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Money, Regulation & Growth: financing new growth in Europe

MONEY, REGULATION & GROWTH: FINANCING NEW GROWTH IN EUROPE

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CIP

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Editors: Marc Quintyn, Donato Masciandaro, Frank Lierman and Morten Balling

Authors: Franco Bruni, Gancho Ganchev, Vladimir Tsenkov and Elena Stravrova, Cécile Bastidon, Alex Cukierman, Edward J. Kane, Mario Quagliariello and Samuel Da Rocha Lopes, Javier Villar Burke, Alessandro Scopelliti

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1. INTRODUCTION

Marc Quintyn, Donato Masciandaro, Frank Lierman and Morten Balling

On June 4-5, 2014, SUERF and Baffi Finlawmetrics jointly organised a Colloquium/Conference “*Money, Regulation and Growth: Financing New Growth in Europe*” at Bocconi University, Milan. The present SUERF Study includes a selection of papers based on the authors’ contributions to the Milan event. The overall themes at the conference were the implications for economic growth of monetary policy, financial regulation and structural changes in European financial institutions and markets.

In chapter 2, “How can the European banking union contribute to growth?” *Franco Bruni*, Bocconi University argues that the European Banking Union (EBU) is an indispensable feature of a sustainable single currency area. The EBU will contribute to financial stability and completion of the single market and trigger the implementation of best practices in regulation, supervision and crisis management. The EBU will impact on the reorganization of banks and enhance their contribution to the acceleration of European growth. Competition-induced reorganizations will enhance the potential proactive response of the supply of banking services to the needs of credit markets. Both the productive and the allocative efficiency of the European banking system will improve, benefitting the real growth of the economy. A successful and growth enhancing EBU would push for corrections of banks’ cost-income ratios, for a stronger involvement of robust shareholders in the design and support of their strategies, for improving the general quality of their governance also stressing the role of risk monitors in the hierarchy of management. ‘The outs’, i.e. the EU countries that are outside the euro area but are allowed to participate in the EBU represent a problem. In the view of the author, EBU is essential for ‘the ins’ but also desirable for ‘the outs’. EBU’s contribution to the real growth of the EU requires adequate arrangements with the countries outside the euro area.

In chapter 3, “Exploring the relationship between credit and nominal GDP”, *Gancho Ganchev, Vladimir Tsenkov and Elena Stavrova*, South-West University, Neofit Rilski, Blagoevgrad, Bulgaria, analyze whether credit growth in Central and Eastern European countries that are members of EU is correlated with changes in the rate of economic growth through the GDP cycles. The statistical analysis does not indicate a strong correlation between nominal GDP growth and bank lending growth. Inclusion of more independent variables improves the explanatory power of the regression model. The authors divide the individual

countries according to the strength of the impact on GDP of changes in bank lending. In Hungary, Latvia and Bulgaria the impact is strong, while it is more modest in Poland, Slovakia, Slovenia, the Czech Republic and Lithuania.

In chapter 4, “Household credits and financial stability: a theoretical model of financial intermediation” *Cécile Bastidon*, Université de Toulon presents a model of financial intermediation, defined by the importance of household credits within banks’ balance sheets and total outstanding credits, and the degree of intermediation of corporate finance. Several researchers have disregarded the fact that household credits represent 40% of banking intermediation activity in France and Spain and up to 80% in the United States. There are structural differences in the composition of household credits by term and destination. In France and Germany, the share of short-term loans is low. In the US, the share is about 25%. Long-term credits are relatively diversified on different items in France and Germany in contrast to the US, where household credits are dominated by housing credits. Consequently, the default risk is probably lower in the European countries. Differences in the role of household credits have, according to the author, implications for monetary policy. In the US, the high proportion of household credits in banking intermediation calls for use of a non-augmented Taylor Rule. In the Eurozone, the relatively lower proportion of household credits calls for extending the range of indicators that are taken into account beyond the simple Taylor Rule.

In chapter 5, “Euro-Area and US banks behavior, and ECB-Fed monetary policies during the global financial crisis: a comparison” *Alex Cukierman*, Interdisciplinary Center and Tel-Aviv University, compares the behavior of banks in the Euro-Area (EA) and in the US during the recent global financial crisis. Two important crisis triggers are singled out: the collapse of Lehmann Brothers in September 2008 and the upward revision of the Greek government deficit in November 2009. After these events, outstanding banking credits shrank. The impact of the first event was stronger in the US and that of the second was stronger in the EA. Since the Lehman event, the ratio of reserves to banking credit has been going up substantially more in the US than in the EA. The Fed has mainly used open market operations to inject liquidity and to keep the bonds it purchases on its balance sheet for an open-ended time, which implies that those operations have a strong and sustained impact on the monetary base. ECB has supplied liquidity to the banks mainly through repos with fixed redemption periods. Consequently, the level of reserves in the EA is determined through an interaction between the terms of the repos set by the ECB and the demand for this liquidity by EA banks. There are two main reasons for this difference in monetary policy procedures: The substantially higher share of banking credit within total credit in the EA, and the relatively higher conservativeness of the ECB in comparison to its US counterpart. In his concluding remarks, the author refers to the importance of ‘bailout

uncertainty' in the liquidity policies of US banks and the importance of 'sovereign risk' in the liquidity policies of EA banks.

In chapter 6, "Please don't throw me in the Briar Patch: the flummery of capital-requirement repairs undertaken in response to the Great Financial Crisis", *Edward J. Kane*, Boston College in strong words criticizes the idea that capital requirements can serve as a stabilization tool. Accounting capital is, according to the author, not a reliable proxy for a financial firm's survivability. In recent years, authorities in the US have been willing to shore up customer funding of big financial institutions in difficulties with explicit and implicit government guarantees of new debt. Government credit support is anticipated by the institutions. In fact, a guaranteed party has the option to 'put' responsibility for covering losses that exceed the value of its assets to the guarantor. If bank capital and stress tests are to remain the centerpiece of financial-stability regulation, capital and stress should, according to the author, be calculated net of the current value of this anticipated 'taxpayer put'. Taxpayer guarantees actually supply loss-absorbing equity capital to any firm that regulators perceive to be difficult to fail and unwind. Reckless managers of large financial firms presume that it is ethically okay for managers to maximize firm profits and their own incentive-based compensation at taxpayers' expense. The author recommends therefore that taxpayers should be given equal rights with stockholders and that managers and directors should be assigned a duty to measure, disclose and service taxpayers' stakeholdings fairly.

In chapter 7, "Banking supervision and growth: a new macroprudential paradigm?" *Mario Quagliariello* and *Samuel Da Rocha Lopes*, European Banking Authority ask if supervisors should be concerned about economic growth. The answer is yes. Evidence shows that the link between the banking sector and the real economy has become stronger over time. Credit aggregates provide valuable information for policymakers aiming for financial and economic stability. There is also evidence that supervisory capital levels are important in explaining banks' credit quality. More capital is typically positive for supervisors as well as for market participants. An EBA analysis shows a clear positive link between capital and credit growth. The authors argue in favor of a rather narrow definition of 'macroprudential tools'. They suggest that the toolbox should only contain those instruments which mitigate systemic risk and cyclicity, and which are applied system wide. This glossary would also help having more clarity on the objectives of macroprudential policy and the direct link between these objectives and the available instruments. It would also contribute to a more efficient allocation of tasks across authorities, improving the governance side.

In chapter 8, "Building a bank resolution fund over time: when should each individual bank contribute?" *Javier Villar Burke*, European Commission analyzes

the potential impact in terms of incentives and pro-cyclicality of individual contributions to a bank resolution fund. The design of the contributions to a resolution fund can influence incentives with respect to risk-taking by banks and pro-cyclicality and, therefore, it can have a positive or negative impact on financial stability. Analysts and policymakers insist that the rationale for establishing a resolution fund is that future crises should be financed by the financial institutions themselves, so that public funds will not be used to bailout banks that have incurred excessive risk. This policy goal springs from the feeling that the balance between risks, rewards and responsibilities between society and the financial sector needs to be adjusted. The present paper argues that the prominent role of a resolution fund is to foster financial stability and to act as a preventive tool. If properly designed, the resolution fund can steer excessive leverage and banking sector growth so that the cycle is smoothed both at upswings and downturns and banks' incentives become aligned with financial stability. Contributions to a resolution fund should both depend on the total size of each bank and take account of the current credit cycle and the income cycle to provide for an anti-cyclical effect. The exact calibration of coefficients is left for later research.

In chapter 9, "Securitization and Risk Retention in European Banking: The Impact of Collateral and Prudential Rules" *Alessandro Scopelliti*, University of Warwick studies the issuances of structured products by European banks from 1999 to 2010. He finds that regulatory incentives has a strong impact on the decisions regarding the retention of credit risk and the composition of bank assets and liabilities after securitization. Banks change their risk-weighted capital and leverage ratios after securitization, by considering structured issuances with different collateral, rating and nationality. This has implications for the impact of the collateral framework on the risk retention behavior of banks and for current reforms of prudential regulation. At the Milan conference, Alessandro Scopelliti's paper was awarded the SUERF Marjolin Prize for having given the best contribution by an author below the age of 40¹.

It is remarkable how many different views and perspectives that are presented by the authors of the chapters in this SUERF Study. Some authors are very optimistic concerning the positive impact of new monetary policy and regulatory initiatives from the Basel Committee, and EU institutions, other authors are – to say the least – very sceptical. It is also remarkable that growth and cyclical perspectives are mixed in most of the contributions. Readers learn that the discussion of money, regulation and growth continues and that financial stability and economic growth are interrelated.

¹ www.suerf.org/index.php?option=com_k2&view=item&id=20:suerf-marjolin-prize-and-lecture.

2. HOW CAN THE EUROPEAN BANKING UNION CONTRIBUTE TO GROWTH?

*Franco Bruni*¹

2.1. THE REASONS FOR A BANKING UNION

The European Banking Union (EBU) is potentially a very important contributor and facilitator for a more rapid and sustainable growth in the EU. In what follows I will try to elaborate on how this contribution can take place, in the short and in the medium-long run as well.

It is useful to start by recalling the reasons that have inspired the EBU project².

First, as it is well known, there is the short term aim of *fighting the euro area fragmentation*, unbundling bank risk from sovereign risk, thus avoiding the type of problems that have been damaging the area, especially in 2011-2 but that are still waiting for decisive actions to be eliminated: sudden stops in the cross border circulation of liquidity and vicious circles where interest rate divergences come to the point of signalling fears of a possible disintegration of the euro. The elimination of fragmentation is also needed to be able to implement a truly single monetary policy in the euro area.

In more general and fundamental terms, monetary unification cannot stand without banking union: this should be as intuitive as the fact that blood cannot keep the human body alive and well without a unified and centrally supervised system of the vessels, arteries and veins, that allow the blood to effectively circulate. Money has a value as long as it is smoothly accepted in the economy; it is useless if its circulation is full of regulatory obstacles and impeded by the lack of trust between agents that should use it for credit operations and payments. Only a denationalised banking system can support a denationalised currency. It is often said that fiscal centralisation is a necessary condition for the sustainability of monetary unification: but one could argue that banking union is an even more indispensable feature of a sustainable single currency area.

Besides assuring a non-fragmented single currency area there is a second, medium-long term target for EBU, which, I think, is often insufficiently stressed.

¹ Slightly revised version of the author's keynote speech to the 31st Suerf Colloquium & Baffi Finlawmetrics Conference 2014 on "Money, Regulation and Growth: Financing New Growth in Europe, Milan, 4 June 2014.

² To prepare this note the author has also drawn ideas from his recent paper "Learning on the Road towards the Banking Union", *Baffi Center Research Paper Series* No. 2014/148, <http://ssrn.com/abstract=2381842>, forthcoming on "Rivista di Politica Economica", April-June 2014, where a rich set of references can also be found to the literature and to the relevant official documents.

EBU is indispensable to *guarantee financial stability* in a financial integrated area where the information on banks' health must be consolidated at a super-national level, the supervision of both individual and systemic risks must be centralised, bank crisis management must be conducted in homogeneous ways and backed by a pool of common funds. The contribution of EBU to financial stability is crucial and rests also on the idea that the unification of the European banking system will trigger the implementation of the best practices in regulation, supervision and crisis management, thus resulting in a stronger and more competitive financial market, also supporting the global role of the euro.

To this end the project must be well connected to the numerous banking policies that are on the EU's agenda, including structural reforms such as those proposed in the Liikanen report³. Not only that: it would make a lot of sense if soon enough a plan were adopted to upgrade also the powers and responsibilities of European Securities Markets Authority and/or creating a separated single supervisory authority also for the non-bank sector of European financial markets. This would probably require modifications in the Treaty but we must remember that the need to have a unification of financial regulation and supervision has been felt since the euro was born and that part of the studies and efforts that were done to move in that direction, like the precious work by Lamfalussy⁴, did not start from the banks but from the securities markets. The single supervisor of the non-bank financial sector should obviously interact a lot with the ECB and banking supervision. This interaction is indispensable to obtain and monitor stability in the whole set of highly interconnected financial markets and operators. A good interaction should also act in favour of a virtuous process leading to a structural reduction of the proportion of bank intermediation in the total activity of the financial sector in continental Europe. Also comparing the US with Europe one can conclude that the financial crisis has shown some special fragilities of an excessively bank-based financial system. But if the role of non-bank finance increases, it would be even more dangerous to create a setting where banks are well supervised in a strict and centralised way, while non-bank finance is less under control. Risky activities could then abandon banks and the non-bank sector could suffer an adverse selection leading to instability. The supervision of securities markets must be at least as strong, coherent and uniform as the supervision of banks.

It is possible to list a third target for EBU which consists in contributing to the *completion of the single market* – the central idea that originated the EU – specifically for banking services and, more generally, for all the rest. In fact, while

³ High Level Expert Group On Reforming The Structure Of The EU Banking Sector, *Final Report*, Brussels, 2 October 2012: http://ec.europa.eu/internal_market/bank/docs/high-level_expert_group/report_en.pdf.

⁴ Final Report of the Committee of Wise Men on the European Securities Markets, Brussels, 15 February, 2001, http://ec.europa.eu/internal_market/securities/docs/lamfalussy/wisemen/final-report-wise-men_en.pdf.

the legal basis for the single supervisory mechanism is the very specific art. 127(6) of the TFEU, the legal basis for the single resolution mechanism has been explicitly indicated in art. 114 which allows the adoption of measures for the approximation of national provisions aiming at the establishment and functioning of the Single Market.

If the aims of EBU are the ones that I have just listed, the defence of the single currency, of financial stability and of the single market, its contributions to growth are obvious. I will therefore devote the rest of my observations to dealing with two more specific issues. First the potential impact of EBU on the reorganisation of our banks, to enhance their contribution to the acceleration of European growth. Second, the fact that we are still not completely sure that the banking union will have, soon enough, some features that seem very important to enable it to effectively reach its targets.

2.2. STRUCTURAL CHANGES AND REORGANISATIONS IN THE EUROPEAN BANKING SYSTEM

To the extent that EBU is a credible tool for fighting the segmentation of European banking markets, it will trigger a ‘convergence game’ analogous to the macroeconomic one that favoured the implementation of EMU. Banks in countries isolated by segmentation will gradually find themselves in a better position, both in funding and in lending. Their profitability and market value will improve relative to banks located in countries that were artificially privileged by a decentralised and non-homogeneous framework for supervising and resolving banks. Moreover, a successful EMU will favour cross border banking and enhance competition between banks of various sorts in Europe. At the beginning this will benefit multinational banks, but the competitive mechanism will later shrink their extra-margins as it will drive resources towards cross border activity.

A widespread *challenge of banks’ business models* will eventually trigger their reshaping. Structural changes, mergers, acquisitions and other forms of competition-induced reorganisations, in nearly all the segments of the European banking industry, will enhance the potential proactive response of the supply of banking services to the needs of credit markets. These developments will contribute to generate in the EU a quicker and more even real growth, especially if European prudential authorities will avoid, when supervising banks, to overlook the examination of their business models, property structure and corporate governance mechanisms. A successful and growth enhancing EBU would push for corrections of banks’ cost-income ratios, for a stronger involvement of robust shareholders in the design and support of their strategies,

for improving the general quality of their governance also stressing the role of risk monitors in the hierarchy of management.

Market discipline could virtuously interact with a well managed EBU as the principle of bail-in will be seriously and prudently applied. Bankers will feel a stronger incentive to formulate and communicate the specificities of their strategies and of their results, thus avoiding that markets deal with insufficiently differentiated 'national' banking systems: the quality of each bank will appear in more transparent ways. Both the productive and the allocative efficiency of the European banking system will improve, benefitting the real growth of the economy.

2.3. DELICATE ISSUES IN IMPLEMENTING THE BANKING UNION

The EBU entered the EU's agenda in the summer of 2012. Given the complexity and the delicateness of the decisions implied by the plan, it is a fine result that both the Single Supervisory Mechanism (SSM) and the Single Resolution Mechanism (SRM) have been approved in less than two years in great detail and that, if the Asset Quality Review (AQR) plus stress tests, performed by the ECB and the European Banking Authority (EBA), will be concluded with a decent success, EBU will enter into force before the end of 2014.

Obviously some of the features of EBU – as it comes out from an accelerated process of design and deliberation that has taken an unusually short time, compared to analogous European institutional evolutions – can be criticised and improved. The SRM, to cite just one example, is often considered to need further streamlining and “*some important details, such as the backstop for European resolution financing, still need to be clarified*”⁵. In other words: we are still not sure to obtain the best possible EBU. Opinions differ on which aspects should be improved and how. I would like here to very briefly deal with only two issues, perhaps not the most important ones, that I think deserve new deliberations and, before that, further discussion and research to understand them better.

First the problem of ‘*the outs*’, i.e. the EU countries that are outside the euro area but are allowed to participate in the EBU. In fact EBU is essential for the ins but also desirable for the outs⁶. Cross country multinational banking in Europe is relevant and involves also countries with derogation. It would be an obstacle to

⁵ M. DRAGHI, *A Consistent Strategy for a Sustained Recovery*, Lecture at Science Po, Paris, 25 March 2014, www.ecb.europa.eu/press/key/date/2014/html/sp140325.en.html.

⁶ See, for instance, Z. DARVAS and G.B. WOLFF, “Should non-Euro Area Countries Join the Single Supervisory Mechanism?”, *Bruegel Policy Contribution* 2013/06, March 2013: www.bruegel.org/publications/publication-detail/publication/773-should-non-euro-area-countries-join-the-single-supervisory-mechanism/.

a sound and natural financial integration of the euro area if countries in central and eastern Europe that are still outside the euro area would not participate as soon as possible in the single supervision and resolution mechanisms. A dangerous segmentation would make it more difficult to further enlarge and develop the role of the euro. Financial stability could suffer with some multinational banks acting in part under other supervisors. Discriminatory treatments could become a threat and reputational problems could hit non-participating countries. Even for those countries that will not accept to participate in the EBU since the beginning (thus profiting also from the opt-out clause that has been made available) a special cooperation should be organised with the spirit of the Vienna initiative⁷, with some attention extended also beyond the limits of the EU. The special cooperation should also take care of the complex problems that might arise if some countries would become part of the SSM while staying temporarily outside of a still immature SRM. EBU's contribution to the real growth of the EU requires adequate arrangements with the countries outside the euro area.

It is obviously a problem that the UK – Europe's major financial centre and crucial network of the market for the euro as well – has already excluded its participation in the SSM. An effort has been done to avoid that non-participating member states might think that the unification of supervision decreases their influence on 'regulation' (to the extent that there is some overlapping or interference of regulation and supervision): the voting rules in EBA, where all EU member states are represented, were changed and a majority of both participating and non-participating countries is now required. But I doubt this decision, that was pushed in particular by the UK, will have positive consequences. It will complicate the already difficult decision making procedure of EBA, thus decreasing its effectiveness, possibly weakening the SSM but also increasing the incentives for ECB's supervisory decisions to try and invade the grounds of EBA's regulatory powers. As on other fronts of UK's attitude with Europe, the British boycott of the banking union could turn out to be counterproductive for the influence of UK's financial legislation on the EU and the world, leaving to the British only the doubtful advantage, if any, of isolation. Let us hope that the opposite happens as the forced cooperation of the UK with EBU, including official agreements and MoUs, might trigger a continuous improvement of the relationship between London and the euro area. Europe's growth would greatly benefit from such an improvement.

Finally, let me mention the issue of systemic versus individual banks' crisis management. Bail-in principles and the organisation of the SRM and Single

⁷ See <http://vienna-initiative.com/> and, in particular: Vienna Initiative, "Observations on Bank Resolution Practices and the EU Proposal Vienna Initiative 2", mimeo, January 9, 2013: <http://vienna-initiative.com/wp-content/uploads/2013/01/Resolution-note-01-09-2013-to-Gov-Belka.pdf>.

Resolution Fund (SRF) aren't aimed at dealing with systemic shocks. But we know that the latter are often difficult to distinguish from more idiosyncratic shocks. To contribute to growth, crisis management mechanisms must be able to effectively deal with both types of shock. Systemic crises require special care by the ESM and the best solution, in my view, to find a sustainable long term solution to the SRM would be to merge its operations in the framework of the ESM. Enhancing the role of the ESM will be certainly beneficial also for the functioning of the EBU. A step in this direction, as far as I understand, is currently discussed⁸ with reference to the special issue of legacy assets, as they will emerge from the current AQR plus stress tests. Originally the ESM had been excluded from dealing with problems of legacy assets. In my opinion it would be promising also for the future developments of the ESM role if a compromise solution could be found where the ESM will be allowed to serve as a backstop of last resort also with legacy assets, provided that sufficiently strict bail-in rules are immediately applied by national authorities following the diagnosis of the AQR and stress tests. After all, an inadequate management of problems originated by legacy assets would constitute a rather serious systemic shock for the euro area and for the real growth of the European economy.

⁸ Statement by the President of the Eurogroup: *ESM Direct Recapitalisation Instrument*, 10 June 2014, www.eurozone.europa.eu/media/533095/20140610-eurogroup-president-direct-recapitalisation.pdf.

3. EXPLORING THE RELATIONSHIP BETWEEN CREDIT AND NOMINAL GDP

Gancho Ganchev, Vladimir Tsenkov and Elena Stavrova

Abstract

The functions of money as medium of exchange and unit of account are closely related to the problems of relative prices formation and the value of money itself. Rejecting the classical dichotomy, we can assume some interaction between the real and the monetary sectors. Following the new trends in monetary theory we focus on the nominal macroeconomic parameters. In particular, econometric research is carried out in order to reveal the relationship between the nominal GDP growth and the total credit in the countries of Central and Eastern Europe. The objective is to measure the level of dependency and the nature of the relationship between these important macroeconomic variables.

3.1. INTRODUCTION

The experts often come to the conclusion that the rapid growth of credit is the cause of the current financial crisis. The latter began as uncontrolled growth of private debt. Later the US crisis spread to the other parts of the global financial system – banking sector, the real estate market, the informal (gray) financial sector, public finances. The principles of conventional banking suggest a very close relationship between the level of aggregate savings and lending. Financial liberalization and the boom in the real estate market, along with the increasing economic activity and ballooning property prices, were obviously boosted by the banking (financial system) lending.

Several areas of disagreement remain however. The first is about the role of the bank credit. If we accept the Keynesian view that investment determines saving (Keynes, 1936), then increased bank lending should really add to domestic demand, what is denied by some authors supporting the loanable funds theory (see Kakarot-Handtke, 2014). If the Keynesian approach is correct we should observe a positive connection between the bank lending and the nominal and the real GDP.

Additional questions raise the puzzle about the difference between money and credit. Some authors rightly emphasize that credit may expand without increasing the money supply as in the case of successful new bond issues (Woolsey, 2009). It is clear however that in a monetary economy any issue of non-monetary debt instruments is intermediated by money and is finally a way of bridging the gap

between economic agents with excess monetary savings and those who need additional purchasing power. Consequently money and credit are strongly correlated, non-bank credit being unilaterally dependent on bank created money. If we assume additionally that modern endogenous money is based on credit, then bank lending is a good proxy of total credit. So studying the interdependencies between the bank credit and nominal GDP we can draw conclusions about more general macroeconomic interdependencies.

Recently the attention of the monetary policy oriented macroeconomists is attracted by the idea of the nominal GDP (NGDP) targeting (see for example Rowe, 2011). The NGDP targeting is especially endorsed by the newly emerged internet based market monetarist school (see for details Hetzel, 2009 and Sumner, 2011). The market monetarists reject the real business cycles approach denying the impact of monetary (nominal) shocks on the real economy (see Kydland and Prescott, 1982). The new monetarists assume that if the monetary authorities guarantee that any increase in money demand is matched one to one by an increase in money supply then nominal GDP will remain unaltered. They, like the Keynesians, acknowledge that in the modern economies prices are sticky. Under these circumstances, if the monetary policy is excessively tight, the nominal GDP will tend to fall. The growth is also expected to be lower. In the case of private sector generated excess demand for money we will observe consequences on commodity, foreign exchange, bond, stock and other markets. This means that money is not neutral and monetary policy matters. If in addition we assume that money is credit based (what is not however the position of the new or quasi monetarists), then we should observe positive relationship between bank credit and NGDP. The impact of lending on the real GDP should be in the same direction.

Another approach to the problem is suggested by the theory of free banking. The proponents of free banking assert that the creation of inside money in terms banknotes and checkable deposits is automatically restricted to the needs of the real economy. Central role in this self-adjusting mechanism plays ‘the rule of excess reserve’ and the more general ‘principle of adverse clearings’ (Selgin, 1988). The excess reserve tenet assumes that a private bank can increase its lending (the new loan is created via a new checkable deposit to the borrower) only if it disposes with excess reserves (in terms of central bank or commodity money). At the same time the bank clients use the borrowed money only to pay their suppliers and not to increase the demand for inside money balances. Since the suppliers are in general served by other banks, then any new loan generates a clearing drain equal to the amount of the new credit. The principle of adverse clearing simply generalizes the excess reserve rule to private bank note issue. It is assumed that this mechanism keeps the private banks money creation in line with real sector requirements and warrants monetary equilibrium.

In practice however we can doubt that this type of self-adjustment can really take place. First of all, the borrowers need additional money not only to pay for purchases, but also to increase inside money balances in line with the increased activities. Secondly, if the excess reserves of a particular bank are exhausted as a result of supplying additional lending, the excess reserves do not disappear, but are merely transferred to other banks, so the process of increased lending will continue. In addition, if the banking system with clearing mechanism consists not only of small banks, but of universal banks with developed and diversified branch structure, the clearing drain will not be equal to the new lending, but will be substantially less. If we take into account also that free banking in its pure form should rely on commodity money as reserve asset, then it is clear that free banking cannot guarantee the stability of the price level and we should expect alternating inflation-deflation periods.

There is another flaw of the free banking system. It is related to the reaction of the money supply to the changes in the frequency of clearing payments (Selgin, 1988). When, for example, the frequency declines, then, *ceteris paribus* (with the same volume of payments), the demand for inside money increases. The supply however declines, because it is positively correlated with the frequency. This may happen in the case of reduced synchronization of payments in the real economy due to increased bunching costs. The problem may be resolved only by using the central bank lender of last resort function to support interbank clearing mechanism as a part of the more general policy of securing money market equilibrium.

If we critically summarize the conclusions of different theories, we can expect strong connection between bank lending and the nominal GDP. So, one of the aims of the present research paper is to examine the dynamics of the supply of credit and nominal GDP growth in the emerging financial markets and in Central and Eastern Europe. The reason for this particular choice is the fact, that in the years before 2008, the region witnessed exceptionally rapid credit growth. Researchers from different countries draw the conclusion, that lending, in conjunction with the eastern expansion of the EU, accelerated economic growth. Consequently, the main intention of the present research is to reveal the relationship between lending and economic growth in nominal terms. The study consists of four parts: introductory, methodological, empirical and theoretical interpretation.

3.2. GENERAL APPROACH

The theoretical part of the thesis is based primarily on literature about the credit creation and its relation to the expansion of the other macroeconomic variables

in the period before the credit crisis and after the financial turmoil. In spite of the fact, that there are many studies about the effects of the financial crisis on the financial systems of the countries of Central and Eastern Europe (many of them develop panels of indicators for early detection of critical events, see Babecky *et al.*, 2012), our research is based on the observation that the origins of the credit boom are not sufficiently explained. Therefore the main task of the first part of our paper is to answer the question whether the credit growth in Central and Eastern European countries (EEC) members of the European Union is correlated with the changes in the rate of economic growth through the GDP cycles.

The empirical study is based on panel time series of the banking system lending and the GDP in the Czech Republic, Estonia, Hungary, Poland, Slovakia, Slovenia, Bulgaria, Lithuania, Latvia, and Romania for the period 1990-2010.

The sources of the data used are the official statistics releases by the central banks, national statistical offices, the International Monetary Fund, the European Central Bank and Eurostat.

The analysis of the main factors generating the rapid credit growth is of crucial importance when trying to find out the causal explanation of particular credit episodes in selected countries. However, this approach is not able to identify completely all factors that directly boost both demand and supply of credit. The main reasons for stimulating the supply of credit and determining the levels of development of financial intermediation in the EEC are usually assumed to be the optimistic expectations about the prospects of EU membership, the speed of adjustment of eastern economies to the European common market and the penetration of European transnational banks into the economies of the post-communist countries.

Factors determining the demand for bank lending are strongly associated with the process of transition to a decentralized market organization of the respective economic systems and the process of privatization of key national industries. The strong foreign banks penetration facilitated the transfer of up to date practices of risk management and thus reduced the spread between interest rates on deposits and loans, eased the access to financing from parent banks, broadened the bank product portfolios. The macroeconomic stabilization achieved in most parts of eastern European countries directly affected not only the demand for credit, but the supply of loanable funds to businesses and individuals. Usually the demand for credit is associated with some macroeconomic variables (GDP, wages, interest rates, input prices) or variables such as stock price indexes, tax payments and others (see for detailed literature review Gattin-Turkalj, Ljubaj, Martinis and Mrkalj, 2007).

In spite of scrutinizing these supply and demand factors, we focused on VAR analysis, including lending and GDP growth. This allows for detailed dynamic

analysis of the interaction between bank lending and economic growth. While this approach is not able to give a positive picture of the causal factor structure laying behind the credit and GDP growth it makes possible the disclosure of causal interdependencies between the real and the monetary sectors.

3.2.1. Econometric Methodology

The study is based on the use of panel data and on evaluating a linear regression equation by means of the method of least squares (ordinary least squares regression).

$$y_{it} = \alpha + \beta x_{it} + u_{it} \quad (1.1)$$

Where:

y_{it} – Dependent variable – nominal GDP growth rate of the i -th country at time period t

x_{it} – Independent variable – bank lending growth rate of the i -th country's at time period t

An important condition for the accuracy of the results obtained by the method of least squares is not to omit some explanatory variable because they are not directly observed or are missing in the design equation. To avoid this possibility and to guarantee the objectivity of the results of the econometric calculations we expand the regression equation with an additional variable – z_i . So we get the following extended equation:

$$y_{it} = \alpha_i + \beta x_{it} + u_{it} \quad (1.2)$$

Where:

$$\alpha_i = \alpha + \gamma z_i$$

3.3. EMPIRICAL RESULTS

Initially we calculate the regression equation without z_i presuming that the dynamics of the nominal gross domestic product (GDP) is mostly attributable to the dynamics of lending/borrowing (CRED) also in nominal terms. The results of the regression evaluation are presented in Tables 1 and 2.

The data does not indicate a strong correlation between the dynamics of GDP and CRED, i.e. we cannot consider CRED as the only variable, determining GDP.

To confirm this finding we first consider the value of R^2 as indicator, stating how much of the variability of GDP is explained by the regression equation. The

explanatory variable CRED, as evidenced, is able to account for 20.85% of the variations of GDP, which means that the variable is a significant factor determining economic growth. The adjusted R-squared indicator, taking into account the other explanatory variables, also supports this conclusion.

If we compare the S.E. and the S.D. (these variables represent the standard error of regression and the standard deviation of the residuals u_{it}) and the standard deviation of GDP, we can see that the values of both are relatively close – 9.206588 and 10.30828. This indicates that the standard deviation of GDP is explained to a relatively lesser extent by the explanatory variable – CRED, compared to the other, not included factors.

Finally, we can deduce that the dynamics of the independent variable CRED is not sufficient in itself to explain the dynamics of GDP and that the applied regression equation does not have sufficient explanatory power due to the lack of significant association between dependent and independent variables and/or failure to include additional important variables in the regression. This conclusion is confirmed by the reading of the Durbin-Watson test, which reveals the presence of significant autocorrelation dependencies included in the regression equation. In addition, we observe that the distribution of the residues u_{it} is characterized by the existence of fat tails pointing out that there is considerable autocorrelation of dependent variable GDP and that these interconnections are not taken into account by the regression.

As a response to the above conclusions and in order to improve the explanatory power of the regression, we include additional elements in the equation $-z_t$. The results from the application of econometric model (1.2) are presented in Table 3.

In a direct comparison of the models (1.1.) and (1.2) we come to the conclusion that the latter demonstrates better results from the application of regression evaluation of interdependencies between the studied variables. This statement is confirmed by the values of the test statistics associated with the Akaike and Schwartz criteria (Akaike info criterion and Schwarz criterion). As evidenced by the results of equation (1.2), the improvement in explanatory power of the regression model is substantial – 40.24% of the variability of GDP is explained by the regression model compared to 20.85% for the model (1.1). There is a decrease in the standard deviation of the residuals u_{it} – 9.206588 in the equation (1.1) and 8.296439 in the model (1.2) – which is in line with the increased explanatory power of the model (1.2), compared to (1.1), but is still relatively close to the standard deviation of CRED of 10.30828.

These results lead to the conclusion that the model (1.2) presents a regression that fails to clarify to the necessary extent the dynamics of GDP. Moreover, there is an improvement in the explanatory power of the regression model due to the

inclusion of more than one independent variable. This reflects the fact that the complex behavior of the dynamics of GDP cannot be explained by the movements of a single variable or, alternatively, this variable may not be CRED.

An additional confirmation of this conclusion are the values of the coefficients of the model (1.2) $-\alpha_i$, $\beta = 7.995368 = 0.083425$, which clearly demonstrate relatively higher weight of α and z_i , given a constant rate and weight of the explanatory variable CRED. This result validates the assumption that the dynamics of GDP is explained largely not by other external independent variables but via the dynamics of its volatility in the past – an indication that is given to us by the values of tests and Durbin-Watson distributions with fatter tails of standardized residues u_{it} , indicating the presence of significant autocorrelation dependencies associated with the volatility of GDP.

Analyzing data from the two models we cannot fail to note that the values of Std. Error, t-Statistic, Prob. (P-value), F-statistic, Prob. (F-statistic) the coefficients of the regression equations are statistically significant and different from zero. Thus, we can determine that the models (1.1) and (1.2), although not containing self-sufficient data about GDP, nevertheless, provide valuable insights about the relationship between the studied variables GDP and CRED, requiring in the same time analysis of underlying factors affecting regression equations (1.1) and (1.2).

Let's look at the values of the explanatory variables determined reflecting the values of CRED in the different countries involved in the study – Table 4. We can divide the countries into two groups according to their average positions vis-a-vis the variable CRED database. In the first group we can include countries showing greater than average pace of change of total average credit than CRED = 26.83231. Countries showing higher than average rates of lending are: 1. Romania (63.65692), 2. Slovenia (32.42308), 3. Latvia (30.31538), 4. Bulgaria (28.37000), 5. Slovakia (27.30000).

At the opposite pole are countries with an average rate of lending less than the average of all countries: 1. Czech Republic (7.681538), 2. Hungary (14.75615), 3. Poland (15.30923), 4. Estonia (24.01077), 5. Lithuania (24.50000). These countries show lower lending rates and higher resistance to lending. In the second group standard deviations are in the range starting from 9.8233508 (Hungary) to 25.13616 (Estonia). The first group shows significantly greater variability: from 24.96350 (Latvia) to 72.95574 (Romania). *Ceteris paribus* the above data indicates that in the first group of countries, the importance of the explanatory variables CRED and GDP is higher than in the case of the second.

This statement, though true in terms of quantification, should not be regarded as evidence of a strong link between CRED and GDP. We should underline that the regression equation reflects relatively low weight of lending as explanatory

variable of gross domestic product ($\beta = 0.083425$), but in some countries the relative importance of the banking sector may be significantly higher.

As already mentioned, in the structure of equation (1.2) the constant α has been transformed into a $\alpha_i = \alpha + \gamma z_i$, in order to capture the impact of possibly omitted independent variables in the regression equation, expressed by the term z_i . In this respect we should analyze the values α_i as a measure of the relative impact of the missing from the equation (1.2) variables. This analysis is done in Table 5. From the latter we can divide the studied countries in two groups- those with relatively low levels α_i of those with high levels.

In the group with low values (from zero to unity) we can include: Hungary, Latvia and Bulgaria. The group of high values (from 1 to 2) consists of Poland and Slovakia. And finally the group of very high values (more than 2) comprises Slovenia, Czech Republic, Lithuania and Romania. Excluding the extremes in this ordering (Hungary and Romania), we can say that high values to α_i indicate greater importance of missing in the regression equations variables.

Consequently, the explanatory variable CRED has the most significant impact on GDP in the countries with the lowest coefficient – α_i – Hungary, Latvia and Bulgaria. It should be pointed out that Bulgaria and Latvia together with Romania, Slovenia and Slovakia fall within the group of countries showing a higher than average lending rates. We should also emphasize on the negative sign of the values α_i for all countries, except Romania.

This fact suggests that the impact of CRED on GDP is not as important as it seems, especially when a negative value of α_i combines with positive value β . So in countries with high absolute values of α_i , such as Poland, Slovakia, Slovenia, Czech Republic, Lithuania, the relative importance of the dependent variable CRED declines. This relationship does not contradict the data about the average value of the CRED in Table 4.

The presented findings reinforce the claim that in the above mentioned countries the impact of credit to GDP is relatively less pronounced compared to the others. The statistical significance of the coefficient α_i , presented in Table 6, also confirms the above conclusions. In this table, the p-value (Prob.) provides reasonable statistical support about the application α_i in the regression equation.

We apply also a VAR model with the following specification:

$$y_t = A_1 y_{t-1} + A_p y_{t-p} + Bx_t + \varepsilon_t \quad (1.3)$$

Where:

y_t – vector of internal to the model variables

x_t – vector of external to the model variables

$A_1 \dots A_p$ and B – matrix coefficients

ε_t – Vector of residuals.

The results of VAR analysis can be divided into two equations related to the variables GDP and CRED respectively. The VAR analysis is performed with lags of 2, 4 and 10 years. Trying to generalize the results, we can specify, that in the short run the impact of the variable GDP is relatively stronger than that of CRED. In the medium term perspective the importance of GDP is still stronger, but less categorically. In the long run the comparative weight of the two variables is indeterminate.

If we look at the VAR model with two years lag (Table 7) we can observe, that in terms of explaining GDP dynamics only the values of GDP(-1) and CRED(-1) are statistically significant. This means that from the point of view of a GDP dynamics explanation, only the latter variables matter and only in the short run (lag of one year). In addition, the impact of GDP is much stronger (the values of the coefficients speak for themselves- 0.654653 for GDP (-1) against 0.047526 for CRED (-1)). Concerning the VAR model for CRED we come to the conclusion, that in the short run the level of lending is determined to a higher extent by the level of GDP than by the own trends of CRED. We observe only two statistically significant lag variables – GDP (-1) and CRED (-2). The particular values of the coefficients support the hypothesis that the impact of GDP is much stronger than that of CRED. The estimates are -2.018369 for GDP (-1) against -0.284788 for CRED (-2) respectively.

The evaluation of VAR models of GDP and CRED with lags of four years (Table 8) reveals strong impact of GDP on GDP and CRED dynamics, but this effect is limited to the first two delays and is decreasing afterward. In the case of the VAR model of GDP we can observe statistically significant impact of only its own lagged values for the first two years with decreasing values of the coefficients. This particularity together with the lack of statistically significant effect of CRED determines in the middle term perspective the much stronger influence of GDP on its own dynamics, but without long term effects.

Concerning the VAR estimation of CRED, we can point out to a middle term impact of GDP, but this dependence is relatively short-lived and with declining strength. The latter assertion can be supported by the fact, that a statistically significant impact is observed only in the case of the coefficient before GDP (-1). The value of the coefficient associated with GDP (-1) with four lags horizon is 1.837594 which is significantly less than the value of the same coefficient with two years lag horizon of estimation – 2.018369.

The results of VAR estimation with ten years of lag interval (Table 9) demonstrate lack of definite long term mutual determinacy on the part of both variables. The VAR estimation of GDP reveals a statistically significant impact in the case of variables GDP (-2), CRED (-4) and CRED (-7). We must emphasize, on the one hand, that the absolute value of the coefficient of GDP (-2) is higher than the values of CRED (-4) and CRED (-7), but if we, on the other hand, take into account the lags of the variables, reflecting the influence of lending, namely 4 and 7 years, we could reasonably suppose that the long term impact of lending, while still limited, has its formative effect on the current levels of GDP.

The evaluation of the 10 year lags VAR model of CRED does not disclose any statistically significant impact of both variables in the case of any lag.

The analysis of the VAR interdependencies between the studied variables can be broadened with the information from the Figure 2, reflecting the reaction of GDP and CRED to the impulse impact of the equations' residues. The examination of the impulse response graphs confirms the conclusions of VAR breakdown. The impulse effect of GDP on its own lagged values displays stronger reaction in short and medium term up to 5 lags with decreasing strength along the lag horizon. The effect of CRED on GDP exhibits short term peak of lag 2 and gradual decline up to lag 4. These impulse reactions coincide with VAR results revealing stronger impact of GDP, compared to CRED in short and medium term. Scrutinizing the impulse impact of GDP over CRED we observe strong reaction in the short term up to 3 lags and subsequent downward trend converging to zero at the 10th lag. As a result we can draw the conclusion that the effect of GDP on CRED is relatively strong in short run but does not determine the CRED dynamics in a long term perspective.

We can test the interdependencies between GDP and CRED also by implementation of Granger causality analysis. The latter is applied with lags of 2, 4 and 10 years (Table 10). The results of testing the respective hypothesis with 2 lags confirmed the existence of Granger causality from GDP to CRED. In the case of 4 years lag the causality is reversed and is taking place from CRED to GDP. In the case of less than 10 years lag horizon no statistically significant causality was revealed. Trying to generalize the econometric results we can conclude that the Granger causality tests substantiate the VAR analysis, namely that in short run GDP determines CRED but in middle term perspective the roles interchange. In the long run no stable statistically significant interdependence is revealed.

3.4. CONCLUSIONS

The econometric research carried out in the present paper relates the dynamics of the nominal GDP to that of nominal lending in the new countries-members of the EU. The choice of nominal values has both advantages and limitations. First of all we should observe that virtually all that matters from the point of view of the economic agents' survival is in nominal terms – the financial obligations, payments, revenue, accounts and so on, everything that determines the financial endurance of the firms, households and individuals, is expressed in nominal values. Even the central banks' targets may be fixed in terms of nominal GDP (McCallum, 2011).

The decomposition of nominal GDP in terms of real growth and inflation is an artificial operation in order to avoid money illusion. In fact both nominal and real parameters matter. In addition, if we assume that at least in the long run, the money illusion does not affect the economic agents and the central bank, then the analysis in nominal and real terms should give the same results. So our paper is based on the idea that the interdependence between nominal GDP and nominal credit dynamics reveal important and lasting regularities.

Another key topic affecting the interpretation of our results is the well-known paradox of thrift. If we, according to Keynes, presume that individual and collective savings differ, then we should come to the conclusion that investment determines saving and not vice-versa – *“It is, of course, just as impossible for the community as a whole to save less than the amount of current investment, since the attempt to do so will necessarily raise incomes to a level at which the sums which individuals choose to save add up to a figure exactly equal to the amount of investment”* (Keynes, 1936, Chapter 7, p.84). In view of the fact that investment is the most vulnerable part of the GDP, than in the short run, the nominal GDP dynamics will affect saving, respectively lending, and not the other way around. Here one should keep in mind that Keynes assumed a closed economy.

In the middle term perspective, however, the past changes of the volume of lending inevitably influence the dynamics of nominal GDP. We should also take into account debt deflation type of effects. According to Irving Fisher (1933), the rate of inflation interacts with the current level of accumulated credit and leads to increase (in the case of deflation) and decrease (in the case of inflation) of the real debt. The real credit fluctuations shape the cyclical behavior of the economy. If the inflation rate depends on the dynamics of money and credit supply, then past changes of nominal lending will affect the real debt level and consequently the real and nominal GDP growth.

In the long run the hypothesis to be tested is that of the neutrality and superneutrality of money. If money neutrality holds, we can expect that the changes of money and credit will affect only the price level and not the real macro economic variables, especially in the long run (Bordo and Schwartz, 2006). If the changes of money and credit affect the price level in the short run, then money neutrality implies that there is no connection between the nominal GDP growth and credit in the long run. In its turn, the superneutrality means that money is not only neutral, but that prices react also to permanent changes in growth rates of the nominal money supply. The latter hypothesis is not tested in the present paper.

What we can observe from our research is that in the short run we can detect impact from nominal GDP to lending and not vice-versa. This seems to confirm the Keynesian hypothesis of investment determining saving and lending. Short-term money neutrality is not corroborated since it implies strong influence from nominal lending to nominal GDP.

As it concerns middle term regularities (lag of four years), we detect statistically significant effect only on the part of lagged values of the nominal GDP on GDP and CRED.

The long term interactions also reveal interesting results. We observe statistically significant impact of CRED over the GDP with lags of 4 and 7 years. The signs of the coefficients are positive. This seems to confirm the credit deflation hypothesis. High credit growth in the past is positively correlated with the inflation rate. The latter relieves the real credit burden and has positive impact on real and nominal GDP. This conclusion is confirmed additionally by Granger causality analysis.

The lack of substantial interdependence between the nominal GDP and CRED dynamics may be viewed as confirmation of the long term neutrality of money.

The observed interdependencies allow for some conclusions concerning macroeconomic policy. The absence of short term impact of CRED on GDP and the relatively strong reverse connection reveals that in principle fiscal policy may be considered as a more efficient tool for short term stabilization, compared to monetary instruments. In the middle term perspective however the monetary policy is important in order to avoid credit deflation. This paper confirms to some extent the suggestion about nominal GDP targeting.

We should emphasize also that these conclusions are confirmed with different strength in the different EEC countries. The impact of CRED on GDP is stronger in Hungary, Latvia and Bulgaria. The latter partially coincides with the conclusion, that Bulgaria, Hungary and Latvia can be characterized by a close to equilibrium credit-to-GDP ratio (see Égert et al., 2006). In Poland, Slovakia, Slovenia, Czech Republic and Lithuania the relative importance of CRED

declines. Since these two groups include countries with different monetary regimes, different fiscal and monetary policies, we need additional research to reveal the origin of the observed discrepancies.

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STATISTICAL APPENDIX

Table 1: Regression Results Using only one Independent Variable – CRED

Dependent Variable: GDP
 Method: Panel Least Squares
 Sample: 1998 2010
 Periods included: 13
 Cross-sections included: 10
 Total panel (balanced) observations: 130

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.941269	0.986666	7.035074	0.0000
CRED	0.122709	0.021132	5.806913	0.0000
R-squared	0.208510	Mean dependent var		10.23385
Adjusted R-squared	0.202326	S.D. dependent var		10.30828
S.E. of regression	9.206588	Akaike info criterion		7.292981
Sum squared resid	10849.44	Schwarz criterion		7.337097
Log likelihood	-472.0437	Hannan-Quinn criter.		7.310906
F-statistic	33.72024	Durbin-Watson stat		1.110511
Prob(F-statistic)	0.000000			

Table 2: Statistical Results of the Regression Equation (1.1) as an Explanatory Variable Including CRED

Dependent Variable: GDP
 Method: Panel Least Squares
 Sample: 1998 2010
 Periods included: 13
 Cross-sections included: 10
 Total panel (balanced) observations: 130
 $GDP=C(1)+C(2)*CRED$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	7.995368	0.912934	8.757885	0.0000
C(2)	0.083425	0.020548	4.060044	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.402458	Mean dependent var		10.23385
Adjusted R-squared	0.352244	S.D. dependent var		10.30828
S.E. of regression	8.296439	Akaike info criterion		7.150350
Sum squared resid	8190.877	Schwarz criterion		7.392987
Log likelihood	-453.7727	Hannan-Quinn criter.		7.248941
F-statistic	8.014908	Durbin-Watson stat		1.174425
Prob(F-statistic)	0.000000			

Table 3: Statistical Results of the Regression Equation (1.2) as an Explanatory Variable Including CRED and additional elements $-z_i$

Estimation Command:

LS(CX=F) GDP=C(1)+C(2)*CRED

Estimation Equation:

GDP=C(1)+C(2)*CRED

Forecasting Equation:

GDP=C(1)+C(2)*CRED + [CX=F]

Substituted Coefficients:

GDP=7.99536818278+0.0834247280081*CRED + [CX=F]

Table 4: Descriptive statistics of the explanatory variables in the PB model (1.2)

Descriptive Statistics for CRED

Categorized by values of ISOCODE

Sample: 1998 2010

Included observations: 130

ISOCODE	Mean	Std. Dev.	Obs.
BUL	28.37000	34.35826	13
CZ	7.681538	18.49416	13
EST	24.01077	25.13616	13
HUG	14.75615	9.823508	13
LAT	30.31538	24.96350	13
LIT	24.50000	21.91012	13
POL	15.30923	12.59863	13
ROM	63.65692	72.95574	13
SLOVA	27.30000	61.39473	13
SLOVE	32.42308	31.31760	13
All	26.83231	38.35935	130

Table 5: Values of Coefficient α_i in Model (1.2)

ISOCODE	Effect
BUL	-0.431358
CZ	-2.951583
EST	-0.959999
HUG	-0.041781
LAT	-0.109036
LIT	-3.416197
POL	-1.180229
ROM	13.86330
SLOVA	-1.857479
SLOVE	-2.915639

Table 6: Statistical Significance Test of the Coefficient α_i in the Model (1.2)

Redundant Fixed Effects Tests

Equation: Untitled

Test cross-section fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	4.291619	(9,119)	0.0001
Cross-section Chi-square	36.542034	9	0.0000

Table 7: Statistics from VAR analysis with 2 year lags

Vector Autoregression Estimates

Sample (adjusted): 2000 2010

Included observations: 110 after adjustments

Standard errors in () & t-statistics in []

	GDP	CRED
GDP(-1)	0.654653 (0.09685) [6.75912]	2.018369 (0.49405) [4.08538]
GDP(-2)	-0.050785 (0.10901) [-0.46587]	0.843110 (0.55606) [1.51623]
CRED(-1)	0.047526 (0.01892) [2.51252]	-0.035887 (0.09649) [-0.37194]
CRED(-2)	-0.011994 (0.02222) [-0.53986]	-0.284788 (0.11333) [-2.51291]
C	2.260839 (1.11114) [2.03471]	4.790013 (5.66781) [0.84513]
R-squared	0.536525	0.294949
Adj. R-squared	0.518869	0.268090
Sum sq. resids	4748.038	123540.4
S.E. equation	6.724538	34.30124
F-statistic	30.38738	10.98137
Log likelihood	-363.1586	-542.3946

Table 7: Statistics from VAR analysis with 2 year lags (*continued*)

Akaike AIC	6.693793	9.952629
Schwarz SC	6.816542	10.07538
Mean dependent	9.505455	26.73991
S.D. dependent	9.694620	40.09416
Determinant resid covariance (dof adj.)		50172.10
Determinant resid covariance		45714.66
Log likelihood		-902.3261
Akaike information criterion		16.58775
Schwarz criterion		16.83324

Table 8: Statistics from VAR analysis with 4 year lags

Vector Autoregression Estimates
Sample (adjusted): 2002 2010
Included observations: 90 after adjustments
Standard errors in () & t-statistics in []

	GDP	CRED
GDP(-1)	0.717883 (0.11424) [6.28374]	1.837594 (0.52008) [3.53330]
GDP(-2)	-0.651907 (0.21512) [-3.03046]	-1.107150 (0.97929) [-1.13056]
GDP(-3)	0.176451 (0.21858) [0.80726]	0.793440 (0.99505) [0.79739]
GDP(-4)	0.226909 (0.16214) [1.39946]	0.271703 (0.73812) [0.36810]
CRED(-1)	0.046479 (0.02417) [1.92320]	0.012399 (0.11002) [0.11270]
CRED(-2)	0.012069 (0.02718)	-0.101465 (0.12372)

Table 8: Statistics from VAR analysis with 4 year lags (*continued*)

	[0.44408]	[-0.82009]
CRED(-3)	0.010149 (0.02614) [0.38823]	0.065034 (0.11900) [0.54649]
CRED(-4)	-0.012459 (0.02549) [-0.48875]	-0.186998 (0.11605) [-1.61139]
C	2.655343 (1.42365) [1.86517]	12.57648 (6.48091) [1.94054]
R-squared	0.465462	0.193030
Adj. R-squared	0.412668	0.113329
Sum sq. resids	3798.117	78710.97
S.E. equation	6.847652	31.17275
F-statistic	8.816593	2.421934
Log likelihood	-296.1148	-432.5222
Akaike AIC	6.780328	9.811605
Schwarz SC	7.030309	10.06159
Mean dependent	8.510000	24.22178
S.D. dependent	8.935110	33.10502
Determinant resid covariance (dof adj.)		44878.54
Determinant resid covariance		36351.62
Log likelihood		-727.9537
Akaike information criterion		16.57675
Schwarz criterion		17.07671

Table 9: Statistics from VAR analysis with 10 year lags

Vector Autoregression Estimates

Date: 04/22/12 Time: 23:05

Sample (adjusted): 2008 2010

Included observations: 30 after adjustments

Standard errors in () & t-statistics in []

	GDP	CRED
GNP(-1)	0.284609 (0.21897) [1.29973]	0.443461 (1.90987) [0.23219]
GNP(-2)	-0.868987 (0.38777) [-2.24100]	3.227957 (3.38207) [0.95443]
GNP(-3)	-1.126138 (0.87417) [-1.28823]	-1.666798 (7.62442) [-0.21861]
GNP(-4)	0.886696 (0.77846) [1.13904]	-4.617375 (6.78964) [-0.68006]
GNP(-5)	0.918986 (0.77634) [1.18374]	1.835502 (6.77117) [0.27108]
GNP(-6)	-0.602822 (0.73925) [-0.81545]	6.095568 (6.44767) [0.94539]
GNP(-7)	0.933217 (0.99140) [0.94131]	-8.052226 (8.64686) [-0.93123]
GNP(-8)	-0.845540 (0.75592) [-1.11856]	1.259165 (6.59305) [0.19098]
GNP(-9)	-0.359757	-0.671750

Table 9: Statistics from VAR analysis with 10 year lags (*continued*)

	(0.46488)	(4.05463)
	[-0.77387]	[-0.16567]
GNP(-10)	0.455084	0.423160
	(0.29517)	(2.57445)
	[1.54176]	[0.16437]
CRED(-1)	0.061684	0.196727
	(0.04842)	(0.42229)
	[1.27402]	[0.46586]
CRED(-2)	0.082416	-0.923863
	(0.07317)	(0.63815)
	[1.12642]	[-1.44773]
CRED(-3)	0.056276	0.173153
	(0.07617)	(0.66437)
	[0.73879]	[0.26063]
CRED(-4)	-0.161894	-0.136252
	(0.06871)	(0.59931)
	[-2.35609]	[-0.22735]
CRED(-5)	0.054437	0.896333
	(0.10727)	(0.93560)
	[0.50748]	[0.95803]
CRED(-6)	-0.019558	-1.038203
	(0.07741)	(0.67517)
	[-0.25265]	[-1.53769]
CRED(-7)	0.195674	-0.160635
	(0.09661)	(0.84261)
	[2.02542]	[-0.19064]
CRED(-8)	-0.035769	0.786075
	(0.05805)	(0.50627)
	[-0.61621]	[1.55267]

Table 9: Statistics from VAR analysis with 10 year lags (*continued*)

CRED(-9)	0.003980 (0.05089) [0.07821]	-0.067651 (0.44388) [-0.15241]
CRED(-10)	0.037968 (0.04629) [0.82026]	0.153455 (0.40372) [0.38011]
C	2.039835 (5.04296) [0.40449]	34.45105 (43.9841) [0.78326]
R-squared	0.869119	0.581900
Adj. R-squared	0.578272	-0.347211
Sum sq. resids	286.8046	21817.58
S.E. equation	5.645102	49.23592
F-statistic	2.988238	0.626297
Log likelihood	-76.43221	-141.4073
Akaike AIC	6.495481	10.82715
Schwarz SC	7.476319	11.80799
Mean dependent	1.026667	12.95700
S.D. dependent	8.692721	42.41937
Determinant resid covariance (dof adj.)		62342.71
Determinant resid covariance		5610.844
Log likelihood		-214.6232
Akaike information criterion		17.10821
Schwarz criterion		19.06989

Table 10: Statistics from Granger Causality Test

Pairwise Granger Causality Tests			
Sample: 1998 2010			
Lags: 2 years			
Null Hypothesis:	Obs	F-Statistic	Prob.
CRED does not Granger Cause GDP	110	3.34459	0.0391
GDP does not Granger Cause CRED		17.9507	2.E-07
Lags: 4 years			
Null Hypothesis:	Obs	F-Statistic	Prob.
CRED does not Granger Cause GDP	90	1.05328	0.3851
GDP does not Granger Cause CRED		3.53652	0.0104
Lags: 10 years			
Null Hypothesis:	Obs	F-Statistic	Prob.
CRED does not Granger Cause GDP	30	1.36348	0.3260
GDP does not Granger Cause CRED		0.49790	0.8538

Figure 1: Residuals distribution

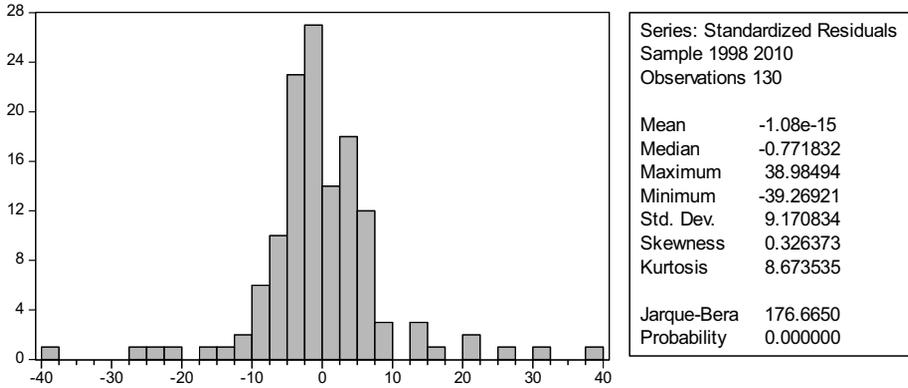
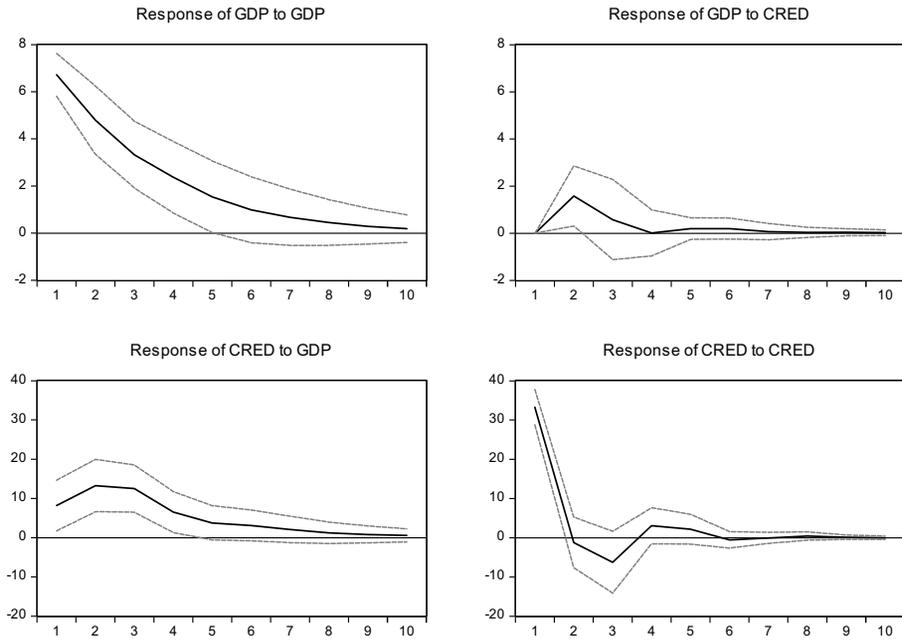


Figure 2: Impulse Response Effects

Response to Cholesky One S.D. Innovations \pm 2 S.E.



4. HOUSEHOLDS CREDITS AND FINANCIAL STABILITY: A THEORETICAL MODEL OF FINANCIAL INTERMEDIATION

Cécile Bastidon

Abstract

We propose a simple theoretical model of a financial system characterised by the proportions of households credits out of total outstanding credits, and credits out of total corporate financing. The central bank follows an augmented Taylor type rule, and may also conduct liquidity injections and assets purchases. We show that the features of the financial system and in particular the sharing out of interest rate risk between banks and borrowers determine the transmission conditions of a shock on households credits defaults, and the modalities for monetary policy. If the borrowers bear an excessive proportion of this risk, any policy rate increase shock can disrupt financing conditions in such a way that the central bank will have to engage the full range of its monetary policy tools. Finally, the existence of a link between households defaults and financial stability highlights that the importance given by the central bank to the output gap in the Taylor rule de facto affects financial stability^{1,2}.

INTRODUCTION

For two decades, monetary policies have undergone profound changes, the latest being the widespread use of unconventional policies in advanced economies. The same can be said of characteristics of financing and intermediation systems. The first observation is the subject of many recent works. The second is less frequently considered, mainly in empirical studies referring to securitized credit and intermediation in the United States. The aim of this paper is to provide a theoretical model of complex financial intermediation with a central bank.

Despite the rise of a specific empirical literature, theoretical models of financial intermediation typically operate on the assumption of simple intermediation chains: firms have financing needs, which are met through credit corresponding

¹ <http://lead.univ-tln.fr>. Université de Toulon.

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to households financing capacities. The risks associated with this intermediation activity result from the necessary maturity transformation, i.e. “*to transform illiquid assets into liquid liabilities*” as in Diamond & Dybvig (1984). Recent theoretical models are still based on this assumption: for example, the interbank credit rationing model of Freixas & Jorje (2008) or the endogenous liquidation cost model of Stein (2012) describe a liquidity shock on bank balance sheets, resulting from a run of households on demand deposits, while loans are granted only to firms³.

However, the features of intermediation in advanced economies are far from this scheme. First, the role of the arbitrage between bank deposits and direct holdings of Treasury securities does not seem decisive in the explanation of recent liquidity shocks on banks balance sheets (Strahan, 2012). Second, the firms financing needs are met to a large extent by intermediation in the broad sense (securities purchases by financial institutions), rather than credit. In both cases funding supply might be characterized by a complex relationship between prices and quantities in times of financial strains. Finally, households credits are an increasing part of both banks’ balance sheets and total outstanding credits (Büyükkarabacak & Valev, 2010). This generates a specific double risk. On the one hand, defaults on households credits are sensitive to the output gap and interest rate risk (Benford & Nier, 2007; Daghli, 2009). On the other hand, the massive occurrence of defaults is more frequent when banks do not hold credit portfolios (Berndt & Gupta, 2009; Maddaloni & Peydro, 2011; Purnanandam, 2011). This occurrence generates simultaneous spread and liquidity shocks in the corresponding complex assets markets, and these shocks are transmitted in the short-term to interbank markets and then the whole financing systems (Krishnamurthy, 2010).

For these reasons, I propose a theoretical model of financial intermediation, defined by the importance of households credits within banks’ balance sheets and total outstanding credits, and the degree of intermediation of corporate finance. The segments of the system are characterised by complex relationships between prices and volumes in times of financial strains, with the possibility that a persistent rationing in the interbank market increases the initial deterioration in funding conditions in other segments. The central bank conducts a monetary policy combining an augmented Taylor-type rule, liquidity injections and assets purchases. This results in two conclusions. First, the model highlights that, beyond the issue of the augmented Taylor rule, the importance given to the output gap affects financial stability. Second, the characteristics of intermediation

³ These mechanisms are also common in DSGE models explicitly taking into account intermediation activity: demand deposits and direct holding of riskless government securities are perfect substitutes (Curdia & Woodford, 2009 and 2010; Gertler & Karadi, 2011); business loans are financed by household deposits (Gertler & Karadi, 2011).

determine the sharing of interest rate risk on credits between banks and borrowers, and thus the magnitude of shocks and modalities of the resulting monetary policy.

The paper is organized as follows: Section 4.1 focuses on recent developments of financial intermediation in advanced economies. The survey is the subject of Section 4.2. The model is presented in Sections 4.3 (environment and actors) and 4.4 (effects of a shock on households credits defaults, depending on the characteristics of the intermediation system and preferences of the central bank).

4.1. STYLISTED FACTS OF FINANCIAL INTERMEDIATION IN ADVANCED ECONOMIES

The stylised facts of intermediation in advanced economies show that some of the usual hypotheses of theoretical models must be questioned. The first of these is that households credits are generally not taken into account (Figures 1 to 4⁴). With respect to the funding system as a whole (credit and securities markets), the subject of the relationship between prices and volumes in periods of financial strains appears to be critical (Figures 5 to 9). To conclude the section, we discuss the link between the various intermediation schemes and forms of the Taylor rule, in order to found the central bank rule in the model (Figure 10).

The first usual hypothesis which is problematic in the formalization of recent financial crises in advanced economies is the assimilation of banks credit portfolios to business credits. In fact, households credits represent 40% of banking intermediation activity in France and Spain and up to 80% in the United States, as shown in Figure 1. Furthermore, with the exception of Germany, where the weight of households credits is high compared to France or Spain, this share is growing.

In detail, Figures 2 (France), 3 (Germany) and 4 (United States) give an overview of the main characteristics of households credits and resulting vulnerabilities of bank assets. The first notable difference is the size of banks credits to non-financial agents, in comparison with banks assets: about one third in France, one half in Germany and 60% in the United States (Figures 2b, 3b and 4b). In addition, in France and Germany, the value of these credit portfolios increases less rapidly than that of securities portfolios. On the contrary, in the United States, the ratio is at best stable, indicating a similar growth in the value of credit portfolios and securities; and at worst increasing between 2003 and 2005, in contrast to France and Germany.

⁴ All the figures are presented in the Appendix.

The second major finding is the comparison between total households credits and total outstanding credits to non-financial agents in banks balance sheet (Figures 2a, 3a, 4a): while the former is about one half of the latter in France and Germany, it is more than 160% in the United States in 2007. Therefore, it is necessary to consider specifically households credits, in and outside of the traditional banking system, in formulating the intermediation scheme and central bank rule.

As regards the composition of households credits portfolios by term (Figures 2c, 3c, 4c) and destination (Figures 2d, 3d, 4d), there are again structural differences. In France and Germany, the share of short-term loans (with a maturity of less than 1 year) is very low when it is about one quarter in the United States. Moreover, long-term credits in France and Germany are characterised by a more diversified structure than in the United States, where they are almost exclusively composed of housing credits⁵. Finally, there are two distinct models. In the 'European' model, households credits portfolios are *a priori* less sensitive to default risk (low proportion of short-term credits, diversified long-term credits). In the 'American' model, they are more sensitive (relatively large proportion of short-term credits, almost no diversification of long-term credit portfolios in the long term). Following the assumption of Benford & Nier (2007) of a procyclicality of households credits defaults, it appears that the corresponding probability may be an endogenous variable in the model, function of whether they are held by the banking system or outside.

Turning to the financing system as a whole (credit and securities markets), the problem of the relationship between prices and quantities in times of financial strains appears to be crucial (Figures 5 à 9). Indeed, the shape of the funding supply function determines the effects of a positive shock on the cost of capital. Depending on the sign of the relationship, this shock may or not result in an excess funding demand. The experience of the current global crisis precisely leads to the conclusion that higher costs of capital are experienced simultaneously with a reduction of its availability in periods of high financial strains.

The data presented here concern the Eurozone interbank market (2002-2012, Figure 5), credit markets (2003-2013, Figures 6 and 7), bonds (2003-2013, Figure 8) and equities markets (2005-2011, Figure 9). In all segments, in the first stage of the crisis (labeled as phase I in the graphs), there is indeed a negative relationship between prices and volumes: i.e. the simultaneous occurrence of a positive shock on the cost of capital and a reduction of its availability. This negative relationship between prices and volumes appears in the case of credit but

⁵ Moreover, while in France and Germany variable rate loans accounted for 15% of new loans in 2007 (ECB, 2009), in the United States for the same year these loans represented 45% of total mortgage loans (New York Fed, 2010). This is not an unusually high value since the proportion exceeds 65% in 1994-1995.

also securities markets. This observation justifies that funding supply functions in the model are negatively related to prices in the context of high financial strains. The magnitude of the resulting output gap depends on the characteristics of financial intermediation and shapes of the funding supply function in the different credit and securities markets.

In credit and securities markets (Figures 6 à 9), the second stage of the crisis (labeled as stage II in the graphs) shows, after a period of rising prices and decreasing volumes, a period of falling prices in which volumes keep decreasing. Funding supply, therefore, decreases with the rise in prices in the first stage of the crisis (I), and keeps decreasing in the second stage (II) when prices fall. Our hypothesis, based on the theoretical model of interbank credit rationing of Freixas & Jorge (2008), is that there is a link between this uninterrupted decline in funding supply and the persistent dysfunction of the interbank market, which is obvious here (Figure 5, phase II). The existence of this connection between the persistence of an excess funding demand in the interbank market and the deterioration of funding conditions in the other segments of the system is a key hypothesis of the model.

In conclusion of the stylized facts, we establish a connection between the features of financial intermediation and a set of estimations of the Taylor rule which compares the ECB, FED and BOE and includes tests of the augmented⁶ (with an indicator of financial conditions) setting (Castro, 2011). This approach (Figure 10) shows that the relevant form of the Taylor rule depends on the characteristics of financial intermediation. Thus, in the United States, the proportion of households credits in banking intermediation is particularly high. A low output gap thus meets a critical condition for financial stability, since unemployment and consequently households failures are directly related to this gap. Therefore, the central bank could indirectly achieve financial stability by using a non-augmented Taylor rule. Actually, the tests do not support the hypothesis of an augmented rule.

In the Eurozone, the proportion of households credits in banking intermediation is lower. Achieving financial stability requires to extend the range of the indicators that are taken into account beyond the simple Taylor rule. In practice, the tests validate the hypothesis of an augmented Taylor rule, with a financial conditions indicator. This setting is associated with a value of the output gap parameter which is significantly lower than in the general (i.e. non-augmented) settings. Finally, in the case of the UK, the proportion of households credits is relatively high, as in the United States. Achieving a low output gap thus partly creates the conditions for financial stability, and only one component of the

⁶ The general and augmented Taylor rule settings are discussed in detail in the survey.

financial conditions indicator which was tested (the credit spread) appears to be significant in monetary policy decisions. Combining these two sets of informations thus indicates a link between, on the one hand, the characteristics of financial intermediation in general and the proportion of households credits in particular; and on the other hand, the modalities of taking into account the financial stability objective by the three central banks.

Finally, the study of stylized facts brings up three key features. First, in times of high financial strains, all market segments can be characterised by higher prices simultaneously with a reduction in the availability of capital. In a second stage, the persistent dysfunction of the interbank market strengthens the funding rationing. Second, there are, schematically, two types of financial intermediation models concerning households credits. In the first model, these credits largely exceed total bank credits and are *a priori* more sensitive to default risk due to their composition. In the second model, their volume is significantly lower than total bank credits and their composition makes them less sensitive to default risk. Finally, in the first case, central banks would rather conduct a simple Taylor rule; and in the second case, an augmented Taylor rule including a financial conditions indicator.

4.2. SURVEY

Let us consider these three points. The first two concern the intermediation model, respectively with regards to banks assets, and the price-sensitivity of funding supply in the different segments of the financial system. The third point concerns the resulting monetary policy choices. Our purpose is to incorporate these mechanisms in a simple⁷ theoretical model of financial intermediation with a central bank, in order to describe the management of a crisis generated by an unanticipated shock on households credits failures. To this end, we introduce a distinction for credit markets between households and firms from the perspective of borrowers, and between banks and non monetary financial institutions from the perspective of lenders. Thus, it is possible to take into account the roles of both households credits and shadow banking (Büyükkarabacak & Valev, 2010; Adrian & Shin, 2010).

As regards the trigger mechanism of the initial shock, the recent theoretical literature remains based on the principle of an arbitrage between bank deposits

⁷ Our purpose is not to build a general equilibrium model, which are typically not adapted to our issues because they do not sufficiently address the issue of interbank risk premia (focusing on non-financial agents / banks relationships at the expense of the relationship between banks) and consequences of reaching the zero lower bound (Carré, 2011). We propose a simple model of financial intermediation, with a central bank conducting an unconventional monetary policy.

and direct holdings of Treasury securities as a source of liquidity shocks affecting the banking sector (Freixas & Jorge, 2009; Stein, 2012). Alternatively, the empirical literature (Adrian & Shin, 2010) discusses the existence of shocks to banks balance sheets which are actually linked to households behaviour but resulting from shocks on credit defaults, and not bank runs (Beck *et al.*, 2008, Büyükkarabacak & Valev, 2010). These defaults are specifically sensitive to the output gap and interest rate risk (Benford & Nier, 2007; Daglish, 2009). Their magnitude also depends on the modalities of financial intermediation (Berndt & Gupta, 2009; Maddaloni & Peydro 2011; Purnanandam, 2011). In particular, securitized loans are subject to a higher default risk than other credits⁸.

As regards the ultimate origin of the shock on households credits portfolios, formalisation must take into consideration both private agents behaviours, within the intermediation model, and monetary policy decisions. The literature relating to the crisis of 2007-2008 illustrates this dual causality. On the one hand, the modalities of financial intermediation have dramatically changed, due to 'supply shocks' on monetary aggregates. These shocks are related to the behaviour of commercial banks (Goodhart, 2007) in the context of an increased liquidity resulting from international balance of payments imbalances. On the other hand, while these arguments tend to mitigate the responsibility of central banks in general and FED in particular, part of the recent empirical literature, based on the theory of the credit channel transmission of monetary policy (Bernanke & Gertler, 1995), calls into question changes in policy behaviour (e.g., with policy more focused on price stability, Boivin *et al.*, 2010⁹). Thus, in our model, the shock on households credits defaults is triggered by the decision of the central bank to raise the official interest rate, in accordance with the monetary policy rule. Then, the characteristics of financial intermediation determine the consequences of this shock, which will threaten the whole financial system if households and firms are already fragile, respectively as regards interest rate risk on outstanding loans and funding supply features.

The sequence of the model then presents the main stylised facts of the global crisis: the shock on variable rate loans leads to a deterioration of financing conditions in the corresponding complex securities market and, therefore, in the interbank market (Caruana & Kodres, 2008). Finally, the whole financing system is disrupted by a decrease in funding supply and increase in the cost of capital

⁸ Moreover, concerning liabilities of banks balance sheets, according to Purnanandam (2011), the link between securitization and credit defaults is enhanced when banks use little traditional deposit funding. This validates the principle of the theoretical model of Stein (2012), where the cost of liquidating assets is endogenous and positively related to the proportion of banks short term funding.

⁹ The authors use a DSGE model taking into account 'non-neoclassical' channels (i.e. credit channel) of monetary policy transmission. Their results suggest that monetary policy innovations and the effect of these changes on expectations, combined with changes in the regulatory environment, explain to a large extent that monetary policy has a more muted effect on real activity and inflation in recent decades than before 1980.

(Krishnamurthy, 2010). This unusual configuration of funding supply is, however, fully in line with the principles of the credit (in case of a positive shock on the cost of capital, credit availability is reduced by the enhancement of informational asymmetries between lenders and borrowers; Bernanke & Gertler, 1995) and risk-taking (credit availability is reduced by the increasing risk aversion of lenders; Borio & Zhu, 2008; Gambacorta, 2009) channels of monetary policy transmission. Credit and securities markets are affected at various degrees (Cardarelli *et al.*, 2011), taking into account that the procyclicality of credit may be positively related to the complexity of the financial system (Cornett *et al.*, 2011). The magnitude of these dysfunctions determines the content and extent of fiscal and monetary policy measures, both directly, and via the resulting output gap (Gerali *et al.*, 2010; Helbling *et al.*, 2011; Hristov *et al.*, 2012).

Regarding the central bank, beyond the issue of its responsibility in triggering the initial shock, the model must meet a specific constraint: the monetary policy rule has to describe decisions in both crises and non-crises times. A Taylor-type rule (Taylor, 1993) can achieve this objective. The precise formulation remains to be determined. The widespread use of this rule is mainly based on its simplicity, which is both its strength and limit. In addition to the questions of the proper formulations of inflation and output variables, and the values of the different central banks coefficients, two central issues are addressed in the literature. The first issue is the hypothesis of a nonlinear and/or asymmetrical rule (Cukierman & Muscatelli, 2008¹⁰; Castro, 2011), The second issue is the consideration of the objective of financial stability through an augmented rule including informational (Sturm & De Haan, 2011) or financial conditions indicators (Castro, 2011; Chadha *et al.*, 2004; Hoffmann 2013). While the integration of the augmented Taylor rule in DSGE models is very gradual, the empirical literature usually show its relevance.

We retain the latter formulation, that is to say a Taylor type rule with a simple formulation of inflation and output gaps, augmented with a financial conditions indicator. This configuration of the Taylor rule is based on Ireland (2004), introducing the ‘money gap’, i.e. the difference between the observed trend rate of growth of money supply and the value which would be consistent with the inflation target. Regarding the financial conditions indicator, there are two possible settings of the augmented Taylor rule (CAE, 2011). The first possibility is to use volume indicators, such as credit indicators, which are well adapted to

¹⁰ Using a specific theoretical model of asymmetrical central bank preferences depending on the monetary policy regime, Cukierman & Muscatelli (2008) test the nonlinearity of the Taylor rules conducted by the Bank of England and FED. Their results indicate that reaction functions and the asymmetry properties of the underlying loss functions are related to monetary policy regimes and major macroeconomic concerns of the moment. In addition, the asymmetry of central banks rules in favor of interest rate cuts may have in part created the conditions for the crisis.

largely intermediated financial systems. The second possibility is to use asset prices or cost of capital indicators, such as credit spreads ('adjusted' Taylor rule; Curdia & Woodford, 2010), which are well adapted to disintermediated financial systems. Alternatively, the use of asset prices indicators is justified by the idea that the usual measure of inflation is not appropriate, primarily because it does not include their prices (Goodhart, 2007). In the model, the official interest rate is determined by a Taylor-type rule augmented with a price indicator of financial conditions, while volumes are also taken into account in the monetary policy rule. Since the initial shock is transmitted through the interbank market (Freixas & Jorge, 2008), the financial conditions indicator is the interbank spread, which is also an usual indicator of financial strains (Williams & Taylor, 2009; Wu, 2008¹¹) and is suitable for largely disintermediated and credit based systems as well.

In the formulation of monetary policy, the idea of a renewed interest of volumes and not only prices variables is quite extensively shared in the recent literature (e.g., Adrian & Shin, 2010; Bordes & Clerc, 2010; Cukierman, 2013). The assumption of financial imperfections which would be limited to bank liquidity markets and would not affect stock or credit markets is now widely questioned (Bordes & Clerc, 2010), which justifies the end of the separation principle between monetary (associated with official interest rates) and financial stability policies (associated with credit policy). Moreover, in our model, the formalization of an unconventional monetary policy with its usual three instruments (interest rates, liquidity injections and assets purchases¹²; Bernanke *et al.*, 2004) cannot be limited to an augmented Taylor rule, which takes into consideration only one of these three instruments. For these two reasons, we include volume variables in the monetary policy rule, through the separate expression of the amounts of liquidity injections and assets purchases.

The model therefore includes the following elements: concerning the central bank, the augmented Taylor-type rule is accompanied with the conditions of a central bank intervention as regards the two other possible instruments of monetary policy (liquidity injections in the interbank market and assets purchases). The initial shock is triggered by an unanticipated increase in households credits defaults, which magnitude and consequences depend on the features of the intermediation model, i.e. the sharing out of households funding (alternatively held by banks or non monetary institutions) and firms funding (in the form of securities or credit).

¹¹ Wu (2008) shows that interbank spreads are sensitive to events in complex securities markets, directly through default rates on households mortgage loans and indirectly through banking sector CDS premia, which makes this indicator specially adapted to our problem.

¹² Mishkin (1906) already noted that "*monetary [assets purchases] policy can be a potent force of reviving economies which are undergoing deflation and have short-term interest rates near a floor of zero. Indeed, because of the lags inherent in fiscal policy and the political constraints on its use, expansionary monetary policy is the key policy action that is required to revive an economy experiencing deflation*".

4.3. THE MODEL: AGENTS AND FINANCIAL SYSTEM

This section contains the description of the intermediation model and funding conditions associated with its different segments. It also contains the monetary policy rule and sequence of the model.

4.3.1. Funding of Economic Agents

There are two types of assets in the model: credit, and securities. Credit markets correspond to $C1$ (interbank market) and $C2$ (credit to non financial agents). Primary securities markets correspond to $E0$ (government bonds), $E1$ (securities, issued by firms – NFC) and $E2$ (complex securities, issued by non monetary financial institutions – NMFI).

Table 1: Funding of Economic Agents

	E0 Government bonds	E1 Securities	E2 Complex securities	C1 Interbank credit	C2b Credit (banks)	C2nb Crédit (NMFI)
Government	X					
Firms (NFC)		X			X	
Households					X	X
Banks				X		
NMFI			X			

The funding of the agents in the model is described by the rows of Table 1. For the government, this funding is in the form of bonds. For households, it is in the form of loans, held either by banks (in proportion h_b of total banks credits portfolios), or NMFI. These loans are supposed to be fixed rates when they are held by banks ($C2_b$), and variable rates when they are held by NMFI ($C2_{nb}$) (see note 3 on page 4). The funding of firms is in the form of bank credit (in proportion $(1 - h_b)$ of total banks credits portfolios) and securities. As regards financial sector, the (short-term) funding of banks is in the form of interbank credit, and the funding of NMFI in the form of complex securities.

The intermediation model is thus characterized by the share of households in bank loans (h_b), the share of households credits held by NMFI relative to total

outstanding credits to non financial agents ($\frac{C2_{nb}}{C2_b + C2_{nb}}$), and the share of secu-

rities funding of firms ($\frac{E_1}{(1 - h_b)C2_b + E_1}$).

4.3.2. Market Conditions

Each asset is characterized by market conditions described by the risk premium and excess funding demand. For a given asset, the risk premium π , is defined as the difference between the nominal yield r and policy rate r_{CB} . The asset yield is thus as follows:

$$r = r_{CB} + \pi \quad (1)$$

In interbank (C1) and non financial agents credit markets (C2), excess funding demand CM_i is measured by the difference between credit demand DC_i , and supply SC_i , which increases when credit interest rates rise. This result is obtained under the conditions that 1/ any increase in the credit interest rate deteriorates expected bank yields by increasing the probability of default on credit portfolios, and the aggregate supply function is then decreasing; and 2/ this function is also steeper than the demand function. Periods of low (high) interest rates are thus characterized by an excess credit supply (demand) (Figures 5 to 7). This specification is empirically justified by the observation that in times of financial strains funding costs increase simultaneously with the decline in outstanding volumes (Krishnamurthy, 2010). On a theoretical level, this observation is fully in line with the principles of the credit (Bernanke & Gertler, 1995) and risk-taking (Gambacorta, 2009) channels of monetary policy transmission¹³. Let CM_i denote the corresponding excess funding demand function:

$$CM_i = D_{Ci}(r_{Ci}) - S_{Ci}(r_{Ci})$$

$$\frac{\partial D_{Ci}}{\partial r_{Ci}} < 0, \quad \frac{\partial S_{Ci}}{\partial r_{Ci}} < 0, \quad \left| \frac{\partial D_{Ci}}{\partial r_{Ci}} \right| < \left| \frac{\partial S_{Ci}}{\partial r_{Ci}} \right| \quad (2)$$

In the remainder of the paper, supply and demand functions in the interbank market are assumed to be linear:

$$S_{Ci} = -cr_{Ci} + d, \quad c > 0, \quad d > 0$$

$$D_{Ci} = -ar_{Ci} + b, \quad c > a > 0, \quad d > b > 0 \quad (3)$$

$$CM_i = (c - a)r_{Ci} + (b - d)$$

¹³ Alternatively, this setting of funding supply could be seen as a generalisation of the non-monotonic supply function of Stiglitz & Weiss. However, this function does not allow to determine the excess demand resulting from a shock on prices since the market equilibrium is not at the intersection of supply and demand curves.

4.3.3. Securities Markets

In securities markets, corresponding to indexes $E1$ (securities, firms) and $E2$ (complex securities, NMFI), the excess funding demand EM_i is measured by the difference between securities supply S_{Ei} and demand D_{Ei} for a given nominal yield r_{Ei} . As in credit markets, the demand function (funding supply) is assumed to be both decreasing and steeper than the supply function. Consequently, a shock on the cost of capital results in a positive excess funding demand, from an initial equilibrium situation (Figures 8 and 9). However, credit and securities markets are affected by excess funding demands of different magnitudes (Cardarelli *et al.*, 2011).

$$EM_i = S_{Ei}(r_{Ei}) - D_{Ei}(r_{Ei})$$

$$\frac{\partial D_{Ei}}{\partial r_{Ei}} < 0, \frac{\partial S_{Ei}}{\partial r_{Ei}} < 0, \left| \frac{\partial S_{Ei}}{\partial r_{Ei}} \right| < \left| \frac{\partial D_{Ei}}{\partial r_{Ei}} \right| \quad (4)$$

In section 5 of the model, excess funding demand functions in credit and securities markets are supplemented by the consideration of two additional elements: first, the asymmetry in the impact of official interest rates decisions¹⁴; and second, the possibility of an increase in the excess funding demand, resulting from the persistent insufficient private funding in the interbank market.

4.3.4. Government Bonds Market

The primary market for government bonds corresponds to index $E0$. Bonds supply S_{E0} depends on an exogenous component \bar{S} (structural level of bonds supply, in the absence of a shock) and the amount of support measures to the sectors which would be affected by a shock on funding conditions. The shock affects the economy as a whole, but the different types of agents are all the more affected than their excess funding demand is important (Gerali *et al.*, 2010; Helbling *et al.*, 2011; Hristov *et al.*, 2012). So fiscal measures aimed to support economic activity are allocated in proportion to excess funding demands:

$$S_{E0} = \bar{S} + \alpha \left(\sum_{i=1,2} CM_i + \sum_{i=1,2} EM_i \right), \alpha > 0$$

Consequently, when a shock arises, securities supply is increased by the amount of support measures to financial sector (in case of an excess funding demand in

¹⁴ An increase in official interest rates is more largely passed on to the cost of capital than a decline. This is particularly visible in the comparison of changes in interest rates in households and firms credit vs. interbank markets (Figures 5 to 7).

interbank and complex securities markets), households and firms (in case of an excess funding demand in credit and securities markets).

Government bonds supply D_{E0} takes a similar form. It depends positively on an exogenous component \bar{D} (riskless part of assets portfolios, compliance with regulatory requirements), negatively on the current fiscal deficit S_{E0} , and positively on flight to quality effects generated by excess funding demands in other markets¹⁵. Depending on the sensitivity of economic agents to fiscal deficit, their risk aversion, and the resulting values of β and γ , the balance of the last two effects is then either positive (low β , high γ), or negative. Let D_{E0} denote the government bonds supply function:

$$D_{E0} = \bar{D} - \beta S_{E0} + \gamma \left(\sum_{i=1,2} CM_i + \sum_{i=1,2} EM_i \right), \beta > 0, \gamma > 0$$

Replacing the supply function with its value gives:

$$D_{E0} = (\bar{D} - \beta \bar{S}) + (\gamma - \alpha \beta) \left(\sum_{i=1,2} CM_i + \sum_{i=1,2} EM_i \right)$$

Excess funding demand in the government bonds markets is then the following:

$$S_{E0} - D_{E0} = (1 + \beta) \bar{S} - \bar{D} + [\alpha(1 + \beta) - \gamma] \left(\sum_{i=1,2} CM_i + \sum_{i=1,2} EM_i \right) \quad (5)$$

For a given excess funding demand in other assets markets, the government bonds market, therefore, has an excess funding demand which is positively linked to α (fiscal policy activism) and β (sensitivity of economic agents to fiscal deficit), and negatively linked to γ (flight to quality effects).

4.3.5. Monetary Policy Rule

The monetary policy rule consists of three types of instruments: an augmented Taylor-type rule including a lower bound for the official interest rate, a liquidity injection function, and an assets purchases function. The official interest rate, thus, follows a Taylor-type rule (1993), augmented with a financial conditions indicator:

¹⁵ As for fiscal policy in the supply function of government bonds, this effect is supposed to depend on the (unweighted) sum of all types of assets excess funding demands, since the model does not mainly focus on public debt. For a more general specification, see Bastidon *et al.* (2012).

$$\left\{ \begin{array}{l} r_{BCt} = ct + \Pi + \mu_{\Pi}(\Pi - \Pi^*) + \mu_y(y - y^*) - \mu_{C1}(\pi_{C1} - \pi_{C1}^*) \\ \quad \text{with } \mu_{\Pi} > 0, \mu_g > 0, \mu_{C1} \geq 0 \\ r_{BC} = r_{BCt} \text{ if } r_{BCt} \geq \underline{r}_{BC} \\ r_{BC} = \underline{r}_{BC} \text{ if } r_{BCt} < \underline{r}_{BC} \end{array} \right. \quad (6)$$

Since our purpose is to focus on the mechanism of central bank decision-making and not to assess monetary policy, the endogenous variable is the official (instrument) and not short-term interbank interest rate (target). This formulation also allows to isolate the endogenous interbank risk in the third term. So the official interest rate depends on a constant representing the neutral real interest rate, the inflation level Π , the inflation gap $(\Pi - \Pi^*)$, the output gap $(y - y^*)$, and the ‘risk premium gap’ $(\pi_{C1} - \pi_{C1}^*)$ ¹⁶. It is worth noting that the coefficient associated with $(\pi_{C1} - \pi_{C1}^*)$ can be zero. When the intermediation model is characterized by a significant weight of variable rates households credits, consideration of the output gap *de facto* affects financial stability. Moreover, the official interest rate can not be lower than its lower bound \underline{r}_{BC} , which is specific to each central bank.

The other two instruments of monetary policy concern excess funding demand in the different market segments. With the exception of credit to non financial agents, where the central bank usually can not conduct direct intervention, it has the possibility to meet a positive excess funding demand by liquidity injections (in the interbank market) and assets purchases (in securities markets). The preferences of the central bank are described below:

$$\left\{ \begin{array}{l} CM_1 < \overline{CM}_1, \overline{CM}_1 = 0 \\ EM_0 < \overline{EM}_0, \overline{EM}_0 < 0 \\ EM_i > \overline{EM}_i, \overline{EM}_i > 0, i = 1, 2 \end{array} \right.$$

For each market segment in which it has the possibility to conduct direct intervention, the central bank wants the excess funding demand to remain below a specific threshold. This threshold is, respectively, zero in the case of the interbank market, which should not be rationed; negative in the case of the government bonds market, which must be characterised by an excess demand; and positive for other securities markets. Consequently, in the interbank market,

¹⁶ The risk premium gap allows to introduce the concept of an optimal risk premium according to the central bank, given its knowledge of current interbank risk.

the amount X of a possible liquidity injection corresponds to the amount of the excess demand of credit. Similarly, the possible amount Z_i of assets purchases corresponds to the difference between the excess funding demand and threshold of the central bank. Therefore, the monetary policy rule is as follows:

$$\begin{aligned}
 r_{BC} &= \begin{cases} r_{BC} = r_{BCt} \text{ if } r_{BCt} \geq \underline{r_{BC}} \\ r_{BC} = \underline{r_{BC}} \text{ if } r_{BCt} < \underline{r_{BC}} \\ \Delta r_{BCt} \neq 0 \Rightarrow (\Delta r_{BCt})(\Delta r_{BCt+1}) \geq 0 \end{cases} \\
 X &= \begin{cases} CM_1 - \overline{CM_1} \text{ if } CM_{1t-1} > \overline{CM_1} \\ 0 \text{ otherwise} \end{cases} \\
 Z_i &= \begin{cases} EM_i - \overline{EM_i} \text{ if } r_{BC} = \underline{r_{BC}}, EM_{it-1} > \overline{EM_i}, EM_{it-2} > \overline{EM_i} \\ 0 \text{ otherwise} \end{cases}
 \end{aligned} \tag{7}$$

This can be expressed simply as follows. The official interest rate corresponds to the Taylor type rate if its determination leads to a higher value than the lower bound; and to this lower bound otherwise. Liquidity injections and assets purchases are only conducted when the excess funding demand exceeds the central bank threshold – in this case, they are conducted in order to reduce this level to the threshold. This occurs systematically at the next period in the case of the interbank market. By contrast, it takes place after two consecutive periods of excess funding demand in the case of securities markets, only if the policy interest rate is at the lower bound. Finally, as regards the official interest rate, the central bank cannot take two immediately consecutive decisions in opposite directions.

4.3.6. Sequence of the Model

The sequence is composed of three periods. All the markets are originally in equilibrium, i.e. characterised by an excess funding demand equal to zero. In t_0 a positive monetary policy (official interest rate) shock happens. This results in an increase in the cost of variable rate loans contracted by households, a negative output gap, and thus an increase in defaults on these loans.

Table 2: Sequence of the Model

<p>t_0 Defaults shock</p> <p>MP shock > 0, output gap < 0 → increase in default rates / households variable rates credits</p>	<p>t_2 Financial crisis, 2nd stage</p> <p>→ second choc on NFA funding conditions → MP: liquidity injections, official interest rate lower bound, assets purchases</p>
<hr style="border: 0.5px solid black; margin: 10px 0;"/> 	
<p>t_1 Financial crisis, 1st stage</p> <p>→ MP: liquidity injections</p>	

The increase in defaults on variable rates credits in t_0 causes a risk premium and excess funding demand shock in the complex securities and, therefore, interbank markets. In t_1 , if needed, the central bank injects the amount of liquidity corresponding to excess funding demand (in comparison to private interbank credit supply) in the interbank market. Because of the central role of the interbank market in the transmission of the shock, this injection is the first crisis management measure taken by the central bank.

In t_2 , credit and securities markets undergo a second deterioration of their funding conditions, because of the persistence of an excess funding demand in comparison to private supply in the interbank market. The central bank continues liquidity injections, in order to compensate for the failure of private funding supply, and uses the other two instruments in its monetary policy rule: interest rate cuts, and if the lower bound is reached, possible assets purchases in securities markets.

4.4. THE MODEL: DEFAULTS SHOCK ON HOUSEHOLDS CREDITS AND CRISIS MANAGEMENT BY THE CENTRAL BANK

This section contains the explanation of the relationship between interest rate risk-sharing and defaults on credit portfolios, and the description of the initial shock in the complex securities market, in t_0 . The shock is transmitted to the interbank market, where the central bank conducts liquidity injections in t_1 and t_2 . A possible intervention in securities markets takes place in t_2 .

4.4.1. Interest Rate Risk-sharing and Defaults on Credit Portfolios

Consideration of an endogenous default rate of non-financial agents (i.e. households) is one of the fundamental assumptions of the model. This probability depends on two characteristics of the intermediation model: the proportion of interest rate risk borne by households (share of households variable rates credits in total outstanding households credits); and the disintermediation of corporate finance (respective shares of securities and credit), which determines the output gap and thus also affect the households repayment capacity.

Defaults on households credits are related to interest rate risk. We assume that the interest rate risk associated with credits held by banks is fully borne by banks (fixed rate loans), while the interest rate risk associated with credits held by NMFIs is borne by households (variable rate loans). In this case, the fact that borrowers bear the entire interest rate risk leads to a positive link between interest rates variations and default rates. In the model, this risk is the first determinant of the default function of households on their variable rate loans.

Defaults on households credits are also related to the output gap. Regarding corporate finance, we assume that the double effect resulting from the enhancement of informational asymmetries and risk aversion of lenders reduces the availability of both credit and securities funding, at various degrees (e.g., Cardarelli *et al.*, 2011). This mechanism is taken into account, in the model, with funding supply functions of different slopes. The reduced availability of funding resulting from a positive monetary policy shock is then the weighted sum (depending on the intermediation of corporate finance) of the respective excess funding demands in credit and securities markets. This results in a negative output gap (Gerali *et al.*, 2010; Helbling *et al.*, 2011; Hristov *et al.*, 2012), which is the second determinant of the default function of households on their variable rate loans.

4.4.2. Initial Shock in Credit and Complex Assets Markets (t_0)

Let λ_b and λ_{nb} denote default rates on credits, respectively held by banks and NMFIs. In the model, for the sake of simplicity, λ_b is supposed to be constant and exogenous. By contrast λ_{nb} is endogenous and depends positively on official interest rates variations and the output gap (Benford & Nier, 2007; Daghli, 2009):

$$\lambda_b = Ct$$

$$\Delta\lambda_{nb} = \zeta\Delta r_{CB} + \eta\Delta y, \quad \zeta, \eta > 0$$

This setting corresponds to a default rate on credits held by NMFI λ_{nb} which is always greater the default rate λ_b on credits held by banks¹⁷ (Berndt & Gupta, 2009; Maddaloni & Peydro, 2011; Purnanandam, 2011).

The shock is triggered by an increase in the official interest rate ($\Delta r_{CB} > 0$). Under the assumption that the output gap is proportional to the weighted sum of the variations in excess funding demands of firms in credit and securities markets¹⁸, we obtain the following form. It is worth noting that interest rates have both a direct effect through the interest rate risk on households variable rate loans, and an indirect effect through the output gap:

$$\Delta\lambda_{nb} = \zeta\Delta r_{CB} + \eta\left[\frac{E_1}{(1-h_b)C2_b + E_1} \frac{\partial EM_1}{\partial r_{CB}} + \frac{(1-h_b)C2_b}{(1-h_b)C2_b + E_1} \frac{\partial CM_1}{\partial r_{CB}}\right] \quad (8)$$

NMFI, which hold variable rates households credits, are funded by selling complex securities. In return, the remuneration of these securities depends on the interests flows on portfolios of variable rates credits. Therefore, the rise in the corresponding default rate λ_{nb} entails a rise in the risk premium π_{E2} in complex securities market, which is assumed to be equivalent:

$$\Delta\pi_{E2} = \Delta\lambda_{nb} \quad (9)$$

Considering the securities supply and demand functions (equation (4)), this results in a positive excess funding demand in the complex securities market.

4.4.3. Transmission of the Initial Shock to the Interbank Market and Liquidity Injections (t_1)

The shock on funding conditions in the complex securities market is transmitted to the interbank market. This results in a simultaneous rise of the interbank risk premium and excess funding demand:

$$\begin{cases} \Delta\pi_{C1} > 0 \\ \Delta CM_1 > 0 \end{cases}$$

The variation of the interbank risk premium depends on the variation of the risk premium in the complex securities market at the origin of the shock (equations (8) and (9)), the size j of this market compared to total outstanding credits, and a random variable ε :

¹⁷ Since the initial value of the former is greater than the latter, which in practice is always the case.

¹⁸ Since all the markets are assumed to be in equilibrium before the shock, any increase in the cost of capital, whether caused by an increase in the risk premium or official interest rate, generates a positive excess funding demand.

$$\Delta\pi_{C1} = \Delta\pi_{E2} j(1 + \varepsilon)$$

Which is equivalent to:

$$\begin{aligned} \Delta\pi_{C1} &= \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{nb}} \right) (1 + \varepsilon) \\ &= \left(\zeta \Delta r_{CB} + \eta \left[\frac{E1}{(1-h_b)C2_b + E1} \frac{\partial EM_1}{\partial r_{CB}} + \frac{(1-h_b)C2_b}{(1-h_b)C2_b + E1} \frac{\partial CM_1}{\partial r_{CB}} \right] \right) \left(\frac{C2_{nb}}{C2_b + C2_{nb}} \right) (1 + \varepsilon) \end{aligned} \quad (10)$$

The total variation of the interbank interest rate is thus the following:

$$\begin{aligned} \Delta r_{C1} &= \Delta r_{CB} + \Delta\pi_{C1} \\ \Delta r_{C1} &= \Delta r_{CB} + \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{nb}} \right) (1 + \varepsilon) \end{aligned} \quad (11)$$

Since the interbank lending market was originally in equilibrium, the excess funding demand (in comparison to private interbank credit supply) is described by the following equation:

$$CM_{1t1} = (c - a) \left[\Delta r_{CB} + \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{nb}} \right) (1 + \varepsilon) \right] \quad (12)$$

The central bank responds to this excess demand by injecting the corresponding amount of liquidity, according to its monetary policy rule (equation (7)), i.e. $Xt_1 - CM_{1t1}$. The monetary policy rule is specifying that the central bank cannot take two immediately consecutive interest rates decisions in opposite directions, so liquidity injections are the only available instrument in t_1 . Excess funding demand in securities markets does not either generate an intervention, since the central bank can conduct assets purchases only after the second consecutive period of positive excess funding demand.

4.4.4. Interest Rate Lower Bound and Liquidity Injections (t_2)

In t_2 , the default rate on households variable rates credits (equation (8)) is assumed to be unchanged. This is the same for risk premia in complex securities (equation (9)) and interbank (equation (10)) markets. As regards monetary policy, an interest rate cut is possible, considering the persistent negative output gap and financial strains (represented by the interbank ‘risk premium gap’, equation (6)), since this decision is not immediately following the initial interest rate rise. The remainder of this section deals with the case where in t_2 the interest rate is taken to its lower bound r_{BC} , in which the central bank is likely to conduct assets purchases in order to meet an excess funding demand in securities markets.

In practice, the interbank risk premium π_{C1} is unchanged, and the official interest rate is set at the lower bound. According to (11), the difference between the interbank interest rate and the initial (before the shock) equilibrium value r^* can be written as follows:

$$\begin{aligned} \Delta r_{C1t1} + \Delta r_{C1t2} &= (\underline{r_{BC}} - r^*) + \Delta\pi_{C1t1} \\ \Delta r_{C1t1} + \Delta r_{C1t2} &= (\underline{r_{BC}} - r^*) + \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{NB}} \right) (1 + \varepsilon) \end{aligned} \quad (13)$$

The excess funding demand (in comparison to private interbank credit supply) in the interbank market in t_2 is thus described by:

$$CM_{1t2} = (c - a) \left[(\underline{r_{BC}} - r^*) + \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{NB}} \right) (1 + \varepsilon) \right] \quad (14)$$

This excess demand, as in t_1 , is met by a central bank liquidity injection of the same amount, that is $X_{t2} = CM_{1t2}$. In the other private sector asset markets (credit and securities), the excess funding demand is aggravated by the persistence of an insufficient interbank credit supply, according to the principle of the ‘rationing channel’ of Freixas & Jorge (2009):

$$\begin{cases} \Delta CM_2 = v_{C2} CM_1 \\ \Delta EM_i = v_{Ei} CM_1 \quad i = 1, 2 \end{cases}$$

Coefficients v represent the correlation coefficients between excess funding demand in the interbank market, and the additional excess funding demand in each segment. Considering that decreases in official interest rates are passed on to interest rates on households and firms credits to a very limited extent in comparison with interbank markets (see note 12 on p. 49), the latter are assumed to be unchanged compared to t_0 and t_1 for the sake of simplicity. Therefore, the excess funding demand corresponds to the sum of the value of periods t_0 and t_1 , and the additional component described above, that is:

$$\begin{cases} CM_2 = \frac{\partial CM_2}{\partial r_{CB}} + v_{C2} CM_1 \\ EM_i = \frac{\partial EM_i}{\partial r_{CB}} + v_{Ei} CM_1 \quad i = 1, 2 \end{cases} \quad (15)$$

4.4.5. Crisis Management and Assets Purchases (t_2)

In t_2 , in addition to liquidity injections, the central bank conducts assets purchases in securities markets (government bonds and other securities), in order to reduce the persistent gap between funding supply and demand to its desired threshold. This occurs only in the case where the official interest rate is set at its lower bound (Mishkin, 1996). As regards government bonds, using (5) and (15), the central bank determines the necessary amount of assets purchases, in order to meet the excess demand threshold defined by its monetary policy rule (7). In the case of government bonds, the excess funding demand takes the following form:

$$\begin{aligned}
 S_{E0} - D_{E0} &= (1 + \beta)\bar{S} - \bar{D} + [\alpha(1 + \beta) - \gamma] \left(\sum_{i=1,2} CM_i + \sum_{i=1,2} EM_i \right) \\
 S_{E0} - D_{E0} &= (1 + \beta)\bar{S} - \bar{D} + [\alpha(1 + \beta) - \gamma] \\
 &\quad \left[CM_1 + \left(\frac{\partial CM_2}{\partial r_{CB}} + v_{C2} CM_1 \right) + \sum_{i=1,2} \left(\frac{\partial EM_i}{\partial r_{CB}} + v_{Ei} CM_1 \right) \right]
 \end{aligned} \tag{16}$$

If this difference is superior to the threshold level \overline{EM}_0 , the central bank will conduct assets purchases of the corresponding amount, that is:

$$Z_0 = (S_{E0} - D_{E0}) - \overline{EM}_0$$

In the other (private sector) securities markets the same principle applies. If the excess funding supply, in comparison to private funding supply, is superior to the threshold level, the central bank purchases assets as long as this value is not reached. Using (14) and (15), we get:

$$\begin{aligned}
 Z_i &= (S_{Ei} - D_{Ei}) - \overline{EM}_i \quad i = 1, 2 \\
 &= \frac{\partial EM_i}{\partial r_{CB}} + v_{Ei} CM_1 - \overline{EM}_i \\
 Z_i &= \frac{\partial EM_i}{\partial r_{CB}} + v_{Ei}(c - a) \left[(r_{BC} - r^*) + \Delta\pi_{E2} \left(\frac{C2_{nb}}{C2_b + C2_{NB}} \right) (1 + \varepsilon) \right] - \overline{EM}_i
 \end{aligned} \tag{17}$$

The decisions of the central bank in t_2 , in accordance with its monetary policy rule (7), are thus the following:

$$\left\{ \begin{array}{l}
 r_{BC12} = \overline{r_{BC}} \\
 X_{12} = CM_{112} - \overline{CM_1} \\
 Z_{012} = (1 + \beta)\overline{S} - \overline{D} + [\alpha(1 + \beta) - \gamma] \\
 \left[CM_1 + \left(\frac{\partial CM_2}{\partial r_{CB}} + v_{C2} CM_1 \right) + \sum_{i=1,2} \left(\frac{\partial EM_i}{\partial r_{CB}} + v_{Ei} CM_1 \right) \right] - \overline{EM_0} \\
 Z_{i12} = \left(\frac{\partial EM_i}{\partial r_{CB}} + v_{Ei} CM_1 \right) - \overline{EM_i} \quad i = 1, 2
 \end{array} \right. \quad (18)$$

The values of CM_{112} and $\Delta\pi_{E2}$ are respectively given by equations (12), and (8) and (9).

These results allow to identify the effects of the initial shock on households variable rate credit portfolios on excess interbank funding demand. These effects positively depend on the magnitude of the initial shock on official interest rates (both directly via the increased interbank interest rate, and indirectly via the increased default rate on households credits); the weighted sum of the deterioration of funding conditions of firms in credit and securities markets; the relative importance of households variable rate credit portfolios within total outstanding credits; the difference between the lower bound official interest rate and the initial interbank interest rate; and finally, the difference in slopes of the funding supply and demand functions in the interbank market.

The persistent deterioration of funding conditions in the interbank market causes that of all other segments of the financial system and, therefore, determines the terms of the monetary policy. If funding conditions in the interbank market are very deteriorated, the Taylor-type equation setting the official interest rate gives a result which is inferior to the central bank lower bound. Thus the interest rate is set at this lower bound level. Now let us assume that the central bank wants the interbank market to be always in equilibrium, as in the model monetary policy rule. Any shock on credit, portfolios defaults directly affects the ability of banks to get interbank credit forcing the central bank to conduct the corresponding liquidity injection. Assets purchases are conducted under the dual condition that the official interest rate is at the lower bound and the excess funding demand is persistent. In the case of private sector securities, the corresponding amount positively depends on the correlation of funding conditions with those of the interbank market. Finally, in the case of government bonds, in addition to the magnitude of the output gap, the amount of assets purchases by the central bank depends on regulatory factors (structural component of government bonds demand), government choices (structural fiscal

deficit, propensity to support economic activity), and private choices (sensitivity of the government bonds demand to fiscal deficit, causing a decline in demand; and sensitivity to financial strains in other segments of the financial system, causing an increase).

CONCLUDING REMARKS

The contribution of this paper in terms of theoretical modeling is threefold. First, the operation of financial system is formalized in order to take into account the major recent transformations, namely, on the one hand, the growing importance of households credits, within banks and total outstanding credits; and on the second hand the apparent disintermediation process, resulting from credit portfolios held outside of the traditional banking system. Then, the model proposes a transmission sequence of a shock on households credit portfolios to the whole financing system via the interbank market. Finally, the central bank monetary policy captures decisions in both non-crises times, with the Taylor-type rule; and crises times, with the intervention thresholds associated with liquidity injections and assets purchases, and the corresponding restrictive conditions.

Two original conclusions emerge. First, with regards to the rule setting the official interest rate, consideration of households credits in the intermediation chain modifies the interpretation of the Taylor rule: a negative output gap, rising the default rate, generates financial strains. In these conditions, in the case of a financial system with large households credits, if the central bank highly weighs the output gap, the financial stability objective is *de facto* taken into account. On the contrary, in a financial system with a lower proportion of households credits, taking into account financial stability requires to use an augmented Taylor rule including a financial conditions indicator. Second, the characteristics of the financial system, and in particular how the interest rate risk is borne respectively by banks and borrowers, determine the extent and conditions of transmission of the initial shock, and therefore the terms of monetary policy. If this risk is borne in excessive proportion by borrowers, any positive interest rate shock can deteriorate funding conditions enough for the central bank to mobilize the full range of unconventional monetary policy instruments.

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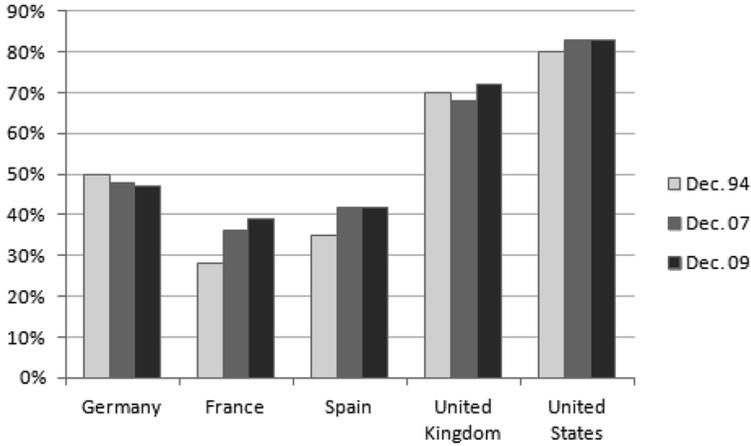
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APPENDIX

Figure 1: Proportion of Households Credits in the Intermediation Rates (narrow sense, in %)



The narrow interest measures the proportion of credits from domestic financial institutions, with respect to all financings of non-financial agents. The data used in this figure were taken from Boutillier & Bricongne (2012).

Figure 2: France: Households Credits and Banking Intermediation (millions EUR, OCDE data)

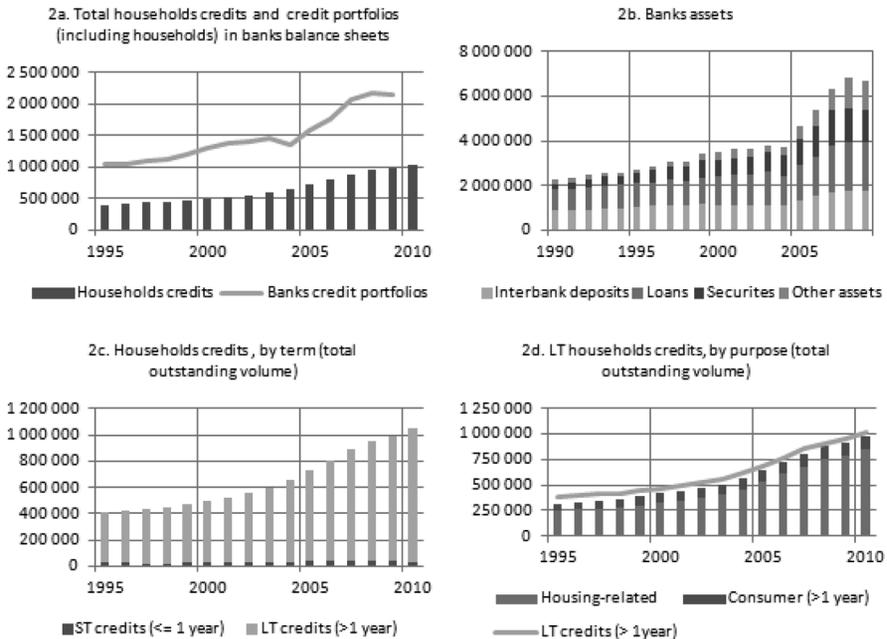


Figure 3: Germany: Households Credits and Banking Intermediation (millions EUR, OCDE data)

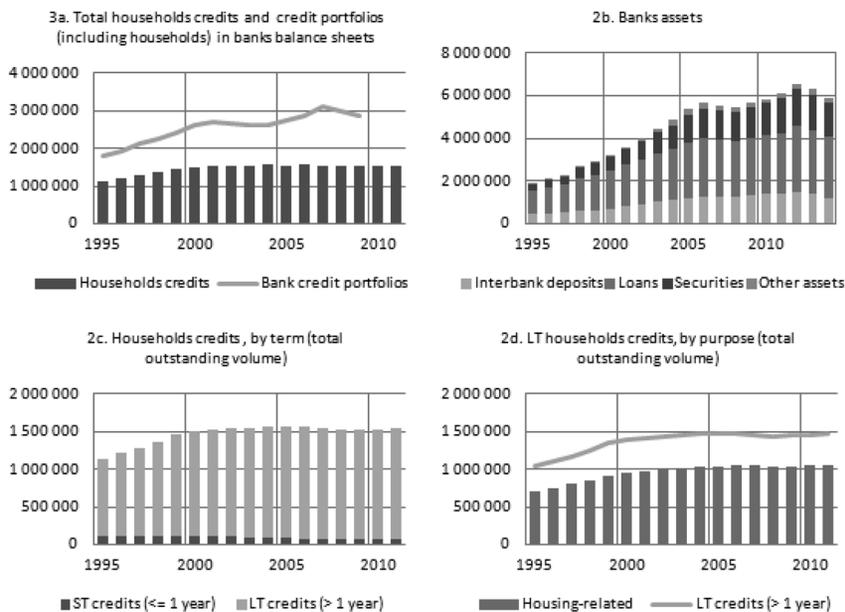


Figure 4: United States: Households Credits and Banking Intermediation (millions USD, OCDE data)

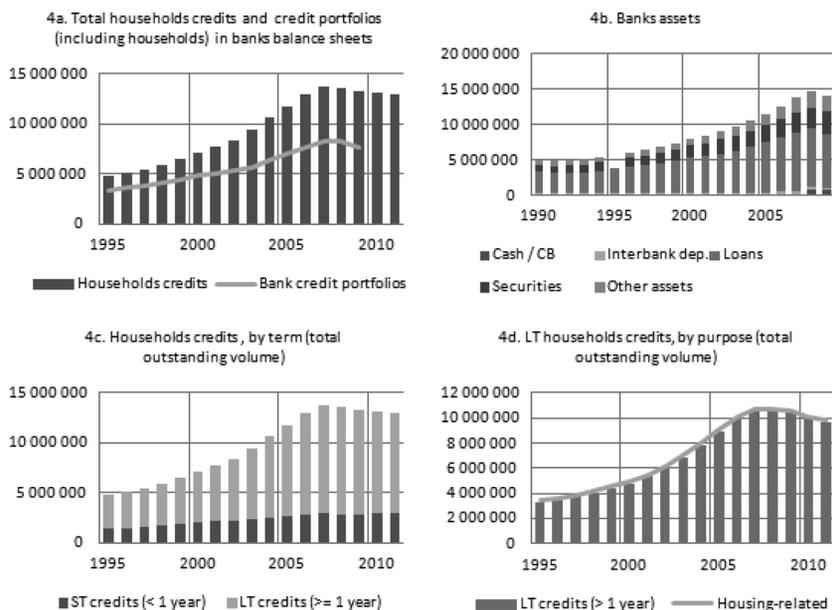


Figure 5: Interbank Market, Eurozone (ECB and EBF data)

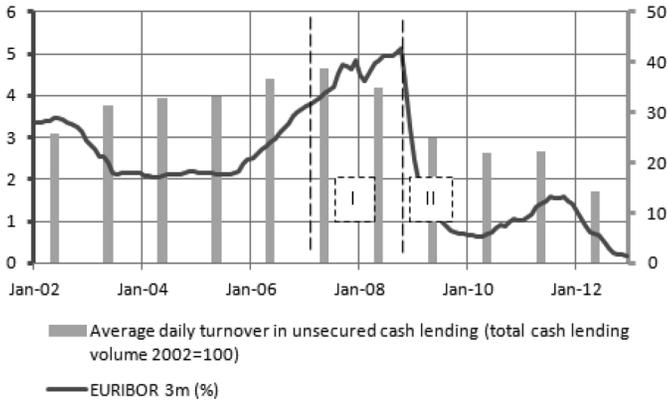


Figure 6: Credit Markets, Eurozone: Non Financial Corporations (ECB data)

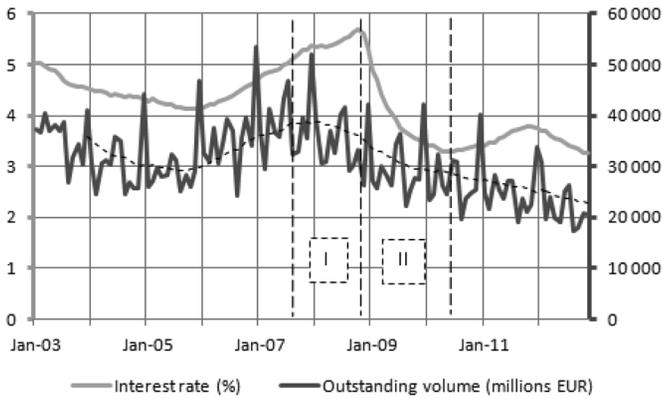


Figure 7: Credit Markets, Eurozone: Households (ECB data)

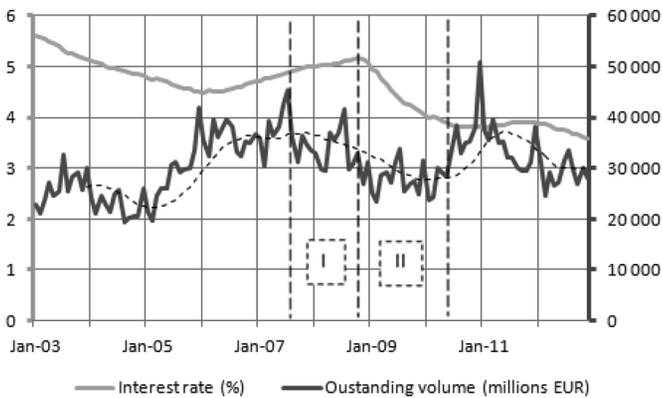


Figure 8: Debt Securities Markets, Eurozone (ECB data)

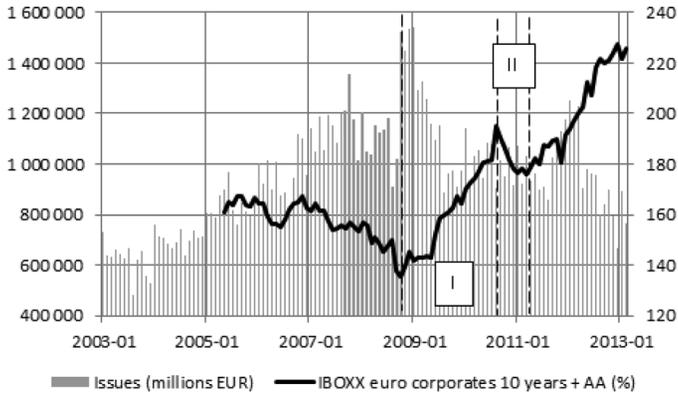


Figure 9: Equities Markets, Eurone (ECB and Datastream data)

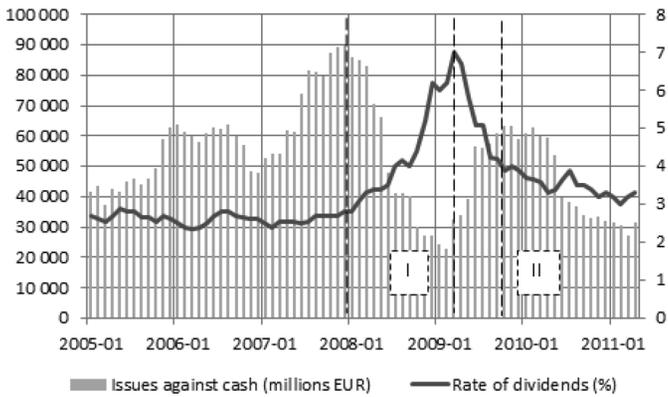
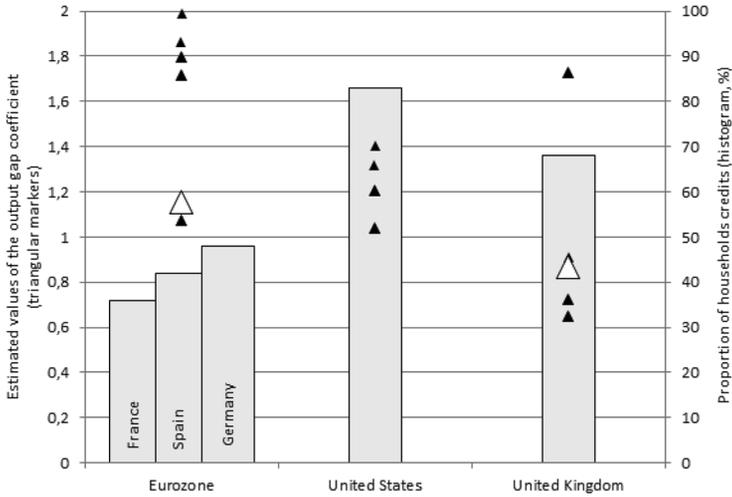


Figure 10: Estimation of the Output Gap Weight in the Taylor Rule (triangular markers, left axis) and proportion of households credits in the intermediation rates (histogram, right axis)



Reading: the estimations with the simple Taylor rule are represented with black triangular markers. The estimation with the augmented Taylor rule, when it is significant, is represented with a white marker. The monetary policy rules followed by the ECB and BOE are best described by an augmented Taylor rule, respectively including a financial conditions indicator, and the credit spread. By contrast, the tests indicate that the FED is following a simple Taylor rule. The data used in this figure were taken from Boutillier & Bricongne (2012) for intermediation rates (in 2007), and Castro (2011) for the Taylor rule estimations (corresponding to 1999-2007 for the ECB, 1992-2007 for the BOE and 1982-2007 for the FED).

5. EURO-AREA AND US BANKS BEHAVIOR, AND ECB-FED MONETARY POLICIES DURING THE GLOBAL FINANCIAL CRISIS: A COMPARISON

*Alex Cukierman*¹

5.1. INTRODUCTION

This paper compares the behavior of Euro-Area (EA) banks with that of US banks during the global financial crisis. In particular it compares the behavior of banking credit and of banks' reserves following major crisis triggers in the US and the EA. Although the downfall of Lehman Brothers constitutes such a trigger for both the US and Europe its impact on the US was stronger than on the EA. The EA was hit only by the blast waves of the Lehman event while the US was at the epicenter of the panic generated by it. An important, internally generated, crisis trigger in the EA was the November 2009 announcement by Greek prime minister, George Papandreou that Greece's annual budget deficit will be more than double the previously announced figure. For the US Lehman's downfall obviously constitutes a clear watershed. Since the EA was affected both by this event as well as by Papandreou's announcement the paper examines the behavior of EA bank credit and reserves following each one of those events.

The paper shows that, although the behavior of banks' credit following widely observed crisis triggers is similar in the EA and in the US, the behavior of their reserves is quite different. The paper argues that, at the source, this is due to differences in the liquidity injections procedures between the Eurosystem and the Fed. Those different procedures are traced, in turn, to differences in the relative importance of banking credit within the total amount of credit intermediated through banks and bond issues in the EA and the US as well as to the higher institutional aversion of the ECB to inflation relatively to that of the Fed.

The paper is organized as follows. Section 2 documents the behavior of banks' credit in the EA and in the US prior to and after the realization of crisis triggers. Section 3 compares the behavior of banks' reserves and of the monetary base during the crisis in the EA and in the US and discusses the reasons for their different behavior. Section 4 argues that differences in monetary policy procedures between the Fed and the Eurosystem underly the different behavior of banks' reserves in the EA and the US. Section 5 documents the relative importance

¹ Interdisciplinary Center, Tel-Aviv University and CEPR. I benefitted from very enlightening discussions with Nuno Cassola and Francesco Papadia and from the reactions of Ulrich Bindseil. Nir Pinchasovitch provided efficient research assistance.

of banking credit in total credit (bank credit plus bond issues) and argues that the traditionally higher weight of bond issues in the US relatively to the EA is an important reason for the difference in policy procedures used by the Fed and the Eurosystem. An additional reason is the relatively stronger focus of the ECB on price stability. Section 6 compares the behavior of total new loan credit and its components (banking credit plus new net bond issues) during the crisis to their behavior during normal times in the EA and in the US. This is followed by concluding remarks.

5.2. BEHAVIOR OF BANKING CREDIT DURING THE CRISIS IN THE EA AND THE US: A COMPARISON

Figure 1 and Table 1 show that total banking credit in both the EA and the US expanded at average yearly rates of about seven percent between 1999 and the last quarter of 2007. Since Lehman's collapse till the beginning of 2014 average yearly rates of credit expansion shrank dramatically – to less than one percent in the EA and to 1.3% in the US. The credit shrinkage in the US preceded its counterpart in the EA by one to two years. In particular, between October 2007 and September 2008 average credit growth in the EA actually went up to 7.7% but dropped to 4.2% in the US.

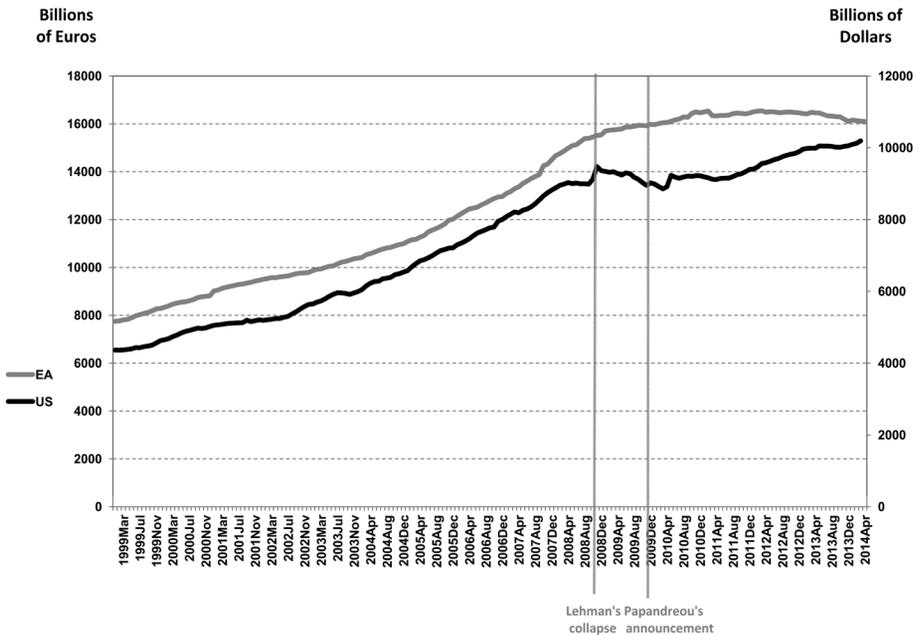
During the year following Lehman's downfall **outstanding** banking credit in the US actually **shrank** by 4.7%. Although it stayed in the positive range the rate of credit growth in the EA during that year dropped to 3.1%. Since Papandreou's dramatic upward revision of the Greek deficit figure in November 2009 till February 2014 the yearly average rate of growth of EA banking credit dropped further to around 0.3% but its US counterpart regained some ground – to 2.9%. Both of those events are marked by vertical lines in Figure 1. It is also noteworthy that since (roughly) the peak of the sovereign debt crisis in the EA till February 2014 outstanding banking credit went down by almost one percent per year on average in the EA (first memo item in Table 1).² By contrast the corresponding rate in the US was back up about half of the way to its pre-crisis level – a bit over 3.5%.

Together the figure and the table show that although credit growth in both the EA and the US went down following Lehman's collapse and Papandreou's announcement the impact of the first event was stronger in the US and that of the second was stronger in the EA. Since the first event precedes the second by over a year, the brunt of the financial crisis hit the EA later than the US and correspondingly credit recovery in the EA lags behind that of the US. However,

² CDS rates on Greek government bonds hovered in the vicinity of their all time high of 35% during the end of 2011 and the beginning of 2012 (Figure 7).

in both the EA and the US rates of banking credit growth are still anemic in comparison to their pre-crisis levels: Overall, in the five and a half years since Lehman's collapse the average yearly rates of credit expansion dropped to less than 0.8% and 1.35% in the EA and in the US respectively (second memo item in Table 1).

Figure 1: Outstanding Total Banking Credit: EA vs. US



Sources: for US: Bloomberg – Ticker: ALCBBKCR Index.
for EA: www.ecb.europa.eu/stats/keyind/html/sdds.en.html.

Table 1: Bankings Credit Growth Prior to and Following the Global Financial Crisis Comparison EA vs. US

Time period	Yearly Growth of Total European Banks' Credit	Yearly Growth of Total US Banks' Credit
Jan 1999 – Sep 2007	6.72%	7.83%
Oct 2007 – Sep 2008	7.72%	4.22%
Oct 2008 – Sep 2009	3.14%	-4.74%
Oct 2009 – Feb 2014	0.28%	2.93%
Memo items		
Dec 2011 – Feb 2014	-0.86%	3.56%
Oct 2008 – Feb 2014	0.80%	1.35%

Sources: for EA: www.ecb.europa.eu/stats/keyind/html/sdds.en.html.
for US: Bloomberg – Ticker: ALCBBKCR Index.

5.3. BEHAVIOR OF TOTAL BANKS' RESERVES DURING THE CRISIS IN THE EA AND IN THE US: A COMPARISON

Figures 2a and 2b show respectively the evolution of total bank reserves in the EA and in the US prior to and after the realization of crisis triggers. In both cases there initially is an acceleration in the rate of growth of those reserves. However since Lehman's collapse rates of reserve growth are substantially lower and much more variable in the EA than in the US. In particular, since September 2008 bank reserves are on a sustained upward trend in the US while in the EA they fluctuate substantially in both upward and downward directions.

The vertical lines in Figure 2a depict the beginnings of the main liquidity injections programs of the ECB. The first of those is the Fixed-Rate, Full-Allotment (FRFA) liquidity provision that was introduced in October 2008. In normal times, the Eurosystem assesses the total liquidity need of the banking sector and, in competitive tenders allots this amount. Since these tenders are usually conducted as variable rate tenders banks have to pay the interest that they offer when they make their bids. As a consequence, during periods of high demand for liquidity, as is the case during a financial crisis, the rate paid by banks goes up. Under the FRFA liquidity provision the ECB provides **the full amount of liquidity that banks request at a fixed pre-announced rate** subject to appropriate collateral. The FRFA provision was initially introduced for a fixed period of time and subsequently extended several times³. By supplying all the desired liquidity at a fixed rate the FRFA provision neutralizes the increase in rates caused by competitive bidding and allows banks to obtain all the liquidity they desire at a rate that is known in advance. The second liquidity injection program is the Covered Bonds Purchasing Plan (CBPP). It was introduced in June 2009 and stipulated the purchase of 60 billion worth of Euro denominated covered bonds over a period of one year⁴. The third liquidity injection program known as the Securities Market Programme (SMP) was introduced in May 2010 and phased out in September 2012. It involved the purchase of mainly sovereign bonds on the secondary markets and was fully sterilized. The total volume of this program peaked at around 210 billion Euro.

In December 2011 and February 2012 the ECB launched two waves of a Long Term Refinancing Operation (LTRO) involving three years loans to banks against appropriate collateral. The total allotted amounted to about a trillion Euro.⁵ The last liquidity injection program (within the time span covered in Figure 2a) known as Outright Monetary Transactions (OMT) was announced in August

³ The information on the various programs in this section is obtained from Voss (2012) and the window on "Key dates of the financial crisis" in the ECB web page.

⁴ A second CBPP for a total of 40 billion Euro was initiated in October 2011.

⁵ In July 2014 a new Targeted LTRO was introduced.

2012. Its objective was to buy EA sovereign bonds with maturities of up to three years on secondary markets. As in other bond buying programs the liquidity injections caused by those purchases were fully sterilized.

It is apparent from Figure 2a that upon the inception of a given liquidity injection program total banking reserves at the ECB shoot up and decrease after a while. In the case of bond purchases the increase is due to the fact that sterilization is achieved through an increase in banks deposits at the ECB in conjunction with the fact those deposits constitute banking reserves. Those additional reserves may go into either a ‘Current Account’ that is designed as a repository for required reserves or into a ‘Deposit Facility’ that pays a higher rate and is designed as a repository for excess reserves. By definition total reserves of the banking system equal the sum of those two accounts. Banks are free to determine in which of the two accounts they hold their reserves and obviously have an interest to hold most if not all excess reserves in the Deposit Facility.

In the case of direct liquidity injections to banks under programs such as the LTRO banks with liquidity deficiencies take advantage of the liquidity offered under the program and use it to repay short term debt to other more financially robust banks. Being flooded with additional liquidity the latter types of banks initially deposit their excess liquidity with the ECB. This process was strongly in evidence during the acute phases of the Euro sovereign debt crisis in which relatively liquid banks in the core countries were unwilling to directly lend to other banks but were willing to do that through the intermediation of the Eurosystem. The upshot is that under both liquidity injections through lending to banks as well as through bond purchases banking reserves at the ECB go up following a liquidity injection program.

This still begs a question about the mechanism underlying the reversals in banking reserves sometime after an expansionary monetary action. A possible explanation follows: ECB expansionary actions are often designed in response to tight market conditions during which there is a strong demand for liquidity for precautionary and even panicky reasons. By supplying this demand an appropriately devised liquidity program, alleviates the panic, reduces the precautionary demand for liquidity and encourages banks to convert some of their reserves into riskier but also higher yielding assets⁶.

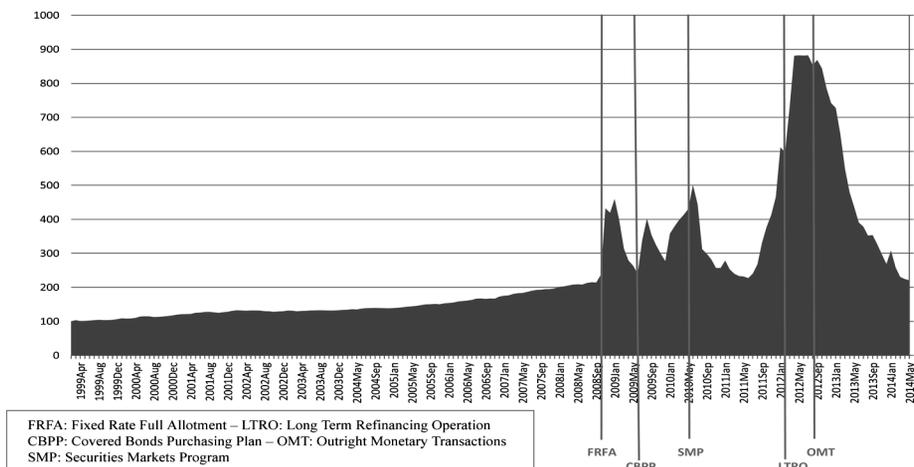
I turn now to the evolution of banking reserves in the US before and during the financial crisis. Figure 2b shows that prior to Lehman’s downfall total reserves of the US banking system were relatively steady at about 50 billion USD. Since that event, reserves strongly trend in an upward direction. At the beginning of 2014 they are about 50 times higher than just prior to the collapse of Lehman’s

⁶ See also ECB (2014).

brothers. Their level evolved in tandem with the magnitude of the various Quantitative Easing (QE) programs used by the Federal Reserve System to inject liquidity into the economy⁷. The beginnings of each of the three major QE programs are marked in the figure by vertical lines.

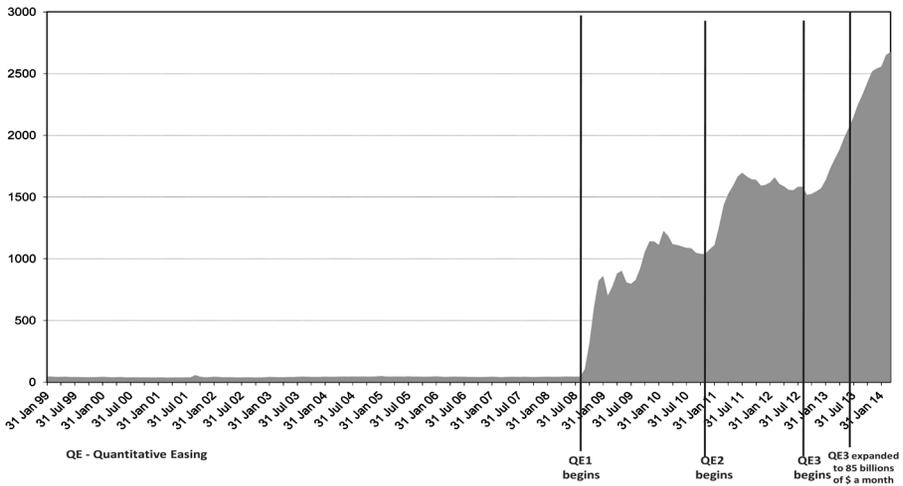
Under QE1 that started in September 2008 the Fed purchased about 2 trillion dollars worth of bank debt, mortgage-backed securities, and Treasury notes. In November 2010, the Fed announced a second round of quantitative easing 'QE2', buying \$600 billion of Treasury securities by the end of the second quarter of 2011. A third round of quantitative easing, 'QE3', was announced on 13 September 2012. In an 11-1 vote, the Federal Reserve decided to launch a new \$40 billion per month, open-ended bond purchasing program of agency mortgage-backed securities. In December 2012, the FOMC announced an increase in the amount of open-ended purchases from \$40 billion to \$85 billion per month. During the last few months this amount has gradually been reduced and (as of July 2014) is expected to converge toward zero sometime during the last quarter of 2014.

Figure 2a: Total Reserves of EA Banking System (Current Account + Deposit Facility [Billions of Euros]



Source: ECB: <http://sdw.ecb.europa.eu/reports.do?node=100000135>.

⁷ A fuller discussion appears in Cukierman (2014).

Figure 2b: Total Reserves of US Depository Institutions [Billions of Dollars]

Source: Federal Reserve Website: <http://research.stlouisfed.org/fred2/series/EXCRESNS>.

Figure 3 (p. 80) compares the evolution of the ratio between reserves and total banking credit in the Euro area and in the US. Since Lehman's collapse this 'reserve ratio' is substantially lower in the EA than in the US.⁸ Another post Lehman difference is that, while this ratio has been on a strong upward trend in the US, there is no such trend in the EA. This begs a question about the reason for those differences. The following section addresses those issues.

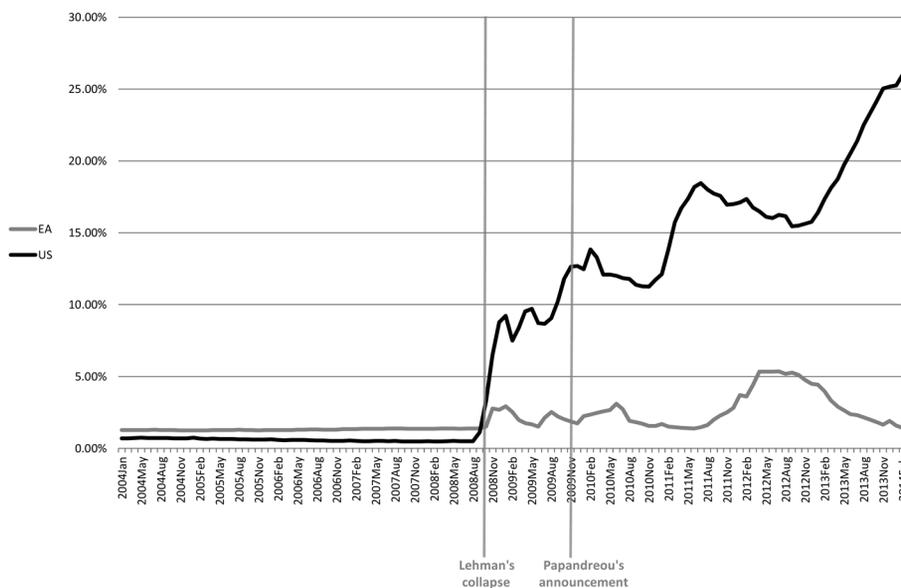
5.4. DIFFERENCES IN LIQUIDITY INJECTIONS PROCEDURES BETWEEN THE EUROSISTEM AND THE FED AS AN EXPLANATION FOR THE DIFFERENT BEHAVIOR OF RESERVES AND OF THE MONETARY BASE BETWEEN THE EA AND THE US

Since October 2008, the ECB passively supplies banks' liquidity demands at the current policy rate. This is done mainly through repos with fixed redemption periods⁹. Basically, provided they have appropriate collateral, **banks largely determine the outstanding quantity of repos**. As a consequence the level of reserves in the EA is determined through an interaction between the terms of the

⁸ Note that this concept differs from the conventional reserve ratio that is defined as the ratio between reserves and deposits. Obviously those two concepts are closely related.

⁹ Redemptions periods were gradually extended as the EA sovereign debt crisis intensified peaking at three years under the large LTRO program.

Figure 3: Total Reserves as a Share of Total Banking Credit in the EA and in the US



Source: for ECB: www.ecb.europa.eu/stats/keyind/html/sdds.en.html.
<http://sdw.ecb.europa.eu/reports.do?node=100000135>.
 for FED: Bloomberg; Ticker: ALCBBKCR Index.
<http://research.stlouisfed.org/fred2/series/EXCRESNS>.

repos set by the ECB and the demand for this liquidity by EA banks – implying that both reserves and the monetary base are determined endogenously by the liquidity demands of the banking system.

By contrast, since the onset of the subprime crisis, liquidity injections in the US mainly take the form of massive purchases of securities including, *inter alia*, US Treasury securities, Federal Agency debt securities and MBS. As a consequence, the level of reserves and the monetary base since the onset of the crisis are largely determined by the Fed's policy decisions about the volume of open market operations. Due to those procedural differences, the monetary base and reserves in the EA are highly sensitive to short run fluctuations in banks' demand for liquidity while in the US those aggregates mainly reflect the Fed's quantitative easing policy decisions¹⁰.

This explains the fact, documented in Figure 2a, that since the start of the financial crisis EA banking reserves experienced strong fluctuations in **both directions**. By contrast in the US, due to the Fed's determination to flood the

¹⁰ A comparison of ECB-Fed policy procedures during normal times appears in Blenck, Hasko, Hilton and Masaki (2001).

economy with liquidity, the monetary base has been on an uninterrupted upward trend since Lehman's collapse¹¹. This difference in policy procedures explains the fact, documented in Figure 2b, that US banking reserves have been on a persistent **upward trend** since that event. By definition the monetary base is composed of banks' reserves plus currency in circulation implying that any exogenous policy increase in the base must take the form of an increase in either reserves, currency or both of them. Although part of the increase in base money usually leaks into cash the bulk of it takes the form of an increase in reserves.

The preceding observations can now be used to explain the fact, documented in Figure 3, that since the Lehman event the ratio of reserves to banking credit has been going up substantially more in the US than in the Euro area. We saw in section 2 that, due to the crisis, banking credit growth went down significantly in both the EA and the US. Hence the growing discrepancy between the EA and the US in this 'reserve ratio' mainly reflects the substantially higher rate of growth of high powered money in the US.

The tendency of the Fed to use mainly open market operations (or outright monetary purchases in EA terminology) to inject liquidity and to keep the bonds it purchases on its balance sheet for an open ended time imply that those operations have a strong and sustained impact on the monetary base. The Eurosystem liquidity injection policy differs from the Fed's operation mode in two respects. First, the cumulative level of its liquidity injections is lower. Secondly, since liquidity injections are done mainly through repos and may be repaid when banks choose to do so, the monetary base is largely determined by banks' liquidity demands implying that the base goes up and down in line with banks' liquidity demands.

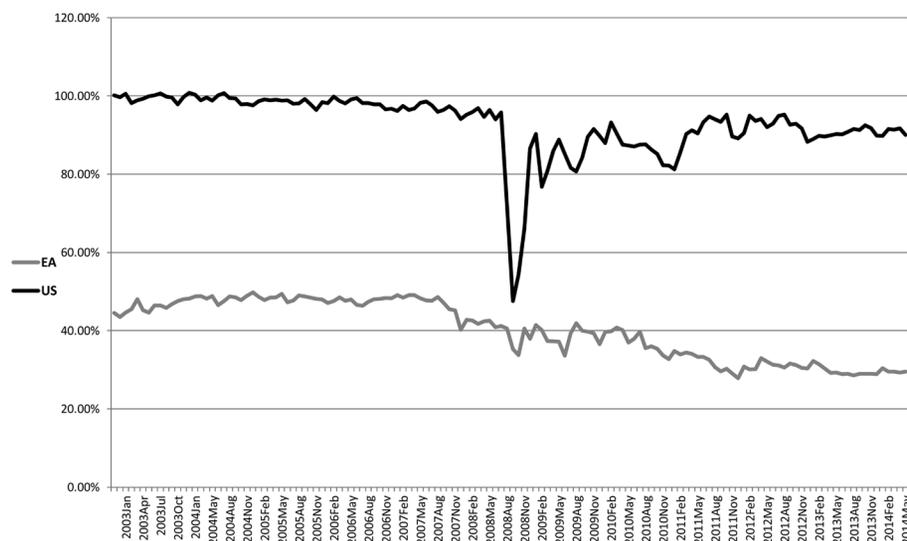
Figure 4 shows the evolution of the share of the monetary base in the total central bank balance sheet for the Eurosystem and for the Federal Reserve System (Fed) between January 2003 and May 2014. The most striking observation is that the share of the base within the Fed's balance sheet is roughly two times higher than its counterpart in the Eurosystem. This is mainly due to the fact that, unlike the Fed, the balance sheet of the Eurosystem includes sizable governmental deposits and other autonomous factors.

Beyond this long term structural difference the figure shows that following Lehman's collapse there initially is a decrease in the share of the base in both the Eurosystem and the Fed. The decrease is particularly dramatic in the case of the Fed. It is largely due to the fact that the immediate response of the Fed to the panic that developed following Lehman's bankruptcy was to lend to specific institutions and to generally provide loans and repos to the financial system. Since those

¹¹ The dramatic increase in US monetary base since that event is documented in Table 5 of Cukierman (2014).

operations raised the total balance sheet of the central bank but did not affect the base the share of the latter went down. As can be seen from the figure, in the case of the Fed the share decrease was quickly reversed mostly by replacing loans and repos with outright purchases of securities. By contrast, in the case of the Eurosystem there is a mild but longer term downward trend in the share of the monetary base.

Figure 4: Monetary Base as a Share of Total Central Banks' Assets – Comparison of ECB and FED



Source: for ECB: <http://sdw.ecb.europa.eu/reports.do?node=100000141>.
for FED: <http://research.stlouisfed.org/fred2/series/WALCL#>.

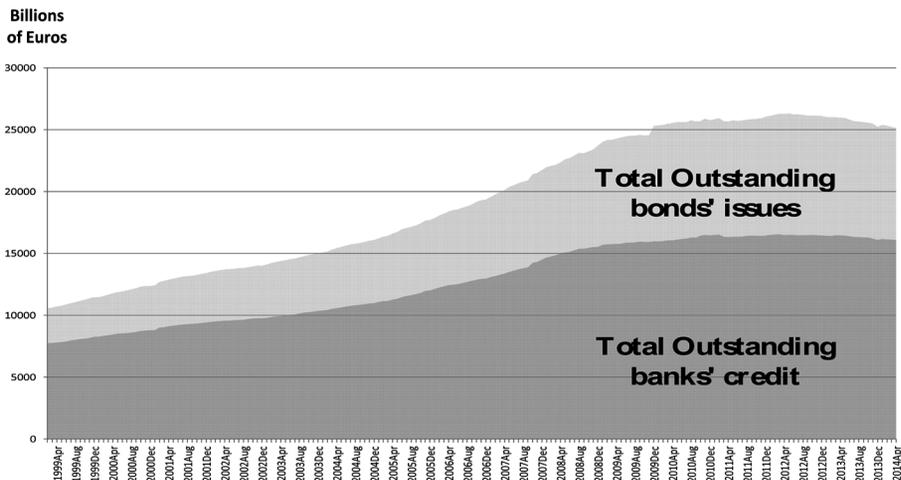
5.5. STRUCTURAL REASONS FOR DIFFERENCES IN POLICY PROCEDURES BETWEEN THE EUROSYSTEM AND THE FED

The difference in policy procedures discussed in the previous section is due to two main reasons. The first is the substantially higher share of banking credit within total credit in the EA. The second is the relatively higher conservativeness of the ECB in comparison to its US counterpart. This section provides some documentation of those differences and discusses their role in shaping the different choices of policies and of policy procedures by the ECB and the Fed in general as well as during the crisis.

The share of banking credit in total credit (outstanding banks' credit plus outstanding bonds issued) is substantially higher in the EA than in the US. In particular, since the beginning of the 21st century, the average share of banks' credit within total outstanding credit has been **over two thirds in the EA** and **only about a quarter in the US**. Figures 5 and 6 illustrate this dramatic long run structural difference. This difference mainly reflects the fact that the bond market is substantially wider and deeper in the US than in the Euro area.

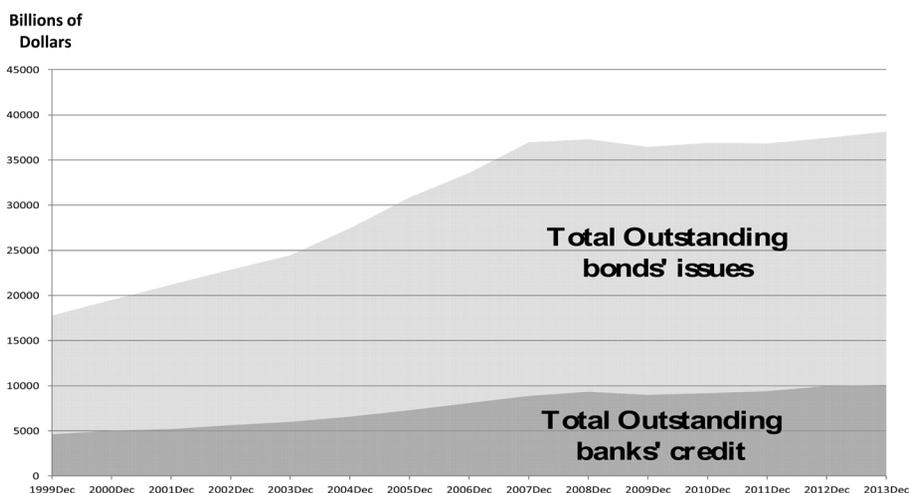
An important consequence of this difference is that (as far as financial stability is concerned) the prime concern of the ECB is about liquidity deficiencies within the banking system while the prime concern of the Fed is about scarcity of liquidity in the bond market. This difference in relative concerns about the two segments of the total credit market dictate different choices of policy procedures. Since it is mainly interested in maintaining sufficient liquidity within the banking system, the ECB operates mainly by offering various types of loan facilities and repos to the banking system. By contrast since the Fed is concerned in first place by lack of liquidity in the bond market, its prime instrument for liquidity injections are open market operations or outright bond purchases. In a recent blog, Papadia (2014), argues that the relative narrowness of EA bond markets implies that, if the ECB decides to engage in sizable quantitative easing operations similar to those of the Fed, it would have to buy mainly sovereign bonds and bank loans.

Figure 5a: Total Outstanding Banks' Credit + Outstanding Bonds' Issues – EURO AREA



Sources: www.ecb.europa.eu/stats/keyind/html/sdds.en.html.
<http://sdw.ecb.europa.eu/browse.do?node=2018781>.

Figure 5b: Total Outstanding Banks' Credit + Outstanding Bonds' Issues – US



Sources: *Bloomberg ALCBBKCR Index.*

Securities Industry and Financial Markets Association (SIFMA).

A second structural difference between the ECB and the Fed is that the former is more conservative in the sense that its charter elevates the price stability objective above all other objectives. By contrast the Fed's charter puts price stability and high levels of employment and economic activity on equal footings. Fearing the potential inflationary consequences of such actions the ECB is more reluctant to engage in large scale outright monetary purchases on a sizable scale in comparison to the Fed. One consequence of this stronger inflation aversion of the ECB is that it waits longer before implementing substantial liquidity injections and, as was the case during the crisis, maintains them at levels that are lower in comparison to their US counterparts. Another consequence is that during stress times the ECB prefers to directly supply self-liquidating collateralized emergency liquidity to banks rather than to engage in longer term open market purchases as indeed is the case in the EA.

5.6. THE BEHAVIOR OF TOTAL NEW CREDIT FLOWS IN THE EA AND IN THE US PRIOR TO AND DURING THE FINANCIAL CRISIS

The difference in the relative importance of banking credit between the EA and the US raises interesting questions about the comparative flows of those two sources of credit during the financial crisis. Some relevant questions are: Did the

crisis differentially affect those two sources of credit to the same extent? Are there any differences in this respect between the EA and the US?

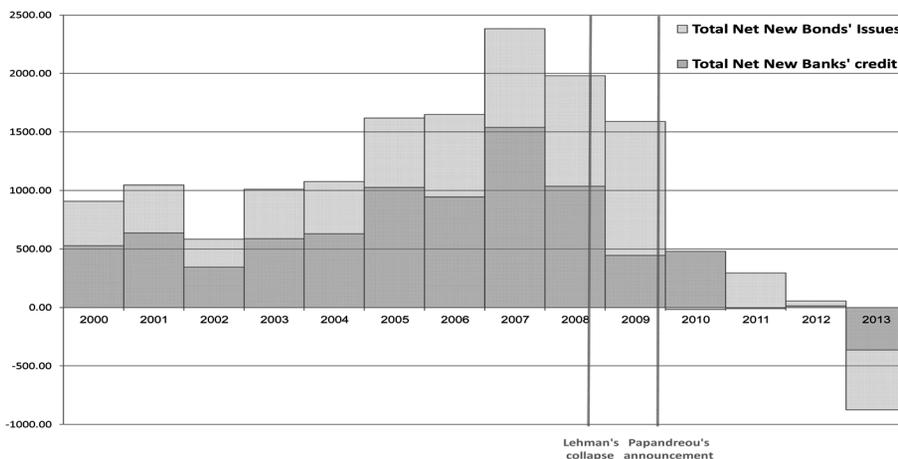
To obtain some feel about those issues Figures 6a and 6b show the evolution of total net new credit as well as its two components; net new banking credit (calculated as the first difference of total outstanding banks' credit) and net new bond issues (calculated as the first difference of the outstanding stock of bonds) in the EA and the US between 2000 and 2013. In both the EA and the US there is a vigorous expansion in total credit up to and including 2007 followed by a dramatic total credit arrest in the US during 2008 and 2009. There is some moderation in the flow of total new credit during those years also in the EA. But a total credit arrest, similar to that experienced in the US during 2008 and 2009, materializes only from 2011 and on. In particular the flow of total new US credit is negative over 2008 and 2009. A similar phenomenon occurs in the EA during 2011-2014.

This is consistent with the view that, in spite of the high degree of integration of international capital markets, the total flow of credit is substantially more sensitive to domestically triggered financial crises than to crises that erupt abroad. Thus, the total flow of net new credit in the US becomes negative in the year of Lehman's collapse and the immediately following year. A similar phenomenon starts in the EA over the three years during and immediately following 2011. The relevant trigger in this case appears to be the peak of the sovereign debt crisis. Judging by the levels of yields on sovereign bonds the peak of the sovereign debt crisis in the EA occurs between the end of 2011 and the beginning of 2012.

What happens to the relative volumes of banking versus bond credit flows in the EA and in the US following the brunt of the crisis in comparison to normal times? Taking the period 2000-2007 as representative of normal times the share of new banking credit in total new credit is almost 61% in the EA and 22% in the US. The corresponding figures for the 2008-2013 period are 45% for the EA and 100% for the US implying that the share of new banking credit in the EA is lower in comparison to preceding normal years. By contrast, in the US, the share of banking credit during the crisis is substantially higher than during the preceding normal period.

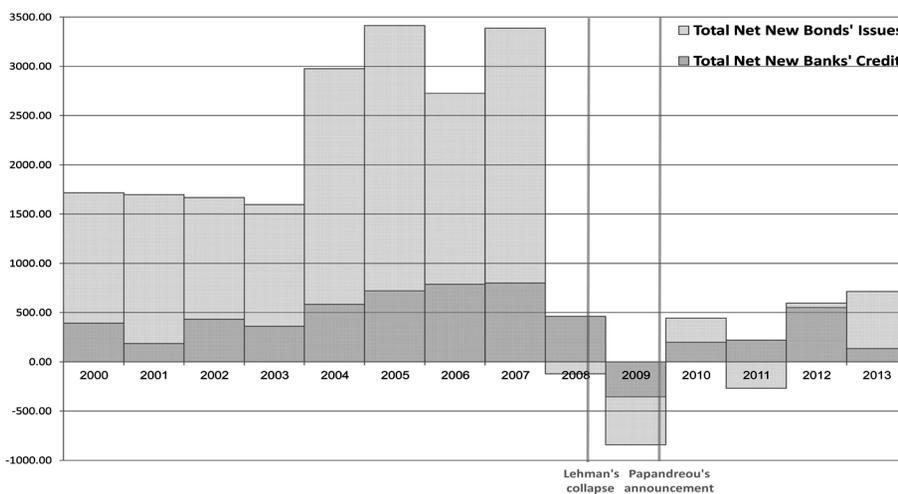
Since the peak of the crisis in the EA occurred almost three years after the crisis peak in the US one could reasonably hold the view that the acute crisis period in the EA started only in 2011. Taking the 2011-2013 period as representative of crisis time for the EA it is found that the share of banking credit actually went up (from 61% during normal times) to almost 68%. The upshot is that, provided the timing difference between the peaks of the crisis in the EA and the US is taken into consideration, the share of banking credit went up during (the respective) crisis times in both the EA and the US.

Figure 6a: Total Net New Banks' Credit + Bonds Issues – EA (Billions of Euros)



Source: www.ecb.europa.eu/stats/keyind/html/sdds.en.html.
<http://sdw.ecb.europa.eu/browse.do?node=2018781>.

Figure 6b: Total Net New Banks' Credit + Bonds Issues – US (Billions of \$)



Source: Bloomberg ALCBBKCR Index.
 Securities Industry and Financial Markets Association (SIFMA).

5.7. CONCLUDING REMARKS AND FURTHER THOUGHTS

This paper documents the behavior of banking credit and of banking reserves in the Euro Area (EA) during the global financial crisis and compares it to the behavior of those variables in the US. In both the EA and the US rates of growth

of banking credit go down sharply and even become negative at the peaks of their respective crises. But the timings of those peaks differ.

In the US the peak of the financial crisis starts already in 2008 and reaches a resounding crescendo following Lehman's insolvency along with the decision not to bail it out. In the EA it builds up more slowly starting with Papandreou's admission, at the end of 2009, that Greek sovereign debt is actually more than double its previously published magnitude. Judging by sovereign CDS rates, the peak of the panic in the EA occurs over the end of 2011 and the beginning of 2012. This peak is followed by a total arrest in banking credit growth as well as in net new bond issues. In 2012 there is practically no new credit and in 2013 the rates of growth of both banking as well as of capital market credit are negative (Figure 6a). A similar phenomenon occurs in the US during 2009 (Figure 6b).

Although the average level of EA banking reserves during the crisis is higher than prior to it this is overshadowed by wide fluctuations in their levels in both directions. By contrast, in the US since Lehman's collapse, banking reserves have been on an uninterrupted upward trend. The paper argues that this is due to different policy procedures between the ECB and the Fed. Most of the ECB liquidity injections during the crisis were done by passively supplying banks' liquidity demands at fixed rates. As a consequence reserves went up and down with banks' liquidity demands. Since those demands fluctuated quite substantially during the crisis, so did reserves and the closely related monetary base.

By contrast most liquidity injections in the US took the form of sustained securities purchases on the open market creating a strong upward, policy induced, trend in the monetary base. Although some of this increase probably leaked into cash the bulk of it took the form of passive increases in banking reserves. As a consequence banking reserves in the US in March 2014 were **about 50 times larger** than they were just prior to Lehman's collapse (Figure 2a). A notable consequence of this difference in liquidity injection procedures is that banks' reserves on deposit with the central bank are more closely related to the banks' aggregate demand for liquidity in the EA than in the US¹².

The paper traces the difference in liquidity injection procedures between the ECB and the Fed to two factors: One is the predominance of banking credit in the EA versus the predominance of credit flows through bond issues in the US. The other is the higher conservativeness of the ECB relatively to that of the Fed. Both sources of credit dry out in both the EA and the US and even become negative at the respective peaks of their crises. Judging by the periods of either negligible or

¹² A detailed account of monetary policy operations during crisis times appears in Part II of Bindseil (2014).

negative total new credit the peak of the crisis in the US occurs over 2008-2009 while the peak of the crisis in the EA occurs over 2011-2013.

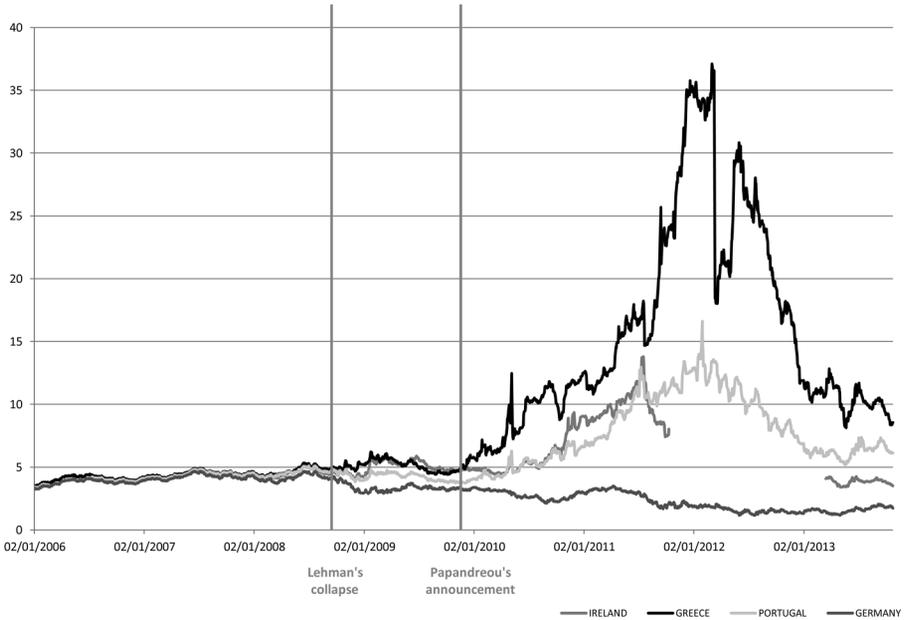
In spite of the huge expansion of the base in the US total credit growth in this country remains anemic since the Lehman event (Figure 6b). Using a multiple priors framework of the type suggested by Gilboa and Schmeidler (1989) Cukierman and Izhakian (2014) argue that the persistence of credit arrest in the US is largely due to a persistent increase in aversion to bailout uncertainty after the decision not to bailout Lehman Brothers. Following this decision financial markets participants became aware of the fact that low bailout probability distributions to which they had assigned zero mass prior to that event are possible. Cukierman (2014) refers to this phenomenon as **an increase in probabilistic awareness to low bailout probability distributions** and suggests that it is the modern decision theory counterpart of a Post Traumatic Stress Disorder (PTSD) in psychology¹³. Although they need not result in deep psychological disorders, dramatic economic events such as Lehman's collapse in the US or (as detailed below) Papandreou's announcement are likely to permanently alter individuals probabilistic beliefs in a pessimistic direction.

Although financial markets participants in the EA were affected by the shock waves of Lehman's collapse the major traumatic event of the European crisis was the realization that default probabilities on sovereign bonds of different governments may differ substantially. But this realization dawned on EA financial markets somewhat more gradually than the increase in probabilistic awareness of low bailout probabilities in the US.

This is illustrated in Figure 7 that shows the behavior of Irish, Greek, Portuguese and German sovereign bonds between 2006 and 2013. Between 2006 and the Lehman event the sovereign yields on those bonds are practically indistinguishable supporting the view that financial markets viewed those bonds as equally risky. Following Lehman's demise some moderate spreads emerge. But those spreads widen substantially only after Papandreou's November 2009 announcement about the true size of the Greek deficit as well as subsequent adverse pieces of information about Irish and Portuguese sovereign debt. The upshot is that, following public events like Papandreou's announcement, EA financial market participants became aware of default probability distributions on sovereign bonds to which they previously had assigned a negligible or even zero mass.

¹³ A PTSD is an anxiety disorder that may develop if a person encounters an unexpected extreme traumatic stressor such as war, personal assault, confinement or a severe car accident (Javidi and Yadollahie (2012)).

Figure 7: Yield on Irish, Greek, Portuguese and German 10 Years Sovereign Bonds; 2006-2013



Source: Bloomberg – Indexes:

Ireland: GTIEP10YR

Portugal: GTPTE10Y

Greece: GTGRD10YR

Germany: GTDEM10Y

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6. PLEASE DON'T THROW ME IN THE BRIAR PATCH: THE FLUMMERY OF CAPITAL-REQUIREMENT REPAIRS UNDERTAKEN IN RESPONSE TO THE GREAT FINANCIAL CRISIS

Edward J. Kane

Regulators define a bank's capital as the difference between the value of its assets and liabilities¹. For at least 30 years, authorities in major countries have made bank capital the linchpin of their efforts to steer the financial sector through periodic shocks that threaten industry solvency. Although this linchpin has failed again and again, government financial regulators assure us after each episode that this time they are going to craft an effective capital-requirement mechanism.

Effective renovation begins with a diagnosis of what needs to be fixed. The nature of alleged improvements and responsibility for paying the repair bill should be predicated on an honest assignment of blame for what went wrong. It is hard to be hopeful about the size and incidence of the bill for the latest round of regulatory adjustments. Government and industry mechanics are tinkering with the nuts and bolts of specific requirements when they should be addressing deep-seated incentive defects in the workings and use of the capital-based steering process they are overhauling.

The Great Financial Crisis traces not so much to a breakdown of *rules and requirements* (such as loophole-riddled obligations to disclose adverse movements in a firm's capital position) as to a cumulative decline in the ethical culture of intrafirm supervision and government regulatory enforcement. The ease with which regulatory restrictions can be circumvented by financial engineering in good times and the political and economic difficulties of enforcing capital requirements when an important firm or industry sector is failing are at the heart of modern financial crises.

To improve supervision and enforcement requires changes in incentives all along the financial-sector risk-management chain. It is dishonest to pretend that future breakdowns can be avoided merely by patching and strengthening a series of hard-to-enforce balance-sheet requirements and scenario-based 'stress tests' that are designed to be applied mainly to the last link in the chain. These formal

¹ The author wishes to acknowledge financial support from the Institute for New Economic Thinking and helpful comments on related papers from Richard Aspinwall, Elijah Brewer, Stephen Buser, Robert Dickler, Rex DuPont, Robert Eisenbeis, Thomas Ferguson, Stephen Kane, Paul Kupiec, Dilip Madan, Roberta Romano, Haluk Unal, Larry Wall, and Arthur Wilmarth.

requirements and tests are the ‘briar patch’ mentioned in the title. Fairness demands that industry have the chance to offer advice on proposed requirements and test procedures during the rule-making process. But industry participation in regulatory decisions goes beyond fairness. In many instances, lobbying pressure exerted by industry managers produces loophole-ridden rules whose very purpose is to make a mockery of the enforcement process. This is a large part of what economists mean by regulatory capture.

What taxpayers need is a system that genuinely *disincentivizes* the pursuit of potentially ruinous tail risk at mega-institutions. To generate effective disincentives requires: (1) revisions in corporate law, in governmental mission statements, training procedures and oaths of office, and (2) a substantial reworking of the ethical cultures that govern the ways in which regulators and managers of regulated financial institutions (‘regulatees’) interact (Kane, 2013).

This paper argues that, in the US and Europe, financial regulation has become a rigged game that has the effect of repeatedly victimizing low and middle-income citizens. Delicately negotiated post-crisis changes in the specific rules of this regulatory game promise to generate inefficient compliance costs, to change the adaptive strategies and tactics that regulators and regulatees employ, and to reformulate the arguments proponents use to depict the purported fairness of the game. But when the dust settles, these changes are not going to give the citizenry either financial stability or a fair deal.

6.1. HOW THE RULES OF THE REGULATION GAME ARE AND ARE NOT CHANGING

The idea that capital requirements can serve as a stabilization tool is based on the presumption that, other things equal, the strength of an institution’s hold on economic solvency can be fairly represented by the size of its capital position.

This way of aggregating information posted on a firm’s balance sheet seems simple and reliable, but it is neither. It is not simple because accounting principles offer numerous variations in how to decide *which* positions and cash flows are and are not recorded (so-called itemization rules), *when* items may or may not be booked (realization rules), and *how* items that are actually booked may or may not be valued (valuation rules). Accounting capital is not a reliable proxy for a firm’s survivability because, as an institution slides toward and then into insolvency, its managers are incentivized to manipulate the ways they apply these rules to hide the extent of their weakness and to shift losses and loss exposures surreptitiously onto its creditors and, through them, onto the government’s safety net.

Post-crisis changes in the US regulatory environment are embodied in new rules and regulatory structures. Some are required by the Dodd-Frank Act of 2010 (DFA). Others are mandated by cross-country agreements such as Basel III capital and liquidity requirements and G-20 plans to increase accounting transparency by forcing: (1) 'standardizable' bilateral swap contracts to be traded through central clearing parties (CCPs) and (2) transaction values to be reported to newly created data repositories.

I cannot see how the heavily lobbied set of rules and requirements for private institutions that will emerge from this process can ameliorate the all-too-understandable tendencies of *regulators* to relax supervisory vigilance in economic boom times and to offer implicit or explicit credit support to relieve well-founded liquidity pressure on deeply distressed firms [such as the American International Group (AIG) in 2008] when they are politically, economically, or administratively difficult to fail and unwind (DFU). In policy discussions, these tendencies are characterized as the 'too complex to supervise' and the 'too big to fail' problems.

As shown by the series of events that triggered both Lehman's bankruptcy and AIG's rescue, a necessary condition for a distressed firm to fail is for its creditors to believe that its assets either have lost or are losing so much value that the firm will be unable to cover its debts in full. It is convenient to term this condition 'insolvency' and to think of the firm's assets as a collection of loans, mortgages, and tradable securities. Such assets can lose value in two ways. The first way is through markdowns of selected assets caused by actual counterparty defaults. The second and less selective way is through sharp increases in the interest rates payable on newly issued instruments of the same type. In turn, there are two ways in which interest rates on financial assets can increase. In the US savings-and-loan mess, increases in interest rates on new instruments were driven by accelerating inflation. During the Great Financial Crisis, inflation and Treasury interest rates remained low, but increases in the interest rates on newly issued private and municipal instruments were driven by increases in the *ex ante* compensation required by investors for accepting what everyone saw to be increased tail-risk probabilities of default. Even as Federal Reserve policy drove interest rates on new issues of top-quality mortgages and bonds to very low levels, the equilibrium interest rates at which lower-quality instruments could trade (if they traded at all) rose and stayed high because of perceived increases in credit risk.

In both eras, just because a decline in an institution's asset value passed through the insolvency threshold did not mean that authorities had to close it down immediately or even at all. For the S&L industry and for mega-institutions in the 1970s and 1980s, authorities proved willing to shore up customer funding with explicit and implicit government guarantees of new debt. In the crisis of 2008-

2009, the Federal Reserve and the Treasury used previously unimagined lending and cross-country swap programs to replace private funding at domestic and foreign institutions alike.

Whether it is expected to be provided transparently or surreptitiously, anticipated government credit support is – in accounting parlance – a *contra-liability*. When the solvency threshold is breached, this contra-liability transfers responsibility for covering additional losses to taxpayers. Currently, movements in the value of this contra-liability are neither estimated nor reported on government and megainstitution financial statements. Their lack of visibility makes it hard for the press and citizenry to be aware of how and when subsidizing megabank issuance of new debt and pursuit of tail risk affects taxpayer loss exposure. It also makes it hard for government officials to manage this evolving exposure effectively.

Any guarantee contract has two components: a put and a call. The first is the contra-liability that allows the guaranteed party to ‘put’ responsibility for covering losses that exceed the value of its assets to the guarantor. Of course, no guarantor wants to expose itself to unlimited losses on this put.

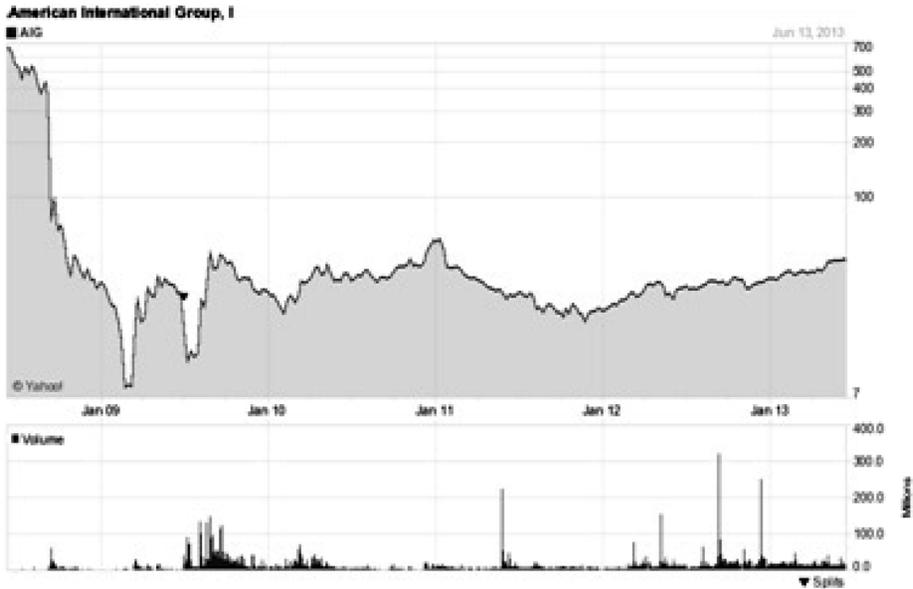
For this reason, all guarantee contracts incorporate a stop-loss provision that gives the guarantor a call on the assets of the firm. This call option is a barrier option because the right to stop losses only kicks in as the insolvency threshold is approached or breached.

In the FDIC Improvement Act of 1991, efforts to exercise the government’s call are termed ‘prompt corrective action.’ For institutions that seemed difficult to fail and unwind, we did not see much prompt corrective action in 2008.

By definition, the government’s right to take over a firm’s assets will never be exercised in a corporation that is truly and permanently too big or too interconnected to fail. Non-exercise means that the government is effectively ceding the value of its loss-stopping rights to the too-big-to-fail organization’s stockholders. The value that this anticipated forbearance gives away improves the risk class and price of such firms’ stock.

Figure 1 graphs the behavior of AIG’s stock price before, during and after the 2008 crisis. The only time AIG’s stock price approached zero – and it did so twice – was when the possibility of a government takeover was being seriously considered, so that the probability of stockholders’ continued rescue was falling. When and as authorities renounced this course of action, the stock price surged again because not exercising the call turned ownership of the stop-loss provision back to stockholders.

Figure 1. AIG Stock Never Became Valueless



If bank capital and stress tests are to remain the centerpiece of financial-stability regulation, capital and stress should be calculated net of the current value of this anticipated ‘taxpayer put.’ To do this in an accountable fashion, regulators must refocus bank examination procedures to measure the tail risk that passes through to the deposit insurance fund and publish estimates of the subsidy on a regular basis.

Regulators’ and citizens’ informational disadvantage will always be compounded by the private sector’s finely tuned taste for lawful deceit. This permanent disadvantage makes it a mistake for regulators to portray capital requirements as powerful medicine. When and where the medicine of stockholder capital most needs to be injected, it will be replaced by the surging value of implicit and explicit government guarantees. As concocted in the pharmacies of Basel I and II, capital-requirement vaccine not only failed to prevent the last crisis, the requirement formula encouraged loophole ways of hiding leverage that helped to inflate the shadow-banking and securitization bubbles whose eventual bursting triggered the crisis (Caprio, Demirgüç-Kunt and Kane, 2010; Admati and Hellwig, 2013).

Basel III and post-crisis stress-tests protocols seek merely to increase the dosage and complexity of previous capital-requirements formulas and to apply the new formula across a broader range of firms. But at the margin, this approach continues to subsidize tail risk at mega-institutions rather than doing something

to disincentivize it. Polls show that it is still widely and confidently anticipated that, when ruinous losses materialize in the midst of a spreading crisis, capital-requirement enforcement will be relaxed or even suspended for well-connected giant institutions.

It is often said that badly administered safety nets privatize profits and nationalize losses. The problem of administering capital requirements has two dimensions, neither of which post-crisis reforms adequately address. First, limited liability gives protected firms an incentive to conceal the extent of their leverage and tail-risk exposure from creditors and guarantors alike. The crisis showed that accounting rules and current bank examination procedures give regulators insufficient vision and incentives to recognize and stop this in a timely fashion. Second, thinking of safety-net support as if it were simply a form of ‘insurance’ masks the fact that taxpayer guarantees actually supply loss-absorbing equity capital to any firm that regulators perceive to be difficult to fail and unwind. The perception that an insolvent firm is too difficult to fail allows it to extract implicit guarantees on any and all future debt it might issue. An insurance company does not double and redouble coverage of a fleet of drivers it knows to be behaving recklessly unless it is paid handsomely and in advance for its services. The cover provided by subjecting reckless pursuit of tail risk at megabanks to insurance law gives DFU institutions a *license* to arbitrage regulators’ risk-weighting schemes in hard-to-observe ways that shift responsibility for funding the deepest layers of their tail risk to government guarantees.

For DFU institutions, the corporate norm of maximizing *stockholder* value is inappropriate because it is unfair to taxpayers. Asking value-maximizing firms to post more capital than they want asks them to lower the return on stockholder equity that their pre-request portfolios were built to achieve. As long as taxpayers’ equity stake is not specifically protected by corporate law, the resulting disequilibrium tells us that installing tougher capital requirements has the predictable side effect of simultaneously increasing a firm’s appetite for tail risk. Over time, this appetite can be satisfied by engineering ways to conceal incremental leverage from authorities and by increasing the average contractual rate of return on (i.e., increasing the average riskiness of) megafirm assets enough to re-establish an equilibrium that victimizes taxpayers but satisfies managers and stockholders.

As Basel III becomes operational, aggressive institutions can and will game the system in this evolutionary manner until it breaks down again. Aided by the best financial, legal, and political minds that money can buy, value-maximizing mega-institutions will abuse taxpayers by ramping up their risk-management skills and expanding their tail risk in increasingly clever and low-cost ways. In the current ethical and informational environments, regulators will find hard to monitor, let

alone to discipline this unfolding process. When it comes to controlling regulation-induced risk-taking, regulators need to be trained to understand and to mitigate the ways in which they are bound to be outcoached, outgunned, and playing from behind.

6.2. MAKING POTENTIALLY RUINOUS RISKS LESS ATTRACTIVE

Tail risk exists in any enterprise. What is unfortunate is that mega-institution incentives to load up on tail risk are inflamed and reinforced by the reluctance or inability of government lawyers to pursue punishments for reckless managers of key financial firms in open court (as opposed to merely fining their corporate shareholders) and by the presumption that it is ethically okay for managers to maximize firm profits and their own incentive-based compensation *at taxpayers' expense*. These morally questionable regulatory and management principles claim that mega-institution managers owe *fiduciary* duties of loyalty, competence, and care to their stockholders, but that their duties to taxpayers and government supervisors have to be explicitly *covenanted* and enforced. By covenanted duties, I mean obligations established by explicit statutory and regulatory requirements.

Deliberately extracting subsidies from a country's financial safety net is in the final analysis a way for mega-institution executives to pick the pockets of unwary taxpayers. I believe that societal goals of financial stability and fair dealing require the law to define exploitive risk taking as theft and to penalize it appropriately. One way to do this would be to amend corporate law to recognize taxpayer's stake in protected institutions as a form of *loss-absorbing equity funding*.

Classifying taxpayers as equity investors of last resort would clarify that managers owe fiduciary duties toward taxpayers and not just toward stockholders. Traditionally, safety-net credit support has been framed as a combination of loans and payouts from so-called government 'insurance' policies. Formally reclassifying taxpayers' loss exposures in difficult-to-fail and unwind firms as equity investments would change taxpayers' legal standing. This standing would re-characterize self-serving tail risk (that seems legal enough when framed as 'moral hazard') as an inequitable transfer of corporate resources from a disadvantaged class of equity holder to managers and current shareholders. To overcome the temptation to ignore their implicit responsibilities to taxpayers, managers and board members must be made subject to stricter legal liability for neglecting or recklessly managing taxpayers' equity stake. My recommendation is to reframe the regulatory game by giving taxpayers equal

rights with stockholders and assigning managers and directors a duty to measure, disclose, and *service* taxpayers' stakeholdings fairly.

Before and during past crises, taxpayers would have benefited greatly if authorities had measured bank capital net of the market value of taxpayers' equity contributions and restricted dividend payouts from undercapitalized banks as soon as such firms showed signs of distress. Refusing to zero in on the shortages of *stockholder-contributed capital* that began to emerge in 2006 and 2007 allowed regulators to permit some of the world's largest financial institutions to operate for years as zombie firms and to support unwisely their right to pay dividends.

6.3. A MORE PROMISING PATH FOR REFORM

Theft is theft. Around the world, the coerced 'cover' taxpayers provide is not being priced, published, or serviced. Theft by safety net is not just *de facto* larceny, it is grand larceny. Since modern legal theory treats corporations as persons, financial holding companies could be prosecuted for this crime. In the US, without special dispensation, convicted felons cannot own insured commercial banks, broker-dealers, or futures commission merchants. The threat of felony convictions would dramatically reduce incentives at mega-institutions to game the financial safety net.

To win such a case, prosecutors need only to construct credible interval estimates of the cover a firm extracts from the safety net. *Mens rea* can usually be found by analyzing intrafirm emails, while the interval estimates in question could be computed from option surfaces linked to stock shares and other underlying assets that mega-institutions issue.

I stress 'interval estimates' because the use of point estimates is part of what has made capital requirements so ineffective in the past. Statistics tells us that, to support meaningful inference, accountants should be asked to build confidence intervals around the bottom-line values they estimate. In the current information and ethical environments, efforts to regulate point estimates of accounting leverage without simultaneously compiling measures of volatility and skewness cannot adequately protect taxpayers from regulation-induced innovation.

Authorities need to put aside their obsession with enforcing overly precise capital-based proxies for systemic risk and instead measure, control, and price the ebb and flow of safety-net benefits directly. This requires: (1) changes in corporate law aimed at establishing an equitable interest for taxpayers in at least the most important of the firms that the financial safety net protects and (2) repurposing regulators as trustees for taxpayer interests, responsible for seeing that taxpayers'

portfolio of equity positions in protected firms is treated as a trust fund that deserves to be accurately valued, reported publicly, and adequately serviced. To carry out this task, regulatory officials need to reorient their training, their examination procedures and bank information systems to focus specifically on tracking the changing value of their portfolio of taxpayer puts and calls and be empowered to sanction *individual managers* who deliberately and materially misrepresent information these systems produce.

Many studies propose operational ways to measure tail risk. Hovakimian, Kane, and Laeven (2012) propose a measure of the quarterly value of taxpayer support that is theoretically sound and easy to implement using publicly available financial and stock market data. Their methods are rooted in academic literature for modeling credit risk pioneered by Merton (1974). Lehar (2005) and Avesani, Pascual, and Li (2006) focus on the probability of default, and estimate this using CDS, option, and equity market data. Additional measures include: conditional value at risk (CoVaR) proposed by Adrian and Brunnermeier (2010), marginal expected shortfall (MES) proposed by Acharya, Pedersen, Philippon, and Richardson (2010) and extended by Brownlees and Engle (2011), and a network-based systemic risk measure proposed by Cont (2010). Kim and Giesecke (2010) study the term structure of systemic risk and Billio, Getmansky, Lo and Pelizzon (2012) compare several alternative systemic risk measures.

To facilitate the implementation of such measures, financial firms whose assets exceed a specified size threshold (say, \$500 billion) should be obliged to build information systems that surface interval estimates of the value of the taxpayer put they enjoy. Auditors, government monitors, and corporate boards should be charged with double-checking and extracting a fair return on the value of the corresponding trust fund. Regulatory response lags could be reduced if provisional data on earnings and stockholder net worth at these institutions were reported more frequently and if responsible personnel were exposed to meaningful civil and criminal penalties for deliberately misleading regulators. In the interim, authorities around the world should be encouraged to prosecute a few thieving financial holding companies for securities fraud or grand larceny in open court.

At the same time, technologies for calculating interval estimates of expected tail-loss exposure should be expanded and the range of resulting estimates used to proxy systemic risk. If mega-institutions could be incentivized to report conscientiously the value of on-balance-sheet and off-balance-sheet positions weekly to national authorities, rolling regression models using stock-market and other financial data could be used to estimate and capitalize changes in tail risk and in the flow of safety-net benefits in ways that would allow society's watchdogs to observe – and regulators to manage – surges in the value of taxpayers' stake in the safety net in more timely and effective ways.

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7. BANKING SUPERVISION AND GROWTH: A NEW MACROPRUDENTIAL PARADIGM?

Samuel Da Rocha Lopes and Mario Quagliariello¹

“By this time Icarus began to feel the joy of beating wings in air and steered his course beyond his father’s lead: all the wide sky was there to tempt him as he steered toward heaven. Meanwhile the heat of sun struck at his back and where his wings were joined, sweet-smelling fluid ran hot that once was wax. His naked arms whirled into wind; his lips, still calling out his father’s name, were gulfed in the dark sea. And the unlucky man, no longer father, cried, ‘Icarus, where are you, Icarus, where are you hiding, Icarus, from me?’ Then as he called again, his eyes discovered the boy’s torn wings washed on the climbing waves. He dammed his art, his wretched cleverness, rescued the body and placed it in a tomb, and where it lies the land’s called Icarus”.

(Ovid, Metamorphoses, Book VIII)

7.1. INTRODUCTION

In the aftermath of the current financial crisis, a consensus has emerged that prudential regulation was not sufficiently aware of systemic risk, interconnections among institutions, and significant impact that incentives put by prudential regulation can have on the macro-economy.

Much emphasis was therefore placed on the need to reinforce capital requirements both quantitatively and qualitatively through a capital conservation to ensure that banks build up buffers outside periods of stress and at the same time to reduce the possible pro-cyclical effects of the prudential regulation of the last years.

The adoption of macroprudential policies has been one of the milestones of the G20 roadmap² in the aftermath of the crisis. In very general terms, the macroprudential approach envisages greater focus on the analysis of systemic risk and vulnerabilities arising from macroeconomic factors, rather than from the

¹ European Banking Authority. The opinions expressed are those of the authors and do not involve either the EBA or its Board of Supervisors. We benefited from helpful comments by conference participants at the 31st SUERF Colloquium and 2014 BAFFI Finlawmetrics, Conference “Money, Regulation & Growth Financing New Growth in Europe” at Bocconi University. We thank David T. Llewellyn, Piers Haben, and Valerie de Bruyckere for helpful comments. Dragan Crnogorac and Raffaele Passaro provided valuable suggestions that helped us in drafting the paper.

² Group of 20 Finance Ministers and Central Bank Governors representing 19 major economies and the European Union. The Financial Stability Board (an institutional continuation of the Financial Stability Forum-FSF) in April 2008 and 2009 provided a roadmap on financial supervision and regulation, and set forth principles for a more robust supervisory and regulatory framework.

behaviour of specific and individual intermediaries. In terms of regulation, the objective is to create more loss absorption capacity in a more disciplined and counter-cyclical financial system that better supports a balanced regulatory environment and uphold sustainable economic growth.

In this paper we want to contribute to this debate and try to clarify what, in our view, macroprudential regulation is and what we can expect from it. The interactions between supervisory concerns, capital, banks' health and economic growth are contextualized. The purpose is to manage expectations, which we feel being too high, on what macroprudential policies can and cannot deliver.

7.2. SHOULD SUPERVISORS BE CONCERNED ABOUT ECONOMIC GROWTH?

We start probably with a very tricky question. Strictly speaking, financial stability – not to mention economic growth – is hardly in the mandate of any microprudential supervisor. In fact, particularly before the crisis, even the involvement of central banks in safeguarding financial stability was generally limited, even though diverse across countries. As reported by the BIS (2011), prior to the financial crisis, the financial stability mandates of central banks differed widely, both for normal and crisis times. The only mandate held by almost all central banks was the oversight of payment systems.

On the other hand, it is clear that banks benefit from better macro conditions and, vice-versa, a sound banking sector is a precondition for stable economic growth. Sound financial systems promote efficient savings and investment, increasing economic activity and welfare.

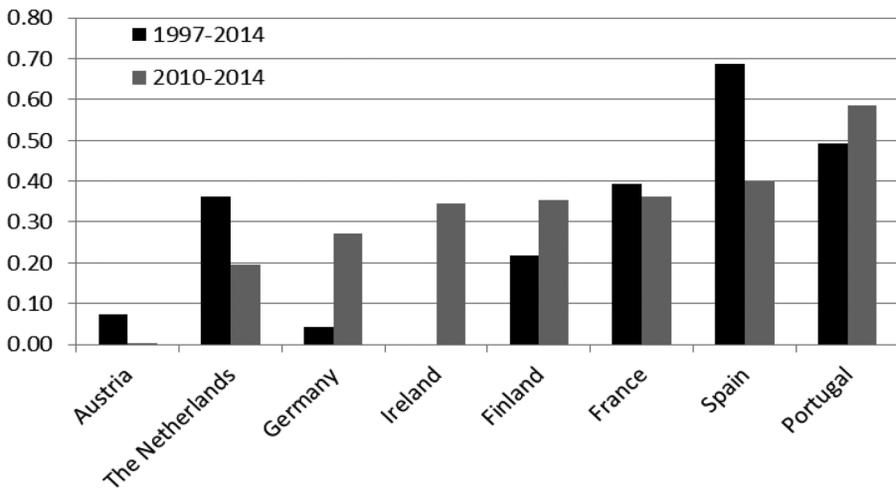
The interconnection between indicators of economic growth and financial development is strong and evident even if not linear. In fact, it is being difficult to establish whether financial development is cause or effect of economic growth, even controlling for possible feed-back effects. It is however accepted that sound and well-functioning financial systems provide better access to information, lowering transaction costs and improving resource allocation with positive consequences for economic growth.

Many studies related economic growth rates to measures of financial development and it is possible to consider that the size of the financial sector may be positively associated with the economic performance, at least until a certain point of development (King and Levine, 1993; La Porta *et al.*, 1998; Demirguc-Kunt and Levine, 2001).

The real economic effects derived from the development of banks have been subject to abundant research. For instance, financial developments derived from important economic reforms increase the amount of external funding available to firms, facilitating business start-ups, growth of smaller firms (Guiso *et al.*, 2004), innovation and expansion. There are several studies concluding that financial development foster growth by allocating capital more efficiently, channelling resources to the best projects and thus boosting aggregate productivity. In addition, in a healthier banking system, banks became less willing to bail out poorly performing firms.

Also simple metrics suggest that there is a link between banks and real economy. The correlation between credit and economic activity (Figure 1) has increased in half of the EU countries, suggesting that the link between the banking sector and the economy has become stronger over time. Correlations between credit growth and real GDP growth have increased substantially since the end of the 1990s in France, Spain, the Netherlands and Ireland and are stronger since 2010 in Germany, Finland and Portugal.

Figure 1: Correlation between Real GDP & Credit Growth, 1997-2014



Source: EBA, OECD and ECB data.

Obviously, the chart should be interpreted with care. It looks at fairly long periods, but within long periods there can be different results. Thus, in the period leading up to the crisis in the UK in the 1970s or more recently in Spain, credit growth was very substantial and growth was also strong. However, both proved to be transitory and unsustainable in the medium term which means that the relationship may depend on the time period of the observations.

Undoubtedly, the substantial structural changes that were observed in the financial system over the past decades have led to an unprecedented expansion of the role of credit in the real economy. This evolution proved to be beneficial overall, but the significant role of the credit system is also a potential source of financial instability. Credit aggregates thus provide valuable information for policymakers aiming for financial and economic stability (Schularick and Taylor, 2012). Banking supervisors should be, at least, aware of the potential role of the financial system in the macroeconomic growth by supporting a balanced regulatory environment, but also prone to act in case of signs of unsustainable evolutions.

7.3. CAPITAL, BANKS' HEALTH AND ECONOMIC GROWTH

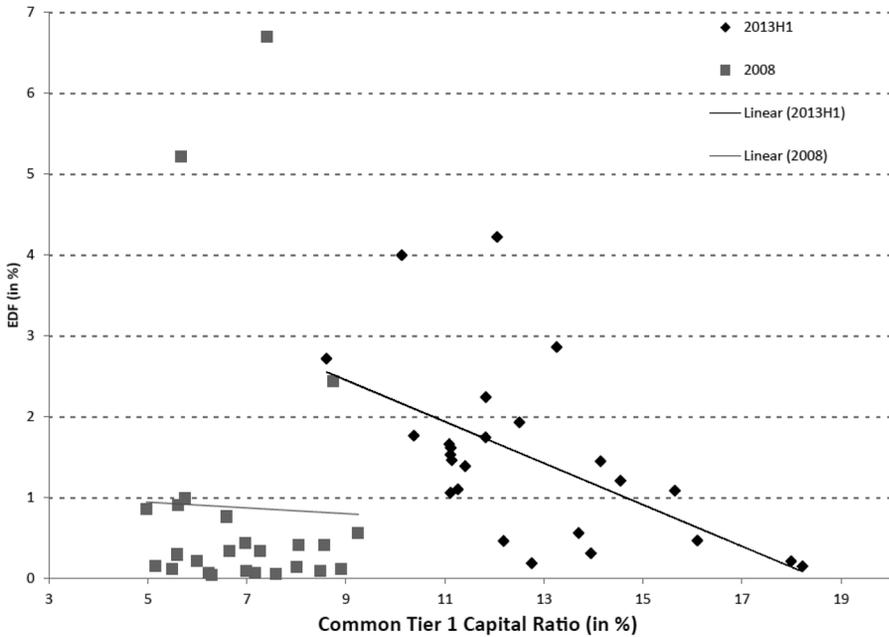
Banking supervisors can rely on different instruments for carrying out their tasks, but setting and enforcing minimum capital requirements is probably the most important device in their toolkit. In fact, capital is to supervisors as interest rates are to monetary authorities. Capital endowment of banks is indeed a decisive factor in signalling banks' trustworthiness to the markets.

We looked, for a sample of 25 listed EU banks, to the relation between the Common Tier 1 Capital Ratio and the Moody's KMV Expected Default Frequency – a market based proxy of banks' probability of default – in two different periods, 2008 and 2013 (Figure 2). In 2013, the relation is negative and statistically significant, i.e. higher levels of supervisory capital imply lower expected defaults. In addition, the importance of the supervisory capital levels in relation to the expected default frequencies has changed in the last few years (EBA, 2013).

In 2013, supervisory capital levels are more important than before in explaining banks' credit quality. Among many reasons, this may reflect market participants' preference for well-capitalised banks as safer investments. In addition, the same banks present better capitalisation levels and higher dispersion at both the supervisory capital and EDF levels. The same change has occurred when comparing the ratio of tangible common equity to tangible assets – a good proxy for the leverage ratio – with the EDFs for the same listed 25 EU banks.

It is thus crystal clear that more capital is typically positive for supervisors as well as for market participants. However, it is much debate on whether more capital is beneficial or detrimental for credit supply and therefore for growth. While the discussion can turn into very technical details, the terms of the discussion can be easily summarised quoting a banker and a scholar:

Figure 2: Common Tier 1 Capital Ratio and Market Risk Perception



Source: EBA December 2013 Risk Assessment of the European banking system, Moody's KMV data.

Thesis 1: More equity reduces credit growth

“More equity {...} would restrict {banks} ability to provide loans to the rest of the economy. This reduces growth and has negative effects for all”
(J. Ackermann)

Thesis 2: Credit crunches arise when banks are undercapitalized

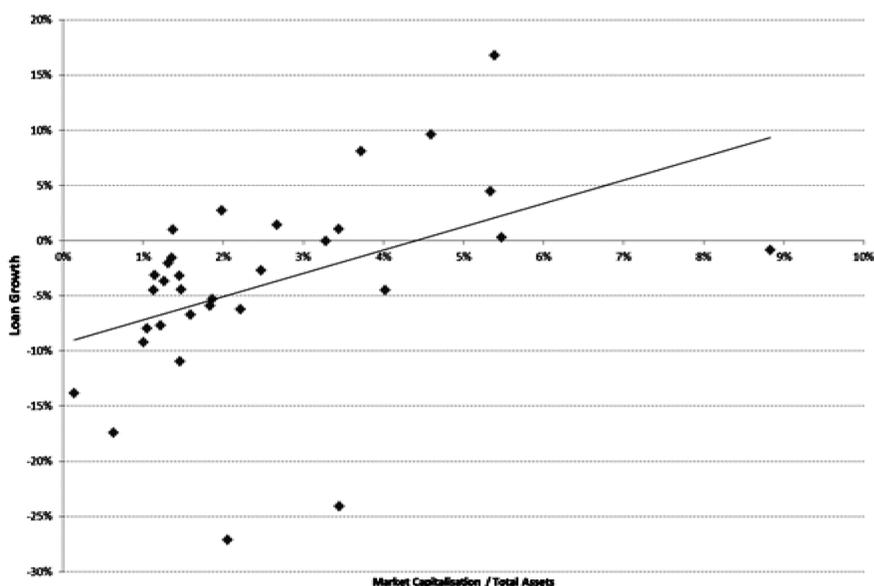
“The biggest ‘credit crunch’ in recent memory, the total freezing of credit markets during the recent financial crisis, was not due to too much equity but in fact to the extremely high levels of leverage in the financial system”
(M. Hellwig)

We tend to sympathise for the second view since recent data found no evidence that more equity and higher capitalised banks leads to lower credit growth. In fact, sound bank balance sheets are fundamental for the recovery of credit following crises by enhancing their ability to withstand financial shocks and continue lending (Kapan and Minoiu, 2013). Only banks with proper and credible capital cushions are able to maintain lending during a financial shock, influencing positively the recovery process.

There is evidence that strongly capitalised banks, for instance, with a market based leverage ratio of more than 4%, continue providing lending to the economy, while medium and weakly capitalised banks show a decline in credit supply.

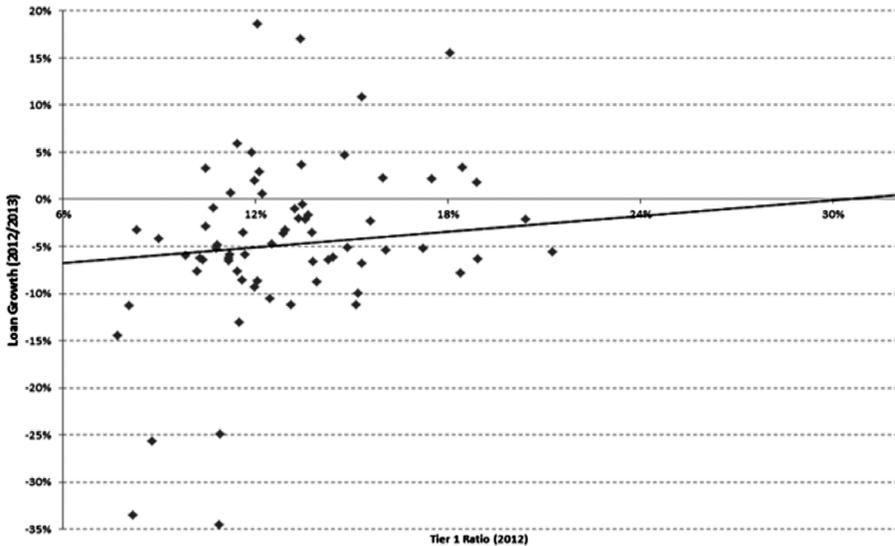
The EBA run a simple analysis (EBA, 2014a) looking at the relationship between different measures of capitalisation at time t and loan growth in the subsequent year for a panel of EU banks (Fig. 3 and 4). Even though univariate analyses should be handled with caution, the evidence shows a clear positive link between capital and credit growth, measured either as market capitalisation or traditional supervisory ratios (Tier 1 ratio in our example). There may be several explanations for this. Higher equity may, for instance, lower the cost of debt finance for the bank. Alternatively, excess capital may enable a bank to expand its balance sheet.

Figure 3: Bank Loan Growth versus Market Capitalisation as a Percentage of the Book Value



Source: EBA June 2014 Risk Assessment of the European banking system, SNL data.

Figure 4: Bank Loan Growth versus Tier 1 Ratio



Source: EBA June 2014 Risk Assessment of the European banking system, SNL data.

The evidence regarding the effect of capital on banks' performance across banking crises also suggest that capital helps banks to increase their probability of survival and market share (Berger and Bouwman, 2013), even though the impact is also linked to banks' size.

7.4. FROM MICRO- TO MACRO-PRUDENTIAL REGULATION

The financial regulation and supervisory processes before the crisis could be characterized as very and undoubtedly excessive micro-prudential oriented. This focus on a micro-prudential view, on the one hand, guaranteed the reduction of risks in some specific intermediaries from a financial stability point of view, however and on the other hand, provoked a limited consideration of systemic risks in a financial system as a whole, by not taking into account the entire structure. In other words, there was little consideration that incentives – behaviour and choices that were perfectly sensible for each bank – and the composition of individual effects could lead to unintended consequences from a stability perspective. Network externalities and the 'fallacy of composition' made it clear that what applies to individual banks may not apply to the system. Thus, whilst each bank individually might behaving rationally (acting alone) the system as a whole might not be because of the aggregate effects of the rational behaviour of individual banks. Similarly, individual banks might be deemed to be safe by

regulators/supervisors but only because they too are ignoring the macro effect of the aggregate of bank behaviour.

In addition, both regulation and supervision (not to mention accounting standards or fiscal policies) were inherently point-in-time, lacking a forward-looking dimension and any concern for procyclicality.

The lessons learnt from the crisis have led to a more comprehensive approach to financial regulation, marrying the micro and the macro perspective. Various instruments have been indeed introduced for reducing spillovers, mitigating systemic risk, ensuring a more countercyclical dynamics of capital requirements (ESRB, 2014 and EBA, 2014b).

At the global level, macroprudential tools aims at both reducing ‘procyclicality’, i.e. the negative conjunctural impact of economic cycle on banks and, possibly, the feedback effects from banks to the economy (what is normally referred to as the time-series dimension of systemic risk) as well as addressing the too-big-to-fail problem, i.e. the cross-sectional dimension of systemic risk. The latter tools focus, therefore, on structural risks that can arise from the size of some intermediaries or the banking sector as a whole, interconnectedness across institutions, the fact that some players are pivotal and their default can threaten vital operations. Indeed, banks and other financial institutions typically do not internalize the risks they pose; if the externality is large material, policy makers may be obliged to support those institutions rather than bear the costs of their failure. In turn, this may lead to weaker market discipline, moral hazard, inefficient allocation of capital and the socialization of losses.

In the macroprudential field, the regulation in the EU goes well beyond the provisions of the Basel III Accord and represents an interesting case study. We focus, however, on a narrow definition of macroprudential tools, namely: a) countercyclical tools; and b) tools for addressing structural risks which are system-wide, i.e. those that are activated with a view to capture and address problems that affect the financial system as a whole. Other bank specific tools, like Pillar 2, that are often included in the macroprudential toolkit are, in our view, microprudential in nature and, even though they can be used in a countercyclical fashion, they are deployed – or they should be – for addressing bank specific problems. In other words, we consider macroprudential only those instruments that: i) mitigate systemic risk and procyclicality, and ii) are applied system wide.

7.4.1. Countercyclical Tools

In very general terms, countercyclical instruments are those that authorities can deploy for tightening prudential (or other) requirements in good times and, ideally, relax them when a crisis is approaching.

We start our overview on the countercyclical instruments from the capital conservation buffer, admittedly the least countercyclical in the menu of the countercyclical tools. This can be described as a target capital ratio, above the minimum requirements, aiming at ensuring that banks build up capital buffers outside periods of stress that can be run down as losses are incurred. The requirement is based on a capital conservation rule linking the ability of banks to distribute profits – dividends, discretionary bonuses and share buybacks – to the distance from the target ratio. The rationale of the buffer is explained by the Basel Committee (2010a). The guiding principle is that banks should not be allowed – as sometimes happened before the crisis – to use the distribution of capital as a way to signal financial strength. *“Not only is this irresponsible from the perspective of an individual bank, putting shareholders’ interests above depositors’, it may also encourage other banks to follow suit. As a consequence, banks in aggregate can end up increasing distributions at the exact point in time when they should be conserving earnings.”* Therefore, the obligation to meet a conservation buffer reduces the discretion of banks that have depleted their capital base to further reduce it via profit distribution.

The incentives posed by this buffer are clear. A bank willing to make payments in excess of the restrictions would have alternative options, such as raising new capital. Since this is relatively easy in favourable economic conditions – and much less in a recession – the likely outcome is that banks will meet the buffer in good times, when the opportunity cost of cutting dividends is significant and capital is cheap, and they will use it in bad times, when profits are low and risk premia increase markedly.

While the capital conservation buffer focuses on idiosyncratic problems, the rationale of the countercyclical buffer is much more linked to the need to introduce a genuine macroprudential view in banking regulation. As explained by the Basel Committee on Banking Supervision (2010a), *“the financial crisis has provided a vivid reminder that losses incurred in the banking sector can be extremely large when a downturn is preceded by a period of excess credit growth. These losses can destabilise the banking sector and spark a vicious circle, whereby problems in the financial system can contribute to a downturn in the real economy that then feeds back on to the banking sector”*.

The countercyclical buffer is to be deployed when national authorities consider aggregate credit growth to be excessive, thus determining an unacceptable build-

up of system-wide risk. However, and this is a central point, the main goal of the buffer is not to manage the credit cycle, but – much more pragmatically – to ensure that the banking system accumulates a buffer of capital in (very) good times to protect it against future potential losses. The countercyclical buffer does not take into account the conditions of every single bank, but it looks at the situation of the banking sector as a whole. In that respect, the nature of the buffer is inherently macroprudential.

While the capital conservation buffer could be classified as an automatic stabilizer, the countercyclical buffer is actively managed by the authorities, which should assess the conditions for activating this extra requirement for exposures towards counterparties in their jurisdiction. Since this could have led to excessive discretion, the decision-making process for switching on and off the countercyclical buffer is partly rule-based and partly judgmental. A ‘guided’ (or ‘constrained’) discretion approach should guarantee, on the one hand, that the decisions are to some extent constrained and predictable – avoiding forbearance and unwarranted surprise effects – and, on the other, that sufficient flexibility is left to the authorities to avoid the adoption of inappropriate countermeasures when the benchmark variable fails to transmit correct signals. The risk that excessive discretion undermines the cross-border level playing field is dealt with through specific obligations on communication and transparency, as well as peer reviews on the implementation of the countercyclical buffer.

Beyond Basel, the CRR/CRD4³ in the EU also provide for more specific, and potentially intrusive tools. Art 124 of the CRR allows national authorities setting higher risk weights for real estate exposures secured by mortgages in the standardised approach. For IRB banks, art 164 allows authorities to impose a floor to LGD for retail exposures secured by residential or commercial property. Both measures can be activated for financial stability considerations, loss experience and forward-looking real estate markets developments.

In addition, article 458 of the CRR widens further the measures that can be put in place based on macroprudential concerns. They range from a higher level of own funds, stricter requirements for large exposures or capital conservation buffer, and liquidity. It also allows authorities to increase risk-weights for specific exposures classes in order to target asset bubbles in the residential and commercial property sector. The aim of the EU Legislator was clearly to provide authorities with a wide range of instruments to be deployed for addressing the build-up of risks in a very flexibly way. Current discussion focuses on whether

³ CRR refers to the Regulation (EU) 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms. CRD4 refers to the Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms.

such flexibility should be balanced with *ex-ante* guidance, harmonised at the EU level, and on the identification of a possible pecking order in employing the different instruments.

7.4.2. Tools for Addressing Structural Risks

Structural risks are addressed in the CRR/CRD4 in various ways, including additional governance requirements for systemic institutions and stricter capital requirements. The philosophy, as mentioned before, is to limit the probability of default of those institutions and, if they default anyway, the cost for the taxpayers and the spillovers to the rest of the financial sector and the real economy. Banks that are systemically relevant at the global level fall under the G-SIBs rules set by the Basel Committee and the Financial Stability Board, which requires them to pay a capital surcharge commensurate to the systemic risk they pose. The identification of those institutions is largely model driven, but supervisors may exercise their judgment for including other banks. This ensures consistency at the global level, but also a certain degree of supervisory discretion in light of specificities that remain in each jurisdiction. However, supervisory judgment can be only used in an asymmetric way: authorities can include more institutions, but they can't exclude those identified in the quantitative assessment. In Europe, the methodology for the identification has been included in technical standards developed by the EBA and it is fully aligned to the Basel approach.

As in Basel, the CRR/CRD4 takes care of the systemic risk arising from institutions that, while not relevant at the global level, play a key role in some EU jurisdictions. In fact, the domestically important banks (that in the EU are labelled 'other' systemically important institutions, O-SIIs) are also subject to additional capital requirements, as well as to possible other measures that go beyond the capital side. Clearly, the O-SIIs framework focuses on the consequences that the distress of those banks can have on the domestic/EU economy.

The EU legislation deviates from the global framework for domestically important institutions (D-SIBs, i.e. O-SIIs in the EU) in two respects. First, the definition of the criteria to identify O-SIIs is somehow more constrained. Second, the capital surcharge for those institutions is capped at the 2% level in the CRD4. In particular, on the first point, the EBA is developing Guidelines for the identification of O-SIIs that try to strike a balance between the degree of discretion that is left to the national authorities and the aspiration of maintaining a level playing field across EU countries. The solution would be a two-step approach, where the assessment of compulsory quantitative indicators in the first step are complemented with soft information and qualitative judgment in the second step.

In the EU regulation, there is also another measure – the systemic risk buffer – that addresses systemic risk of the banking sector (or part of it) as a whole. This additional buffer has been advocated by some jurisdictions where banking sectors are particularly important during the negotiation of the CRR/CRD4. While G-SIIs and O-SIIs buffers are applied to specific banks based on their own characteristics, the rationale of the systemic risk buffer is different since the reference is the relative size of the banking sector in the economy of a country. Its scope is, indeed, broad since it aims at preventing and mitigating ‘long term non-cyclical systemic or macro-prudential risks’ and can be applied to the entire financial sector or a subset of institutions. No *ex-ante* guidance is provided to the authorities, which are – at least up to a certain level of the buffer – free to deploy it as they deem necessary. The purpose and the necessity of this instrument can be discussed, but it is clear that it represents another way for confining the repercussions of banks instability to economic growth.

7.5. WHAT MACRO-PRUDENTIAL POLICY CAN AND CANNOT DELIVER

The macroprudential toolkit emerged after the crisis addresses many of the shortcomings of a purely ‘microprudential’ regulation. Authorities are today better equipped with instruments to deal with threats to financial stability. In the EU, there is a plethora of tools that can be potentially deployed for achieving macroprudential goals.

However, there is still lack of clarity on what macroprudential should or can deliver. This is not surprising since macroprudential policy is new – new the objective, new the instruments – and expectations on its performance are very heterogeneous. This is also linked, in our view, to the confusion – or different views – on the objectives of macroprudential policy.

What is then the final objective of macroprudential policies? At least two answers are available, reflecting two different philosophies behind macroprudential instruments.

According to a first viewpoint, macroprudential policy is primarily a complement to traditional microprudential supervision: since the latter neglects the time-dynamics of credit markets, it has to be supplemented by the former, which ensures that capital resources are adequately allocated across booming and recessionary periods and, thus, that banks are able to cover future losses. In that respect, banks are required to build-up capital buffers in upturns as squirrels need to stockpile acorns in summer. This does not (necessarily) prevent banks from expanding credit when economic conditions are favourable as hoarding does not

prevent squirrels from eating as many acorns as they wish when food is abundant (Quagliariello, 2011).

The second perspective is more ambitious and considers macroprudential instruments as an effective tool for leaning against the wind, i.e. for reducing banks' incentives to expand credit and leverage in buoyant economic conditions. The primary goal is now to limit the amount of loans that are granted in good times and, possibly, avoid credit bubbles (Clark and Large, 2011). According to this second interpretation, macroprudential policy turns into an autonomous policy – along with monetary and fiscal policies – with a specific goal.

The consequences of the two different philosophies in terms of design and use of the policy tools are important.

In the first case, the instruments aim at being neutral and its functioning is relatively automatic: the maximum amount of the buffer is predefined, the process of accumulation and depletion ruled by preset variables. Some discretion may be left to the policy maker, but it is typically a constrained discretion.

In the second case, much more discretion is needed and the policy maker is endowed with a significant degree of freedom in adapting the policies to the specific juncture. The second standpoint has the merit of acknowledging that there is a need to have a specific policy for safeguarding financial stability.

Therefore, we agree that monetary and fiscal policies should be complemented by macroprudential policy. However, since this policy is still in its infancy, we believe that expectations should be carefully managed and it is probably preferable to avoid being over-ambitious. First, the 'objective' of macroprudential policy is still difficult to define and quantify. Financial stability can have different facets and can be hardly summarized in a single target variable – like inflation and price index for monetary policy or GDP growth or income pro capital for fiscal policy. In addition, while it is clear that macroprudential sets a new objective, however difficult to define, it is questionable whether it also introduces new instruments. Indeed, as we have shown, most macroprudential tools – first and foremost bank capital – are actually a different application of existing microprudential instruments already allocated to banking supervisors. There is, therefore, a risk to breach Tinbergen's golden rule stating that each policy objective should be pursued with at least an autonomous policy instrument (Libertucci and Quagliariello, 2010). Clarity on objectives and instruments would also allow improving the governance of the macroprudential policies, simplifying, rationalizing and harmonizing the allocation of financial stability tasks across ad-hoc established authorities, microprudential supervisors, central banks and ministries of finance.

We have also the impression that there is an increasing temptation to deploy macroprudential policy not when it is the most effective tool to achieve an

objective, but when policy makers are unwilling or unable to adopt different policies. On this, we warn that – even under the most ambitious view – macroprudential policy cannot replace monetary policy in ensuring price stability; it is not fiscal policy and, thus, cannot incentivise growth; neither is industrial policy and therefore cannot channel resources to specific sectors. Our knowledge of the interlinkages between financial stability, banks, growth is too limited for attempting to use macroprudential policy for fine-tuning the credit cycles.

7.6. CONCLUSIONS

In this short paper, we tried to provide an overview of the current debate on the rationale and use of macroprudential policies. This is a key issue at the global level, and it is particularly relevant in the EU, where the legislation offers a wide set of macroprudential tools to be employed by national authorities. We are afraid that the paper presents many more questions than possible answers, but also signals relevant aspects to take into account in order to achieve relevant and credible responses to the discussions ahead. We are still at the very start of the learning curve and there is limited experience in using these tools, virtually no evidence of their long-term impact.

However, we would like to summarise which are, in our view, the main issues that we should keep discussing and where, we believe, the debate will continue in the next years.

First, the interaction between micro- and macro-prudential instruments. We have recalled Tinbergen's rule of economic policy and we noted that the macroprudential policy makers tend to have an ambitious agenda, various objectives, but it is still unclear whether the instruments at their disposal are truly new and autonomous. We have the impression that, so far, most macroprudential instruments are somehow recycled from the micro-prudential toolbox. This might create tensions among micro- and macroprudential authorities and lead to the deployment of conflicting policies. The obvious example is the decision of the optimal amount of capital banks are required to hold. For microprudential authorities, the simple rule is the more capital (or, to be more precise, capital levels proportionate to risks), the better. Macroprudential authorities may, instead, allow – or even impose – the release of capital based on financial stability or even economic growth considerations.

A second point is that a very comprehensive toolkit, where the design and deployment of measures is left to the national level, may reduce the level playing field across institutions based in different jurisdictions. A possible option,

probably our first best, would be to put those policies in the hands of a regional or global authority, less prone to external pressures and to the temptation to use macroprudential tools for achieving goals that go beyond financial stability. We understand this solution as too ambitious for the time being, but then we advocate strongly for EU *ex ante* guidance and a rigorous ex-post peer review process. In that respect, we think that the framework relatively automatic applied to the countercyclical buffer could be extended to the other tools through constrained discretions, ensuring the right balance between flexibility and consistency.

The definition of common EU practices from a very comprehensive toolkit would also reduce the likelihood that macroprudential instruments are used for ring-fencing capital, thus jeopardizing the smooth functioning of the Single Market. The harmonisation of approaches is also a precondition for extending reciprocity in the use of these tools, which are currently mostly applicable to domestic banks leaving room for regulatory arbitrage.

In the shorter term, we propose some further efforts for clarifying what macroprudential tools are. As a starting point for a possible ‘glossary’ we suggest to consider only those instruments that: i) mitigate systemic risk and cyclicality; and ii) are applied system wide (vs. bank-specific/idiosyncratic). The glossary would also help having more clarity on the objectives of macroprudential policy and the direct link between these objectives and the available instruments. It would also contribute to a more efficient allocation of tasks across authorities, improving the governance side.

We acknowledge that there are other goals and tools – such as improvements in credit risk internal models – that are in the current regulation in a grey area between micro- and macro. They are equally important, but they are not macroprudential and should not be treated as such.

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8. BUILDING A BANK RESOLUTION FUND OVER TIME: WHEN SHOULD EACH INDIVIDUAL BANK CONTRIBUTE?

Javier Villar Burke

Abstract

A series of resolution funds, levies and taxes are being set up, implemented or discussed in several jurisdictions. The goal of some of these initiatives is to make the financial sector repay the costs of the last crisis. Some others aim to make private funding available for financing future resolutions of banks as an alternative to bailing out financial institutions with public funds. After analysing the economic implications, in terms of incentives and pro-cyclicality concerning these initiatives, this paper argues that the resolution fund, when the time dynamics are not taken into account, can have unintended consequences by exacerbating the cycle and promoting perverse incentives. A well designed resolution fund should promote financial stability as a preventive tool. This can be achieved through contributions based on a dynamic factor which would depend on assets growth and income. By setting the right incentives, dynamic contributions can prevent excessive risk-taking, reduce the probability of bank failure and smooth the cycle both at the upswings and the downturns^{1,2}.



We need to address not just the unstable [financial] structures that have become so evident in the recent crisis, but we also need to better understand why these sorts of structures emerge and take steps to prevent their reoccurrence in whatever forms they may take,

Donald L. Kohn, former Vice Chairman of the Board of Governors of the Federal Reserve System (Comments to Shin, 2010, p. 23).

8.1. INTRODUCTION

In June 2013, the European Commission (EC) tabled a proposal for a Single Resolution Mechanism (SRM) and a Single Bank Resolution Fund (SRF), with the final text adopted by the co-legislators in April 2014³. This initiative was framed within the bank crisis management and resolution framework which, in turn, constitutes one of the pillars of a Banking Union in Europe.

¹ The opinions and statements expressed in this paper remain solely those of the author and do not necessarily reflect the views of the European Commission (Contact: javier.villar-burke@ec.europa.eu).

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³ See EC (2013a) and European Parliament [EP] and Council (2014a).

The main goal of a resolution framework is twofold: 1) to protect public finances by building up an ex-ante buffer to finance the potential costs of future bank crises, and 2) to increase market discipline by allowing for an orderly winding down procedure for failing banks. On top of that, it aims to ensure the continuity of critical functions of banks, to preserve financial stability, including the prevention of contagion, and to protect depositors⁴.

Most academic and discussion papers, such as Fonteyne *et al.* (2010), Goyal *et al.* (2013) or Financial Stability Board [FSB] (2013), focus on high level issues such as the rationale of a resolution framework, the resolution tools, the powers of the resolution authority, governance, resolution triggers, the overall size of the fund needed to finance resolution, etc. However, there is a lack of in-depth discussion about the economic and financial consequences of the individual contributions to such a fund, in particular, the implications of time dynamics.

This paper tries to fill the gap by analysing the potential impact in terms of incentives and pro-cyclicality of individual contributions to a bank resolution fund. It shows that the design of the contributions to a resolution fund can influence incentives with respect to risk-taking by banks and pro-cyclicality and, therefore, it can have a positive or negative impact on financial stability.

The paper argues that a resolution fund cannot only be used as a safety net against contagion when the economy is confronted with a failing bank, but it can also play an important role as a preventive tool. In other words, a resolution fund should not only ring fence taxpayers' money against excesses of financial institutions, but it could also 1) reduce the probability that banking crises occur and 2) reduce the overall costs of those crises in case they do materialise.

Unless the resolution fund is explicitly designed to be a preventive tool, it can easily fail to play such a role. There is even a risk that a badly designed resolution fund could promote perverse incentives and therefore contribute to feed future financial crises and to exacerbate their costs (Stiglitz, 2010, argues that an economic system that promotes perverse incentives constitutes one of the main roots of the recent crisis). To avoid such a scenario, this paper proposes a design of contributions to foster the resolution fund as a preventive tool.

The paper is organised as follows. Section 8.2 presents the background to understand the effects of the contributions to a resolution fund. It first explains the political and economic context leading to the creation of a Banking Union in Europe, as well as the main characteristics of the SRF and other existing resolution funds and levies.

⁴ See, for instance, the BRRD (Directive 2014/59/EU), art. 31.

Section 8.3 discusses how the contributions to the resolution fund can interact with the credit cycle. Section 8.4 provides a similar discussion with respect to the income cycle. Thereafter, the paper presents a proposal on how the resolution fund can be used to counterbalance the cycles and to align incentives of banks with financial stability (Section 8.5). Some conclusions are presented in Section 8.6.

8.2. BACKGROUND

This paper discusses how the contributions to a resolution fund can be designed to promote the right incentives for aligning the behaviour of banks with financial stability. Two aspects need to be clarified to understand the rationale of the proposal: first, the economic and political context that led to the proposal of a Banking Union and a Single Bank Resolution Fund in the EU (SRF) (Section 8.2.1); and second, the main characteristics of the SRF and other resolution funds (Section 8.2.2).

8.2.1. From the global financial crisis to the Banking Union

The recent global economic and financial crisis evolved throughout different stages. The response to the last stage, a severe sovereign debt crisis in a number of EU countries, was the proposal to create a Banking Union. This section explains the economic and political context that led to that proposal and its economic rationale.

The financial crisis started in the US in summer 2007. While it was initially restricted to the subprime segment and to securitisation activities, the collapse of Lehman Brothers in September 2008 triggered a true systemic crisis by spreading the crisis to other segments of the financial system and across jurisdictions. The EU, which hosts some of the biggest banks in global financial centres such as London, Frankfurt or Paris, was especially vulnerable.

Central banks and governments across the globe reacted to the crisis on two main fronts. In the immediate term and to prevent the collapse of the financial system, they provided a wealth of support to the banks through a diversity of measures⁵. In the more medium term, they embarked on a comprehensive regulatory reform agenda to ‘fix’ the many shortcomings that the crisis had uncovered⁶.

⁵ In Europe, they came both from the ECB, in the form of conventional and unconventional monetary policies, and from governments, in the form of public capital injections, guarantees on bond issuance, asset relief measures and liquidity support measures (for details, see EC, 2014a, Chapter 2).

⁶ For an overview of the EU regulatory reform agenda, see EC (2014a), Chapter 2.

Among the various reforms, the reinforcement of the supervisory framework in the EU should be highlighted. A European System of Financial Supervision (ESFS) was created following the recommendations put forward by the report of the high level group chaired by De Larosière (2009). It consists of a European Banking Authority (EBA), a European Securities and Markets Authority (ESMA) and a European Insurance and Occupational Pensions Authority (EIOPA). A European Systemic Risk Board (ESRB) was also entrusted with macro-prudential oversight.

In 2009, the crisis hit the public sector. A combination of structural deficiencies, the contraction in economic activity and the massive support granted to financial institutions distressed public finances in many countries. Latvia, Hungary and Romania, outside the Euro area, followed by Greece, Ireland and Portugal, within the Eurozone, became unable to refinance themselves on the markets and had to ask their European partners and the IMF for support. Later on, Spain and Cyprus also applied for financial support⁷.

The current consensus states that interlinks among weak sovereigns, weak banks and subdued economic activity created a vicious circle which hampered recovery. Overcoming the crisis is dependent on breaking this loop. In this context, the European Council (2012) mandated the European Commission (2012a) to establish a *Roadmap towards a Banking Union* aimed at breaking the vicious circle between sovereign debt and bank debt. That BU will be based on three pillars: shifting the supervision of banks to the European level through a Single Supervisory Mechanism, a common system for deposit protection and an integrated bank crisis management and resolution framework.

Once the BU is in place, the stress in individual banking institutions will not spill over to individual States and their public finances. In September 2012, the European Commission (2012c) put forward a legislative proposal for a Single Supervisory Mechanism (SSM) in Europe. After final adoption by the Council in October 2013, the SSM is fully operational since November 2014.

The European Commission (2010c) presented a proposal for amending the Directive on Deposit Guarantee Schemes as early as July 2010 with the aim of improving depositor protection and was finally approved in April 2014 (EP and Council, 2014b). Following the *Blueprint* (European Commission, 2012b), the current priority is to pre-fund the national Deposit Guarantee Schemes (DGS) in all countries and, only at a later stage, converge to a single European DGS.

The third leg of the BU is the framework to resolve banks. In June 2012, the European Commission (2012d) tabled a proposal for a *Directive on resolution and recovery (BRRD)* which was later complemented by a proposal on a

⁷ For details about the European framework of financial support to sovereigns under stress, see Villar Burke (2012) and EC (2014a), Chapter 2.

*Regulation on a Single Resolution Mechanism (SRM) and a Single Bank Resolution Fund (SRF)*⁸ (EC, 2013a)⁹. These proposals follow the principles previously set by the European Commission (2010a, 2010b, 2012b). These legislative initiatives table a comprehensive framework including, among other things, the resolution tools, the powers of the resolution authority, governance arrangements, resolution triggers, the overall size of the fund needed to finance resolution, how the money collected should be held to ensure liquidity and avoid pro-cyclicality, which backstop would finance the fund in the event that ex-ante funds proved insufficient, how to deal with new countries and banks joining the resolution fund at a later stage.

All these elements need to be clarified for the resolution framework to be operational, but they go beyond the purpose of this paper and are not discussed here. This paper focuses on how the contributions to the resolution fund can affect economic incentives, but prior to this, the characteristics of bank resolution funds are briefly discussed in the next section.

8.2.2. Main Features of Bank Resolution Funds

This section presents an overview of the main features of the future European Bank Resolution Fund (SRF) and of resolution funds in other jurisdictions.

8.2.2.1. Existing Resolution Funds and Bank Levies

The discussion in this paper focuses on the Euro Area and the European Union. However, the main findings and conclusions can be translated to other jurisdictions. Major financial centres such as the UK, the US or Japan and emerging economies such as Mexico, Russia, Korea, Brazil or Argentina, among others, have all established resolution funds or have deposit insurance systems that may be drawn on to fund bank resolutions. On top of that, a number of jurisdictions have established other taxes and levies on banks. The main rationale of the latter is to recover the costs generated by the financial institutions in the recent crisis. The findings of this paper and the proposed design of the contributions are also relevant for those other taxes and levies. This section briefly reviews the existing resolution funds and bank levies according to the compilations published by FSB (2013) and KMPG (Larking, 2012).

There are three FSB jurisdictions with privately funded dedicated resolution funds (Germany, Japan and the US) and fifteen jurisdictions with DGs that may be drawn on to fund bank resolution (Argentina, Brazil, Canada, France, Indonesia,

⁸ The BRRD applies to all 28 Members of the EU while the SRM and SRF apply to the Member States that form part of the Banking Union.

⁹ Both texts were finally adopted by the co-legislators in April 2014. See EP and Council (2014a and 2014c).

Italy, Japan, Korea, Mexico, the Netherlands, Russia, Spain, Turkey, the UK and the US). On top of those jurisdictions, KMPG adds Austria, Belgium, Hungary, Iceland, Portugal, Romania, Slovakia, Slovenia and Sweden as countries with a variation of bank levy in place.

While the FSB does not provide information about the contributions, KPMG compiles information on the tax base and the rates to be applied. In all cases, the tax base corresponds to a measure of liabilities by excluding some items such as capital or covered deposits. In some cases, derivatives (off-balance sheet) are also taxed. In most cases, the rate is the same across the board. However, in a few countries, there is a progressive rate depending on the size of each bank (Austria, Germany, Hungary and Iceland) or the rate depends on the maturity of the liabilities (Korea, the Netherlands and the UK). The rationale for variable rates lays on the risks discussed in Sections 8.3 and 8.4.

One should highlight that, in at least nine countries (Austria, France, Hungary, Iceland, Portugal, Slovakia, Slovenia, the Netherlands and the UK), the contributions levied on banks go either to the Treasury or directly to the State budget. This seems inconsistent with the goal of clearly delimiting the privately raised funds and of protecting public funds from banking crises.

This short review points to the scarce analysis available about the economic impact of the contribution to resolution funds and levies over time. Improving the understanding on how they affect incentives is the main goal of this paper.

8.2.2.2. The European Bank Resolution Fund: Size, Transitional Period and Individual Contributions

The contributions to a resolution fund are developed in Title VII of the BRRD and on Title V of the SRM-SRF. The BRRD provided some flexibility about the ‘financing arrangements’. However, the SRM established that existing national financing arrangements¹⁰ would be phased into an EU resolution fund (the SRF), which would be independent from national budgets or the EU budget. The SRF shall reach at least 1 per cent of covered deposits after a transitional period of 8 years.

The contributions from each institution shall be proportional to its liabilities (excluding own funds and guaranteed deposits). Contributions should be adjusted to the risk profile of the institutions taking into consideration elements such as: trading activities, off-balance sheet exposures, leverage, stability of funding, financial conditions of the institution, probability that the institution enters into resolution, previous benefit of State support, complexity of the institution and systemic importance. The European Commission is currently

¹⁰ See also Nieto and Garcia (2012) on how national financial arrangements could work together.

working on the specifications on how the risk profile of each financial institution will be taken into account for computing its individual contribution to the fund (EC, 2014b)¹¹.

The legal texts take into consideration the impact of time in the following way. The contributions to the fund *shall be spread out in time as evenly as possible until the target level is reached* (SRM-SRF, Art. 69.2 and BRRD, Art. 102.2). The parliamentary discussion added an important nuance to the initial Commission text as the contributions should have *due account of the phase of a business cycle and the impact pro-cyclical contributions may have on the financial position of contributing institutions*. But the text of the SRM-SRF continues by requiring for the overall contributions *not exceed annually the 12.5 per cent of the target level*, which corresponds to an even distribution of the contributions throughout the 8 years of the transitional period.

Our interpretation is that the legal text stipulates a strict amount for the overall annual contributions but it allows for taken into consideration cyclical effects at a lower level, i.e. at country or bank level. The rest of this paper discusses the interactions of the contributions to the resolution fund with the credit cycle (Section 8.3) and the income cycle (Section 8.4) and proposes a design of the contributions to avoid pro-cyclical effects and perverse incentives that could jeopardise financial stability (Section 8.5).

8.3. THE CREDIT CYCLE

8.3.1. Bank Assets as an Indicator of the Cycle and of Risk

The Basel III Agreement (Basel Committee on Banking Supervision [BCBS], 2011) is the global framework of prudential requirements for financial institutions. The main goal of Basel III is to control excess risk-taking by banks. In paragraph 152, Basel III states that one of the underlying features of the crisis was the build-up of excessive leverage in the banking system. The role of excessive risk in the recent crisis is also stressed by HM Treasury (2009), IMF (2012), Stiglitz (2010) and many others.

Barrel *et al.* (2011) argue that both size and growth of bank assets are related to risk taking: size leads to greater risk and growing banks are taking on more risk than banks of an equivalent size that do not grow. Similarly Pagano *et al.* (2014, p. 16) argue that as banking systems increase, they are increasingly likely to

¹¹ When this paper was about to go to press, the European Commission adopted, on 21 October, the detailed rules on contributions of banks to resolution funds. Those rules address mainly the allocation of the contributions across banks. The discussion of this paper about the need to take into consideration time dynamics and its effects on incentives remains fully significant. Similarly, the results of the comprehensive assessment and the stress test of the ECB and EBA were published on 26 October. They are not analysed here.

finance negative net-present-value projects; in other words, there is a tendency of excessively large banking systems to take excessive risk.

Ignatowski and Korte (2014) suggest that the establishment of resolution regimes are effective for disciplining risk-taking behaviour of banks, except for the largest and most systematically important institutions, which are unaffected. In a similar vein, Hoenig (2014) shows how the total size of the large banks in the US increased by a factor of 9 between 1984 and 2012 while total assets of smaller banks not even doubled in the same period. Haldane and Alessandri (2009) argue that one of the main strategies for banks to maximise expected profits was through higher leverage, which explains the expansion in assets. The authors maintain that most of this expansion was focused on trading assets.

Shin (2010) and Adrian and Shin (2010) argue that, even under stable leverage ratios, risks can increase both on the asset and the liability side of the balance sheet. Villar Burke (2013) explains that the risks embedded in leverage and the dynamics discussed by Adrian and Shin (2010) are better captured by a marginal leverage ratio, or leverage ‘*speed*’, than through the traditional absolute leverage ratio.

An important lesson that can be extracted from Adrian and Shin and Villar Burke is that stable leverage ratios during economic expansions can conceal aggressive balance sheet growth, which is likely to entail increasing risks. On top of that, banks can become too big to fail. Taking advantage of an implicit subsidy by the State, these banks can embark on riskier activities with benefits being enjoyed solely by the banks and the losses, in case they materialise, being supported by taxpayers’ money¹².

The arguments of all those authors support the thesis that a quick expansion in assets is a clear indicator of a bubble or the build-up of increase risks in the balance sheet of a bank. This is also somehow acknowledged by legislators in those countries where bank levies are progressive (see Section 8.2.2.1).

8.3.2. Moral Hazard and the Balance Sheet Cycle

The benefit of a resolution fund in terms of financial stability would be reflected on a smoother cycle. In the troughs of the cycle, when banks under extreme difficulties can become insolvent, the resolution fund can avoid contagion and smooth the downturn. However, this paper argues that the resolution fund should have a wider scope. The positive impact of the resolution fund will be maximised if it is designed for deterring the build-up of bubbles in the expansionary phase of the cycle.

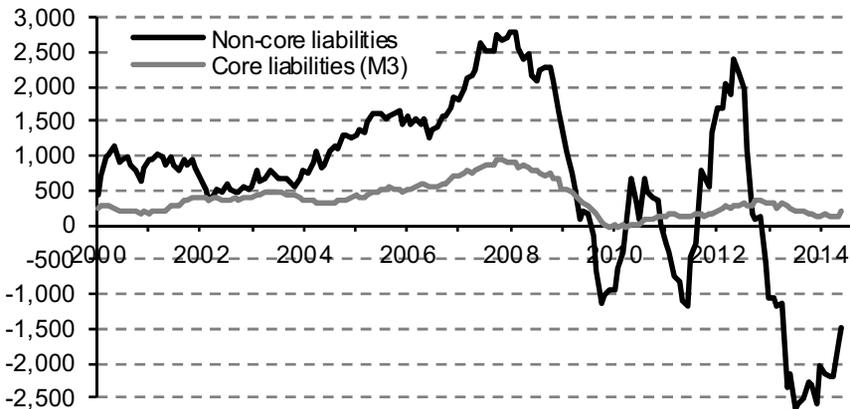
¹² A brief discussion about the too-big-to-fail problem is presented in Villar Burke (2014a).

8.3.2.1. The Resolution Fund for Smoothing the Troughs

Most of the explicit goals of the resolution framework relate to smoothing the trough of the next crisis. This is the case for goals which aim to protect public finances in future banking crises, to ensure the continuity of critical functions of banks, to preserve financial stability, to prevent contagion, and to protect depositors¹³.

Authors like Krugman (2013), Reinhart and Rogoff (2011), Varoufakis (2011) or Fonteyne, *et al.* (2010) explain how traditional banks, whose balance sheets were dominated by loans and deposits, have evolved to modern banks with much more complex balance sheets, operations and contingent liabilities. The modern version of bank runs is the drying up of interbank markets and other sources of wholesale funding. Data show an increasing importance of non-core liabilities (wholesale funding) on banks' funding structure in the mid-2000s and a collapse in late 2008 and 2009, what triggered most of the problems for European banks in the recent crisis (Chart 1). This illustrates a modern bank run, as argued by Krugman (2013), Gorton and Metrick (2012), Varoufakis (2011), Abbassi and Schnabel (2009) or Cochrane (2014)¹⁴.

Chart 1: Funding of Banks: Core versus Non-core Liabilities, Euro Area Banks
Net annual flows, billion EUR



Notes: M3 is used as a proxy for core liabilities. Non-core liabilities are the difference to total assets. Annual flows are computed as the sum of net flows for 12 consecutive months through a rolling window. 'Net' refers to new transactions minus redemptions.

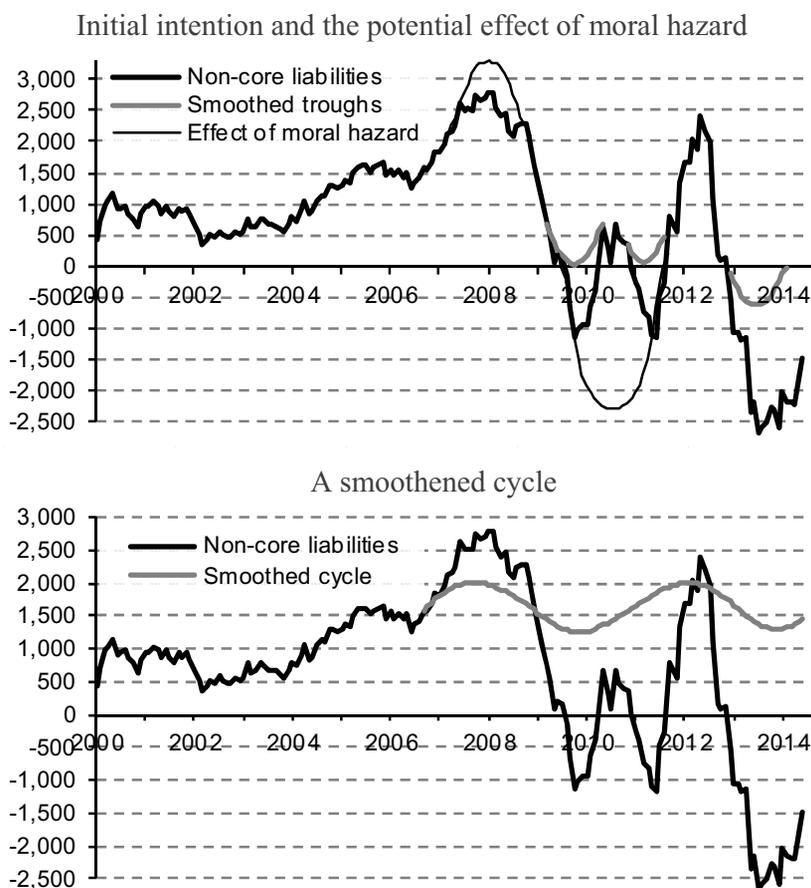
Source: ECB Statistical Data Warehouse and own calculations.

¹³ It should be highlighted that the SRF will be ready for confronting future crises, but it does not intend to tackle the legacy of the current crisis, nor the potential weaknesses that may be detected by the comprehensive assessment being carried out by the ECB ahead of taking its supervisory responsibilities under the SSM.

¹⁴ A similar decline in the flow of non-core liabilities is observed from mid-2012 onwards. However, this seems more linked to the process of deleveraging, balance sheet clean up and restructuring than to a panic episode as it was the case in 2008-2009.

Deposit insurance, as in the case of the FDIC in the US, has prevented recurrent bank crises triggered by deteriorating depositors' confidence and runs to the bank to withdraw funds. The existence of deposit guarantee schemes (DGSs) have played an important role in smoothing the reaction of core liabilities throughout the crisis (Chart 1). The future resolution fund could act as a protection against contagion and massive withdrawals of wholesale funding in a similar way as DGSs have contained depositor runs. Article 76 of the SRM-SRF sets the mission of the Fund which includes: "to guarantee the assets or the liabilities of the institution under resolution [...]"¹⁵. With a resolution fund in place, the troughs of non-core liabilities would be smoother (see Chart 2, upper panel).

Chart 2: Effect of the Resolution Fund on the Balance Sheet Cycle



Source: ECB Statistical Data Warehouse and own calculations.

¹⁵ This is particularly the case for the liabilities excluded from the scope of bail-in within the BRRD. See ECB (2014b, pp. 45-46) for a short discussion about resolution tools.

The Outright Monetary Transactions (OMT) programme of the ECB provides another illustration of the potential economic effects of the resolution fund. The OMT was announced in summer 2012 in a moment of increased turbulence in the markets. The sole announcement that, in case deemed necessary, the ECB would purchase an unlimited amount of sovereign bonds was enough to calm the turmoil and bring financial indicators closer to fundamentals. This was achieved without spending a single Euro. Similarly, the actual economic impact of the resolution fund would be to foster confidence in the markets and to avoid a panic, so that the resolution fund can have a significant impact without even being activated. However, this can only be achieved if the resolution framework is credible.

8.3.2.2. Moral Hazard and Amplification of the Cycle

An unintended effect of building a safety net to be used on the downturn is that it may exacerbate risk-taking during the boom. Indeed, the safety provided by any (mispriced) insurance or guarantee can generate moral hazard or ‘excessive risk taking’. Banks that have become too big to fail constitute a typical example of this behaviour¹⁶: they can embark on riskier activities taking advantage of the implicit state subsidy. Barrel *et al.* (2011) suggest that the safety net generates risk taking incentives. This can make the amount needed to support the financial system go beyond the capacity of the safety net. Should the firepower of the safety net reveal insufficient, the panic and the run would be unavoidable and this could lead to an amplified and an even deeper downturn than the one it was supposed to prevent at a first place (see Chart 2, upper panel for an illustration).

The HM Treasury (2009, paragraph 3.39, 3.44 and Box 3.B) defends that the resolution funds should be designed in such a way as to mitigate moral hazard and influence firms’ actions to discourage excessive risk-taking. The conversion of bail-inable debt into equity before recurring to the resolution fund is supposed to foster market discipline. It is sometimes argued (see, for instance, Verwey, 2013, 6m 35s) that the banking industry will exert peer pressure and denounce or avoid misbehaviour if the resolution of a bank would be financed from a common pot funded by the industry.

However, this latter argument has to be taken with caution. The British Financial Services Compensation Scheme (FSCS) was based on a rationale of market discipline by depositors, but this exacerbated or triggered the run on Northern Rock in late 2007. It is assumed that institutional investors can exert a much stronger control than retail depositors. However, HM Treasury (2009, paragraph 1.10) argues that the mechanism of market discipline is not always adequate to

¹⁶ A brief discussion about the too-big-to-fail problem is presented in Villar Burke (2014a).

deliver this. The rationality of investors and markets might rely more on a heroic assumption rather than on reality as the subtitle of Reinhart and Rogoff (2011) suggests: “*Eight centuries of financial folly*”. In a similar line, Min (2014) argues that market discipline did not prevent the build-up of bank risk that caused the recent financial crisis.

Section 8.3.3 presents a concrete illustration on how the contributions to the resolution fund can indeed amplify the credit cycle.

8.3.2.3. The Resolution Fund for Smoothing the Peaks

In order to be effective in its objective, this paper argues that the resolution fund can foster financial stability only if, beyond smoothing the trough, it is designed to mitigate moral hazard in the form of bubbles and excessive growth during the booms. This principle is somehow embedded in the objective of the SRF to increase market discipline.

In line with HM Treasury (2009, paragraph 3.40), beyond the activation of the fund in the resolution stage, the contributions to a resolution fund can play a fundamental role as a preventive tool by reducing the probability that the resolution materialises; and, therefore smoothing the cycle both during the booms and the downturns (see Chart 2, lower panel for an illustration).

8.3.3. The Resolution Fund, Balance Sheet Growth and Incentives

Even if sometimes it has been claimed that the financial crisis responsibility fee could have a deterrent effect against excessive leverage¹⁷, the contributions to a resolution fund are not neutral with respect to balance sheet growth and incentives. Two simulations illustrate how, given the evolution of the balance sheet over time, the contributions to a resolution fund based on a flat rate will promote the banks with a quick balance sheet expansion in detriment of banks with a more stable size. The simulations are based on the following stylised assumptions:

- the target size of the fund is set at 1 per cent of total assets;
- annual contributions are set at 1/10 of the target (i.e. 0.1 per cent of total assets);
- there is one unique bank in the economy with EUR 50,000 of total assets.

¹⁷ See, for instance, the White House (2010) or Nieto and García (2012).

The above values have been chosen to provide an order of magnitude for the future European resolution fund, but the lessons from the simulations in terms of incentives would be the same with any other figure (e.g. using percentages). The target size is in the range of proposals by the IMF (Goyal *et al.*, 2010, paragraph 30), the BRRD or the SRF; the transitional period of 10 years corresponds with the initial proposal of the Commission and EUR 50,000 bn exceeds slightly current assets of Euro area banks to take into consideration the potential participation of non-Euro area countries in the SRF and assets growth throughout the transitional period.

By construction, when total assets remain constant, the target size of the fund (1 per cent of total assets) is reached after a transitional period of 10 years (Table 1, Scenario 1).

Table 1: Simulation on the contributions to a resolution fund

Scenario 1: no growth in assets					Scenario 2: expansion of assets over time				
Year	Assets	Contribution (EUR)		% of Assets	Year	Assets	Contribution (EUR)		% of Assets
		Annual	Cumulative				Annual	Cumulative	
1	50,000	50	50	0.10%	1	50,000	50	50	0.10%
2	50,000	50	100	0.20%	2	55,000	55	105	0.19%
3	50,000	50	150	0.30%	3	60,000	60	165	0.28%
4	50,000	50	200	0.40%	4	65,000	65	230	0.35%
5	50,000	50	250	0.50%	5	70,000	70	300	0.43%
6	50,000	50	300	0.60%	6	75,000	75	375	0.50%
7	50,000	50	350	0.70%	7	80,000	80	455	0.57%
8	50,000	50	400	0.80%	8	85,000	85	540	0.64%
9	50,000	50	450	0.90%	9	90,000	90	630	0.70%
10	50,000	50	500	1.00%	10	95,000	95	725	0.76%
11	50,000	0	500	1.00%	11	100,000	100	825	0.83%
12	50,000				12	105,000	105	930	0.89%
13	50,000				13	110,000	110	1,040	0.95%
14	50,000				14	115,000	115	1,155	1.00%
15	50,000				15	120,000	0	1,155	0.96%

Notes: Annual contribution = 0.1 per cent of assets; target contribution = 1 per cent of assets.

Source: Own calculations.

However, banking assets evolve over time; besides inflation effects, banks have a tendency to grow (see Section 8.3.3.1). When the balance sheet grows, reaching a contribution of 1 per cent becomes a moving target: the transitional period is extended from 10 to 14 years when assets increase by EUR 5,000 a year (Table 1, Scenario 2). A proportional increase in assets of 10 per cent a year was also investigated; in this case, the transitional period is further prolonged to 25 years.

The firepower of a resolution fund with contributions proportional to the static size of banks would lag behind the expansion of assets. This can make the fund insufficient in the boom, precisely at the moment when it will be most needed: fast expansion of assets (embedded with increasing risks) leading to a higher probability of banks becoming insolvent. These dynamics further illustrates the outcome postulated in Chart 2, upper panel.

Besides the extension of the transitional period, the ‘moving target’ effect engenders two other consequences. First, if contributions were to stop completely when the 1 per cent target is reached, the size of the fund would fall below the target. Second, the cumulative contribution of a bank depends on the historical evolution of its balance sheet. After 6 years, a bank could have accumulated a total contribution of 0.60 per cent of its assets (Scenario 1), while another one could have contributed only up to 0.50 per cent (Scenario 2). This situation could, not only create perverse incentives, but also infringe the single market by jeopardising the level playing field among banks with different growth rates in their balance sheets.

To keep track of the cumulative contribution of each bank, contributions should be booked as an asset in the balance sheet of banks. This cumulative perspective would otherwise be diluted, e.g. if the contributions are considered a levy and, therefore, they are registered in the profit and loss account as an expenditure. A registration in the balance sheet can provide a robust and fair rule for distributing dividends in the future (when the fund is fully funded and it has obtained a profit).

8.3.3.1. Are Banks’ Balance Sheets Expected to Grow in the Future?

With the outbreak of the recent financial crisis, the expansion of banking assets reduced its speed. Legislative reforms such as the increase of capital requirements or structural reforms like the ones proposed by the Volcker rule (Dodd Frank Act, Section 619), the Vickers Commission (2011) or the Liikanen Group (2012) place banks in a restructuring mode either through direct legal mandate or through market discipline. On top of that, State aid rules oblige public support to banks to be accompanied by restructuring plans and to be preceded by burden sharing (to the extent legally possible). Finally, the ECB is undertaking an Asset Quality Review and a Stress Test ahead of taking over supervisory functions through the SSM. This will probably trigger further write-offs and reductions of the balance sheets of European banks.

However, there is also increasing pressure on banks to grow. With the credit to the real economy having been squeezed for several years, the reactivation of the flow of credit to the real economy has become a political priority as stressed by

the European Council (2013). Therefore, once European banks have undertaken those various reforms, cleaned their balance sheets and Europe has overcome the crisis, total banking assets are expected to grow and, most probably, at significant rates. This expansion is expected in banks of all sizes and, as argued above, quick growth is often embedded with an increase in risk.

8.4. THE INCOME CYCLE

A series of arguments support the case for designing the contributions to the resolution fund in a way that avoids a pro-cyclicality effect on the income cycle.

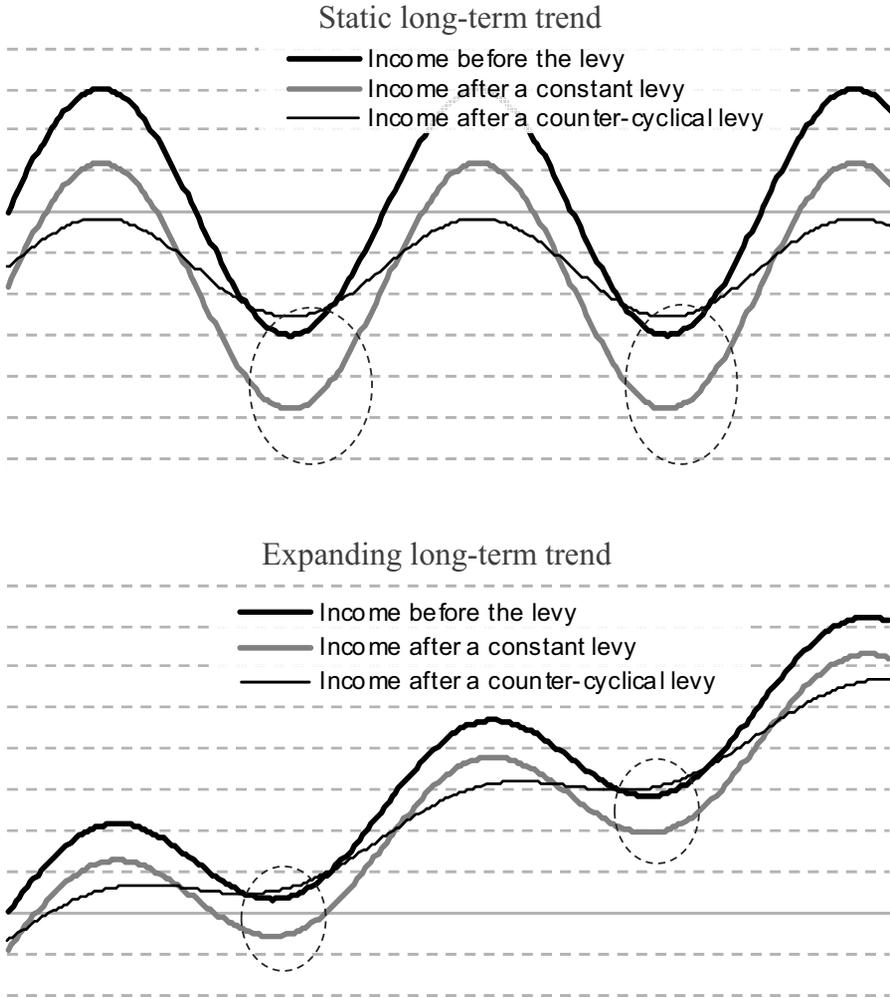
The contributions to a resolution fund imply a net drag on the income of banks¹⁸. Bank income is not constant over time, but evolves reflecting the general economic cycle. The introduction of a levy, such as the contributions to a resolution fund, can ignore or take into account the existence of such a cyclical evolution of income. These two approaches, a constant levy and a counter-cyclical one, and their impact on the income cycle are illustrated in Chart 3.

A constant levy would neglect the general economic outlook and could exacerbate the downturns. Banks can support a certain level of losses before becoming insolvent. It cannot be discarded that a levy charged during the trough could trigger the resolution. In this case, the resolution fund would by amplifying the negative shocks. In a similar vein, the EBF (2014, p. 2) argues that high fixed annual costs push troubled banks closer to failure and therefore advocates for minimising the pro-cyclicality of contributions; a similar argument is also put forward by the Association for Financial Markets in Europe (2014, p. 2).

Counter-cyclical contributions could be an alternative design which would foster financial stability. Many instances of such counter-cyclical policies are already present in most economies, e.g. the automatic stabilisers of fiscal policy or the fact that companies with losses do not pay income tax. For the specific case of banks, it is desirable that they retain equity during the booms so that more capacity is available to absorb losses during the downturn. In this vein, the Banco de España (2013) recommended banks to cap the distribution of dividends to 25 per cent of their profit.

¹⁸ The European Banking Federation [EBF] (2014) highlights that fund contributions “*will have a significant impact on the earnings of European financial institutions over the next decade*”.

Chart 3: Income cycle and levies



Notes: A constant levy could be an extra burden on the downturn while a counter-cyclical levy can alleviate it.

Source: Own elaboration.

An additional argument to take into consideration the evolution of income is the competitive features of the banking sector. Classical economics foresee that, under perfect competition, all companies will operate with the same return rates. In case one company manages to get extraordinary income, resources will be attracted towards the new business model of that company until marginal costs and profits are once again identical across the economy. A sustained extraordinary benefit signals the existence of a market failure, e.g. a monopoly. The

classical model of perfect competition assumes a large number of companies operating in the economy with none of them having market power; besides, there are no barriers to entry to or exit from a given industry or sector and all agents have access to perfect information.

The banking system is far from the classical model. Haldane and Alessandri (2009, p. 9) explain how the global banking system is dominated by a small number of large banks, what leads to a high degree of concentration and relatively low rates of entry and exit. Indeed, by 2008, the five largest global banks had around 16 per cent of global banking assets. The situation in specific countries is even more extreme: in most EU countries, the five largest banks have more than 40 per cent of domestic assets; with this share going even beyond 60 per cent in many cases (EC, 2014a, pp. 48-51).

This structure implies that a few actors have a strong market power. The concentration of market power is one of the reasons for the banking system to be one the most regulated and supervised sector in the economy -which was already the case even before the outbreak of the financial crisis- and for the proposal of the Banking Union. Rather than an efficiency advantage, permanent levels of high returns in the banking sector may signal excessive risk taking (Haldane, 2010), a market failure or lack of competition (Stiglitz, 2010). Banks and bankers have tried to exploit remaining loopholes in this highly regulated sector: e.g. the manipulation of benchmarks (EC, 2013b) and foreign exchange markets, the exploitation of risk weights within the capital requirements framework (BCBS, 2013), the fact that bank managers reaped massive bonuses even when they had led their banks to enormous losses and to be bailed out by taxpayers money (Stiglitz, 2012), etc. In short, the crisis has revealed an unbalanced order between risk, reward and responsibility within the financial sector.

Finally, from an accounting point of view, the obligation to contribute to the resolution fund should be recognised progressively (EBF, 2014, p. 2). This points to the need to take into consideration the income of banks, which is generated over time; and not just their balance sheet, which refers to a specific moment in time.

8.5. CONTRIBUTIONS TO THE RESOLUTION FUND AND DYNAMIC ALIGNMENT OF INCENTIVES

Because of its significant size, the resolution fund needs to be built throughout a transitional period. The design of the contributions to the resolution fund should not neglect the effect of time, in particular, with respect to the credit cycle and the income cycle, as to align bank incentives with risk-taking and to

foster financial stability. Systems with progressive levies represent a move in the right direction, but a design in steps generates cliff effects. As an alternative, this paper proposes a continuous approach by including a dynamic factor (Equation 1). A static factor ($x * RA$) marks the final or target contribution and a dynamic factor ($y * \Delta A + z * I$) accelerates or slows down the contribution of each bank depending on the specific position of the bank in the assets and income cycles. The various components of the equation are discussed in more detail hereafter.

Equation 1: Contributions to a resolution fund

$$\text{Contribution} = x * RA + y * \Delta A + z * I$$

Where:

x, y, z = Coefficients.

RA = Resolution assets.

A = Assets.

I = Income.

Source: Own elaboration.

8.5.1. The Static Factor

The Communication on Resolution Funds (EC, 2010a, p. 9) mentions that a crisis management framework must ensure that any losses in the context of a bank failure are first and foremost borne by shareholders, holders of subordinated debt and unsecured creditors, before resolution funds can be available. The static factor should, therefore, exclude subordinated liabilities such as equity, bail-inable (convertible) bonds and some subordinated debt, but also liabilities that already enjoy protection such as deposits covered by DGS.

The target contribution can potentially be corrected by its 'static' risk as foreseen in the BRRD (art. 103) and currently under elaboration by the EC (2014b). Finally, resolution assets could also include off-balance sheet exposures through derivatives as it is already the case in some jurisdictions.

8.5.2. The Dynamic Factor

8.5.2.1. The Component Linked to the Credit Cycle

Section 8.3 shows how a contribution based on the static factor would exacerbate the credit cycle and increase risk during the boom. A dynamic component based on the expansion of assets ($y * \Delta A$ in Equation 1) would correct this and set the right incentives (Table 2).

This dynamic component provides two main benefits. First, despite the expansion in the size of banks, the transitional period is reduced and the target contribution can be reached within a reasonable time horizon. In other words, the ‘moving target’ problem is mitigated. For instance, under a dynamic contribution of 0.4 per cent, the transitional period is reduced from 14 to 11 years (Scenarios 2 and 3, respectively). When assets grow at a rate of 10 per cent a year (instead of a constant growth), the transitional period is reduced from 25 to 12 years.

And secondly, incentives would be realigned with risks. Banks in the expansionary phase contribute faster to the resolution fund than banks in other parts of the credit cycle. Scenario 1 shows how a bank with a stable size would contribute up to 0.60 per cent of its assets after 6 years; when the dynamic contributions are activated, a bank with an expanding size contributes with 0.63 per cent of its assets (Scenario 3) and not 0.50 per cent as it would be the case without dynamic contributions (Scenario 2).

Table 2: Simulation on the contributions to a resolution fund

Scenario 3: Expanding banking system and dynamic contributions

Year	Assets	Contribution (EUR)		% of Assets
		Annual	Cumulative	
1	50,000	50	50	0.10%
2	55,000	75	125	0.23%
3	60,000	80	205	0.34%
4	65,000	85	290	0.45%
5	70,000	90	380	0.54%
6	75,000	95	475	0.63%
7	80,000	100	575	0.72%
8	85,000	105	680	0.80%
9	90,000	110	790	0.88%
10	95,000	115	905	0.95%
11	100,000	120	1,025	1.02%
12	105,000	0	1,025	0.98%
13	110,000			
14	115,000			
15	120,000			

Notes: Annual contribution = 0.1 per cent of assets; target contribution = 1 per cent of assets. Dynamic contributions are computed as 0.4 per cent of the increase in assets with respect to the previous year.

Source: Own calculations.

Which assets should be considered as a reference of the credit cycle? The drivers of leverage (leverage targets and valuation effects) as presented in Villar Burke

(2013) support the use of total assets for calculating the dynamic factor rather than resolution assets or other targeted items of the balance sheet.

8.5.2.2. The Component Linked to Income

The component linked to income (z^*Inc in Equation 1) introduces several advantages. First, it reinforces the countercyclical effect by increasing the contributions in moments of higher profits and limiting the drag on results during the downturns; secondly, it helps to better grasp the risk stemming from valuation changes and expansion of assets as presented in Villar Burke (2013); finally, it provides an indication of the ability to pay, which is a general principle of taxation (see Common Consolidated Corporate Tax Base Working Group, 2004).

Several options are possible with respect to the specific income item to take as a reference. Contributions based on net operational income, which is very stable over time (Villar Burke, 2014b), would focus on banks' ability to pay. A contribution based on trading income or net income would target the riskier activities and would have the highest impact in terms of countercyclical effects.

8.5.3. Size of the Fund and Calibration of Coefficients

Despite the mobilisation of unprecedented amounts of funds, the FSB (2013, p. 39) still considers that "it is not clear whether [current financing] arrangements are adequate or appropriate in terms of scale or scope. Public financial support therefore remains an important component of resolution funding arrangements for SIFIs". In other words, while the bail-in of debt and the resolution fund can mitigate the impact of future crises on public finances, it seems unrealistic that bailouts will be totally terminated. This reinforces the thesis that the focus of the resolution fund should be widened from a perspective centred on privately financing bail-outs to a broader reach. The main goal of a resolution fund should be to promote the right incentives in the behaviour of banks. This claim might seem twisted at first sight; however, a similar rationale is widely accepted for deposit guarantee regimes or the OMT programme.

On these grounds, this section discusses what could be the target size of the fund, the transitional period to build it up and general principles on how the coefficients in Equation 1 should be calibrated.

8.5.3.1. Size of the Fund and Banks' Income

The recent financial crisis can provide an indication of the scale of the resolution fund that would potentially be needed for tackling future crises. In Europe, EUR 1,700 billion of liquidity were injected by the ECB in Euro Area banks and

EUR 1,600 billion were committed by EU governments to support their banks (EC, 2014a, Chapter 2). In the US, besides the \$700 billion of the TARP programme, the Deposit Insurance Fund was pledged so that the government allowed the Fund to borrow up to \$500 billion from the Treasury while the Dodd-Frank act had eliminated the cap in the size of the Deposit Insurance Fund.

In this context, Goyal *et al.* (2013, paragraph 30) consider that a European BU would need a ‘relatively’ small resolution fund: 1-2 per cent of total liabilities. However, given the size of the Euro area banking system, this translates into the non-negligible figure of EUR 500 billion in the lower range. HM Treasury (2009, paragraph 3.42) acknowledges that a resolution fund would have to be built over an extended period and may ultimately need to be quite large.

On the other hand, Huertas and Nieto (2014) argue that a well-designed architecture for regulation, supervision, and resolution would make banks less likely to fail and safe to fail. Under these circumstances, the authors consider that a size of the fund of EUR 55 billion as targeted under the SRF could be sufficient.

The feasibility of a resolution fund of any size should be assessed against the capacity of the banking system to generate resources. This is needed for assessing what could be a reasonable length for the transitional period and for ensuring the acceptability of the proposal by the banking industry.

Income fluctuates widely both over time (volatility) and across countries. The return on assets (RoA) is tiny: a maximum of 0.2 per cent for the EU average and around 0.5 per cent for the best performing core Euro area countries (Austria, Luxembourg, Finland or France). Central and Eastern European countries, including some members of the Euro area, show higher RoA, but their banking systems are small and, therefore, also their potential contributions to a European resolution fund¹⁹. Besides the impact of the crisis, these small figures for the RoA reflect the leverage of banks. With an average leverage of 18 to 1 (Villar Burke, 2013), the RoA of European banks is 18 times smaller than their return on equity (the return on equity for Euro area banks would, therefore, be around 3 per cent in 2010).

The features of net income (volatility) and RoA (very low values) reinforce the importance of taking into consideration banks’ income when calculating their contribution to a resolution fund (Equation 1). This component allows for individual contributions to flexibly adapt to the circumstances of each bank and its ability to pay.

Depending on the evolution of bank income over the coming years, certain flexibility in the duration of the transitional period for building up the resolution

¹⁹ For country data on RoA, see EC (2014a), pp. 41-42.

fund could be envisaged in order not to jeopardise the survival of banks or not to impact customers with higher charges²⁰.

8.5.3.2. Calibration of Coefficients and Incentives

This paper argues that the economic relevance of the resolution fund relies on its preventive role. On these grounds, restraining excessive risk-taking during booms could be considered more important than the speed for building the fund to its full capacity. However, a critical aspect of the resolution fund is that it needs to be credible. This implies, on the one hand, reaching a minimum capacity rather quickly and, on the other, that some kind of backstop should be available in case available funds are revealed to be insufficient²¹. The role of the static and dynamic contributions (and therefore, the effect on the risk behaviour of banks) and the length of that transitional period is moulded through the coefficients of Equation 1.

Liikanen (2012, p. 82), the BRRD and the SRF propose a size of 1 per cent of covered deposits for the resolution fund, corresponding to around EUR 55 billion. This benchmark could be used to set an *interim target*. This interim target would distinguish between two stages. In a first stage, when a minimum firepower of the fund needs to be built up, the bulk of the contributions (e.g. 80 per cent) would stem from the static factor and, the rest, from the dynamic factor.

Liikanen, the BRRD and the SRF also propose a limited transitional period of 8 or 10 years. In light of the data on income generation by banks, it should be assessed if such a short transitional period may generate negative impacts for both the banking system and its customers; in which case, the transitional period might need to be extended up to 15 or 20 years.

In a second stage, once the resolution fund is equipped with the minimum firepower set by the interim target, contributions could be slowed down and recalibrated. The dynamic factor and its capacity to steer incentives would be allowed to play a prominent role (for instance, 80 per cent of the contributions could stem from the dynamic factor). The second transitional period, from the interim to the overall target, could be set in another additional 30 to 40 years. Obviously, should the fund be pledged below the interim target, the first calibration would be reactivated.

The length of the total transitional period (up to 60 years) allows enough time to investigate what would be the appropriate size of the resolution fund. It also allows a better understanding of the impact of other initiatives agreed throughout

²⁰ The EC (2010a, p. 4) states that *it should be avoided that increased costs are passed on to bank customers in the form of higher charges*.

²¹ In this context, the SRF can borrow from the markets under certain circumstances.

the crisis such as new rules on capital requirements, the financial transaction tax or structural reforms in the financial sector.

To ensure a level playing field, changes in the calibration should apply at system level, not at bank level. That is, independently of the amount already contributed by each bank, in a given moment, the same calibration will apply to all banks.

8.6. CONCLUSIONS

The recent financial crisis triggered a comprehensive regulatory reform agenda in the financial sector aimed to foster financial stability, prevent the occurrence of crises in the future and reduce the potential negative impacts and costs to society.

Analysts and policymakers insist that the rationale for establishing a resolution fund is that future crises will be financed by the financial institutions themselves so that public funds will not be used to bailout banks that have incurred excessive risk. This policy goal springs from the feeling that the balance between risks, rewards and responsibilities between society and the financial sector needs to be adjusted. A massive amount of public money was mobilised by public authorities to support the financial system while economic growth remains subdued in many countries and unemployment is breaking all historical records.

Without precluding the need to develop a framework for financial crisis management and resolution, this paper argues that the prominent role of a resolution fund is to foster financial stability and to act as a preventive tool. If properly designed, the resolution fund can steer excessive leverage and banking sector growth so that the cycle is smoothed both at upswings and downturns and banks' incentives become aligned with financial stability.

The proposal for the design of the contributions to a resolution fund takes into consideration a static and a dynamic factor. The static factor depends on the total size of each bank – possibly corrected for risk – and marks the final target contribution. The dynamic factor takes account of the credit cycle and the income cycle to provide for an anti-cyclical effect. The dynamic factor acts as a sort of speed switch, while the target contribution remains linked to the size of the bank. Depending on the evolution of assets and income, the dynamic factor either accelerates the contribution of banks upfront or slows it down but the target contribution is not affected. While the paper provides some guidance, the exact calibration of coefficients is left for a later research. The parameters to be used are also subject to political choice and preferences.

The proposal presented in this paper aims at aligning incentives so that banks that remain within a 'manageable' size are incentivised and those that grow towards

a too-big-to-fail size are penalised. While the system is robust in itself, the departing point might already be embedded with the too-big-to-fail problem, which should be addressed with other policies or measures.

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9. SECURITIZATION AND RISK RETENTION IN EUROPEAN BANKING: THE IMPACT OF COLLATERAL AND PRUDENTIAL RULES

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9.1. INTRODUCTION

The analysis of the incentives driving the securitization process has been at the center of the academic and policy debate in the aftermath of the global financial crisis. In particular, given the traditional view of securitization as a credit risk transfer technique, aimed at removing the credit risk of the underlying assets from the bank's balance sheet, much attention has been focused on the misalignment of incentives between originators and investors and on the effects of structured finance operations on the lending standards of originator banks.

However, this transfer of credit risk might not be complete for several reasons, either because banks may provide some explicit or implicit support to special purpose vehicles, or because banks may retain some or all the tranches of securitization on their balance sheets. The latter case is particularly relevant to explain the securitization behavior of European banks in the aftermath of the subprime crisis. Indeed, while in the US the crisis induced a severe downfall in the volumes of securitization issuances, especially for non-agency structured finance, in Europe banks continued to issue structured products but by retaining almost all the tranches on their balance sheets.

This paper intends to analyze the determinants of the risk retention behavior of European banks in securitization, by focusing on the incentives induced by the regulatory framework, and particularly by the collateral standards for monetary policy and the prudential requirements for capital adequacy. In this context, the study addresses various questions that are relevant for the policies of central banks and supervisory authorities, especially in Europe. Can prudential requirements and collateral standards affect bank securitization decisions? More

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precisely, can they influence bank decisions to transfer or to retain the credit risk related to the underlying assets? To what extent can crisis liquidity needs change or strengthen the incentives of banks, to exploit the opportunities for collateral creation and capital arbitrage offered by the regulatory framework?

The discussion on the role of prudential and collateral rules in the securitization behavior of European banks, in particular for the effects on risk retention decisions, assumes further relevance in light of the recent policy initiatives undertaken by some central banks, such as the proposals presented by the ECB and by the Bank of England to address the regulatory treatment of high-quality Asset-Backed Securities, as well as the design and the implementation of the new ECB program for ABS Purchases.

In general, as discussed in previous studies for the US securitization market, banks may have various incentives to retain some credit risk, both in case of explicit support, and in case of implicit recourse. Originators and sponsors may provide explicit support, by arranging credit or liquidity enhancement on a contractual basis, for different purposes: as a skin in the game mechanism, in order to signal the quality of the underlying assets (Gorton and Pennacchi, 1995; Demiroglu and James, 2012); to obtain a higher credit rating for a securitization deal (Erel, Nadaul and Stulz, 2011; Adelino, 2009); or as a regulatory arbitrage device (Acharya, Schnabl and Suarez, 2013; Demyanyk and Loutskina, 2013). Moreover, banks may offer implicit recourse to their vehicles, without any previous contractual commitment, also after the asset sale and mostly for reputational reasons (Higgins and Mason, 2004).

In a recent paper (Scopelliti, 2014), focused on the European securitization market, I present an empirical study – based on tranche-level data for more than 17,000 structured products issued from 1999 to 2010 – in order to investigate the incentives affecting the retention policy of European banks. In particular, I examine whether and how the differences in the regulatory treatment across distinct securitization classes can explain the decisions of originator banks to transfer or to retain the credit risk. I show that, in the pre-crisis period, banks increased their risk-based capital ratios by using securitization as a credit risk transfer technique, while in the crisis period banks issued and retained structured products to pledge them as collateral with the Eurosystem. Also, given their liquidity needs during the crisis, banks retained mostly those products which were subject to a favorable regulatory treatment, i.e. which were eligible as collateral for monetary policy operations and/or charged with low risk weights for prudential requirements.

In this study, I provide a non-technical summary of the new findings in Scopelliti (2014), by discussing the economic functioning of such regulatory incentives and by considering the related policy issues, also in the perspective of the current

central bank initiatives on securitization being undertaken in Europe. The article is organized as follows. Section 2 highlights the different developments in the securitization markets in the US and in Europe during the crisis period and describes the key features of the regulatory framework for securitization in Europe. Section 3 summarizes the economic intuition and the empirical approach of the analysis. Section 4 discusses the main results concerning the impact of collateral and prudential regulation on securitization decisions, by classifying the issuances by asset type and by credit rating. Section 5 presents the relevant policy implications for current central bank and regulatory initiatives. Section 6 concludes.

9.2. THE ROLE OF THE REGULATORY FRAMEWORK IN SECURITIZATION

In the immediate aftermath of the crisis, securitization had been strongly blamed for being one of the main causes of the disruptions which had distressed the financial system and the real economy. However, it is also true that simple and transparent securitization can be actually helpful for the economy, especially in bank-based systems, to the extent that it can be used to reduce the credit risk borne by financial institutions for their lending activity, by distributing the related risk across a wide range of market investors². In this perspective, securitization can also contribute to alleviate the supply-induced constraints for credit provision and then it may help in removing the persisting impairments in the transmission mechanism of monetary policy. This holds particularly in crisis times, when credit institutions are reluctant to extend their supply because of the concerns for the credit risk of their exposures, and despite the central bank's accommodative stance.

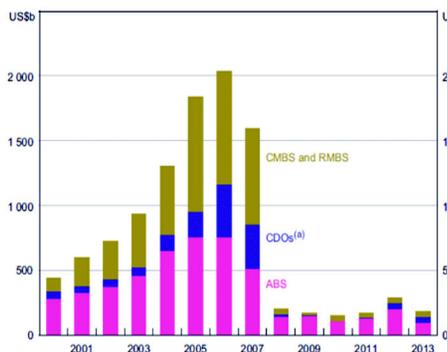
Nevertheless, in order to avoid that securitization may constitute again a further source of financial instability, appropriate and effective regulatory arrangements have to be designed by central banks, supervisory authorities and standard-setter bodies. In this context, the present study aims at contributing to the current policy debate, particularly by providing some insights on the way the regulatory framework can shape or change the securitization incentives of originator banks. A good understanding of the interactions between the regulatory setting and the bank incentives is useful also to ensure that the newly designed policy measures may induce the desired effects, in terms of possibly expected changes in bank behavior.

² For an accurate discussion on the benefits and risks of securitization for the economy, as well as on the impediments for a well functioning securitization market in the EU, see the joint discussion paper by the European Central Bank and the Bank of England (2014)

Then, in order to further motivate this study with regard to some recent stylized facts on securitization, it may be useful to examine the trends in the issuances of structured products in the US³ and in Europe, especially during the crisis period.

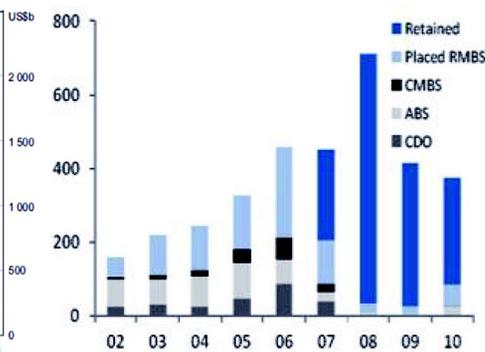
The Trends of Securitization Issuances in the US and in Europe

Figure 1: Volumes of Non-Agency Securitization Issuances in the US, 2000–2013, in \$ bn.



Source: Johnson and Santor (2013)

Figure 2: Volumes of Securitization Issuances in Europe, 2002 – 2010, in € bn.



Source: AFME (2011)

In the US, after the disruption in the subprime market, banks reduced drastically their issuances of structured products: in particular, they almost discontinued the issuance of collateralized debt obligations (CDOs) and private-label mortgage-backed securities (MBSs), while they contracted substantially the new volumes of asset-backed securities (ABSs), mostly backed by credit card receivables or auto loans. Indeed, because of the lack in demand for private securitizations, banks didn't have any incentive to issue structured products. The only segment of structured credit which has remained relevant in the US after the crisis is related to the issuances of MBSs by Government Agencies or Government-sponsored enterprises.

In Europe, banks continued to issue structured products during the crisis and they even increased the volumes of new issuances from 2007 to 2008. However, starting from the last quarter of 2007 and until mid-2010, banks retained almost all the issuances of structured products, and especially of asset-backed securities, on their balance sheets. According to the data (ECB, 2010), for the new issuances of Euro Area banks, before August 2007 the retention rate was close to 0, while in 2008 and 2009 – although changing across months – it was always included in

³ In order to evaluate the market developments of structured products that are actually comparable, for the US I focus on the issuances of private-label securitization issuances, by excluding the agency-based structured issuances, which are guaranteed directly or indirectly by the US Government.

a range between 80% and 100%. The very few issuances not retained on balance sheet were mostly residential MBSs or other ABSs.

In the period considered for the empirical analysis, from 1999 to 2010, banks were not required by prudential rules to retain risk in securitization either in the US or in the EU. Indeed, only in 2011 the amendments to the Basel securitization framework introduced as an immediate response to the subprime crisis – in the US with the Dodd-Frank Act and in the EU with the Capital Requirements Directive II – required the originator or the sponsor to retain a material net economic interest of at least 5% in the securitized assets, in order to avoid that a complete transfer of credit risk could reduce the lender's incentives to screen and monitor the borrower.

In the absence of any compulsory retention requirements before then, the differences in the securitization issuances between US and European banks during the crisis, as well as the *risk retention behavior of European banks* provide the factual motivation for the empirical analysis presented in this study. In general, the crisis generated wide concerns for the true creditworthiness of structured products and this caused a lack in demand in all countries. However, while in the US such confidence crisis determined a very severe contraction in securitization markets, in Europe banks continued to issue structured products but by retaining them. This difference might suggest some key role for institutional and regulatory factors. For this reason, I investigate the possible determinants of such retention behavior, focusing on the incentives provided by the specific framework existing in Europe. Various sets of regulations may potentially affect the securitization behavior of originator banks, such as the accounting standards, the prudential requirements for capital adequacy and the collateral eligibility criteria for monetary policy.

In Europe, the existing accounting rules (the IFRS principles) require full consolidation of special purpose vehicles when they are controlled by the sponsor institution, while in the US the accounting rules (the GAAP principles), as applicable until the reform introduced in 2010, allowed for the treatment of securitization as a true and effective sale also when the sponsor bank had the control of the SPV. Moreover, the *prudential requirements* applicable in Europe starting from 2007 (the Basel II rules)⁴ have established strict conditions for significant and effective risk transfer in order to permit the exclusion of securitized exposures from risk-weighted assets, while in the US the banks

⁴ The Basel II agreement was adopted in the EU by the Capital Requirements Directives, Dir. 2006/48 and Dir. 2006/49, so the new rules were applicable since the beginning of 2007, subject to a transitional period. Basel II was implemented also in the US, but later than in Europe and not for all institutions (mainly for large banks using internal risk models). More recently, in 2011 the Basel Committee approved a new accord on the international regulatory framework for banks, called Basel III. Then, in 2013, the EU adopted the legislative package called CRD4 to implement the Basel III agreement in the EU legal framework.

benefiting from the accounting treatment of a true sale were not expected to hold capital buffers with regard to securitization for prudential purposes (at least until the above mentioned reform of the accounting principles and the Dodd-Frank Act).

Also, a key factor to explain the risk retention behavior of European banks is related to the *collateral framework* of the Eurosystem, given that it recognizes a broad range of assets as eligible collateral for its liquidity operations. Also before the beginning of the crisis, the collateral framework for the Eurosystem⁵ credit operations included asset-backed securities, subject to certain requirements. In order to be eligible as collateral, the ABSs must be issued in the European Economic Area⁶ and denominated in Euro. Also, they must fulfill the general credit quality threshold of a “single A” both at issuance and over the lifetime of the transaction. In this respect, the ECB kept unchanged the minimum credit quality threshold for asset-backed securities also at the beginning of the crisis⁷, while introducing some technical refinements of risk control measures. In particular, it adopted some measures to control for the risks of eligible ABS collaterals, by requiring higher haircuts compared to other marketable assets and by applying graduated valuation haircuts for ABS products depending on their ratings. This explains why, even with a large set of eligible collaterals (in terms of credit ratings), banks still preferred structured products with the highest possible rating: pledging lower-rating collateral could imply higher haircuts on the repo and then higher cost of funding.

9.3. ECONOMIC INTUITION AND EMPIRICAL ANALYSIS

Based on the above motivating facts, this study is aimed at exploring the determinants of the decisions taken by originator banks for risk retention after securitization. In order to clarify the options available to an originator institution and to understand the implications of such decisions on the bank balance sheet, I will consider a simple illustration of the securitization process⁸.

⁵ Indeed, also other central banks outside of the Euro Area, like the Bank of England, accept ABSs as eligible collateral for their refinancing operations.

⁶ The European Economic Area (EEA) includes the member states of the European Union, plus Iceland, Liechtenstein and Norway.

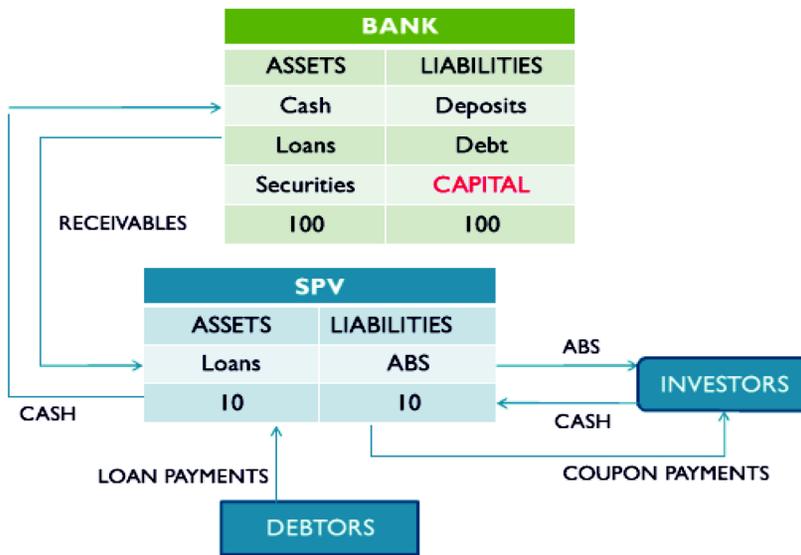
⁷ Indeed, in October 2008, the ECB amended its collateral eligibility requirements for marketable and non-marketable assets, by decreasing the minimum credit threshold from “A-” to “BBB-”, with the exception of asset-backed securities, for which the minimum threshold of “A-” remained in force.

⁸ Clearly, the above example assumes many simplifications from the accounting point of view. The key purpose of the example is to identify the main economic effects of different decisions on bank balance sheets and capital ratios.

9.3.1. Risk Retention and Bank Balance Sheets

Figure 3 presents the balance sheet of a hypothetical bank: to simplify, this bank has cash, loans and securities on the assets side, while it has deposits, debt and capital on the liabilities side, for a total amount equal to 100. Let us suppose that this bank creates and sponsors a special purpose vehicle, to which it transfers a given amount of loans, for example 10. The SPV finances the purchase of the asset pool through the issuance of asset-backed securities: indeed, the revenues collected from the investors in structured products are passed on to the bank in order to pay for the sale of receivables.

Figure 3. A stylized representation of the securitization process



Source: Author's elaboration

Given the accounting framework implemented in the EU⁹ through the IFRS principles, this SPV has to be consolidated by the bank holding, so the assets transferred to the SPV need to be included in the consolidated amount of total assets for accounting purposes. However, this general principle of accounting consolidation, even when it is fully implemented, doesn't imply automatically risk retention. Indeed banks can decide whether to transfer or to retain the credit risk in the securitization deal and in case of risk retention whether to provide an explicit or an implicit support. In all cases, this decision has significant implications for the balance sheets and for the capital position of originator

⁹ Switzerland is not a member of the EU, so it is not subject to the mandatory implementation of the accounting principles as for the EU countries. However it has implemented the IFRS.

banks. I briefly discuss these effects, with specific regard to the risk-weighted capital ratios, as regulated in the traditional Basel framework.

Firstly, if the bank transfers entirely the credit risk related to the securitized pool, it reduces the amount of risk-weighted assets and then, for a given capital buffer, it increases the risk-adjusted capital ratio.

Secondly, if the bank provides explicit support or retains some tranches of structured issuances and if this implies a securitization position for prudential purposes, the bank should hold *ex ante* some risk-based capital for the exposure. This means that, if the risk-weighted value of the securitization position is lower than the risk-based amount of the securitized assets¹⁰, the capital ratio is expected to increase. While, if the risk-weighted value of the securitization position is equal to the risk-weighted amount of the underlying assets, the capital ratio should remain unchanged.

Thirdly, if the bank offers some implicit support to a SPV without a previous contractual arrangement, the bank is not expected to hold *ex ante* any capital buffer. However, the implicit recourse implies an *ex post* increase in the amount of risk-weighted assets and then it determines a decrease in the risk-weighted capital ratio afterwards. Moreover, this negative impact of implicit recourse on capital ratios may be even larger if the bank has to stand some losses from securitization and then it has to reduce capital.

9.3.2. Empirical Approach

Based on this intuition, in order to explain how banks manage their balance sheets and their capital when they transfer or retain the credit risk, I analyze the effects of securitization issuances on the capital ratios of European banks, also for distinct categories of structured products. In particular, I estimate the impact of securitization issuances on two measures of prudential solvency, the risk-weighted capital ratio and the leverage ratio, also to exclude the effects of the risk weights. I control for some other bank-specific characteristics able to affect bank capital.

I use data from the Capital IQ Database¹¹ in order to match the tranche-level information on more than 17,000 structured products, issued by subsidiary

¹⁰ This is a quite relevant case in the empirical analysis, also for the implications of securitization in terms of regulatory arbitrage. Indeed, if a bank – by securitising a given amount of assets and retaining the structured tranches on balance sheet – can obtain an improvement in terms of risk-based capital ratios, this may induce substantial incentives to securitize for regulatory capital reasons. A similar argument is developed, with regard to the liquidity enhancement provided to ABCP conduits by US banks, in the paper by Acharya, Schnabl and Suarez (2013).

¹¹ I thank the Financial Regulation Division at the ECB for providing me with the access to the Capital IQ Database.

vehicles of European banks from 1999 to 2010, with the bank-level balance sheet data of the corresponding originator banks. In the baseline empirical specification, I estimate the following panel regression model by introducing bank and time fixed effects:

$$\begin{aligned} CAP_RATIO_{it} &= \alpha_i + \delta_t + \beta_X SECUR_X_{it} + \beta_Y SECUR_Y_{it} + \dots + \beta_Z SECUR_Z_{it} + \gamma CONTROLS_{it} + u_{it} \\ LEV_RATIO_{it} &= \alpha_i + \delta_t + \beta_X SECUR_X_{it} + \beta_Y SECUR_Y_{it} + \dots + \beta_Z SECUR_Z_{it} + \gamma CONTROLS_{it} + u_{it} \end{aligned}$$

The dependent variable is either the risk-weighted capital ratio (CAP_RATIO_{it}) or the leverage ratio (LEV_RATIO_{it}). The risk-weighted capital ratio is defined as the ratio of regulatory capital over risk-weighted assets, as in the traditional Basel framework. The leverage ratio is computed as the ratio of regulatory capital over total assets, following the definition of the new leverage backstop introduced by Basel III.

The main explanatory variables ($SECUR_X_{it}$, $SECUR_Y_{it}$, ..., $SECUR_Z_{it}$) are defined as the ratios of the outstanding amounts of securitization, for different categories of tranches (X, Y, ..., Z), over the amount of total assets. For the purpose of the analysis, the outstanding amounts of securitization are classified by collateral type or by credit rating. $CONTROLS_{it}$ is a vector of bank balance sheet variables and ratios, used to control for other factors able to affect capital ratios, such as asset quality, bank business model, bank profitability, funding liquidity position.

Based on this specification, the hypothesis I want to test is whether the incentives of the regulatory framework can be important determinants for the risk retention behavior. A key idea for the identification strategy of the analysis is that the above mentioned rules affect in a heterogeneous way different types of structured instruments.

For instance, the collateral framework defines the specific requirements of the products which are considered as eligible instruments, as they have to comply with some rating thresholds and they have to be backed only by certain types of underlying assets. This would imply that the issuance of products eligible as collateral (like AAA-rated ABSs) should induce a different impact on bank balance sheets and then on capital ratios than the issuance of instruments not satisfying the eligibility requirements (such as BBB-rated ABSs or CDOs).

A similar argument would hold also for prudential requirements, given that they assign different risk weights and then require different capital buffers for products with diverse ratings. Indeed, the issuance of high-rating products with very low risk weights would be expected to affect retention incentives in a different way than the issuance of medium-low rating products with high risk weights, because of the different amount of capital that banks should hold in case of retention.

I test the hypothesis about the impact of regulatory incentives by examining the effects of securitization on bank capital ratios for different types of structured products. The identification assumption is that, if regulation matters for affecting bank decisions, the issuance of structured products subject to a given regulatory regime X produces different effects on bank balance sheets and capital ratios than the issuance of securitization products subject to another regulatory treatment Y.

The rationale for this assumption is that the decisions of originator banks for the transfer or the retention of credit risk affect the capital amount and structure of these institutions and this effect can be observed from the changes in bank capital. Then, if the issuances of distinct classes of structured products implied different impacts on capital ratios and if such differential effects reflect the distinct regulatory treatment of one category of product with respect to another one, we can argue that the regulatory incentives were key determinants of the bank strategy for risk transfer or retention.

9.4. THE EFFECTS OF THE COLLATERAL AND PRUDENTIAL FRAMEWORK ON SECURITIZATION

In order to illustrate how the regulatory framework has affected the incentives of banks to securitize and manage the credit risk, I show that the differences in the regulatory treatment for distinct classes of structured products can actually explain the differences in the bank securitization behavior for diverse tranches, i.e. why banks decided to issue and to transfer or retain certain types of securitization rather than others. In this perspective, the classification of structured tranches by categories is useful to identify the distinct effects induced by collateral and prudential regulation for different types of products. In particular, I classify the outstanding amounts of structured products by asset type and by credit rating.

Given this classification, I review the key results in Scopelliti (2014), also by highlighting the regulatory incentives behind the decisions of the originator banks. Also, given that the crisis has strongly affected the securitization behavior of banks, I distinguish a pre-crisis period (from 2003 Q1 to 2007 Q2) and a crisis period (from 2007 Q3 to 2010 Q4).¹²

¹² In order to ensure the homogeneity in the accounting standards, I define the pre-crisis period from 2003 Q1 to 2007 Q2, because the IFRS principles were implemented in the European Union and in the European Economic Area starting from 2003.

9.4.1. Securitizations Classified by Asset Types

In the first part of the analysis, I consider the issuances of securitization classified by asset type. Securitizations may be backed by different types of assets, such as residential mortgages, home equity loans, personal loans, syndicated loans, corporate bonds or other structured products.

The type of underlying asset is relevant to determine the regulatory treatment, both for the collateral standards and for the prudential requirements. Firstly, only structured products backed by relatively transparent assets, such as Asset-Backed Securities based on residential mortgages, can be accepted as eligible collateral, while other more complex structured instruments backed by riskier assets, like Collateralized Debt Obligations backed by corporate bonds or other structured products, cannot be eligible as collateral for monetary policy operations.

Moreover, the type of asset may have some relevant implications also in terms of prudential regulation. Indeed, in a capital regulation perspective, especially if the bank decides to retain some credit risk for the issued tranches, the incentive to securitize depends also on the difference between the risk weight for the underlying assets and the risk weight for the structured products backed by those assets: in particular, if the risk weight for the (retained) securitization is lower than the risk weight for the securitized assets, banks may have incentive to securitize and retain also to improve their capital ratios. So the sign and the size of this wedge between the risk weight of the assets and the risk weight of the tranches explain why securitization may be more or less convenient for certain assets rather than for others.

In order to illustrate the economic relevance of the results and to provide a more immediate interpretation of the observed effects, Table 1 reports directly the estimates of the changes in the risk-based capital ratios and in the leverage ratios¹³, as they would result from a one-standard deviation increase in the securitization ratio (i.e. the ratio of outstanding securitizations over bank total assets) for distinct categories of structured products.

¹³ The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis. For an extensive presentation of the empirical results, with regard to the coefficients of the estimated regressions, see Scopelliti (2014).

Table 1. Securitizations Classified by Asset Types

VARIABLES	2003Q1-2007Q2		2007Q3-2010Q4	
	Cap_Ratio	Lev_Ratio	Cap_Ratio	Lev_Ratio
Collateralised Bond Oblig. (CBO)	+0.791 ***	+0.297 ***	-0.37	-0.076
Collateralised Debt Oblig. (CDO)	+0.361 ***	+0.162 **	+1.177	+0.286
Personal Loans	+0.229 ***	+0.099 **	-0.026	-0.037
Residential Mortgages	+0.085	-0.031	+0.782 **	+0.073
Home Equity Loans	+0.014	-0.043	+0.757 **	+0.177 *
Credit Card Receivables	-0.860 ***	-0.257 **	+0.074	0.102

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In the *pre-crisis period*, banks issuing structured products showed in general an improvement in their risk-based capital ratios, mostly because they were using securitization as a credit risk transfer technique to remove credit risk from their balance sheets. These results hold both for complex products not eligible as collateral, like CDOs or CBOs¹⁴, and for simpler eligible products, such as ABSs backed by personal loans. Indeed, at that time banks didn't have particular liquidity needs, or at least they could exhaustively satisfy their liquidity demand through the wholesale market, so they didn't have to retain structured products as a way to increase their collateral availability. Plausibly, this transfer of credit risk was also implemented through the derecognition of some underlying assets for accounting purposes, given that we observe also some increase in the leverage ratio (due to the decrease in the consolidated amount of total assets). However, the magnitude of such effect in the leverage ratio is much smaller than the size of the corresponding impact on the risk-weighted capital ratio.

The only exception to this risk transfer approach, for the pre-crisis period, concerns structured products backed by credit card receivables: in this case, the issuance of securitization is associated with a significant decline in the risk-weighted capital ratios (and to a minor extent in the leverage ratio). This effect can be interpreted as a consequence of the implicit recourse which is often provided by originator banks for credit card securitizations.

During the *crisis period*, when banks retained almost entirely the tranches of structured products, the issuances of ABSs backed by residential mortgages and home equity loans induced a substantial improvement in the risk-weighted capital ratios, but with none or very limited impact on the leverage ratios. No significant effects are observed for other categories of products, also because their volumes

¹⁴ CBOs stand for Collateralized Bond Obligations. They are structured products backed by high-risk and high-yield bonds.

of issuances were severely contracted. Indeed, the issuances of securitization during the crisis were mostly focused on relatively simple products, like ABSs based on residential mortgages and home equity loans, as they were subject to a relatively favorable regulatory treatment, both because eligible as collateral and because charged with low risk weights. In such cases, the risk weight for the structured products could be lower than the risk weight for the underlying exposures. For this reason, banks issuing ABSs backed by such underlying assets and retaining them on balance sheet could even get an increase in their risk-weighted capital ratios (as shown in the results of the analysis).

Looking at the effects of a one-standard deviation increase in the securitization ratio, the empirical exercise also provides a quantitative idea of the regulatory arbitrage incentives driving the securitization process: the different sizes of the changes in the risk-weighted capital ratios over the two periods, as implied by the securitization of diverse types of loans, would suggest why banks preferred to issue certain categories of structured products rather than others, such to maximize the improvement in capital ratios due to the transfer or the retention of the credit risk.

In the pre-crisis period, when banks were transferring the credit risk of the underlying assets, the rise in the risk-weighted capital ratios is proportional to the credit risk of the underlying assets: the higher is the credit risk of the securitized assets, the larger is the improvement in the risk-adjusted solvency ratios. For instance, an average bank increasing the outstanding amount of securitization issuances of CBOs (typically high-risk products) would have increased its capital ratio by 0.79 points, while a bank expanding its issuances of ABSs backed by personal loans would have raised its capital ratio by 0.23 points. On the contrary, in the crisis period, a one-standard deviation increase in the securitization ratio for residential mortgages and home equity loans is associated with a rise in the capital ratio respectively of 0.76 and 0.78 points, and with none or much smaller change in the leverage ratio (no significant effect for residential mortgages and an increase of 0.17 points for home equity loans). This positive effect on prudential solvency, as driven by the risk weights in the existing capital regulation, explains why banks decided to securitize certain types of credit claims and to retain the issued tranches.

9.4.2. Securitizations Classified by Credit Ratings

In the second part of the study, I consider the issuances of structured products, classified by credit ratings. In particular, I focus on some rating buckets which are specifically relevant for regulatory reasons and for investment strategies, like the AAA, the AA and A, the BBB tranches, and I compare the sign and the magnitude

of the effects on capital ratios for distinct product classes. Also, as before, I present a table (Table 2), where the reported results illustrate the estimates of the impact of a one-standard deviation increase in the securitization ratio for various rating buckets¹⁵.

Credit ratings are important to determine the regulatory treatment of structured products, both for collateral reasons and for prudential purposes. Indeed, in the Eurosystem framework at the time of the analysis, only structured products with at least a single A rating could be pledged as collateral, while other instruments with lower rating could not be eligible in the refinancing operations. Also, in the Basel II securitization framework, founded on the rating-based approach, credit ratings are relevant to determine the risk weights for securitization positions: the higher is the credit rating of the product, the lower is the risk weight assigned to the securitization tranche, and then the lower is the capital buffer that the bank has to keep for that exposure.

Table 2. Securitizations Classified by Credit Ratings

VARIABLES	2003Q1-2007Q2		2007Q3-2010Q4	
	Cap_Ratio	Lev_Ratio	Cap_Ratio	Lev_Ratio
AAA	+ 0.849 ***	- 0.104	- 0.416	- 0.003
AA & A	- 0.613 ***	- 0.081	+ 0.817 **	+ 0.066
BBB	- 0.333 **	- 0.144	- 1.276 ***	- 0.102

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

In the *pre-crisis period*, banks issuing AAA products showed a positive and significant increase in their risk-weighted capital ratios, but no significant change in their leverage ratios. Indeed, they were transferring the credit risk through securitization and so they could exclude the underlying pool from their risk-weighted assets¹⁶, even if the assets were included in the balance sheets of some controlled special purpose vehicles. This result is important also to compare the adequacy of different measures of prudential solvency in reflecting the build-up of leverage risk through securitization. While the evolution of the risk-weighted capital ratio seems to show even an improvement in prudential solvency, the observation of a pure leverage ratio doesn't display any change in the actual capital position. In particular, a one-standard deviation increase in the

¹⁵ The results in bold characters denote the effects which correspond to statistically significant coefficients in the regression analysis. For a wider presentation of the results and of the coefficients, also with regard to the whole scale of credit ratings from Standard and Poor's, see Scopelliti (2014).

¹⁶ At that time, before the introduction of Basel II, there were not strict conditions requiring a significant and effective risk transfer to exclude securitization exposures from the risk-weighted assets for prudential purposes.

securitization ratio for AAA products is associated with a rise in the risk-based capital ratio equal to 0.85 points, but with no change in the leverage ratio.

During the *crisis period*, structured products were heavily downgraded, because of the concerns related to the creditworthiness of the underlying assets. This massive process of downgrading has particularly affected the previously AAA rated products; for the same reason, during that period the new issuances of securitization were almost never rated as AAA, and at most they were assigned a AA or a A rating. The results suggest that banks issuing AA or A securitizations during the crisis obtained a significant increase in their risk-weighted capital ratios, also while retaining most of the tranches, because of the favorable prudential treatment assigning low risk weights for high ratings.

The results of the analysis also provide some evidence of *implicit recourse* for some tranches of securitization which were subject to an unfavorable regulatory treatment, either because they were not eligible as collateral or because they were charged with high risk weights, or also for both reasons at the same time. The BBB products provide an interesting example of this case, given the strong negative effect of securitization on bank capital ratios. Indeed, BBB is the lowest investment-grade rating in the Standard and Poor's scale, which implies that investors might not be interested in purchasing these tranches, given that a one or two-notch downgrade may move them from an investment grade to a non-investment grade. Then, given the difficulties in placing such products on the market, originator banks may be induced to provide some implicit support to securitization vehicles. This would explain the negative effect of securitization on risk-based capital ratios, which is observed both before and after the crisis.

Also, the magnitude of this negative effect increases substantially from the pre-crisis period (-0.33) to the crisis period (-1.28), for two reasons which can be referred to the impact of regulatory incentives. Firstly, in a period when the demand for structured products was mostly driven by collateral purposes, BBB tranches could not be pledged in the liquidity operations with the Eurosystem, so financial institutions were not interested in these products and originator banks were constrained to intervene in support of their securitization vehicles.

Secondly, in the Basel II securitization framework, implemented in Europe starting from 2007, BBB tranches were heavily subject to a "cliff effect" in prudential regulation. In the rating-based approach, the risk weights are assigned to structured products on the basis of their credit ratings: however, the relationship between credit risk and risk weight embedded in the Basel weighted system is non-linear, in fact it may be described as a convex function (i.e. the marginal increase in risk weight is quite modest for high-rating products but it rises for riskier products). This implies that, for medium-low rating products, such as BBB tranches, an increase in the credit risk is associated with a more than

proportional rise in the risk weight¹⁷, with the consequence that BBB tranches are strongly penalized by prudential regulation.

9.4.3. Summary and Interpretation of the Results

The empirical results show that, especially during the crisis period, the decisions of originator banks about what types of structured products to issue and whether to transfer or to retain the credit risk of the underlying assets were significantly affected by the regulatory incentives induced by the collateral and prudential framework.

In particular, also because of the additional liquidity needs due to the disruptions in the interbank market, banks used securitization of existing loans in their balance sheets in order to create new collateral, which could be pledged in the refinancing operations of the Eurosystem. For this reason, in the period between mid-2007 and 2010, banks issued and retained mostly those structured products which could fulfill the eligibility standards of the Eurosystem. This happened also because, at that time, the possibility to post directly credit claims as collateral for the refinancing operations was very restricted. Later on, when at the end of 2011 the ECB allowed national central banks to accept additional performing credit claims as collateral, the incentive to use self-securitization as for collateral creation was sensibly reduced and since then the retention rate has substantially decreased (as well as the volumes of issuances have diminished).

Moreover, given that in a repo transaction eligible securities are only temporarily transferred to the counterparty¹⁸, banks had to keep the retained asset-backed securities on balance sheet and then they had to hold some capital buffers for such securitization positions. As an implication of this, credit institutions issued and retained prevalently those tranches which were also subject to a favorable prudential treatment, as they were charged with lower risk weights. In a few cases, banks could also exploit some positive wedge between the risk weight of the underlying asset and the risk weight of the securitization position to improve their risk-based capital ratios.

The “new” usage of securitization by European banks during the crisis, not anymore as a credit risk transfer technique, but as a way to increase their

¹⁷ For a more precise idea of the rating scale and of the corresponding risk weights in the Basel II Securitization Framework, see BCBS (2006). Also, for tranches below BB-, the securitization framework require the full deduction of the exposure tranche from the computation of bank capital. Then it follows that the cliff effect is particularly evident for rating classes like BBB.

¹⁸ During the period considered for the analysis, the Eurosystem was conducting both main refinancing operations (MROs), with a maturity of one week, and long-term refinancing operations (LTROs), with a range of maturities from 1 month to 12 months. Indeed, the 3-year LTROs were implemented only in December 2011 and February 2012. This doesn't exclude that the same eligible security can be used by a bank as collateral in various consecutive repo transactions with the central bank.

availability of eligible collateral, has then affected the selection of the underlying assets for the securitization pool. As the empirical exercise based on the estimation results would suggest, before the crisis banks were incentivized to securitize high-risk assets in order to obtain a larger increase in their capital ratios, because of the transfer of credit risk, while during the crisis banks preferred to use low-risk assets for the securitization pool, as they had to retain the credit risk of the exposures. Overall, the combination of incentives due to the collateral and prudential rules induced banks to issue more simple and transparent structured products, possibly based also on less risky assets, although this positive effect was mainly a consequence of the decision to retain tranches for liquidity and collateral purposes.

9.5. THE IMPLICATIONS FOR CENTRAL BANK AND REGULATORY POLICIES

The empirical evidence presented in this study points out that the bank strategies for securitization can be decisively shaped by the regulatory incentives due to the monetary policy collateral standards and to the prudential capital requirements. This is particularly important also for the current policy initiatives undertaken by central banks and regulatory authorities, in light of the revived interest in securitization – particularly in Europe – as an instrument to encourage bank lending and promote risk diversification, particularly in financing private non-financial corporations. In this perspective, the experience of the risk retention of Asset-Backed Securities by European banks, as analyzed in this work, can provide some interesting lessons, in particular on two aspects, namely the implementation of monetary policy and the ongoing reforms of prudential regulation.

9.5.1. Monetary Policy Collateral Framework and ABS Purchases

For the implementation of monetary policy, the evidence on the risk retention in securitization suggests that the collateral framework for central bank operations may have some micro- and macro-prudential implications for bank strategies, as it affects the risk management of credit institutions. Precisely, banks may be induced to issue and retain specifically some tranches of structured products in order to fulfill the eligibility requirements and then to signal large availability of eligible collateral to the market.

From an incentive point of view, this evidence on the past experience with the collateral framework for structured products may provide some possible policy

implications also for the design and the impact of other unconventional measures related to securitization, such as the outright purchases of asset-backed securities, although taking into account the differences in the programs. Indeed, the new ECB program for ABS purchases (ABSPP)¹⁹, being implemented by the Eurosystem starting from the 4th quarter of 2014, is aimed to the outright purchase of senior and guaranteed mezzanine tranches of ABSs in both primary and secondary markets.

For the purposes of the program, asset-backed securities are subject to the same eligibility rules of the Eurosystem collateral framework and in addition they have to be backed by loans to private non-financial corporations. So, given the homogeneity in the eligibility criteria, the evidence observed for the collateral framework would suggest that banks tend to actively respond to this type of incentives when developing their plans for the issuances of structured products. For the same reason, also the ABS purchase program could induce significant incentives for banks to issue and to retain, at least for some part of the overall issuance²⁰, those products fulfilling the eligibility criteria, i.e. asset-backed securities based on corporate loans. Then, given this effect on bank incentives, the program could contribute to revive certain segments of the securitization market and to encourage a reallocation of the credit risk for corporate loans from bank balance sheets, by allowing originators to get funding and then potentially to provide new lending.

However, to see if this program will be effective also with respect to the latter scope, i.e. fostering new lending to firms, this will depend on whether banks will securitize existing loans or new loans. In principle, the operational details of the program allow for both and also the evidence discussed in this study, at least for the crisis period under consideration, shows that banks were securitizing mostly outstanding loans on their balance sheets. But then, for the implementation of the new ABS purchase program, additional incentives could actually induce banks to securitize new loans: firstly, nowadays the market for ABSs backed by claims to non-financial firms in Europe is quite tight, so banks might need to extend and securitize additional loans if they want to increase the amount of assets available for ABS origination; secondly, the incentives coming from the simultaneous

¹⁹ The decision on the operational details of asset-backed securities and covered-bond purchase program was adopted by the ECB Governing Council on October 2nd, 2014. For more details, see the press release and the technical annex at http://www.ecb.europa.eu/press/pr/date/2014/html/pr141002_1.en.html. In particular, according to the above decision, in order to qualify for the purchase program, ABS senior tranches must be: 1) eligible under the Eurosystem collateral framework for monetary policy; 2) backed by credit claims against private non-financial entities resident in the euro area – either legacy or newly originated. The eligibility criteria for guaranteed mezzanine tranches of ABSs will be communicated at a later stage.

²⁰ The annex on the operational details also specifies, with regard to the purchase of senior ABSs, that the Eurosystem will purchase at most an issue share of 70% per ISIN and that, for fully retained securities, Eurosystem purchases would be possible subject to some participation by other market investors. So banks may be incentivized to retain a large part of the senior tranches, but not all of them, in order to qualify for the purchase program.

implementation of the Targeted Long-Term Refinancing Operations²¹ (TLTROs) should also encourage banks to provide new lending, given that the amount of liquidity which can be drawn from the Eurosystem under this funding facility is computed on the basis of the new lending flows provided to private non-financial corporations.

Finally, before deriving implications from past experience, two main technical differences between the ABSPP Program and the Eurosystem Collateral Framework should be underlined, and they are related to the duration of the purchase and to the driver of the initiative. Indeed, the new ABSPP program implies a purchase of ABSs on a permanent basis and subject to a central bank initiative, while the pledge of collateral for Eurosystem credit operations entails a temporary purchase of ABSs (for the maturity of the repo transaction) and based on the counterparty's initiative. In particular, the fact that the outright purchases of ABSs are driven by the Eurosystem's initiative should play in favor of a stronger effectiveness of this purchase program in affecting bank securitization incentives. Indeed, while the issuance of retained securitization to be used as collateral was induced essentially by bank liquidity demand, such that banks used this opportunity only when they needed further collateral (in crisis times), the amount of outright ABS purchases will be determined by a central bank decision, with two important consequences for the Eurosystem. Firstly, by driving directly the demand for ABS products, it can select what types of structured products to purchase, also within the range of eligible products. Secondly, by deciding the amount of purchases, the Eurosystem can control more directly the size of its balance sheet and then the process of money creation due to the asset purchases.

9.5.2. Reforms of Prudential Regulation

The work offers some insights also for the current reforms of prudential regulation, especially for the retention requirements on securitization and for the introduction of the new leverage ratio.

Firstly, I consider the possible effects of the *new retention requirements* on the incentives driving the securitization decisions of banks. The recommendations formulated by the Financial Stability Board for the regulation of the shadow banking sector indicate such requirements among the key measures to address the risks for financial stability in the area of securitization.

²¹ The Targeted Long-Term Refinancing Operations (TLTROs), announced by the ECB on June 5th, 2014, and implemented for the initial allowance starting from September and December 2014, are Long-Term Refinancing Operations – with final maturity in September 2018 – subject to a conditionality scheme, aimed at providing new lending to private non-financial entities.

On one hand, the retention requirements would help solving the problem of incentive misalignment between originator and investors: indeed the lender, by keeping an economic interest in the securitized assets, would be induced to choose better borrowers at the time of loan applications and to monitor them more closely during the duration of the loan. On the other hand, as the results of the empirical analysis suggest, the effective impact of the retention requirements (as well as of any reform of financial regulation) on the risk transfer behavior of originator banks would strongly depend on the interaction of the new introduced rules with the existing regulatory framework, in particular the prudential standards and the collateral criteria for monetary policy.

Indeed, if the existing prudential and collateral rules already provide significant reasons for the retention of structured products, the new requirements may not add any further incentive, as banks would retain anyway some credit risk, presumably more than a 5% net economic interest in the securitization. On the contrary, if there is no other regulatory incentive to retain them, the new retention requirements can provide an effective skin in the game mechanism, to improve the quality of the underlying asset pool. However, this may not exclude – for the non-retained part – some space for potential regulatory arbitrage incentives, as observed in the discussion of the empirical results. Also, the requirements leave ample discretion to banks as to the determination of the credit risk to retain (e.g. vertical vs. horizontal slices).

Moreover, the empirical evidence provides some positive implications about the introduction of the new *leverage ratio* in the Basel III framework, as a backstop to identify the build-up of excessive leverage. The results show that the issuance of a given category of structured products may produce different effects on the risk-adjusted capital ratio and on the leverage ratio, where such differences are mainly driven by the risk weighted system. For this reason, the analysis supports the idea of the complementarity between the leverage ratio and the risk-based capital ratio in prudential regulation: by providing both benchmarks to measure bank solvency, the new system should also reduce the margins for regulatory arbitrage that credit institutions could exploit in the past. Indeed, the evolution of the leverage ratio can either reveal some additional information not observable from risk-based ratios or even contradict the evidence on the effective bank solvency based on the evaluation of risk-based capital.

9.6. CONCLUSIONS

This article, based on the new findings in Scopelliti (2014), discusses the role of the regulatory framework, and particularly of monetary policy collateral standards and of prudential capital requirements, in affecting the securitization

decisions of originator banks, with specific attention to the risk retention behavior of European banks before and after the crisis. Using a tranche-level analysis to identify the impact of different regulatory incentives, I find that: 1) in pre-crisis period banks used securitization to increase their risk-based capital ratios through the transfer of credit risk; 2) in the crisis period, banks issued and retained structured products to pledge them as collateral with the Eurosystem; 3) the retention behavior in the crisis time was focused on structured products with a favorable regulatory treatment (eligible as collateral and subject to low risk weights); 4) banks provided implicit recourse for securitizations not eligible as collateral and penalized by prudential regulation.

The results of the study may be relevant in a policy perspective for at least two aspects. Firstly, the study shows – specifically for European banks – that some decisions related to monetary policy implementation, such as the determination of the eligible collateral for the Eurosystem operations, may have significant micro- and macro-prudential implications, because of their effects on the risk management and on the securitization behavior of originator banks. Also, the previous experience for the impact of the collateral framework on securitization can offer useful lessons for the design and for the effects of new unconventional measures, such as the outright purchases of asset-backed securities, as recently decided by the ECB.

Secondly, the work suggests some insights for the current reforms of prudential regulation, as the evidence supports the introduction of the new leverage ratio as a complement to the risk-based capital ratio. Also, the effectiveness of the new retention requirements on securitization will strongly depend on their interaction with the existing collateral and accounting standards.

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