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THE IMPACT OF MONETARY POLICY ON FINANCIAL STABILITY: USING AN AGENT-BASED MODEL TO EXPLAIN REBOUND EFFECTS

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ABSTRACT

Since the financial crisis 2007, financial stability has come into the focus of central banks and the associated monetary policy. The impact of monetary policy on financial stability is dependent on financial market and inflation expectations which influence the behavior of a variety of agents in financial markets and in the real economy through the so called monetary transmission channel. These expectations of agents are mutually dependent and trigger rebound or spillover effects for every single monetary policy decision. Hence, understanding the dynamics of rebound effects is crucial to stabilize the economy. To get a better understanding of how monetary policy determines financial stability, we develop a sophisticated agent-based model that mimics the entire monetary transmission mechanism.

1 ECONOMIC BACKGROUND

Monetary policy is the subject of a central bank (CB) with the mandate to target the interest rate level to ensure price stability which is realized by the monetary transmission mechanism (MTM). The MTM is the process by which general economic conditions are affected as a result of monetary policy decisions. Figure 1 shows the MTM and the correspondent agents in a nutshell. The CB is the main player to set the interest rate level which can be influenced via four instruments in order to keep price stability (Box 1 in Figure 1). These instruments are mutually dependent on each other and affect the real economy indirectly via the interbank market (Box 2 and 3 in Figure 1). The combination of all four transmission channels affect the price level and vice versa (illustrated by arrows in Figure 1). Therefore, a crucial role is played by rebound effects, which depict the effects of monetary policy on the expectations of each agent. Hence, every decision of each agent group is intertwined with each other and makes it very difficult to implement the optimal monetary policy that should ensure trust on the respective currency and its price level. A further goal of monetary policy is to contribute to financial stability, which follows the underlying criteria to facilitate and enhance economic processes, manage risk and absorb shocks within the financial system. While the influence of monetary policy on price stability is well elaborated, the influence on financial stability is poorly understood (IMF 2015). In contrast to common used tools, e.g., a dynamic stochastic general equilibrium model, an agent-based model is able to replicate the multi-level interactions of individuals in a dynamic financial system (Haldane and Turrell 2017).

2 THE AGENT-BASED MODEL

Basic agent-based models that provide a simple prototype of decentralized multi-market transactions mimicking co-movements over the business cycle were proposed by Gatti et al. (2011). Variations of these models have been further developed, e.g., implementing monetary policy in order to investigate the

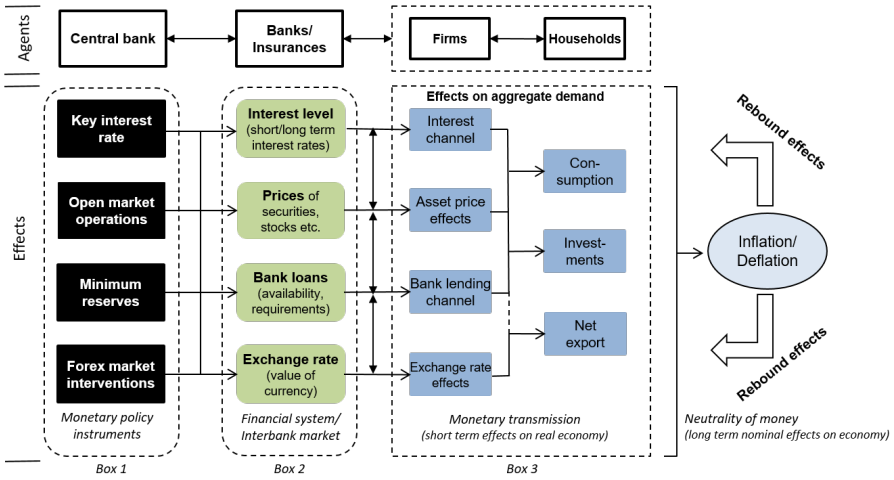

Figure 1: Schematic representation of the monetary transmission mechanism.

influence of the interest rate on inflation and employment (Gualdi et al. 2017). With implementing the credit channel, first steps have been taken to mimic the monetary transmission channel (see Figure 1 and economic background) in an agent-based model. However, those models lack to reproduce the entire monetary transmission channel. This paper follows a holistic analysis approach by implementing all four transmission channels and the interbank market in order to shed quantitative light on the intricacies of the dynamic interplay between monetary policy and financial stability. The model is currently implemented in the Modeling Language for Linked Lives (ML3) (Warnke et al. 2015), a domain specific modeling language designed to implement agent-based models with dynamic interaction networks, e.g., between employers and employees, in continuous time. The language allows to express the complex behavior and dynamic relations of the agents of the economic system succinctly and with clear semantics. The simulation experiments are constructed in the way to adjust the monetary policy instruments in box 1 of Figure 1. The measured outcome is compared to the baseline scenario which reflects real world economic performance and is validated with empirical results from Benes and Kumhof (2012). In order to validate financial stability, external shocks are simulated to put the banking/financial system under stress and to test the resilience against financial crises.

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