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Identifying the interdependence between US monetary policy and the stock market[☆]

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ABSTRACT

We estimate the interdependence between US monetary policy and the S&P 500 using structural vector autoregressive (VAR) methodology. A solution is proposed to the simultaneity problem of identifying monetary and stock price shocks by using a combination of short-run and long-run restrictions that maintains the qualitative properties of a monetary policy shock found in the established literature [Christiano, L.J., Eichenbaum, M., Evans, C.L., 1999. Monetary policy shocks: what have we learned and to what end? In: Taylor, J.B., Woodford, M. (Eds.), *Handbook of Macroeconomics*, vol. 1A. Elsevier, New York, pp. 65–148]. We find great interdependence between the interest rate setting and real stock prices. Real stock prices immediately fall by seven to nine percent due to a monetary policy shock that raises the federal funds rate by 100 basis points. A stock price shock increasing real stock prices by one percent leads to an increase in the interest rate of close to 4 basis points.

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1. Introduction

It is commonly accepted that monetary policy influences private-sector decision making. If prices are not fully flexible in the short run, as assumed by the New Keynesian theory framework, the central bank can temporarily influence the real interest rate and therefore have an effect on real output in addition to nominal prices. It is commonly believed that central banks have clear objectives for exerting control over real interest rates, including low and stable inflation and production close to the natural rate. In order to best fulfill these objectives, the central bank must monitor, respond to and influence private-sector decisions appropriately. Thus, the central bank and private sector mutually affect each other, leading to considerable interdependence between the two sectors. In the financial markets, where information is readily available and

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prices are sensitive to agents' expectations about the future, this interdependence should largely be simultaneous. Allowing for simultaneity between monetary policy and financial markets is therefore likely to be both quantitatively and qualitatively important when measuring the degree of interdependence. The aim of this paper is to explore just how important this link is.

Analyses of the effects of monetary policy have to a large extent been addressed in terms of vector autoregressive (VAR) models, initiated by Sims (1980). Yet, studies that use VAR models to identify interdependence have found little interaction between monetary policy and asset prices, see for instance Lee (1992), Thorbecke (1997) and Neri (2004) among others. Furthermore, the effect of a monetary policy shock on real stock prices is often counterintuitive and may imply permanent effects on stock returns, which is clearly unrealistic. However, these conventional VAR studies have *not allowed* for simultaneous interdependence, as the structural shocks have been recovered using recursive, short-run restrictions on the interaction between monetary policy and asset prices. Their implausible results provide a strong motivation for moving to an alternative specification.

In this study we analyze the interaction between asset prices and monetary policy in the US, represented by the S&P 500 and the federal funds rate, respectively, using a VAR model that takes full account of the potential simultaneity of interdependence. We solve the simultaneity problem by imposing a combination of short-run and long-run restrictions on the multipliers of the shocks, leaving the contemporaneous relationship between the interest rate and real stock prices intact. Identification is instead achieved by assuming that monetary policy can have no long-run effect on real stock prices, which is a common long-run neutrality assumption. By using only one long-run restriction, the simultaneity problem is addressed without deviating too far from the established literature (i.e., Christiano et al., 1999, 2005) of identifying monetary policy shocks. Contrary to previous studies, we find *strong* interaction effects between the stock market and interest rate setting. Much of this interaction is found to be simultaneous. These results are achieved without considerably altering conventional views on how monetary policy affects macroeconomic variables, as previously found in the VAR literature.

Section 2 provides a brief survey of theoretical, methodological and empirical arguments related to the interaction between asset prices and monetary policy. Section 3 presents the identification scheme used in this VAR study to identify the interdependence between monetary policy and the stock market. Section 4 presents and discusses the empirical results, including issues pertaining to robustness. Section 5 concludes.

2. Monetary policy and stock price interaction: a short overview

Economic theory suggests several reasons why there should be interaction effects between monetary policy and asset prices, in particular, stock prices. Since stock prices are determined in a forward-looking manner, monetary policy, and in particular surprise policy moves, is likely to influence stock prices through the interest rate (discount) channel, and indirectly through its influence on the determinants of dividends and the stock return premium by influencing the degree of uncertainty faced by agents.

Asset prices may influence consumption through a wealth channel and investments through the Tobin Q effect and, moreover, increase a firm's ability to fund operations (credit channel). The monetary policymaker who manages aggregate demand in an effort to control inflation and output thus has incentives to monitor asset prices in general, and stock prices in particular, and use them as short-run indicators for the appropriate stance of monetary policy.¹ Therefore, there is likely to be considerable interdependence between stock price formation and monetary policymaking.² Empirical modelers should thus be open to the potential influence of asset prices on monetary policymaking.

2.1. Empirical evidence

Compared to the vast number of studies that analyze the influence of monetary policy actions on the macroeconomic environment, there are relatively few that attempt to model interactions between monetary policy and asset prices. Early attempts, like Geske and Roll (1983) and Kaul (1987), examine the causal chain between monetary policy and stock market returns separately (see Sellin (2001) for a comprehensive survey). More recently, empirical studies have tended to use a joint estimation scheme like the vector autoregressive approach, see e.g., Lee (1992), Patelis (1997), Thorbecke (1997), Millard and Wells (2003) and Neri (2004) among others. All of these studies find that monetary policy shocks account for only a small part of the variation in stock returns. However, stock prices tend to respond with a significant delay, which is difficult to understand from the perspective of financial market theory, which predicts

¹ See Vickers (2000) for an overview of the use of asset prices in monetary policy in inflation-targeting countries.

² The form of interaction is further complicated by issues of whether asset prices should be included in the central bank loss function (see e.g., Bernanke and Gertler, 1999 and Carlstrom and Fuerst, 2001), on how to use asset price information efficiently and whether assets prices convey information that is not available elsewhere (e.g., Faia and Monacelli, 2007), whether the credit channel is important (see Bernanke et al., 2000; Bernanke and Gertler, 1989) and whether asset prices include expectations-driven sunspot components that may influence target variables more than what is reflected by the fundamental part of the asset price (see e.g., Cecchetti et al., 2000; Bernanke and Gertler, 2001).

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