

Comments on: Debt Deleveraging and Business Cycles: An Agent-Based Perspective

From: Marco Raberto, Andrea Teglio and Silvano Cincotti

The authors employ the popular EURACE model to analyze the role of debt in the macroeconomy. They find that higher willingness to grant credits can lead to higher growth but also produces the threat of bankruptcy waves.

The research question is very interesting especially after the recent crisis. The method that the authors employ is very well suited for the research question and up to date.

In my opinion it is a nice paper. Of course there are some issues that I want to tell the authors about.

Major issues

It is not completely clear which methods and assumptions you took from the existing EURACE model and which you made yourself. The reader should be told whether you took the EURACE model as it was or you implemented some extensions.

When using a complex model like EURACE you should mention which version you use. Where can one find the documentation and source code? For example on page 6 it is said: "We model this asynchronous decision making by letting agents have different activation days."

Does "We model" mean you made this assumption yourself on top of an existing version of EURACE?

You do not show a plot that illustrates the monetary aggregates. Since money is endogenous, the reader wants to know, how large the money amount is.

Closely related is the role of quantitative easing. You say that the cb uses this policy but you don't explain how it works and to what extend it is used in the simulations.

In section 7 you are setting α to values between 5 and 9 and you mention that the mechanism is inspired by Basel II. Can you give the parameter value of α that is used in the real world Basel II? The reader does not necessarily have an idea of which size this parameter is in reality and whether you have used reasonable values.

You don't mention the way you set starting conditions. Are you using any burnin? The rising amplitude of the time series suggests that the properties of the endogenous variables are not stable over time. In this case starting conditions are very important.

Section 7.2: This is the most important section because it generalizes the results of the previous section by using Monte Carlo. In my view the section is very complicate to read and often it is unclear what you want to say. I think the whole section should be worked over again and explained in more detail. Just a few points, to give you an idea of what my problems are:

- Why did you only perform 15 simulations? One would expect thousands. Does one simulation take so much time?
- Tables should be better integrated into the text and the order (numbering) of tables should correspond to the order in which the reader is referred to them.
- The subtitle of table 7 should include that it is for the first 20 years. As far as I understood it, this is the new point of this table compared to table 6.
- "In particular, one can notice that for low values of a , the difference in GDP (that is the sum of production and investments) are mainly given by investment gaps." → Very difficult! Difference of GDP to what? What do you mean with gap? Do you mean that changes in investment are the main

reason for the change in GPD?

-In table 9 you report 99.1 bankruptcies but you only have 20 producing firms. How can this make sense?

- Table 10 & 11: Which one is the lagged variable?

Minor issues

p.6: “which gives the agents more power to enable writing of complex models for large complex systems.” The agents have the power to write models? That does not make sense in my mind.

p.7: In Eq. (1) D has an index b. The equation shows how to calculate equity as a residual. One can visually see how equity is calculated in table 1. Why is D stated differently in the table? Why is there no index b? Lambda should be explained near that table if it is used.

p.8-9: You should write down the production function here.

p.10: “Standard results from inventory theory suggest...” → can you name a source?

p.10: between EQ (6) and (7): I understand what you mean. But your wording suggests that unit costs are given by the average of (itself) unit costs and something else. Can you express more clearly what you mean? Why is there a bar above one c and not above the other. The same problem appears on page 11. There is one b with and one without a bar. What is the difference between those two? Can you give them meaningful names?

p.12: “If the desired capital amount is lower than the available capital, ... then all the amount of capital available at month tau should be used” Why no investment in this case?

p.16: “risk is defined by the likelihood” → sound like an objective probability. But I think it should be a subjective one. Maybe you should call it “subjective probability as estimated by firms”

p.18: “For any bank b, the stocks of total deposits D_b and loans L_b are updated daily following the changes in their stock levels, i.e., changes in the private sector (households and firms) deposits due to payments (i.e. flows of money among private sector agents) and changes in the loan portfolio due to the granting of new loans and old loan repayments.” → Difficult. I don't understand this sentence. Can you reformulate?

Why have loans to be updated? Does “updated” mean that new loans are granted to firms?

p.18: You explain the decision of whether or not dividends are distributed. But it is unclear HOW dividends are distributed among households?

In Eq (20) the variable “ r^{cb} ” shows up on both sides. Is this correct? Maybe the one on the right side should be a “target” value? Or should it be the lagged policy rate? But in this case I would expect a much slower reaction of the policy rate to inflation than you plot in figure 1.

p.23: Can you give a more detailed explanation of figure 5, please? For example: What is the difference between the two types of bankruptcy?

p.27: You conclude about the debt write-offs of banks. But throughout the paper you never explained how such write-offs are modeled concretely.

Typos and language

I am not a native speaker, so all my suggestions should be handled with care ;-)

p.2: “in the Fall 2008” → “in the fall of 2008”

p.3: “Hyman Minsky which proposed” → “Hyman Minsky who proposed”

p.3: “and a number of studies has therefore appeared” → “and a number of studies have therefore appeared”

p. 3-4: “yet far to be general purpose macroeconomic models” → awkward, reword!

p.4: “in line with the Minsky’s” → “in line with Minsky’s”

p.5: “Tsfatsion and Judd (2006)” → in parentheses

p.7: “produces are much more complex agents” → an “r” is missing

p.9: Eq (3) has a double plus

p.12: “multiplied by the the” → double the

p.13: “firm asks loans to the bank“ → “firm asks loans from the bank“

p.15: “Labor and capital income taxes are a fixed percentages” → “Labor and capital income taxes are fixed percentages”

“typical balance sheet of an household.” → “typical balance sheet of a household.”

p.15: “household h samples on a weekly basis the prices of different consumption goods” → maybe better “draws a sample” or “selects a subsample”

p.16: “that follows a probability distribution given by a logit model.” → “that it follows a probability distribution given by a logit model.”

“whose goods has been sampled” → “whose goods have been sampled”

p.17: “capital requirement are fulfilled.” → “capital requirements are fulfilled.”

“therefore it does non enter in the “ → “therefore it does not enter in the “

Eq (16): Is it correct that there is one small and one capital lambda?

p. 19: “Table 4 presents the sketch of assets, i.e. liquidity, and liabilities, i.e., bonds of the Government in Eurace.” → two time “i.e.” in one sentence

“balance sheet of a Centra Bank.” → “balance sheet of the Central Bank.”

p.21 and 24: “From figure XY it emerges” → “In figure 1 it is shown”

p.25: “As emerged from the simulation paths” → “It became clear in the simulations ... “

p.21: “investments decisions depend on” → “investment decisions depend on”

p.25: “but the recover is” → “but the recovery is”

p.26: “credit credit money” → double credit

“This causal relation are obviously less evident” → “This causal relation is obviously less evident”

p.27: “in turn determines higher of interest rates” → “in turn increases interest rates”

p.28: “first a by period“ → “first by a period“

p.28: “scientific environment and an useful computational facility” → “scientific environment and a useful computational facility”

Further Literature you might consider

You find cascades of bankruptcies in your model that stem from too high leverage. This phenomenon reminds me of the phrase “system wide risk”. After the crisis some authors have argued that one of the problems with mainstream theory is, that it does not take such “system risk” into account. You might want to quote this authors (e.g. Collander et al: “*The Financial Crisis and the Systemic Failure of Academic Economics*”) and claim that your model is better.

p.6.: “In the EURACE “. This passage deals with the balance sheet accounting. You nicely explained the bookkeeping of EURACE in “Credit Money and Macroeconomic Instability in the Agent-based Model and Simulator Eurace”. I think you should cite this paper here.

Of course all criticism is meant to be constructive. I like the paper and enjoyed reading it! All the points mentioned above should be understood as recommendations only.