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# Monetary policy shocks and financial conditions: A Monte Carlo experiment☆

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A B S T R A C T

The effects of monetary policy shocks on financial conditions are often estimated by appealing to recursive Vector AutoRegressions (VARs). We assess the ability of this class of VARs to recover the true effects of a monetary policy shock via a Monte Carlo experiment in which the Data Generating Process is a Dynamic Stochastic General Equilibrium (DSGE) model featuring macro-finance interactions and estimated with U.S. quarterly data. Our DSGE model predicts a negative and significant reaction of financial conditions to an unexpected monetary policy tightening. We point out that such reaction is just overlooked by recursive VARs. Moreover, we show that Cholesky-VARs may substantially underestimate the welfare costs due to macroeconomic fluctuations.



## 1. Introduction

The recent financial crisis has re-boosted the discussion on how central banks should deal with financial markets' swings. Critically, this depends on the ability to influence financial markets by monetary policy makers. The impact of monetary policy shocks on financial markets has often been assessed with the use of Vector AutoRegressions (VARs).[1] Typically, monetary policy shocks have been

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[1] A non-exhaustive list includes Lee (1992), Thorbecke (1997), Patelis (1997), Millard and Wells (2003), and Neri (2004).

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identified by appealing to 'recursive VARs'. In short, a Cholesky decomposition of the variance–covariance matrix of the residuals is performed in VARs in which the policy rate is ordered after 'slow moving variables', which react to monetary policy shocks with a one-period delay. This assumption is handy, in that it does not force the researcher to identify other shocks than the monetary policy shock (Christiano et al., 1999). However, a Cholesky-based identification of the monetary policy shock does not line up with conventional wisdom, which suggests an immediate reaction of asset prices to a monetary policy shock (see Bjørnland and Leitemo, 2008 and the references therein for discussions).

This paper asks the following question:

> *Suppose a DSGE model allowing for contemporaneous macro-finance interactions is the Data Generating Process of the economy. Is a Cholesky-VAR able to recover the true response of financial conditions to a monetary policy shock?*

We investigate this issue by proceeding in two steps. Firstly, we estimate a DSGE model featuring simultaneous interactions between the financial and real sides of the economy with U.S. data. We concentrate on the framework developed by Nisticò (2007), Airaudo et al. (2008), and Castelnuovo and Nisticò (2010), in which households' consumption decisions are taken conditional on a finite (in expected terms) financial planning horizon. Consequently, fluctuations in households' financial wealth influence individual and aggregate consumption and, therefore, aggregate demand.[2] Given that swings in financial conditions may affect the business cycle, monetary policy interventions to dampen fluctuations in the financial markets may very well occur. Our empirical model is flexible enough to allow (and test) for this scenario to occur. As empirical proxy for the U.S. financial conditions, we employ the Kansas City Financial Stress Index (KCFSI) recently developed by Hakkio and Keeton (2009). Such index is computed as the common factor of a variety of financial indexes continuously monitored by policymakers and financial analysts (we postpone the description of the KCFSI to the following section). To our knowledge, this is the first contribution employing a financial conditions index to estimate a structural DSGE model for the U.S. economy.

This first step is instrumental to the second one, in which we employ the estimated DSGE model as Data Generating Process (DGP) in our Monte Carlo exercise. Such exercise i) simulates artificial data, and ii) employs them to estimate impulse responses to a monetary policy shock identified with a Cholesky-VAR. We then contrast the (true) DSGE model-consistent impulse response functions with those produced with Cholesky-VARs. This comparison allows us to assess to what extent the imposition of the (wrong) Cholesky timing is problematic.

We find evidence in favor of structural macro-finance interactions in our DSGE model.[3] Consistently, conditional on our estimated DSGE model, impulse responses to a monetary policy shock put in evidence the existence of strong macro-finance interactions in the U.S. economy. However, our Monte Carlo exercises reveal that such interactions are in fact overlooked by Cholesky-VARs, which substantially underestimate the reaction of financial conditions to a monetary policy shock. This is due to the imposition of (wrong) zero restrictions on the matrix regulating the contemporaneous relationships among the modeled variables, which force all variables ordered before the policy rate to react with a lag. This timing is inconsistent with our DSGE model, which in our Monte Carlo experiment is the DGP. As a consequence, the Cholesky-VAR monetary policy 'shock' is, in fact, a linear combination of the structural shocks modeled with our DSGE model. These structural shocks exert (partly) offsetting effects on financial conditions. Hence, their combination leads to a milder reaction of financial conditions than the one actually realizing in reaction to the structural monetary policy shock only.

To summarize, a muted reaction of financial conditions to a monetary policy shock identified with a Cholesky-VAR is consistent with a 'significant' impact of monetary policy shocks on financial

[2] Nisticò (2007, 2011) analyzes optimal monetary policy with a calibrated purely forward looking version of the model we employ in our investigation. Airaudo et al. (2008) deal with the issue of equilibrium uniqueness and stability under learning with the setup proposed by Nisticò (2007).

[3] This result, obtained with the KCFSI as observable variable in the estimation, corroborates the findings in Castelnuovo and Nisticò (2010), who work with the S&P500 index. The empirical support for an active financial wealth effect is relevant in light of the policy prescriptions conditional on an active financial wealth effect recently proposed by Nisticò (2007), Airaudo et al. (2008), and Nisticò (2011).