A macroeconometric framework for monetary policy evaluation: A case study of Pakistan ☆

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ABSTRACT

This paper attempts to establish the quantitative importance of the various channels of monetary transmission by constructing, estimating and simulating a small macroeconometric model of Pakistan's monetary sector, while using data from the monetary statistics and the monetary survey of the State Bank of Pakistan over 1976–2007. The paper elucidates that the key feature of the study of monetary policy in Pakistan has been preoccupied with neglect either of the demand or the supply function of money and shows how this may lead to imprecise policy actions and mistaken conclusions. Accordingly, we delineate the transmission mechanism of monetary policy by taking into consideration all structural money demand and money supply linkages along with the historically implied identifying assumption in the framework of a marginalized macroeconometric model. The within-sample and out-of-sample evaluations of the model are found satisfactory. The paper presents results of three policy simulations from the estimated model that highlight the impact of alternative monetary policy instruments on the monetary variables under a rule-based and a discretionary policy environment. We find that (i) the SBP subscribes to an unannounced monetary policy rule, (ii) the determination of the policy rate under the announced rule environment stabilizes the monetary sector in that convergence to full equilibrium is smooth and rapid, (iii) a 100 bps reduction in the discount rate, ceteris paribus, decreases money supply by 4.97%, and (iv) the long term implication of reducing (increasing) the reserve requirement ratio on time (demand) deposits, ceteris paribus, is only higher inflation. Finally, we establish that a 100 bps increase in interest rate increases money supply by 3.14% in full equilibrium.

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1. Introduction

Pakistan economy has recently experienced a steady fall in GDP growth, a deterioration in its current account balance and balance of payments, a fall in the currency exchange rate, a rise in the fiscal deficit, an unprecedented rise in inflation, a rise in the profits of the banking firms underscored by a sizeable divergence between the lending and borrowing rates and a fall in the stock of foreign exchange reserves (State Bank of Pakistan, 2007a, 2008a; Government of Pakistan, 2008). The State Bank of Pakistan (henceforth referred as SBP) has responded to these macroeconomic imbalances with a

steady increase in the policy interest rates, an increase (decrease) in the reserve requirements against time (demand) deposits and an overall increase in the statutory reserve requirements. In addition, SBP has also endeavored to place constraints on public sector borrowing for budgetary support.

Is this the correct policy response? In fact, and as we show in this paper, these policies have only intensified macroeconomic pressures and inflation has sharply increased over the period 2007–2009.[2] While many researchers, and especially those at the SBP, believe that monetary policy has no role in generating these outcomes (see State Bank of Pakistan, 2007b,c, 2008b), the role of SBP in not delivering upon its fundamental promise of keeping inflation low and stable cannot be disregarded. Given SBP's commitment to maintaining low and stable inflation (State Bank of Pakistan, 2008b), we identify that it is the incorrect belief of the SBP about the interest elasticity of

[2] The State Bank of Pakistan reversed these policies at the end of 2009 (specifically the required reserve ratios for time and demand deposits) which have led to a reduction in the rate of inflation from 17.2% in 2008 and 21% in 2009 to about 13% in 2010. This also supports our contention (see Section 4.2.2 for more details).

money supply[3] that inhibits SBP to know the exact effects of its actions on monetary equilibrium. This wrong belief, we conjecture, stems from the absence of the correct identifying assumption about monetary policy[4] and from the absence of use of a detailed macroeconometric model that spells out the transmission mechanism of monetary policy.

The SBP reckons that it is targeting nominal money supply growth using interest rates as the key policy instrument (State Bank of Pakistan, 2008b). However, regardless of the corroborated significance of the credit channel in monetary transmission (State Bank of Pakistan, 2001, 2008b; Agha et al., 2005), or the endogeneity of money supply (Ahmad and Ahmed, 2006; Omer and Saqib, 2008), the SBP continues to remain ignorant of the effect of interest rates on the supply of money. The SBP predominantly relies on planned rates of growth of net credits to public and private sectors (while ignoring their interdependence, or their dependence on the interest rates and the level of economic activity) along with only an estimated money demand equation to derive its target rate of growth of the money supply (State Bank of Pakistan, 2008b). This approach not only happens to be quite naïve, but inevitably implies the incorrect identification of monetary policy. The ignorance of the understanding as to what drives monetary policy coupled with the lack of use of a detailed macroeconometric model thus makes monetary policy stand in a state of chaos.

Accordingly, we set the objective of this paper to establish the quantitative importance of the various channels of monetary transmission in Pakistan by estimating and simulating a small macroeconometric model of Pakistan's monetary sector, while explicitly incorporating an identifying assumption for monetary policy. The model seeks to determine the short term rate of interest as an equilibrium process generated through the interaction of money demand and money supply. It also establishes a precise estimate of the interest elasticity of money supply.

The rest of the paper is organized as follows: Section 2 provides a brief review of the theoretical issues in the study of monetary policy and evaluates the study of monetary policy in Pakistan. In Section 3, we discuss our methodology and model specification. This is followed by results of estimation and simulation exercises in Section 4. The paper concludes with a discussion of the results and policy implications in Section 5.

2. Literature review

2.1. Issues in the study of monetary policy

The central questions in the literature on the empirical analysis of monetary policy revolve around the sorting out of monetary policy actions from monetary policy shocks.[5] This identification problem of

monetary policy is vital because, in practice, economic realizations are contemporaneous with policy actions. In Mankiw's words:

> "Since central banks do not conduct controlled experiments in practice, we cannot observe what might happen to the economy after these actions have been taken and see their effects. In practice we only observe the equilibrium outcome of central bank actions and real economic activity on monetary variables. The study of monetary policy thus deals with the difficult task of sorting out the effects of central bank actions from the causes of those actions" (Mankiw, 1999).

Monetary economists have tried to solve this problem in two ways. One is to take a narrative approach to monetary history. This approach dates back at least to Friedman and Schwartz's classic study, which attempts to outline the causes and effects of monetary changes over a century for the United States while emphasizing historical and institutional factors (see Friedman and Schwartz, 1963). More recently, Romer and Romer (1989, 1994) have extended this narrative approach. The fundamental claim this approach makes is that by combining narrative information about monetary policy decisions with modern statistics, the direction of causation between monetary factors and real developments can be identified.

A second way of trying to disentangle the causes and effects of monetary policy is to take the econometric approach. That is, rather than relying on a careful reading of history, one can study the effects of monetary policy by applying time-series analysis to macroeconomic data. To make this approach work, some identifying assumption is necessary to sort out cause and effect. One might assume, for instance, that changes in short-term interest rates not explicable by other macroeconomic variables reflect changes in the preferences of the central bank towards inflation.[6] One drawback of this econometric approach is that it relies on identifying assumptions that are usually open to dispute.[7] On the other hand, compared to the narrative approach, the econometric approach asks for less subjective judgment on the part of the researcher, which increases the verifiability of the results and reduces the possibility of involuntary bias. Moreover, as Hoover and Perez (1994a,b) and Leeper (1997) show, the descriptive approach is no better than econometric approach towards understanding monetary policy in that the identification assumption has to be determined exogenously for both. While Romer and Romer (1997) attempt to re-establish the significance of their methodology, Christiano et al. (1996) show conclusively that the Romer's contention of considering every particularly big policy move as exogenous implies that the feedback component of monetary policy is zero. This in itself constitutes an identification assumption which has no justification at all.

The established dominance of the econometric approach over the narrative approach has subsequently led to the development of a wide range of models that are robust to Lucas' (1976) and Sims' (1980) criticisms (see McCallum, 2001; Gali and Gertler, 2007 and Sims, 2007 for a review of this literature). These models impose structure on macroeconomic data either through explicitly incorporating expectations and identification assumptions or through dynamic optimization based microfoundations. However, the entirety of this literature studies monetary policy without explicitly incorporating money or

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[3] The SBP recently increased its policy rate by 200 bps with a view to creating liquidity of about 39.5 billion in the money market. This implies that the SBP believes the (semi) interest elasticity of money supply to be $(1/M).(\Delta M/\Delta i) = 0.4211$ (see Interim Monetary Policy Measures 2008, www.sbp.org.pk). However, this result is not based on any macroeconometric model and only shows the initial balance sheet effect of the policy.

[4] Identifying assumptions are a set of econometric conditions imposed on data to sort out the exogenous shifts in policy from the endogenous changes in policy instruments (see e.g. Christiano et al., 1996; Zha, 1997; Höoppner, 2000). Once such a rule is in place, exogenous monetary policy shifts can easily be sorted out from endogenous changes taking place in the monetary environment and the dynamic effects of monetary policy may be studied. The ultimate test whether an identifying assumption is correct or contrariwise is its usefulness in predicting the historical path of endogenous variables.

[5] Christiano et al. (1996) define monetary policy *actions* as induced changes in money supply (the response of monetary variables to changing economic conditions) and monetary policy *shocks* as the response of monetary authorities to changes in economic conditions (exogenous policy shifts). Zha (1997) uses the simple principles of demand and supply for any commodity to demonstrate this *identification* problem of monetary policy. These definitions imply that monetary policy identification may be regarded as a method that decomposes total change in money supply into these two components so that unanticipated monetary policy changes are synchronous with *shocks*. The easiest way of doing so is to specify the behavior of the central bank in terms of a monetary policy reaction function. Deviations of the actual path of the policy variable from this reaction function would be monetary policy *shocks*. See also; Sims (1992), Bernanke and Blinder (1992), Leeper et al. (1996), Bernanke and Mihov (1998), Höoppner (2000), etc. for more details.

[6] Identifying assumptions may range from Friedman's constant monetary growth rule to inflation targeting to fiscal theory of price level to Taylor's rule to Calvo's Principle etc. The purpose an identifying assumption serves is the recognition of the behavioral rule the central bank sticks to for conducting monetary policy.

[7] Bernanke and Mihov (1998) discuss this dispute regarding the choice of appropriate identification assumption for studying US monetary policy. However, Sims (2007) and Gali and Gertler (2007) document the fact that virtually all monetary policy models have verified that monetary policy can best be identified as an interest rate setting rule. We corroborate the same for Pakistan economy too in Section 4 below.