Monetary policy transmission in a model with animal spirits and house price booms and busts

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ABSTRACT

Can monetary policy trigger pronounced boom-bust cycles in house prices and create persistent business cycles? We address this question by building heuristics into an otherwise standard DSGE model. As a result, monetary policy sets off waves of optimism and pessimism ("animal spirits") that drive house prices, that, in turn, have strong repercussions on the business cycle. We compare our findings to a standard model with rational expectations by means of impulse responses. We suggest that a standard Taylor rule is not well-suited to maintain macroeconomic stability. Instead, an augmented rule that incorporates house prices is shown to be superior.

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1. Introduction

The recent boom-bust cycle in the U.S. housing market and its repercussions on financial and economic developments have ignited a debate about the driving forces of the recent housing cycle and on the role of housing in the monetary policy transmission mechanism in general.[1] In this paper, we take up these issues and incorporate heuristics into an otherwise standard dynamic stochastic general equilibrium (DSGE) model that captures important features of housing and provide qualitative insights into how monetary policy actions affect the housing market and in turn the overall economy when behavioral mechanisms play a role. The reasons to do so are twofold. First, for many people behavioral mechanisms provide a natural way to explain the emergence of the recent U.S. house price cycle. For instance, Shiller (2007) states that the recent U.S. house price rally represented notions of a speculative bubble. Also Kohn (2007) emphasizes that "*when studies are done with cooler reflection, the causes of the swing in house prices will be seen as less a consequence of monetary policy and more a result of emotions of excessive optimism followed by fear.*" Second, from a modeling perspective, the notion of heuristics is substantial because the vast majority of recent DSGE models that deal with the role of the housing market in the macroeconomy rely on the rational representative agent approach (see Iacoviello, 2005; Pariès and Notarpietro, 2008; Iacoviello and Neri, 2010; Aspachs-Bracons and Rabanal, 2010, 2011; Forlati and Lambertini, 2011; Calza et al., forthcoming,

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  [1] See the Jackson Hole Conference organized by the Federal Reserve Bank of Kansas City on August 30 to September 1, 2007 "Housing, housing finance and monetary policy" as well as Jarocinski and Smets (2008) and Iacoviello and Neri (2010), among others.

among others). In these models housing booms and busts merely reflect macroeconomic fundamentals and/or are the outcome of various structural disturbances.[2] To put it differently, in the standard housing DSGE models behavioral mechanisms, such as Shiller's (2005, 2007) "*new era story*" or his notion of "*emotional speculative interest in the market*", do not play any role in the determination of house prices. In contrast, in our *Behavioral Expectations* (BE) model we take account for these mechanisms. Thereby, we succeed to implement notions of non-linearities and pronounced boom-bust cycles into an otherwise standard model.[3]

Our findings suggest that appropriate policy recommendations and issues of monetary policy design critically hinge on the degree of rationality of agents. In an environment of bounded rationality we provide evidence that augmented Taylor rules that respond to the evolution of housing markets are appropriate to prevent the emergence of house price cycles and its repercussions on the broader economy. In a standard DSGE setting in contrast, these rules do not improve welfare in a quantitatively important way measured against a prespecified objective function based on the assumption that the ultimate goal of monetary policy is to reduce real GDP and consumer price variability. Additionally, impulse response analysis reveals that the effects of monetary policy on the economy are surrounded by uncertainty in the *Behavioral Expectations* model. In such an environment augmented Taylor rules proof successful to prevent contagious outbreaks of belief that drive waves of optimism and pessimism. Given the empirical evidence and success at the micro- and macro level in favor of heterogeneity in expectations (see Hommes, 2013), standard approaches to issues of monetary policy design that do not account for these insights, might therefore be systematically ill guided.

Key to our approach is that agents form heterogeneous and biased expectations. In particular, we assume that agents choose between an optimistic and a pessimistic rule to forecast future real house prices. Thus, at each point in time, some agents bias the future real house price upwards, while others bias the future real house price downwards. Although agents systematically have wrong beliefs about future real house prices, they are assumed to behave rationally in the sense that they base their choice on a continuous evaluation of the forecast performance of both rules (see Anderson et al., 1992; Brock and Hommes, 1997). Thus, the fraction of house price optimists or pessimists endogenously varies over time. Agents that were pessimistic (optimistic) about the future track of the real house price cycle might learn that their beliefs were wrong. Depending on their degree of rationality, they take this as a reason to change beliefs and use the optimistic (pessimistic) forecasting rule instead. These switches between the two heuristics are of macroeconomic relevance when a large fraction of agents chooses the same heuristic simultaneously. If such a contagion in beliefs happens, a sustaining house price boom or bust can be initiated. In a full-fledged model we assume that agents not only use an optimistic and a pessimistic rule to forecast future real house prices but also to forecast future consumption of nondurable goods and that agents apply simple inflation-forecasting rules as well (see Brazier et al., 2008; De Grauwe, 2011).

Our modeling strategy is motivated by the recent work of De Grauwe (2010a, 2010b, 2011). He replicates Keynes' notion of "animal spirits" by incorporating heuristics into a standard New Keynesian (NK) model. He finds that when agents choose between an optimistic and a pessimistic rule to forecast future output and adaptively update their beliefs, endogenous and self-fulfilling waves of optimism and pessimism ("animal spirits") can arise in response to economic shocks. Moreover, the notion of agents using heuristics to guide their behavior can be motivated by a large literature of financial heterogeneous agent models.[4] However, despite their use in many financial market models, the rational representative agent approach is dominant in macroeconomic models. Recent studies that introduce heterogeneous forecasting rules that may not be fully optimal in macroeconomic models include Branch and Evans (2006, 2010), Brazier et al. (2008), Branch and McGough (2009, 2010), Guse (2010), Massaro (2013) and Anufriev et al. (forthcoming).

In deriving the DSGE framework, we build on the recent strand in the housing DSGE literature that extends the standard NK model with a housing sector and a collateral constraint tied to housing along the lines of Kiyotaki and Moore (1997) and Iacoviello (2005). In this model housing has two features: first, it provides housing services and thus utility, and second, for a fraction of households it serves as collateral in the credit market. With respect to the exogenous driver of the business cycle we follow the arguments of Taylor (2007), among others. Taylor (2007) identifies the exceptionally low short-term interest rates during the period of 2003–2006, compared to what a Taylor rule would have recommended, as a policy mistake that significantly contributed to the U.S. housing boom. Using a Bayesian vector autoregressive model Jarocinski and Smets (2008) find that the Fed's easy monetary policy from 2002 to 2004 contributed to the boom in the U.S. housing market, but the impact on the overall economy was limited. More recently, Iacoviello and Neri (2010) study the sources and consequences of fluctuations in the U.S. housing market by using an estimated DSGE model. They show that while monetary policy played a minor role in the run-up of house prices, it accounted for the entire reversal of house prices from 2005 to 2006. Moreover, they find that housing market spillovers are non-negligible and occur largely through the effects that fluctuations in house prices have on consumption. This finding is in line with the notion of collateral constrained households. Consider, for the sake of argument, an expansionary monetary policy shock. When house prices are more flexible than consumer prices, expansionary monetary policy increases the real house price and thereby increases the

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[2] See Williams (2011) for a brief discussion.

[3] Note that there are other approaches to model expectations driven endogenous cycles that relate the emergence of volatility in expectations to concepts of animal spirits and market psychology (see Grandmont, 1986). Also in this vein is the literature by Azariadis (1981), Benhabib and Farmer (1994) and Farmer and Guo (1994). This class of models traces back business cycles to the notion of multiple equilibria and sunspots and thus accommodate non-fundamental stochastic cycles driven by random shocks.

[4] See LeBaron (2006) and Hommes (2006) for detailed surveys.