Money Creation and Financial Instability: An Agent-Based Credit Network Approach
Answer to Referee Report 2

*Referee: **Evaluation:** The paper deals with the important topic of credit networks and financial instability and shows that systemic financial crises can arise endogenously. It applies the agent-based simulation methodology, which is a fascinating new tool ideal for the analysis of systemic effects of individual interaction. Presenting agent-based models to a general economic audience is important, because the methodology can only gain acceptance if its power is demonstrated with relevant examples. In order to promote agent-based computational economics as an alternative approach, it is necessary to stop talking about the flaws of other approaches and reflecting about its advantages at a general level. Instead, proponents must get started on doing relevant research. The present paper does this.*

We are happy that the referee is generally sympathetic with our model. All given comments are constructive and will surely help to increase the readability and quality of the paper. We generally share the referees opinion and will therefore introduce all his suggestions as far as it is possible. This is sometimes difficult because it interferes with the positions of referees 1 and 3.

The referee's formulations given above are so eloquently written and straight to the point that we would like to borrow some of them for our introduction if we are allowed to.

Referee: That said, the present paper does not go far enough. From my point of view, the authors concentrate too much on saying what DSGE model cannot do and provide too little constructive discussion of what the proposed model contributes to our understanding of financial crises. I would propose reformulating the Introduction, Section 2 and the Conclusions in order work out better what the insights from this model are (and less its advantages over standard theory).

We share the referees opinion that ACE macroeconomists have to spend less time criticizing and more time doing constructive research and developing ACE further. The opposition of different camps in the discipline has created an atmosphere in which it is difficult to progress in a cooperative way, e.g. by using the advantages of both mainstream and heterodox modeling.

We will shorten our critique of the mainstream and keep it only where it's necessary to highlight our contribution in comparison to existing (DSGE) models.

Referee: Furthermore, I would suggest to de-emphasize the textbook money multiplier. Among academic macroeconomists, this simple textbook model is not very popular (see the discussion of Simon Wren-Lewis in his blog: http://mainlymacro.blogspot.de/2012/07/kill-money-multiplier.html).

This multiplier is typically criticized because it implies a fixed relation between M0 and higher monetary aggregates, although it is observed in the current crisis that such a fixed relation does not exist.
In publications that date back to Bernanke & Blinder (1988) it is shown that the money multiplier also depends on (credit-)risk. If risk increases the multiplier decreases which might lead for example to constant M2 with rising M0. Such a risk adjusted multiplier can (at least partly) explain why the relationship between M0 and higher aggregates can break down during risky times.

But of course, we can less often stress in the paper that we reproduce the very simple textbook multiplier.

Referee: The results in the baseline model are somewhat oversold and the discussion could be shortened. That the money supply converges to the equilibrium level from the money multiplier formula is not really surprising. While it is true that the model does not include explicit equilibrium conditions, it is hard to see what else could emerge from the assumptions of the baseline model. By assumption, agents will only stop adjusting their behavior when they hold cash, deposits, and reserves in the imposed proportions, which forces the agents into a state of mutually consistent plans, in other words an equilibrium.

The referee's assessment is right and we're going to deemphasize the result of the convergence towards the theoretical equilibrium. Despite that, the fact that we can reproduce this convergence with zero intelligence (ZI) agents is an interesting result on its own. But we will focus more on why we use ZI agents in the revised version of the paper. In order to meet the requirements of the referee we also conduct a more formal analysis by adding a new section whose content is described below.

Referee: The second part of the paper, in which an interbank market is introduced and analyzed, is the stronger and more interesting part. This part could be extended, for instance by a more systematic and formal analysis of the conditions for a systemic crisis. While the results from the Monte Carlo runs are interesting, the authors could do more, for example explore systematically how these probabilities depend on the parameters of the model.

This interferes with points raised by referee 1 and 3. Referee 1 wants us to change our assumptions more towards the post keynesian endogenous money approach, *"so that banks can obtain cash from the Central bank"*. Referee 3 wants us to introduce the possibility to analyze policy measures.

We want to offer the following way to reconcile these different suggestions:
First of all, we keep our simple baseline simulations (with and without an interbank market) because it is important to present ACE SCF models to a general audience by using simple models.

Within the sections about the baseline model, we are going to analyze the conditions that generate (in)stability. E.g. (1) which role does the existence of systemic banks play for (in)stability, (2) how often do total breakdowns occur, (3) should large banks be more strictly regulated than small ones, ...

Then, we add a new section at the end of our paper in which we introduce save assets (e.g. AAA-bonds). In order to get high powered money, the banks could make use of RePo operations with the central bank. In this way we can make the banks and central bank less passive and also move into the direction of the "endogenous approach" (to satisfy referee 1). We control the amount of save assets exogenously to be able to meet the request of referee 2 and 3. We have an instrument (the endowment with save assets) *"that can be influenced by the policy maker"*(referee 3). To please referee 2, we can perform an additional instability analysis that looks at the impact of capital endowment of banks on aggregate (in)stability. Such questions have been heavily debated during and after the crisis (e.g.: BASEL 3) and are therefore interesting and up to date.

For compensation in the number of pages, we shorten the first chapters by spending less time criticizing the mainstream.

Computationally, these changes bring us already (despite the model's simplicity) to a computational boundary. The necessary simulations are so elaborate that they would take at least one week on a standard desktop computer. We are currently trying to make use of a high-performance Linux-Cluster by parallelizing the simulations on multiple cores at the same time. On a technical level the necessary steps are already very involved and it will certainly take us some time to do the necessary programming and simulation work.

Referee: Some detailed comments ...

Thank you very much for taking your time to correct all these formulations, typos, small issues, ... All suggestions are useful and can be quickly integrated. We will do our best to incorporate as much of them as possible.