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News shocks and asset price volatility in general equilibrium

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ABSTRACT

We study equity price volatility in general equilibrium with news shocks about future productivity and monetary policy. As West (1988) shows, in a partial equilibrium present discounted value model, news about the future cash flow reduces asset price volatility. We show that introducing news shocks in a canonical dynamic stochastic general equilibrium model may not reduce asset price volatility under plausible parameter assumptions. This is because, in general equilibrium, the asset cash flow itself may be affected by the introduction of news shocks. In addition, we show that neglecting to account for policy news shocks (e.g., policy announcements) can potentially bias empirical estimates of the impact of monetary policy shocks on asset prices.

1. Introduction

Cochrane (1994) and more recently Beaudry and Portier (2004) revived the idea that "news shocks" may be important sources of aggregate business cycle fluctuations. Cochrane (1994), in particular, noted that one reason why traditional demand and supply sources of business cycle fluctuations fared badly against the data was that economic agents may be subject to (and hence observe) shocks that are not observable to the macroeconomists or the econometricians. He then went on to conjecture that one such set of shocks may be represented by changes in expectations about the future realization of economic fundamentals (the so-called "news shocks").

While news shocks are attractive in principle, because they provide a clear and plausible example of disturbances unobservable to the econometricians but observable to the economic agents, in practice it has proven difficult to build models in which they fit the business cycles well. More recently, however, Beaudry and Portier (2004, 2007), Jaimovich and Rebelo (2009), and Schmitt-Grohé and Uribe (2008) set up dynamic stochastic general equilibrium (DSGE) models in which news shocks contribute significantly to explain aggregate fluctuations in the data.[1]

If news shocks can drive the business cycle, they should also be important for asset prices that are inherently forward looking variables. For instance, Beaudry and Portier (2006) and Gilchrist and Leahy (2002) study the interaction between asset prices and

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[1] Devereux and Engel (2006, 2009) study optimal monetary policy in the presence of news shocks in a two-country open economy model. Other recent studies include Christiano et al. (2008), who study the implications for the conduct of monetary policy of the presence of a disturbance about the future value of the fundamentals, and Fujiwara et al. (2008), who examine the role of news shocks in aggregate fluctuations for Japan and the United States.

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news shocks. Engel et al. (2008) also show that the main reason why fundamentals do not predict exchange rates is that currencies indeed depend heavily on expectations about the future value of the fundamentals as opposed to their current values as standard models suggest. But it is difficult to measure expectations about the future value of the fundamentals as they are not only a function of the present and the past, as it is often assumed in canonical models, but also of the future. Thus, it is useful to model the role of information about future fundamentals separately from information about current fundamentals.

Nonetheless, important theoretical results by West (1988) imply that conditioning on information sets that include also information about the future value of the fundamental should reduce the conditional variance of asset prices in present discounted value models (hereafter PVM) relative to an environment in which agents form expectations about the future conditioning only on current and past value of fundamentals.[2] Thus, one might conjecture that providing more information about future fundamentals in DSGE models (i.e., more information about the exogenous stochastic processes) would reduce asset price volatility. Since DSGE models typically generate less asset price volatility than in the data, incorporating news shocks should make their empirical performance even worse with respect to this dimension of the data.

This paper incorporates news shocks about technology and monetary policy in a canonical, closed-economy DSGE model and shows that the model's ability to generate asset price volatility is not necessarily undermined. More specifically, the paper's contribution is twofold. First, the paper studies the role of news shocks for asset price volatility in a PVM. After providing a general definition of "news", we show that the introduction of news shocks in such a partial equilibrium environment always induces a fall in asset price volatility relative to the same model without news shocks.[3] However, this does not necessarily imply that, with news shocks, asset price volatility has to be low relative to that of the fundamental. In particular, we show that if news shocks are positively correlated with current shocks (which we call correlated news shocks for brevity), then the data generating process for the fundamental is serially correlated.[4] As a result, asset price volatility can increase in a PVM relative to that of fundamentals with the magnitude of this correlation, holding the unconditional variance of the fundamental constant.

The fact that a persistent fundamental leads to a volatile asset price is well known in the literature.[5] The difference between a persistent fundamental process and a process with positively correlated news shocks is that, in the latter case, the asset price depends both on future and current as well as past values of fundamentals, whereas in the former it depends only on current and past values of fundamentals. This distinction is important because correlated news shocks may help to explain why standard asset price models tend to fare badly against the data, consistent with the insight of Cochrane (1994) and Engel et al. (2008).

Second and more importantly, we show that, in general equilibrium, introducing news about future productivity need not decrease asset price volatility relative to an environment without news shocks (in which agents can observe only current and past values of fundamentals).[6] That is, providing more information about the future value of the exogenous process may increase the conditional variance of asset prices significantly. The reason is that, in general equilibrium, the stochastic process for the endogenous fundamental (e.g., the cash flow of the asset) is no longer invariant to the information set. In contrast, a crucial assumption of West (1988) is that the stochastic process for the cash flow of the asset is invariant to the information set. For example, in a PVM, the dividend process would be the same regardless of whether agents receive news about future dividends or not. However, in general equilibrium, this may not be the case as alternative information assumptions can change the behavior of economic agents. For example, news shocks about future technology can change consumption and pricing behavior even though the exogenous stochastic process for technology is invariant to the introduction of news shocks. As a result, the profit of the firm and the dividend process can depend on whether agents receive the news about future productivity or not.

The DSGE model we set up is a simple production economy model with sticky prices. The model is simple enough to yield closed-form solutions for key variables and their conditional variances. The only model novelty is the introduction of both monetary and technology news shocks. While allowing for news shocks to aggregate technology in DGSE models is not controversial, considering monetary policy news shocks is more novel. We think about monetary policy news as the by-product of an active communication strategy aimed at guiding expectations about the future course of monetary policy, as we observe it in practice.[7] In this paper, we do not provide the rationale for an active monetary policy communication strategy, but we study its effect on asset price volatility.

While the DSGE model we set up is too simple to attempt matching asset price volatility in the data, a parameterized version of the model shows that the introduction of news shocks can indeed increase asset price volatility dramatically, measured as the conditional variance of the asset price. The model also illustrates clearly the transmission mechanism of news

[2] Throughout this paper, we evaluate asset price volatility using the conditional variance following West (1988).

[3] In this paper, the expression "without news" means that agents do not have information about the future fundamental, but the underlying stochastic process follows exactly the same process as "with news."

[4] It is therefore impossible for the econometrician, who does not observe news shocks, to distinguish between a model in which agents observe correlated news shocks and a model in which they observe a standard serially correlated process.

[5] See for instance Frenkel (1976) on the so-called "magnification effect" of a persistent money supply process on exchange rates volatility. More recently, interest rate smoothing has been used to explain high exchange rate volatility—e.g., Chari et al. (2002), Benigno (2004), Monacelli (2004), and Groen and Matsumoto (2004).

[6] We also call a model "partial equilibrium" when the cash flow process is exogenous, i.e., invariant to the information set as in West (1988), and "general equilibrium" when the dividend process is endogenous and affected by the information assumptions.

[7] See for instance Okina and Shiratsuka (2004), Woodford (2008), Laséen and Svensson (2009), and Blinder et al. (2009).