

# An Empirical SFC Model of Real-Financial Cycles and Financial Market Regulation

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The aim of our research is to capture the increasing influence of globalised and increasingly complex financial markets on the structure of real-economic interactions and to shed new light on the power of financial markets to shape real economic developments. To systematically explore this topic, we construct a novel macroeconomic model which incorporates the endogenous dynamics of the creation, valuation and distribution of financial assets and their repercussions on the real economy. In particular, our focus is on the ability of the financial (i.e. traditional and shadow banking) system to create money and credit under little or loose regulation, which according to our model can have detrimental economic impacts by fostering financial bubbles with potentially harmful effects for real economic development. Our consideration of the shadow banking sector as a separate entity within financial markets highlights the importance of recent institutional developments in the financial sector that shape amplitude and structure of financial cycles.<sup>1</sup> We investigate whether limiting (e.g. by financial regulation) the power of the financial system to create money and credit can have positive economic effects from a policy perspective, especially regarding the amplitude of financial cycles, distributional issues, as well as sustainable real economic growth and investment.

For this purpose, we use a stock-flow-consistent (SFC) model. These models have become popular since the seminal work of Godley and Lavoie (2007), see Caverzasi and Godin (2014) for an overview. They are flexible and highly suitable for depicting stocks of financial and non-financial assets, as well as flows of any type of assets and income between different agents across time, including the creation, destruction and distribution of different forms of money and credit.

Specifically, we present an empirically founded model of growth and the development of balance sheets. As sectors our model includes workers, capitalists, firms, banks, shadow banks (other financial intermediaries - OFIs), a central bank, and a government. As assets, we consider deposits, loans, equity, securities, OFI shares, government bonds, and central bank reserves. The explicit goal of the modelling effort is (1) to capture the endogenous forces of modern financial markets that lead to the build-up of bubbles in a financialised economy and (2) to depict how they affect real economic growth as well as the evolution and composition of all agents' balance sheets, and (3) how potential detrimental effects of financial bubbles on real economic development can be alleviated by financial market regulation.

The basic structure of our model features a distinction between financial and real investment for non-financial firms (NFCs) as proposed in Caverzasi and Godin (2014). Explicitly, NFCs decide whether to invest in real capital or in financial markets subject to expected returns in the real and financial economy, respectively (Tobinesque portfolio choice). Furthermore, NFCs face a financing decision for their investments between retaining past profits, equity and debt financing (bank loans).

Credit created in the financial sector that is re-channeled into financial markets causes a self-reinforcing feedback cycle in our model, leading to asset price inflation and repercussions on the real

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<sup>1</sup>See Borio (2014) for an empirical investigation into the features of the financial cycle.

economy via the real/financial investment decision of NFCs. We consider three types of credit creation: (1) by banks via the simultaneous creation of deposits and loans, (2) by other financial intermediaries (shadow banks) via the issuance of shares on capital markets, e.g. derivatives, or mutual fund shares, and (3) by the ECB via the quantitative easing (QE) program.

Once returns (profits) in the real economy fall behind returns on financial markets in our model economy (secular stagnation), real investment decreases due to deteriorating expectations of NFCs regarding real profits, who increasingly revert to financial investment. This, in turn, leads to lower real economic growth, inducing all agents in the economy, including NFCs, to shift to financial rather than real assets in their portfolio choice. Furthermore, rising returns on financial markets encourage additional credit creation on financial markets that is not channeled to the real economy, leading to asset price inflation due to supply and demand interaction on financial markets. This pro-cyclical leverage effects induced by asset price inflation, see Adrian and Shin (2010), improve the balance sheets (leverage) of all agents in the economy. As outcome of this endogenous model process, a credit-fuelled asset price bubble on financial markets develops (the “upswing” of a financial cycle), which is self-reinforcing until some exogenous “trigger point”, motivated by empirical evidence.

A major extension of the literature cited above is the way we aim to take our model to the data. Most SFC models are calibrated to a steady state (i.e. all variables grow at the same rate), and used to assess effects of exogenous shocks or policy scenarios on various topics, see Caverzasi and Godin (2014) for a review. However, empirical evidence<sup>2</sup> contradicts the notion of a steady state. Thus differently to the models cited above, our model is not calibrated to converge to a steady state. Contrarily, we calculate all model parameters on a yearly basis from Eurostat’s ESA 2010 data for 1995-2014, Eurostat (2013), so that the development of variables in the model fits these data. We forecast trends in these calculated parameters and obtain non-constant values for their future values. This allows us to use the model for a medium-term business as usual simulation that depicts endogenous dynamics over time, as determined by the recent past. The model is hence very much “data driven”, making endogenous dynamics an integral part of the analysis.

The framework then allows us to easily conduct several scenario simulations regarding behaviour, regulation, and exogenous shocks and comparing them to the business as usual scenario. By including the shadow banking sector as a separate agent in the model, we furthermore address the boundary problem in financial regulation, i.e. the often-observed tendency that regulating a particular part of the financial sector shifts pro-cyclical provision of credit to the still unregulated part of the financial system.

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<sup>2</sup>See e.g. Godley (1999), for the period before the great moderation, and commonly known developments before and after the 2007 crisis (rising inequality, asset price inflation, rising unemployment, rising debt-to-GDP ratios, etc.). Specifically, macroeconomic time series data from European System of Accounts (ESA) for EU countries show growth rates for total financial assets held by households which are significantly higher than growth rates for output from 1995-2013.