Journal of Economic Dynamics & Control 59 (2015) 95–117

Contents lists available at ScienceDirect

Journal of Economic Dynamics & Control

journal homepage: www.elsevier.com/locate/jedc

Animal spirits and credit cycles

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ARTICLE INFO

Article history:
Received 3 April 2014
Received in revised form
3 July 2015
Accepted 13 July 2015
Available online 29 July 2015

JEL Classifications:
E03
E14
E44

Keywords:
Animal spirits
Credit cycle
Interest rate spread
Stabilization

ABSTRACT

In this paper we extend the behavioral macroeconomic model as proposed by De Grauwe (2012) to include a banking sector. The behavioral model takes the view that agents have limited cognitive abilities. As a result, it is "rational" to use simple forecasting rules and to subject the use of these rules to a fitness test. Agents are then driven to select the rule that performs best. The behavioral model produces endogenous and self-fulfilling movements of optimism and pessimism (animal spirits). Our main result is that the existence of banks intensifies these movements, creating a greater scope for booms and busts. Thus, banks do not create but amplify animal spirits. We find that increases in the equity ratios of banks tend to reduce the importance of animal spirits over the business cycle. The other policy conclusion we derive from our results is that the central bank has an important responsibility for stabilising output: output stabilization is an instrument to "tame the animal spirits". This has the effect of improving the trade-off between inflation and output volatility.

1. Introduction

Since the start of the financial crisis DSGE modelers have hurriedly attempted to introduce a banking sector into their models. This has been done in the framework of models that assume rational expectations, i.e. that assume that the representative agent understands the complexity of the underlying model. If there is anything we have learned from the financial crisis it is that this crisis was made possible by the fact that agents do not understand the complexity of the world in which they live. Instead, their cognitive abilities are very limited. Therefore there is a need to introduce a banking sector in models that recognize the cognitive limitations of agents. While recent contributions have explored the need to introduce banking in an agent based simulation framework (e.g., Ashraf et al., 2011; Delli Gatti et al., 2008), no attempts have been made to introduce bounded rationality and rule switching behaviour in a macro model that preserves the spirit of the original "financial accellerator approach" of Bernanke and Blinder (1988) and Bernanke et al. (1999). This is what we attempt to do in this paper.

Economists have long recognized the role of expectations' formation. This has been mainly in the light of evidence from experimental studies supporting the idea of information processing with agents' limited cognitive abilities. Recent contributions, including Carroll (2003), Mankiw et al. (2004), Branch (2004, 2007) and Pfajfar and Santoro (2010) provide empirical evidence in favor of agents' heterogeneity using survey data on inflation expectations. Honkapohja and Mitra (2005) point to the idea of agents possibly using structurally different learning rules. In the same vein, Frenkel and Froot

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http://dx.doi.org/10.1016/j.jedc.2015.07.003

(1987, 1990), Bloomfield and Hales (2002), Branch (2004), Hommes et al. (2005), Pfajfar and Zakelj (2011), Assenza et al. (2013), and Hommes (2011), find evidence in favor of heterogeneity in learning to forecast, conditional on recent forecasting performance, using both survey and laboratory data. Despite this evidence, the dynamic effects of expectations' heterogeneity has been explored only recently in macro models (for a survey, see Milani (2012)), and even less so in models with a banking sector (e.g., Ashraf et al., 2011; Delli Gatti et al., 2008).

Much of the previous attempts to model expectations that deviate from rational expectations have tried to stay as close as possible to the rational expectations' assumption. In these types of models, expectations of agents are assumed to satisfy a number of intuitive properties, including linearity and the law of iterated expectations (LIE). These include studies focusing on alternative forms of information processing, such as learning (Sargent, 1994; Evans and Honkapohja, 1999, 2001; Milani, 2007), rational inattention (Mackowiak and Wiederholt, 2005; Sims, 2003, 2005; Ball et al., 2005; Schorfheide, 2005); "sticky information" (Mankiw and Reis, 2002; Levine et al., 2012; Trabandt, 2007; Mankiw and Reis, 2007; Reis, 2009 in the DSGE literature) or bounded rationality at large (Sargent, 1994). All such models ask whether agents would converge to the same rational expectation equilibrium if they started with a more limited degree of knowledge or they were allowed to learn over time (for a discussion see Milani, 2012; Cornea et al., 2012; Massaro, 2013).[1] These types of approaches generally produce sunspot-equilibria or multiple steady states (see Howitt and McAfee, 1992; Evans et al., 1998; and Evans and Honkapohja, 1999, 2001; Branch and Evans, 2007), overall improving the endogenous propagation of shocks, and hence model fit. Overall, however, as remarked previously, in the majority of cases such models have to tradeoff between rational and bounded-rational agents.

Following Brock and Hommes (1997, 1998), in this paper we treat the realization of economic choices as being an interactive process between different types of agents. In particular, following De Grauwe (2008a, 2008b, 2011, 2012), our model includes two types of agents. The first type are fundamentalists, who forecast output and inflation based on their equilibrium value. The second type use the simplest backward-looking rule of thumb – i.e., their forecast coincides with the last available observation – to forecast future the output gap and inflation. De Grauwe (2008a, 2008b, 2011, 2012) is not the only one to model heterogenous expectations in a New Keynesian Model (NKM). Recent examples of expectations' heterogeneity in a NK framework include Branch and McGough (2009) and Levine et al. (2012). In particular, Branch and McGough (2009) introduce heterogeneous expectations into a New Keynesian framework where the forward looking term in a New Keynesian Phillips Curve (NKPC) is a convex combination of backward- and forward-looking behaviors. The authors show that a microfounded NKM under bounded rationality can be obtained if specific axioms within the optimizing behavior of households and firms are considered, implying the law of iterated expactations (LIE). These axioms ensure the ability of agents to forecast the output gap and inflation at the micro level as well as aggregation at the macro level. Overall, however, such an approach, while making an important contribution to bridge aggregate forecasting rules with micro derivation, still strives to keep the benchmark rational expectations valid.

De Grauwe's approach is instead a more "radical" departure (Milani, 2007) from the previous literature (e.g. Branch and McGough, 2009), as no agent in the economy is assumed to have rational expectations. No agent in this economy posseses sufficient cognitive skills to understand the complexity of the underlying model and to know the distribution of the exogenous shocks hitting the economy. Rationality in this model is introduced instead by assuming agents are willing to learn from their mistakes. Thus, the concept of rationality used in De Grauwe (2008a, 2008b, 2011, 2012), and followed by this paper, is consistent with the idea that agents are aware of the fact that their beliefs are biased, but they are willing to learn from the past. In this set up, the heuristic behaviour employed in the formation of expectations is more "drastic" than the one employed by the standard bounded rationality literature in the sense that rational expectation equilibria are not nested by the model.[2]

We believe the assumption of individuals having cognitive limitations – leading them to use simple rules that do not take all the available information into account – is necessary once we take the view that agents are limited in their capacity to collect and process the immense information set that is present in the world. In our opinion, this evolutionary rationality is a better way to describe rationality in a world that is too complex and uncertain for agents to understand.

2. The model

In this section we first present the baseline behavioral macroeconomic model proposed by De Grauwe (2008a, 2008b, 2012). We then go a step further by decomposing aggregate demand into consumption and investment demand. Finally banks are introduced.

[1] Rationality would then not be achieved immediately either because of the existence of explicit costs in acquiring all information in the economy (i.e. full rationality implies agents already have full knowledge about the structure of the economy), or because agents are assumed to update their information only with some probability in each period.

[2] The model presented in De Grauwe (2008a, 2008b, 2011, 2012) thus differs from multiple equilibria models in that it does not rely on extraneous "sunspots." The economic fluctuations are driven instead by the intrinsic random shocks of the model. This is similar to Evans and Honkapohja (2001, Ch. 14), but differ from the latter in that it does not have multiple equilibria under rational expectations.