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Learning about the interdependence between the macroeconomy and the stock market☆

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ABSTRACT

How strong is the interdependence between the macroeconomy and the stock market?

This paper estimates a New Keynesian general equilibrium model, which is extended to include a wealth effect from asset price fluctuations to consumption, to assess the quantitative importance of interactions among the stock market, macroeconomic variables, and monetary policy.

The paper relaxes the assumption of rational expectations and assumes that economic agents learn over time and form near-rational expectations from their perceived model of the economy. The stock market, therefore, affects the economy through two channels: through a traditional "wealth effect" and through its impact on agents' expectations. Monetary policy decisions also affect and are potentially affected by the stock market.

The empirical results show that the direct wealth effect is modest, but asset price fluctuations have important effects on future output expectations. Through this expectational channel, shocks in the stock market can account for a large, but varying, portion of output fluctuations.

1. Introduction

How strong are the links between the macroeconomy and the stock market?

The New Keynesian models that are widely employed to characterize the joint dynamics of output, inflation, and monetary policy choices, have, for a long time, ignored the stock market altogether.[1]

It is well known, however, that asset prices can influence the economy through a variety of channels. Policy discussions emphasize, in particular, the impact that asset price fluctuations can have on consumption spending decisions: this is the so-called "wealth effect". Monetary policymakers may consider actively responding to asset prices if the wealth channel is sizable. But the size of the effect is still controversial: although most regressions that have been estimated in the literature show a positive and significant causal effect of wealth on consumption,[2] recent studies, which exploit cointegrating relationships or panel data sets, conclude that the effect is smaller than previously thought (Case, Quigley, & Shiller, 2005; Lettau & Ludvigson, 2004).[3]

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[1] Notable exceptions are models with a "financial accelerator", as in Bernanke, Gertler, and Gilchrist (1999). Interest in the stock market and financial variables has expectedly surged after the 2007–2008 Financial Crisis.

[2] Research goes back to Ando and Modigliani (1963), Poterba (2000) and Davis and Palumbo (2001) offer recent surveys.

[3] Additionally, asset prices can affect real activity through other channels, such as through a Tobin's Q effect on investment and through a balance sheet/credit channel effect. This paper will focus only on the wealth channel, while the Tobin's Q and balance sheet effects will be, instead, omitted from the analysis.

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Another central area of interdependence involves the link between asset prices and monetary policy decisions. Researchers have been interested in understanding both whether monetary policy responds to asset price fluctuations and how strongly the latter are affected by policy shocks (e.g., Bernanke & Kuttner, 2005; Bjørnland & Leitemo, 2009; Rigobon & Sack, 2003, 2004) or other macroeconomic fundamentals (e.g., Chen, Roll, & Ross, 1986).

This paper adopts a structural New Keynesian model, which will be estimated on U.S. data, to infer the strength of the interdependence among macroeconomic variables, monetary policy, and the stock market. The model, which is based on a Blanchard-Yaari overlapping generations framework, includes a wealth effect from asset prices to consumption, whose magnitude depends on the length of the households' planning horizon. Current output is affected by expectations of future output, real interest rates, and by current financial wealth, which is influenced by swings in stock prices. Current stock values depend on their own expected future values, on expectations about future real activity, and on the ex ante real interest rate.

In modeling the expectations formation, the paper relaxes the traditional informational assumptions imposed by rational expectations and it assumes that agents form subjective – near-rational – expectations and that they attempt to learn the model parameters over time.

Some critics of the conventional wealth channel effect have argued that changes in stock wealth mainly affect consumption through changes in expectations and consumer confidence, but no direct wealth effect exists.[4] This paper includes both effects: a direct wealth effect of asset prices on consumption and output, and an effect of asset prices on future expectations. The estimation tries to empirically disentangle the two effects.

The model is estimated using Bayesian methods on monthly U.S. data. The constant gain coefficient is jointly estimated with the structural parameters of the economy, so that the learning process can be extracted from the data, rather than arbitrarily imposed.

1.1. *Results*

The empirical evidence suggests a small direct wealth effect of stock prices on output. Fluctuations in the stock market, however, affect economic agents' expectations of future real activity. The effect has considerably varied over the sample: in the first half, economic agents believed changes in the stock market to have a strong effect on output, while they revised their beliefs downward in the second part of the sample.

Through such effect on expectations, therefore, the stock market plays an important role for macroeconomic variables. In the 1960s–1970s, a sizable proportion of fluctuations in the output gap were explained by shocks that originated in the stock market; the stock market also acted to amplify the transmission of monetary policy shocks. The importance of stock market shocks has, however, declined over the sample: in the 1990s–2000s, they typically accounted for less than 20% of the variability in output. Fluctuations in the stock price gap were mainly driven by its own innovations until the 1970s, but they have been increasingly affected by demand shocks afterwards. Monetary policy shocks account for at most 10% of fluctuations in the stock market and their effect has also changed over time.

The data show that the estimated response of monetary policy to the stock price gap has been positive if computed over the full sample. But monetary policy has reacted less to the stock market in the post-1984 sample. Moreover, post-1984 policy has responded to the stock market only to the extent that it affected output and inflation forecasts: when those forecasts are included in the policy rule, the estimated reaction to stock prices drops to zero.

1.2. *Related literature*

This paper aims to contribute to the literature on the interaction between the stock market and macroeconomic variables. Their linkages have interested researchers for a long time (e.g., Fischer & Merton, 1984, for a general discussion, Blanchard, 1981, for an early theoretical analysis), but empirical analyses in a general equilibrium setting have been rare. The paper's main objective, therefore, is to offer quantitative estimates about the role of such linkages using a theory-based general equilibrium model.

The paper is related to the studies that seek to estimate the wealth effect (e.g., Davis & Palumbo, 2001; Lettau & Ludvigson, 2004; Poterba, 2000), typically using single-equation regressions or error-correction models, and to those that analyze the interaction between asset prices and monetary policy from a positive or normative perspective (e.g., Bernanke & Gertler, 1999, 2001; Bjørnland & Leitemo, 2009; Cecchetti, Genberg, Lipsky, & Wadhwani, 2000; Gilchrist & Leahy, 2002; Rigobon & Sack, 2003, 2004). This paper provides estimates of the wealth effect in a structural model, which permits to control for general equilibrium effects, and it reveals a quantitative important channel through which asset prices affect the economy and that operates through expectations. The paper also adds to the evidence on the interrelationship between monetary policy and asset prices, by showing that both monetary policy has reacted to stock prices – but, after Volcker, not beyond their role as leading indicators – and that stock prices are affected by policy shocks, and that both responses have varied over time.

The paper is also related to the countless empirical studies that adopt the New Keynesian model, as it hints that the typical omission of stock market variables may represent an important misspecification of the model, to the empirical studies that replace rational expectations with adaptive learning (e.g., Adam, 2005; Milani, 2006, 2007, 2008; Orphanides & Williams, 2003), and to the

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[4] Examples are Hymans (1970), who argues that stock market wealth has small effects on consumption after accounting for changes in consumer confidence, Otoo (1999), who shows that the relation between stock prices and consumer confidence is counterfactually similar between stock owners and non-owners, and Jansen and Nahuis (2003), who find that the short-run impact of changes in the stock market depends on their effect on perceptions about future real activity, rather than personal finances, as would be expected under a traditional wealth channel.

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