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**Response to Referee Report 1 from January 19th 2013**

March 16, 2013

Dear Referee 1,

thank you very much for your in-depth reading and professional analysis of my submitted paper *'On the Bottom-up Foundations of the Banking-Macro Nexus'*. In particular I am highly grateful for your critical remarks regarding the originality and novelty of my proposed application of the generic rule-based approach to the realm of bank lending. Your report can be considered as significantly constructive and straight to the point, since it became obvious to me now that I have not articulated substantially the prospects and benefits of the generic rule-based approach (Dopfer and Potts 2008) for agent-based modelling in general and especially for an empirically founded rule taxonomy for bank-lending and demand-for-loan rules. In the following I focus on each of your comments and suggest strategies to improve my paper correspondingly for a revised version for this special issue.

**Comment 1:**

Of course, there are several contributions, as also mentioned in my paper, articulating the cornerstones of agent-based modelling for macroeconomic purposes, indicating the potential of the new paradigm. However, there is currently not any work on rule taxonomies to my knowledge, about generic rules and agents carrying knowledge for a particular operation. I will explain this notion more specifically with reference to the relevant sections 2.2, 3.5 and 4.2 in Delli Gatti et al. (2011), as suggested by you. The point of my paper is that agents carry a greater ensemble of rules than just behavioural rules, i.e. cognitive, behavioural, social and technical rules (the cornerstones for the new revised rule taxonomy are given in the **Appendix** at page 3-6). In a Schumpeterian tradition the meso level represents the active core (Dopfer 2012) of a heterogeneous multi-agent economy, where a restructuring of the macroeconomy is dependent on self-organizing changes within a full generic rule-set, beyond the mere operations (understood as actualizations of a generic rule). Insofar it is suggested to follow this promising taxonomy as a potential standard for the preparation of future models, because on the one hand it leads to sharper definitions about the agents' possible and implemented actions and on the other hand it facilitates empirical calibration easier on grounds of a taxonomy of rules. With regards to the originality of this approach, Delli Gatti, Gaffeo and Gallegati (2010, p. 119) highlight also explicitly this potential. However in presence of the given potential it needs more in-depth clarification of this approach to attract more agent-based modellers working with such a taxonomy sequentially. Your raised critique indicates that my first attempt in such a direction was too vague, which will get definitely changed in the revised version (see **Appendix**).

**Comment 2:**

I totally agree with your comment that *'…the "rules of thumb" are a very weak point of the bottom-up approach.'* That's why I emphasize the necessity of a deeper theoretical framework, making the generic rule-based approach (Dopfer and Potts 2008) more explicit within the realm of bank lending and demand for loans. This endeavour enables a consistent integration of theory, empirical evidence

and modelling, which is still lacking in agent-based macroeconomics. The generic rule-based approach provides a theoretical taxonomy to specify empirical material for a proper articulation of rule ensembles, ready for integration in actual bottom-up models. Insofar it goes definitely beyond the usage of 'rules of thumb', rather the opposite is suggested. In my paper I argue that a generic rule taxonomy for bank lending addresses two problems: identification of credit-rule populations with regards to the elaborated characteristics of the Bank Lending Survey (BLS) and identification of potential reactions across the whole ensemble of empirically elaborated rules. These two points provide sufficient justification for modelling choices with regards to artificial credit markets building upon this approach and it provides additionally justifications for social learning mechanisms between and within different credit rule populations. The revised version will focus on a detailed articulation of the empirically investigated ensemble of bank-lending and demand-for-loan rules (compare the **Appendix** on basis of the BLS) with regards to the subject and object dimension as well as to the order of generic rules, as proposed in my article. In this respect I have to mention that I don't propose a specific agent-based model of credit-rule evolution, but I provide a rule taxonomy for bank-lending (to enterprises and households) and for the demand-for-loans (from enterprises and households) on behalf of empirical survey data. Insofar I deliver a theoretical tool to minimize the degrees of freedom and maximize controllability/tractability in future agent-based models concerned with bank lending and demand for loans in artificial credit markets. Finally the focus on the announced rules is not covered yet by economic experiments with senior loans officers to identify their generic rule-set. In consequence we can't rely on experimental data at the moment, but the BLS provides a solid empirical basis in this regard.

**Comment 3:**

The exposition is not ideal and needs to get improved as suggested by you. In the revised version more focus is given to the empirical integration, providing extra tables and figures in the various dimensions as given in the **Appendix**. Moreover I will acknowledge more previous work from the field where it seems to be important and significant.

My proposed paper explains why there are two major streams in the history of monetary economic thought and why the Cambridge approach suggests in principle a bottom-up evolutionary methodology. In the paper I want to arrive at a proper bottom-up foundation (a rule taxonomy for heterogeneous, learning agents) for artificial credit markets, i.e. the realm of bank-lending and demand for loans.

**Comment A:**

The suggested articles fit perfectly into the overview on models with a bottom-up approach in this realm (section 3.2 in the paper).

**Comment B:**

Thank you very much for identifying the various printing errors. Moreover if possible, I will try to find a native speaker revising the resubmitted version of this paper! Again thank you very much for your highly significant and constructive comments!

With kindest regards,

Manuel Wäckerle

**References**

Berg, J., Rixtel, A., Fernando, A., de Bondt, G. and Scopel, S. (2005), *The Bank Lending Survey for the Euro Area*, ECB Occasional Paper Series No. 23.

Delli Gatti, D., Gaffeo, E. and Gallegati, M. (2010), 'Complex agent-based macroeconomics: a manifesto for a new paradigm', *Journal of Economic Interaction and Coordination*, Vol. (5)2: 111-135.

Delli Gatti, D., Desiderio, S., Gaffeo, E., Cirillo, P. and Gallegati, M. (2011), *Macroeconomics from the Bottom-up*, Springer.

Dopfer, K. (2012), 'The origins of meso economics: Schumpeter's legacy and beyond', *Journal of Evolutionary Economics*, Vol. 22(1): 133-160.

Dopfer, K. and Potts, J. (2008), *The general theory of economic evolution*, London: Routledge.

**Appendix**

In the following I introduce the planned improvements for the empirical foundation of bank-lending and demand-for-loan rules.

**Rule populations**

It is important for agent-based models to consider the different rule populations or meso units (Dopfer and Potts 2008) of investigation in advance. In order to model an artificial credit market module we are able to identify three different groups. Let me recall following passage of my paper:

*'…within the credit categories of corporate lending (group 1), SME, short and long term rates (group 2), loans for house purchase, consumer credit and other loans to households (group 3). For credit supply, the BLS shows that group 1 is primarily affected by cost of funds balance sheet constraints, group 2 by competitive pressures and risk perception and group 3 by all three of them. For credit demand, group 1 is affected by financing needs and group 2 is affected by alternative sources of finance and group 3 by all two of them.'* Wäckerle (2013, p. 23)

Now it is proposed to look deeper into these rule populations with regards to the survey data. We are able to extract rules for backward and forward looking (for every past/ahead three months since 2003). Basically there are two super-categories of rules dependent in the BLS:

- 'net percentage': difference between the share of banks reported that credit standards have been tightened and the share of banks reporting that have been eased
- 'net demand': difference between the share of banks reporting an increase in loan demand minus the share of banks reporting a decrease in loan demand

The first category relates to credit standard setting - following question (1) and (2) - and the second relates to the demand for loans - (3) and (4).

**(1) General question for bank lending – credit standards for enterprises:**
Past three months, credit standards as applied to approval of loans or credit lines to enterprises changed: loans to small and medium-sized enterprises, large enterprises; short-term loans, long-term loans
**(2)General question for bank lending – credit standards for households:**

Past three months, credit standards as applied to approval of loans or credit lines to enterprises changed: loans for house purchase, consumer credit and other lending

**(3) General question for the demand for loans or changes in credit lines to enterprises:**

Past three months, how has demand for loans or credit lines to enterprises changed (decreased or increased) at bank, apart from normal seasonal fluctuations: loans to small and medium-sized enterprises, large enterprises; short-term loans, long-term loans

**(4) General question for the demand for loans to households:**

Over past three months, decreased or increased loans for house purchase, consumer credit and other lending

If we take a deeper look into the BLS we are able to extract following specific factors as conditions/triggers for generic rules.

**(A) Specific question for bank lending – credit standards: bank position**

Over past three months, factors that have affected your bank's credit standards as applied to the approval of 'loans or credit lines to enterprises':

**0th order rules:** (Social, legal, political, cultural, and other constituent rules that underpin generic rules for economic operations)

*factors for social/organizational rules (market): underpinning/constitutive market rules*

- Other conditions and terms: loan covenants

*factors for cognitive rules (mental schemata): underpinning/constitutive cognitive rules*

- Other conditions and terms: collateral requirements, maturity

**1st order rules: (**Generic rules originated, adopted and retained by carriers for operations)

*factors for social/organizational rules (market): requests and monitoring from agent to other agents (active and passive)*

- Cost of funds and balance sheet constraints: bank's ability to access market financing
- Pressure from competition (competition from other banks, competition from non-banks, competition from market financing)

*factors for behavioural rules (behavioural heuristics, norms): agent follows trend (passive)*

- Perception of risk: Expectations regarding general economic activity
- Perception of risk: Industry or firm-specific outlook

*Factors for cognitive rules (mental schemata): agent re-evaluates own position (active)*

- Cost of funds and balance sheet constraints: costs related to bank's capital position
- Perception of risk: Risk on the collateral demanded
- Price: bank's margin on average loans, bank's margin on riskier loans
- Other conditions and terms: non-interest rate charges, size of the loan or credit

**no empirical information on 2nd order generic rules**

**(B) Specific question for demand for loans or changes in credit lines: enterprise position (approached via bank)**

Over past three months, factors that have affected the demand for loans or credit lines to enterprises at your bank:

**no empirical information on $0^{th}$ order rules**

**$1^{st}$ order rules: (**Generic rules originated, adopted and retained by carriers for operations)

*factors for social/organizational rules (market): requests and monitoring from agent to other agents (active and passive)*

- Financing needs: mergers/acquisitions and corporate restructuring
- Use of alternative finance: loans from other banks, loans from other non-banks

*No empirical information on factors for behavioural rules (behavioural heuristics, norms): agent follows trend (passive)*

*Factors for cognitive rules (mental schemata): agent re-evaluates own position (active)*

- Financing needs: fixed investment, inventories and working capital, debt restructuring
- Use of alternative finance: internal financing, issuance of debt securities, issuance of equity

**no empirical information on $2^{nd}$ order generic rules**

Same schema holds for:

- factors for generic rules with regards to expectations.
- factors for generic rules with regards to changes in the past three months for loans to households for house purchase.
- factors for generic rules with regards to changes in the past three months for consumer credit and other lending to households
- factors for generic rules with regards to changes in the past three months for loans to households for house purchase

Then we are able to declare generic rules as following, according to the BLS:

If **[loan covenants]** then **[tightened considerably]** over the past three months
($0^{th}$ order social object credit standard rule)
If **[industry or firm-specific outlook]** then **[eased somewhat]** over the past three months
($1^{st}$ order behavioural subject credit standard rule)
If **[debt restructuring]** then **[expect increase considerably]** in the next three months
($1^{st}$ order cognitive subject demand loan rule)
If **[loans from other banks]** then **[expect decrease somewhat]** in the next three months
($1^{st}$ order social object demand loan rule)

In the revised version of the paper I prepare a full rule taxonomy regarding all significant points within the BLS, but will also deliver empirical examples for meso rule trajectories over the past 10 years for specific rule-sets. The first point provides rule ensembles for banks, enterprises and

households in artificial credit markets for agent-based models and the second point provides basic prototypes for social and individual learning trajectories for agents in such artificial markets.

In particular the articulated extensions provide an empirically grounded rule taxonomy and not just a set of behavioural assumptions. This taxonomy defines rules not just by context and situation, but clarifies the nature of structured rule ensembles. On such a basis we are able to get a deeper understanding of structural change in an evolving economy, serving as a template for proper bottom-up foundations of the banking-macro nexus and resulting from the previously elaborated history of economic thought and institutional perspectives, in line with the brief survey on the two major modelling architectures.