



# Does money matter for the identification of monetary policy shocks: A DSGE perspective

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## ABSTRACT

This paper investigates how the identification assumptions of monetary policy shocks modify the inference in a standard DSGE model. Considering SVAR models in which either the interest rate is predetermined for money or money and the interest rate are simultaneously determined, two DSGE models are estimated by minimum distance estimation. The estimation results reveal that real balance effects are necessary to replicate the high persistence implied by the simultaneity assumption. In addition, the estimated monetary policy rule is sensitive to the identification scheme. This suggests that the way money is introduced in the identification scheme is not neutral for the estimation of DSGE models.

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## 1. Introduction

Recent years have seen the withdrawal of monetary aggregates from discussions of the implementation of monetary policy. A part of the literature admits that money perfectly accommodates to variations in the interest rate—used as a policy instrument by central banks—and assumes that it does not affect the dynamics of output and inflation. From this perspective, Dynamic Stochastic General Equilibrium (DSGE) textbook models nowadays omit money from behavioral equations. The view that money is irrelevant to understanding business cycles has been supported by [Woodford \(2003\)](#) who argues that real balances do not govern consumption dynamics. [Ireland \(2004\)](#) and [Andrés et al. \(2006\)](#) confirm this prediction by estimating a New Keynesian DSGE model including money; they conclude that the real balances enter into neither the IS nor the Phillips Curve.<sup>1</sup> However, this idea is still debated; for instance [Favara and Giordani \(2009\)](#) show that Ireland's conclusions might be the result of failures in his theoretical model's restrictions. Drawing on a monetary Structural Vector Autoregressive (SVAR) model, these authors show that money demand shocks affect the dynamic behavior of output, prices and the interest rate.<sup>2</sup> Money's role in the pursuit of monetary policy is also discussed in the literature. For instance, [Woodford \(2008\)](#) argues that there is no valid argument in favor of the exploitation of the information delivered by monetary aggregates. [Dotsey and Hornstein \(2003\)](#) reach the same conclusion by focusing on the usefulness of money in a context of optimal monetary policy. However, [Christiano et al. \(2007\)](#) contest this view by

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<sup>1</sup> However, it should be noticed that [Andrés et al. \(2006\)](#) find that money enters significantly into the Taylor-type monetary policy rule, by estimating a DSGE model for the euro area.

<sup>2</sup> Other contributors to this debate include [Rudebush and Svensson \(2002\)](#) and [Nelson \(2002\)](#).

arguing that central banks should include money and credit indicators into their information set so as to anchoring inflation expectations. Another contribution is in [Leeper and Roush \(2003\)](#). Based on the estimation of a SVAR model, they show that the dynamic impacts of monetary policy shocks on inflation and output depend on how money interacts with the interest rate in the identification strategy of this shock.

This paper contributes to this literature by questioning the role of money in the transmission of monetary policy shocks. Following the contributions by [Rotemberg and Woodford \(1997, 1999\)](#) and [Christiano et al. \(2005\)](#), a DSGE model featuring nominal and real rigidities is estimated by relying on the Minimum Distance Estimation (MDE) strategy that matches theoretical model-based impulse responses with those obtained from the SVAR model.<sup>3</sup> The identification strategy of the monetary policy shock is of particular interest in this analysis.

In the MDE-DSGE literature, most papers resort to the *recursive identification strategy*—namely the Cholesky decomposition—to identify monetary policy shocks. This implies that certain private sector variables are predetermined with respect to the monetary policy shock whereas some informative variables are assumed to respond immediately after the shock. In a purely empirical analysis, [Leeper and Roush \(2003\)](#) estimate a monetary SVAR model but they depart from this *recursive identification strategy* by identifying the monetary policy shock so that the interest rate and money are simultaneously determined. In other words, they freely estimate both the interest elasticities of supply and demand for money. Under this assumption, their key findings are a rise in both the degree of inertia exhibited by inflation and the magnitude of the responses of output and consumption to the monetary policy shock. In addition, standard overidentifying restriction tests suggest that the data favor the simultaneity specification between the interest rate and money rather than the Cholesky-type decomposition. Thus, the omission of this simultaneity in the identification strategy might result in a misspecification of the SVAR model.

In the light of these findings, one may legitimately wonder how the inferences about a DSGE model, estimated by MDE, are changed once one resorts the *non-recursive identification strategy* proposed by [Leeper and Roush \(2003\)](#), instead of the standard Cholesky decomposition, implemented in the CEE-based model.<sup>4</sup> This is the question under study in this paper. Precisely, I address two specific issues: (i) Can the CEE-based model replicate the increased amount of persistence in inflation, without relying on unreasonable degrees of nominal rigidity? (ii) Is money's role in the transmission channels of monetary policy shocks is modified by the assumptions made regarding simultaneity between the interest rate and money.

To answer these questions, I proceed in two steps. First, two SVAR models are considered which differ in the restrictions imposed to identify the monetary policy shock. In a first specification, I assume that all the macroeconomic variables are predetermined for the interest rate, except money growth, which roughly corresponds to the Cholesky decomposition. In a second specification, I follow [Leeper and Roush \(2003\)](#) by assuming that money growth and the interest rate are simultaneously determined, which is to say that the interest elasticities of supply and demand for money are unconstrained. These quarterly SVAR models are estimated on a set of U.S. variables over the sample 1959Q2–2006Q4. Second, by using these two SVAR models, the structural parameters of a standard CEE-based model are estimated by MDE. In other words, the model's parameters are estimated so as to minimize the distance between the model-based and the SVAR-based impulse response functions.

The results emphasize that a standard DSGE model, which embodies reasonable degrees of rigidities, does a very good job to replicate the stronger persistence implied by the simultaneity assumption between the interest rate and money growth. In addition, the estimated monetary policy rule in the DSGE model is deeply changed by the identification scheme. Indeed, when the Cholesky decomposition is used, it corresponds to the standard Taylor rule in which the central bank does not pay explicit attention to money to implement its policy. However, as soon as the simultaneity assumption is made, the interest elasticity to money supply in the monetary policy rule is high and significant. This paper also shows that the real balance effect is an important monetary transmission channel under the simultaneity assumption. Indeed, allowing for unconstrained elasticities of money supply and money demand makes money highly sensitive to monetary policy shocks. This affects thereby output and inflation dynamics through the standard Euler equation and New Phillips Curve. Finally, the taste parameters and the degrees of nominal rigidities are not strongly changed by the identification scheme. Consequently, I show that the way money is inserted in the identification scheme is not neutral on the inference about DSGE models when we are interested in the transmission of monetary policy shocks.

The remainder is organized as follow. Section 2 expounds the SVAR models. Section 3 presents the theoretical model. Section 4 introduces theoretical mechanisms through which money influences the transmission of monetary policy shocks on business cycle. Section 5 presents the estimation strategy. Section 6 discusses the estimation results. The last section briefly concludes.

## 2. Money in a SVAR model

Two empirical SVAR models are estimated by identifying monetary policy shocks with a non-recursive identification strategy. I compare two identification schemes, based on the simultaneity (or otherwise) between the interest rate and the money growth, in order to see whether the monetary aggregate provides information useful to identify monetary policy shocks. Firstly, I introduce the estimation method and secondly, I describe the identification strategy and the results.

<sup>3</sup> A non-exhaustive list of contributions using the MDE strategy includes [Amato and Laubach \(2003\)](#), [Trigari \(2009\)](#), [Altig et al. \(forthcoming\)](#), [Boivin and Giannoni \(2006\)](#), [Hülsewig et al. \(2006\)](#), [Meier and Müller \(2006\)](#), [DiCecio and Nelson \(2007\)](#), and [Carrillo et al. \(2007\)](#).

<sup>4</sup> By CEE-based model, I mean the fully fledged model proposed by [Christiano et al. \(2005\)](#). This framework has become a benchmark in the literature when it comes to understanding the effects of monetary policy shocks. It features a set of frictions, namely habit formation, nominal rigidities on prices and wages, investment adjustment costs and variable capital utilization in order to reproduce the persistence properties of key macroeconomic variables.

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