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Monetary policy shocks: Testing identification conditions under time-varying conditional volatility[☆]

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Abstract

We propose an empirical procedure, which exploits the conditional heteroscedasticity of fundamental disturbances, to test the targeting and orthogonality restrictions imposed in the recent VAR literature to identify monetary policy shocks. Based on U.S. monthly data for the post-1982 period, we reject the non-borrowed-reserve and interest-rate targeting procedures. In contrast, we present evidence supporting targeting procedures implying more than one policy variable. We also always reject the orthogonality conditions between policy shocks and macroeconomic variables. We show that using invalid restrictions often produces misleading policy measures and dynamic responses. These results have important implications for the measurement of policy shocks and their temporal effects as well as for the estimation of the monetary authority's reaction function. © 2004 Elsevier B.V. All rights reserved.

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1. Introduction

There has been in recent years a considerable interest in the identification of monetary policy shocks and measurement of their effects on the economy.¹ An important strand of literature uses vector autoregressions (VAR) to generate various data-based measures of policy shocks. These shocks are typically identified by imposing targeting and orthogonality restrictions. The targeting restrictions define the monetary policy indicator, while the orthogonality conditions imply that the policy shocks have no current effects on macroeconomic variables such as output and price indices. Unfortunately, it is impossible to formally verify the validity of these identifying restrictions by performing joint statistical tests. Rather, the selection of the restrictions relies on prior beliefs about the Federal Reserve operating procedures and about the signs, shapes, and persistence of certain dynamic responses to policy shocks. Thus, this approach entails a certain amount of subjectivity.

This paper proposes a procedure which permits for the first time formal testing of the identifying conditions assumed in the VAR-based literature. For this purpose, we use a flexible structural VAR (SVAR) that displays three important features. First, unlike previous studies, it relaxes the assumption that the fundamental disturbances are conditionally homoscedastic. Importantly, accounting for time-varying conditional volatilities leads to the overidentification of the SVAR (e.g. Sentana, 1992; King et al., 1994; Sentana and Fiorentini, 2001; Normandin, 2004). Hence, the restrictions typically imposed in earlier work to identify monetary policy shocks become individually and jointly testable.

Second, our SVAR incorporates a standard model of the market for bank reserves (e.g. Brunner, 1994; Gordon and Leeper, 1994; Bernanke and Mihov, 1998). This model nests the most popular monetary policy indicators. This allows us to test the indicators related to interest-rate targeting (e.g. Bernanke and Blinder, 1992; Sims, 1992), non-borrowed-reserve targeting (e.g. Eichenbaum, 1992; Christiano and Eichenbaum, 1992), borrowed-reserve targeting (e.g. Cosimano and Sheehan, 1994), adjusted non-borrowed-reserve targeting (e.g. Strongin, 1995), and mixed interest-rate and reserve targeting (e.g. Bernanke and Mihov, 1998).

Third, our SVAR admits current interactions between the monetary policy variables and macroeconomic aggregates such as output and prices. This allows us to test the orthogonality conditions. To do so, we verify whether the policy variables directly affect current output and prices. Moreover, we check whether the policy variables indirectly affect contemporaneous output and prices through their current impacts on other non-policy variables.

We estimate our SVAR using U.S. monthly data for the post-1982 period. The estimates reveal that all, but one, structural innovations display time-varying conditional variances. In particular, the policy shocks exhibit pronounced volatilities for the 1984:05–1985:02 and 1988:04–1991:03 periods. Interestingly, the first episode coincides almost exactly with the Continental Illinois incident, where the Fed has

¹See Pagan and Robertson (1995), Bernanke and Mihov (1998), Christiano et al. (1999) and the references therein.

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