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Stabilizing an unstable complex economy on the limitations of simple rules

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ABSTRACT

This paper offers a systematic comparison of a wide range of leaning-against-the-wind interest-rate policy rules within a macroeconomic, stock-flow consistent, agent-based model. The model generates endogenous booms and busts along credit cycles. As feedback loops on aggregate demand affect the goods and the labor markets, the real and the financial sides of the economy are closely interconnected. The baseline scenario is able to qualitatively reproduce a wide range of stylized facts. We show that a monetary policy rule that targets the movements in the net worth of firms significantly dampens the credit cycles and reduces the employment costs of financial crises, because this indicator incorporates early signals of financial imbalances. Performances of this three-mandate Taylor rule are also more robust to the specific parameter values and regulatory framework than the standard dual-mandate Taylor rules. Nonetheless, none of the policy rules under study completely eliminates the high employment costs of financial crises.

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1. Introduction

The 2007-08 financial crisis, the ensuing Great recession and the “not so great” recovery have revived the idea that credit-driven expansions, when accompanied by growing financial imbalances, may result in debt-deflation dynamics and deep recessions that have persistent effects on the real economy. This idea has challenged the so far prevailing view that the central banks should only care about credit growth insofar as it affects inflation (and growth) outlooks (see the extensive literature in the wake of the seminal contribution of Bernanke and Gertler, 1999). Whether monetary policy should integrate an additional objective of financial stability within the inflation targeting frameworks, whether such an objective could be achieved through the use of interest rate policies only, or whether it should be left to prudential policies and banking supervision institutions are still debating questions. Smets (2014) provides a survey of the terms of the debate, and highlights the non-trivial trade-offs that are implied.

If central banks would worry about the level of private debt in the economy, as advocated for instance by Christiano et al. (2007), they would follow a so-called “leaning-against-the-wind” policy: they would cautiously increase interest rates in face of growing indebtedness, which would discourage excessive leverage and risk-taking and hence reduce

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over-investment, so that the bust would eventually involve less severe economic consequences. Such a policy is a reaction to the pro-cyclical nature of credit, private debt and leverage that tend to grow in good times, and contract along busts. However, at least two risks have raised concerns. The implied monetary tightening may come at the expense of output (Svensson, 2017), and measuring *ex ante* the risk of a financial crisis is a particularly uneasy task (Woodford, 2012). This raises the additional question of which indicators the central bank should monitor. The effectiveness of such a monetary policy may also depend on the availability and effectiveness of macroprudential tools which, broadly speaking, refer to any policy tool directed towards the decrease in systemic risk, rapid credit growth and excess leverage. Some voices advocate the primary use of those tools to contain financial risk (see Dudley, 2015 for a detailed argumentation). In that respect, empirical studies provide tentative evidence that those tools help limit credit-driven expansions, but the results seem sensitive to the rest of the monetary policy framework (IMF, 2015; Lim et al., 2011). In other words, the debate whether monetary policy should “lean against the wind” is far from being settled.

A related but more radical view is that the recent financial crisis has been caused by policy making walking away from rules-based policies (Taylor, 2010). Such a view makes the case for the systematic implementation of monetary policy rules to prevent the build-up of massive financial imbalances, excessive risk-taking, and outburst of prolonged recessions. Under this view, leaning-against-the-wind policies would be at least redundant, if not detrimental.

In this paper, we aim to contribute to this on-going debate on monetary policy reformulation in the wake of the financial crisis by the use of an agent-based model (hereafter ABM). We add to the existing literature by offering a systematic comparative study of alternative designs of interest-rate policies to lean against the wind, possibly in combination with prudential regulations, within a simple but yet fully-fledged macroeconomic ABM. In particular, we seek to identify an indicator that contains early signals about upcoming financial imbalances. To the best of our knowledge, such a systematic search is new in the literature, but it is highly needed given the lack of consensus about which indicators of financial imbalances the central bank should react to, if it should at all. The technical and conceptual challenges to such an exercise certainly explain the scarcity of this type of policy analysis within DSGE frameworks.[1]

Some very recent contributions address the challenging issue of financial stability through monetary policy and prudential regulation within macro ABMs. However, most of those contributions have largely focused on the analysis of prudential tools, while leaving monetary policy through interest-rate setting rules out of the picture.[2] There also exist few ABMs that incorporate a traditional, dual-mandate Taylor rule and analyze prudential policies, see e.g. Ashraf et al. (2017) or Assenza et al. (2017), but studies aimed to explicitly model leaning-against-the-wind monetary policy within ABMs do remain scarce.

Da Silva and Lima (2016) show how countercyclical capital buffers can conflict with leaning-against-the wind monetary policy that react to a credit gap. However, the authors do so in a simplified framework where the labor market and unemployment are absent, which limits the analysis of the real costs of recessions. Popoyan et al. (2017) study in a systematic way the prudential rules involved in Basel II and III, and their interactions between each other and monetary policy within a rather sophisticated macroeconomic ABM. The paper does not achieve crystal-clear results regarding the role of monetary policy for a given macroprudential framework: while dampening credit cycles is best achieved through leaning-against-the-wind rule that targets credit growth, the authors reveal the existence of conflicting objectives between financial stability, unemployment rate and inflation. The closest contribution to ours is Chiarella and Di Guilmi (2017), who present a stylized ABM that accounts for the risk-taking channel. The authors show that a leaning-against-the-wind policy that reacts to excess leverage of private units may turn counterproductive. A major difference with our study though is that none of those papers compare different designs of the policy rules, neither regarding the policy parameters nor the incorporated indicators. The main contribution of our paper is to fill this gap by offering such a systematic comparative study of a large range of potential interest rate policies to lean against the wind, in interaction with simple prudential rules, within a fully-fledged macroeconomic ABM.

ABMs offer indeed a number of interesting features that make them particularly suited to tackle those issues. An ABM builds upon a collection of heterogeneous agents conceived as individual units (firms, households) that interact with each other on decentralized markets.[3] From those local interactions emerge macroeconomic patterns. Once the main emergent properties of a baseline simulation have been validated against a set of stylized facts from real-world economies, the model becomes a sort of artificial economy that can be used as a laboratory to experiment alternative policy designs. We can therefore implement different monetary policy rules, in which indicators of financial stress are directly observable, without bearing the constraint of analytical tractability or aggregation of heterogeneous units, which remain major obstacles to their analysis in DSGE models. Last but not least, AB frameworks have proven to be particularly successful in making

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[1] Those challenges concern in particular the restrictions on heterogeneity and disaggregation, the equilibrium focus of the model resolution, the fully rational and infinite-horizon expectations as the main transmission channel of policies, as well as the difficulty to model non-linear feedback loops between the financial and the real sides of the economy. Woodford (2012) is an example but the proposed framework remains heavily stylized, and does not analyze various indicators.

[2] We refer the interested reader to the survey of Fagiolo and Roventini (2017) for a comprehensive treatment of macroeconomic policy analysis in general within ABMs. Cincotti et al. (2012) and Teglio et al. (2012) analyze the stabilizing power of counter-cyclical capital buffers. Van der Hoog and Dawid (2018) use the Eurace@Unibi model to analyze alternative macroprudential policies, and conclude that reserve requirements succeed in dampening fluctuations, while capital adequacy ratios, due to their pro-cyclical nature, do not. Krug et al. (2015) perform pairwise analyses of micro and macroprudential components implied by Basel II and III in a model featuring a detailed interbank market.

[3] We refer here to, for instance, Delli Gatti et al. (2011) for an introduction to this literature. We only give here the general principles.

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