil, Baldini and Ribeiro (2008) for some Sub-Saharan African countries (Cameroon, Kenya, Nigeria, Rwanda and South Africa).

Fig. 4. Surplus/GDP, Liabilities/GDP, Discount Rate

Note: The VAR model is estimated with two lags and a constant.

The top panel ordering is Surplus/GDP \rightarrow Liabilities/GDP \rightarrow Discount factor

The bottom panel ordering is Liabilities/GDP \rightarrow Surplus/GDP \rightarrow Discount factor.

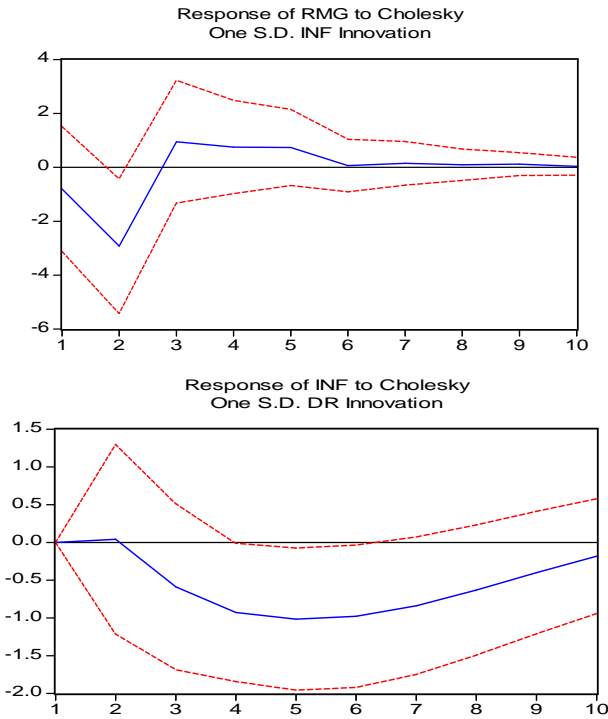
The wealth effect pass through analysis on price is done by decomposition of inflation variability reported in Table 2 and by impulse responses pictured in Figure 5 for ten periods. The analysis is undertaken that which of the two policy variables, reserve money growth or nominal debt growth better explains 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 domestic 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), than 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 Ethiopia, Lesotho, Mauritius, Uganda and Zambia where the pass through analysis indicates the inflation variability is more closely associated with nominal debt, while analysing 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.

Table 2

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.

Fig. 5. Inflation Responses Due to Shock in Reserve Money Growth and Domestic Public Debt

Note: The VAR for causal ordering Output Gap→inflation→Reserve money growth (or Discount Rate) with two and a constant.

5. CONCLUSION

The present study provides quantitative evidence for application of fiscal theory of price level. For Pakistan, the evidence is less clear to infer that authorities are following a certain type of regime during the sample period 1970-2007. The liabilities respond negatively to the innovation in surpluses, that is in the subsequent period the liabilities decreases in the face of increase in surplus. This characterises 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 analysing 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. Therefore, the implication that comes out of this study is 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 1970-2007.

There are certain limitations of the Canzoneri, *et al.* (2001) 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 to identify when regimes are switching [Leeper and Troy (2006)] for a theoretical model, and for an application to Brazil [Fialho and Portugal (2005)]. The use of different econometric tests and approaches to underpin the relative importance of monetary and fiscal determinants of inflation should improve the reliability of the results.

REFERENCES

- Afonso, A. (2002) Disturbing the Fiscal Theory of the Price Level: Can it Fit the EU-15? (Mimeographed).
- Alesina, A. and G. Tabellini (1987) Rules and Discretion with Non-coordinated Monetary and Fiscal Policy. *Economic Inquiry* 25, 619–30.
- Auernheimer, L. and B. Contreras (1990) Control of the Interest Rate with a Government Budget Constraint: Determinacy of the Price Level, and other Results. (Mimeographed).
- Baldini, Alfredo and M. Ribeiro (2008) Fiscal and Monetary Anchors for Price Stability: Evidence from Sub-Saharan Africa. (IMF Working Paper /08/121).
- Baldirici, Melike and Ozgar Omer Ersin (2006) Fiscal Theory of Price Level and Economic Crises: Case of Turkey. *Journal of Economic and Social Research* 7:2, 81–114.
- Barro, Robert J. (1974) Are Government Bonds Net Wealth? *Journal of Political Economy* 82:6, 1095–1117.
- Beetsma R. and H. Jensen (2002) Monetary and Fiscal Policy Interactions in a Microfunded Model of a Monetary Union. (CEPR Discussion Paper No. 3591).
- Benhabib, Jess, Stephanie Schmitt-Grohe, and Marin Uribe (1999) Monetary Policy and Multiple Equilibria. Rutgers University, Department of Economics. (Working Paper).
- Benhabib, Jess, Stephanie Schmitt-Grohe, and Marin Uribe (2001) The Perils of Taylor Rules. *Journal of Economic Theory* 96, 40–69.
- Benigno, P. and M. Woodford (2003) Optimal Monetary and Fiscal Policy: A Linear-quadratic Approach. (NBER Working Paper No. 9905).

- Bergin, P. (2000) Fiscal Solvency and Price Level Determination in a Monetary Union. *Journal of Monetary Economics* 45: 1, 37–55.
- Blanchard, O. (2004) Fiscal Dominance and Inflation Targeting: Lessons from Brazil. (NBER Working Paper No 10389).
- Boothe, P. and B. Reid (1989) Assets Returns and Government Budgets in a Small Open Economy. *Journal of Monetary Economics* 23:1, 65–77.
- Buiter, W. (1997) Neutrality, Price Level Indeterminacy, Interest Rate Pegs, and Fiscal Theories of the Price Level. (Mimeographed).
- Buti, M., W. Roeger and J. in't Veld (2002) Monetary and Fiscal Policy Interactions under a Stability pact. In Marco Buti, Jurgen von Hagen and Carlos Martinez-Mongay (eds.) *The Behavior of Fiscal Authorities*. Palgrave.
- Calvo, G. and P. Guidotti (1992) Optimal Maturity of Nominal Government Debt: An Infinite-horizon Model. *International Economic Review* 33:4, 895–919.
- Calvo, G. and P. Guidotti (1993) Management of Nominal Public Debt: Theory and Applications. In H. Verbon and F. van Winden (eds) *The Political Economy of Government Debt*. Amsterdam: Elsevier Science Publishers, pp. 207–32.
- Canzoneri, M. and B. Diba (1998) Fiscal Constraints on Central Bank Independence and Price Stability. In J. Malo de Molina, J. Vinals and F. Gutierrez (eds.) *Monetary Policy and Inflation in Spain*. MacMillan.
- Canzoneri, M. R. Cumby and B. Diba (1997a) Fiscal Discipline and Exchange Rate Regimes. (Mimeographed).
- Canzoneri, M. R. Cumby and B. Diba (1997b) Does Monetary or Fiscal Policy Provide a Nominal Anchor? Evidence from the OECD Countries. (Mimeographed).
- Canzoneri, M. R. Cumby and B. Diba (2001) Is the Price Level Determined by the Needs of Fiscal Solvency? *American Economic Review* 91:5, 1221–38.
- Canzoneri, M. R. Cumby and B. Diba (2002) Should the European Central Bank and the Federal Reserve be Concerned about Fiscal Policy? (Mimeographed).
- Caramazza, F. (1993) French-German Interest Rate Differentials and Time-varying Realignment Risk. *International Monetary Fund* 40, September, pp. 567–83. (IMF Staff Papers.)
- Cashin, P.N. Hauque and N. Olekalns (2003) Tax Smoothing Tax tilting and Fiscal Sustainability in Pakistan. *Economic Modeling* 20.
- Chari, V. V., L. J. Christiano and P. J. Kehoe (1991) Optimal Fiscal and Monetary Policy: Some Recent Results. *Journal of Money Credit and Banking* 23, 519–39.
- Christiano, L. and T. Fitzgerald (2000) Understanding the Fiscal Theory of the Price Level. (NBER Working Paper No. 7668).
- Cochrane, J. (1998) A Frictionless View of US Inflation. In B. Bernake and J. Rotemberg (eds.) *NBER Macroeconomics Annual* 323–84.
- Cochrane, J. (1999) Long Term Debt and Optimal Policy in the Fiscal Theory of the Price Level. *Econometrica* 69:1, 69–116.
- Correia, I., JP Nicolini and P. Teles (2003) Optimal Fiscal and Monetary Policy. (Banco de Portugal Working Paper 3–03).
- Daniel, Betty C. (2001) The Fiscal Theory of the Price Level in an Open Economy. *Journal of Monetary Economics* 48, 293–308.
- Debelle, G. and S. Fischer (1994) How Independent should a Central Bank be? In *Goals, Guidelines, and Constraints Facing Monetary Policy-makers*. Federal Reserve Bank of Boston. (Conference Series No. 38).

- Dixit, A. and L. Lambertini (2001) Monetary-fiscal Policy Interactions and Commitment versus Discretion in a Monetary Union. *European Economic Review* 45, 977–87.
- Dupor, B. (1997) Exchange Rates and the Fiscal Theory of the Price Level. (Mimeographed).
- Dupor, Bill (2000) Exchange Rates and the Fiscal Theory of the Price Level. *Journal of Monetary Economics* 45, 613–30.
- Fair, R. (1994) Is Monetary Policy Becoming Less Effective? Cowles Foundation. (Discussion Paper No. 1071).
- Favero and F. Giavazzi (2004) Inflation Targets and Debt: Lessons from Brazil. (NBER Working Paper No. 10390).
- Favero, C. (2002) How do European Monetary and Fiscal Authorities Behave? (IGIER Working Paper Series No. 214).
- Favero, C. and T. Monacelli (2003) Monetary-Fiscal mix and Inflation Performance: Evidence from the U.S. (IGIER Working Paper Series No. 234).
- Fialho, Marcelo Ladeira, and Marcelo Savino Portugal (2005) Monetary and Fiscal Policy Interactions in Brazil: An Application of the Fiscal Theory of the Price Level. Photocopy, available at: www.test.aup.edu/lacea2005/system/step2_php/papers/portugal_msp.pdf
- Hamilton, J. and M. Flavin (1986) On the Limitation of Government Borrowing: A Framework for Empirical Testing. *American Economic Review* 76, 808–819.
- Hebbel (eds.) *Monetary Policy: Rules and Transmission Mechanisms*. Central Bank of Chile.
- Hussain, M. (1982) The Relative Effectiveness of Monetary and Fiscal Policy: An Econometric Case Study of Pakistan. *Pakistan Economic and Social Review* 20, 159–181.
- Leeper and David Troy (2006) Endogenous Monetary Policy Regime Change. (CAEPR Working Paper No. 2006–02.)
- Leeper, E. (1991) Equilibria under Active and Passive Monetary Policies. *Journal of Monetary Economics* 27, 129–47.
- Loayza, N. and K. Schmidt-Hebbel (2002) *Monetary Policy: Rules and Transmission Mechanisms*. Central Bank of Chile.
- Loyo, E. (2000) Tight Money Paradox on the Loose: A Fiscalist Hyperinflation. (Mimeographed).
- Lucas, RE Jr. and NL Stokey (1983) Optimal Fiscal and Monetary Policy in an Economy without Capital. *Journal of Monetary Economics* 12, 55–93.
- Masood, K. and E. Ahmed (1980) The Relative Importance of Autonomous Expenditures and Money Supply in Explaining the Variation in Induced Expenditures in the Context of Pakistan. *Pakistan Economic and Social Review* 18, 84–99.
- Melitz, J. (2002) Debt, Deficits and the Behaviour of Monetary and Fiscal Authorities. In Marco Buti, Jürgen von Hagen and Carlos Martinez-Mongay *The Behaviour of Fiscal Authorities—Stabilisation, Growth and Institutions*. Palgrave, pp. 215–40.
- Melitz, J. (1997) Some Cross-country Evidence about Debt, Deficits and the Behaviour of Monetary and Fiscal Authorities. (CEPR Discussion Paper No. 1653).
- Min, H. G. (1998) Determinants of Emerging Market Bond Spread: Do Economic Fundamentals Matter? (World Bank Policy Research Paper No. 1899).
- Minella, A., P. Springer de Freitas, I Goldfajn and MK Muinhos (2003) Inflation targeting in Brazil: Constructing Credibility under Exchange Rate Volatility. Central Bank of Brazil. (Working Paper No. 77).

- Sala, L. (2003) Testing the Fiscal Theory of the Price Level. (Mimeographed).
- Saqib and Yasmin (1987) Some Econometrics Evidence in the Relative Importance of the Monetary and Fiscal Policy. *The Pakistan Development Review* 26: 4.
- Sargent, T. and N. Wallace (1981) Some Unpleasant Monetarist Arithmetic. *Federal Reserve Bank of Minneapolis Quarterly Review* Fall, 1–17.
- Schmidt-Hebbel, K. and A. Werner (2002) Inflation Targeting in Brazil, Chile, and Mexico: Performance, Credibility, and the Exchange Rate. Central Bank of Chile (Working Paper No. 171).
- Schmitt-Grohe, S. and M Uribe (2003c) Optimal Simple and Implementable Monetary and Fiscal Rules. (Mimeographed).
- Schmitt-Grohe, S. and M. Uribe (2003a) Optimal Fiscal and Monetary Policy under Imperfect Competition. (NBER Working Paper No. 10149).
- Schmitt-Grohe, S. and M. Uribe (2000) Price Level Determinacy and Monetary Policy under a Balanced Budget Requirement. *Journal of Monetary Economics* 45:1, 211–246.
- Schmitt-Grohe, S. and M. Uribe (2004) Optimal Fiscal and Monetary Policy under Sticky Prices. *Journal of Economic Theory* 114:2, 198–230.
- Sims, C. (1995) Econometric Implications of the Government Budget Constraint. (Mimeographed).
- Sims, C. (1998) The Precarious Fiscal Foundations of EMU. (Mimeographed).
- Sims, C. (1994) A Simple Model for Study of the Price Level and the Interaction of Monetary and Fiscal Policy. *Economic Theory* 4, 381–99.
- Sims, C. (1997) Fiscal Foundations of Price Stability in Open Economies. (Mimeographed).
- Tanner, E. and A. Ramos (2002) Fiscal Sustainability and Monetary versus Fiscal Dominance: Evidence from Brazil, 1991–2000. (IMF Working Paper No 02/5). Published in *Applied Economics* 2003, 35, 859–73.
- Tufail, Saira (2008) Fiscal Policy Dynamics in Pakistan. MPhil Thesis submitted to Department of Economics, Quaid-i-Azam University, Islamabad.
- Von Hagen, J., AH Hallett and R Strauch (2002) Quality and Success of Budgetary Consolidations. In Marco Buti, Jürgen von Hagen and Carlos Martinez-Mongay *The Behavior of Fiscal Authorities—Stabilisation, Growth and Institutions*. Palgrave, pp. 17–38.
- Woodford, M. (1994) Monetary Policy and Price Level Determinacy in a Cash-in-Advance Economy. *Economic Theory* 4, 345–80.
- Woodford, M. (1995) Price Level Determinacy without Control of a Monetary Aggregate. *Carnegie Rochester Conference Series on Public Policy*, pp. 1–46.
- Woodford, M. (1996) Control of the Public Debt: A Requirement for Price Stability? (NBER Working Paper No. 5684).
- Woodford, M. (1998) Doing without Money: Controlling Inflation in a Post-monetary World. *Review of Economic Dynamics* 1, 173–219.
- Woodford, M. (2000) Fiscal Requirements for Price Stability. *Journal of Money Credit and Banking*.
- Wyplosz, C. (1999) Economic Policy Coordination in EMU: Strategies and Institutions. <http://heiwww.unige.ch/~wyplosz/>.
- Zoli, E. (2004) Credit Rationing in Emerging Economies' Access to Global Capital Markets. (IMF Working Paper No 04/70).