Financial Innovation and Market Dynamics

The Role of Securities Regulation

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Università Commerciale
Luigi Bocconi

CAREFIN
Centre for Applied
Research in Finance

CENTRO BAFFI
Paolo Baffi Centre
on Central Banking
and Financial Regulation

E-mail: r.masera@unimarconi.it.

Abstract

In the aftermath of the 2007-2008 financial crisis, a wide consensus developed on the idea that the global financial system requires a good, well-designed and integrated infrastructure, notably a sound and consistent regulatory and oversight framework. The well-functioning of the infrastructure depends, in turn, on sound and sustainable economic policies at national and international level.

The aim of this paper is to provide a brief critical survey of the state of implementation of financial systems reforms, adopting the holistic approach of the de Larosière Report. The implications for financial stability of the new Basel standard approach are examined and the shortcomings and dangers of underlying risk models critically assessed.

The analytical framework presented, based on the distinction of exogenous vs. endogenous risk, is used to interpret the interaction of sovereign and banking stresses in the Eurozone. The two fallacies of composition behind fiscal and regulatory policies, which undermine recovery prospects in the area, are explored, and ways and means to break the destabilising loop are suggested.

JEL Classification: E58, G18, G01, G14.

Keywords: Global Financial System, Financial regulatory reform, Basel 3, endogenous risk, liquidity, base monetary reserve, ECB, financial innovation, sovereign and bank risk.

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1. INTRODUCTION AND SUMMARY

The leitmotiv of this paper is that the global financial system requires a good, well-designed and integrated infrastructure to fulfil its fundamental role of efficient allocative bridge between saving and investment. The well-functioning of the infrastructure depends, in turn, on sound and sustainable economic policies at national and international level, i.e. on effective macroprudential supervision. A holistic approach is thus required, engineered and managed by taking into account not only the workings and functions of the nodes, but also the dynamic interconnections of complex networks.

In this framework the interconnectedness of banking and securities regulation and surveillance is of paramount, growing importance, notably in view of the workings and development of derivative markets and instruments. The *a-priori* assumption behind this approach is that the financial system requires sound, consistent regulatory frameworks (including accounting standards) and oversight. It cannot be left entirely to self-regulation and market adjustment, but regulation must be based on appropriate incentive structures and cannot be prone to moral hazard. As will be argued, this approach is not postulated upon irrational market behaviour. It does, however, assume that market efficiency in strong form does not generally hold.

In the aftermath of the 2007-2008 financial crisis, a wide consensus developed on these lines of thought, which formed the basis for reform of financial frameworks in Europe and in the United States. Paragraph 2 of this paper contains a brief critical survey of the new systems, adopting the perspective of the de Larosière Report. It indicates that the initial unitary approach has apparently been lost on both sides of the Atlantic. The driving force of the current regulatory and supervisory approaches has again become the Basel capital standard (Mark 3), which represented the pillar stone of financial surveillance in the past quarter of a century. But, in the United States, the standard is directed to few, very large, internationally oriented banking groups. In Europe, instead, through CAD (*Capital Adequacy Directive*) and EBA (*European Banking Authority*), the Basel accord is all pervasive and has distracted attention from other fundamental components of the process of revision of the financial infrastructure. This is notwithstanding the much larger role of capital market financing of the real economy, as against to bank based financing, in the United States compared to Europe.

In the third paragraph the shortcomings and dangers of the current surveillance approach are highlighted. To this end, the analytical distinction between endogenous, exogenous and systemic risk is used. Exogenous risk represents volatility which can be assessed and measured in terms of fundamental analysis. Endogenous risk is more complex and difficult to measure; it comes from

behaviours and shocks within the financial system, which can have amplifying ripple effects leading to systemic risk.

Current risk models – notably VaR (*Value at Risk*) – are critically assessed and the weaknesses of underlying statistical assumptions highlighted. Reference is made to two main analytical approaches: one of a "technical" nature, developed by Kurz (1997), and the second of a "fundamental" character, developed by Danielsson, Shin *et al.* (2011). This analytical framework helps bringing to the fore a crucial flaw of the Basel capital standard, and its potential destabilising role. It is also recalled that the Basel rules do not capture the intrinsic role of derivatives (notably credit default swap) as instruments to shift promises in the financial system and thereby to activate regulatory arbitrage.

This model is used in paragraph 4, to examine the interaction of country and banking risk in the Eurozone. In a monetary union with a single central bank, but decentralised fiscal policies and sovereign debts, default-free public financial instruments do not exist. Yet the Basel approach to liquidity did not take this point into account and has not developed a correct framework to liquidity risk. The two fallacies of composition behind fiscal and regulatory policies, which undermine recovery prospects in the Eurozone, are examined. Ways and means to break the destabilising loop are indicated, notably in terms of financial surveillance policy. The various points are summarised in the final concluding paragraph.

2. THE NEW REGULATORY FRAMEWORK IN EUROPE AND IN THE US, AFTER THE 2007-2009 FINANCIAL CRISIS

The financial crisis, that began to unfold in the summer of 2007 in the United States and led to the worst economic downturn after the Great Depression, with huge direct and indirect costs to public finances, brought to the fore great weaknesses in the system of financial surveillance worldwide. Macroeconomic imbalances were major underlying factors of the crisis, together with the a-critical celebration of the "invisible hand" and of markets' efficiency, rationality and self-corrective properties. The need was, therefore, recognized to bring together a better understanding and adjustment of macroeconomic and financial issues. In particular, financial surveillance should be better designed and implemented around sustainable macroeconomic developments.

To ensure a good regulatory and supervisory framework, major changes had to be made to the whole regulatory framework, which behind the crisis was based on interrelated elements that were fundamentally flawed. Both the EU and the US are implementing an improved regulatory environment. The approach has two main common objectives: first, decreasing the likelihood of a similar financial crisis reoccurring; and second, ensuring that the costs of any failure of financial

institutions are not borne by taxpayers, but by the failing bank and the financial sector more generally. To this end, moral hazard (i.e. wrong incentive structures) should be drastically reduced. In turn, this requires that resolution procedures ensure that even systemically relevant financial institutions can be allowed to fail in an orderly manner.

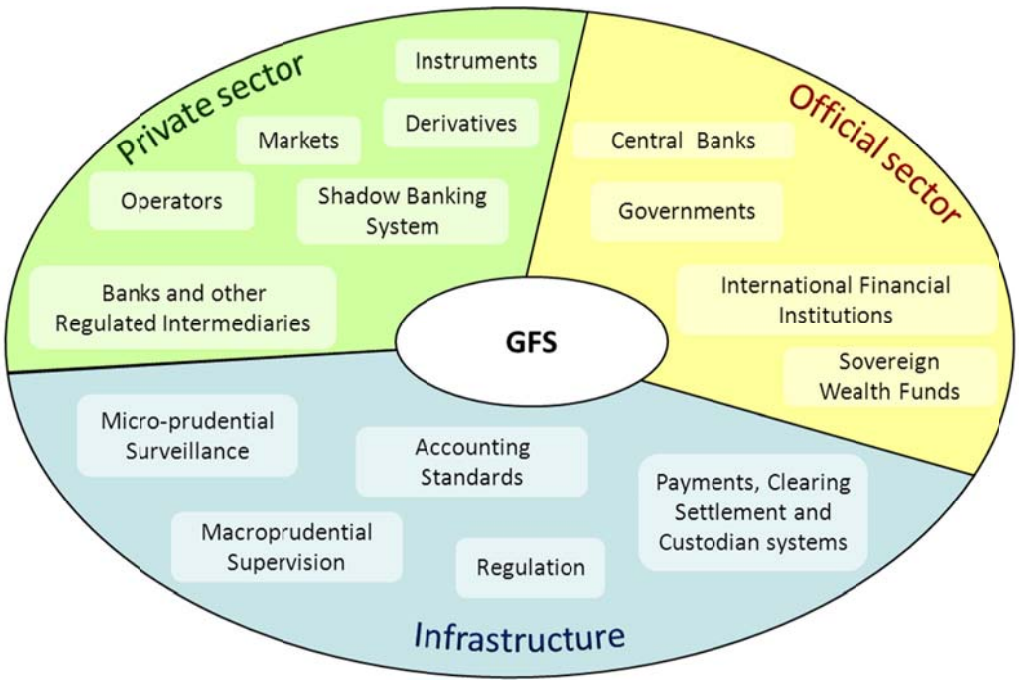
The *Dodd-Frank Act* (July 2010) represents, in principle, the most important change to financial regulation in the US since the Great Depression: it impacts all federal supervisory agencies and affects all major aspects of the financial services industry. The EU, in spite of an early start through the endorsement of the *de Larosière Report* (February 2009), is lagging behind in terms of a paradigm shift in the European financial framework. As will be indicated, the implementation of the new system encounters delays.

2.1. The new surveillance systems in Europe and in the US

The Global Financial System (GFS) is an essential structure to support the global economy, a central network to achieve the economy's potential at world level. It is a worldwide integrated dynamic innovative network of interactive components (Chart 1): intermediaries, securities (products), markets, private and public operators (which comprise governments and central banks), derivatives.

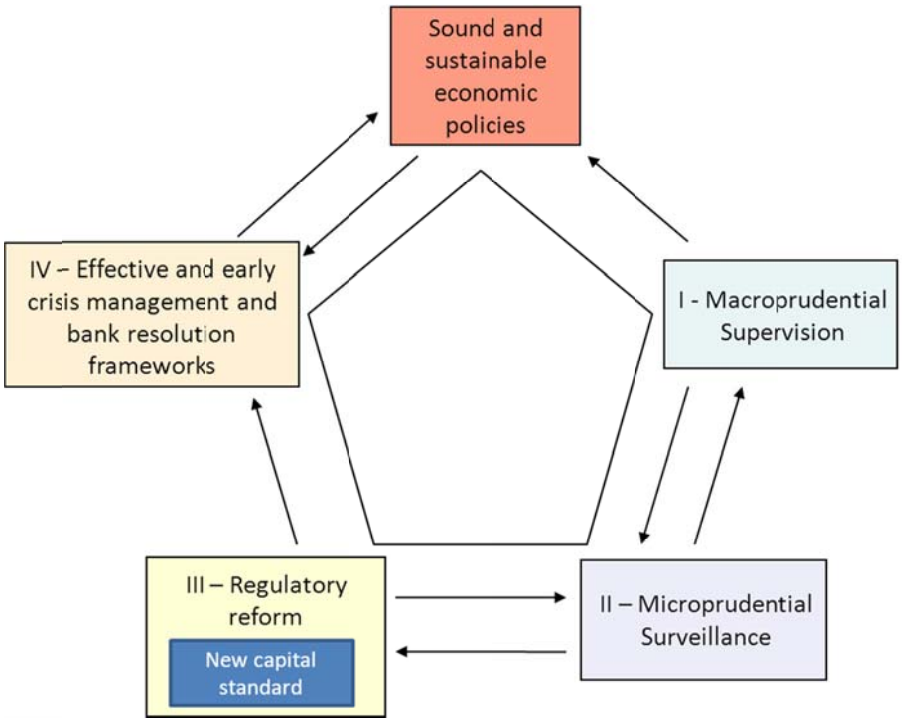
Regulation and supervision, accounting standards, payments, clearing & settlements, custodian systems represent the system's infrastructure.

Chart 1 - The global Financial System: main components



To design a new financial architecture in Europe, consistent with global developments and international trends, the *de Larosière Report* examined the causes of the crisis and underlined the importance of sustainable economic policies and of macro-prudential oversight, also on economic policies, for financial stability. The Report was focused on the connections between the causes of the financial turmoil and the suggested elements of regulatory and supervisory reform. To this end, it presented a new interactive framework (Chart 2), which superseded the traditional EU Lamfalussy scheme.

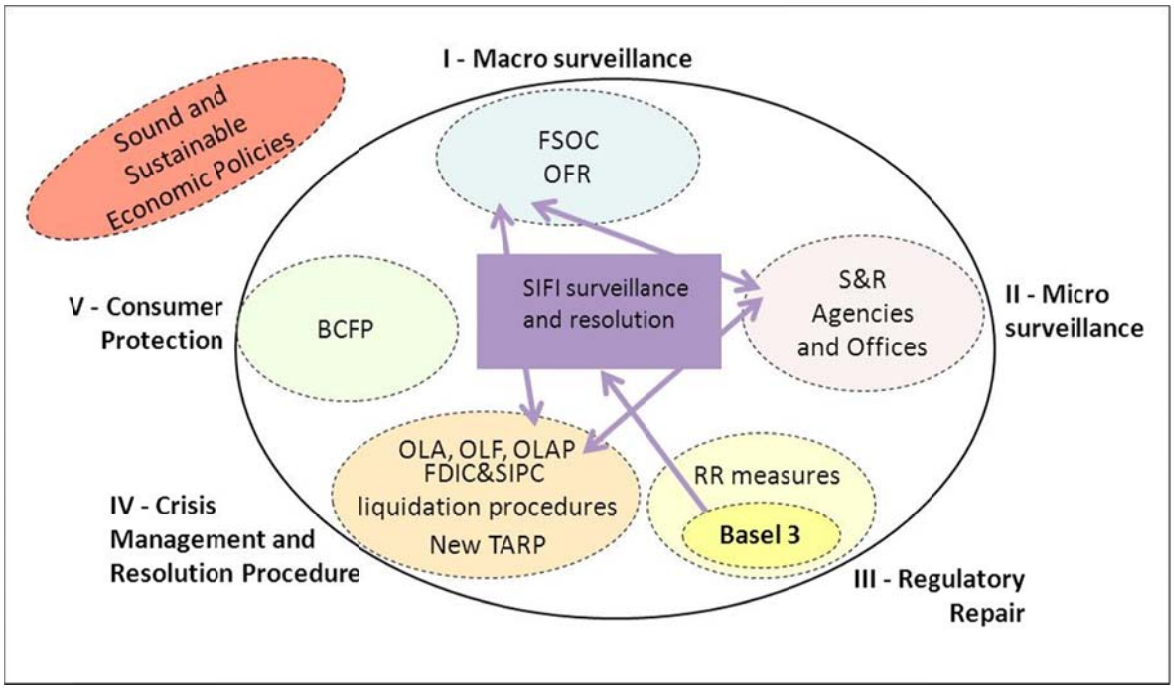
Chart 2 - The interactive model of the de Larosière Report to financial stability



The new US institutional financial framework is constructed around building blocks which should operate in an integrated and cooperative way, but with distinct responsibility and accountability, under a clear guidance of the Treasury (Chart 3).

The blocks have been grouped here following the logical thread outlined in the de Larosière Report. Systematically Important Financial Institutions (SIFIs) surveillance and resolution play a key role in the Dodd-Frank Act.

Chart 3 - The new US institutional financial framework

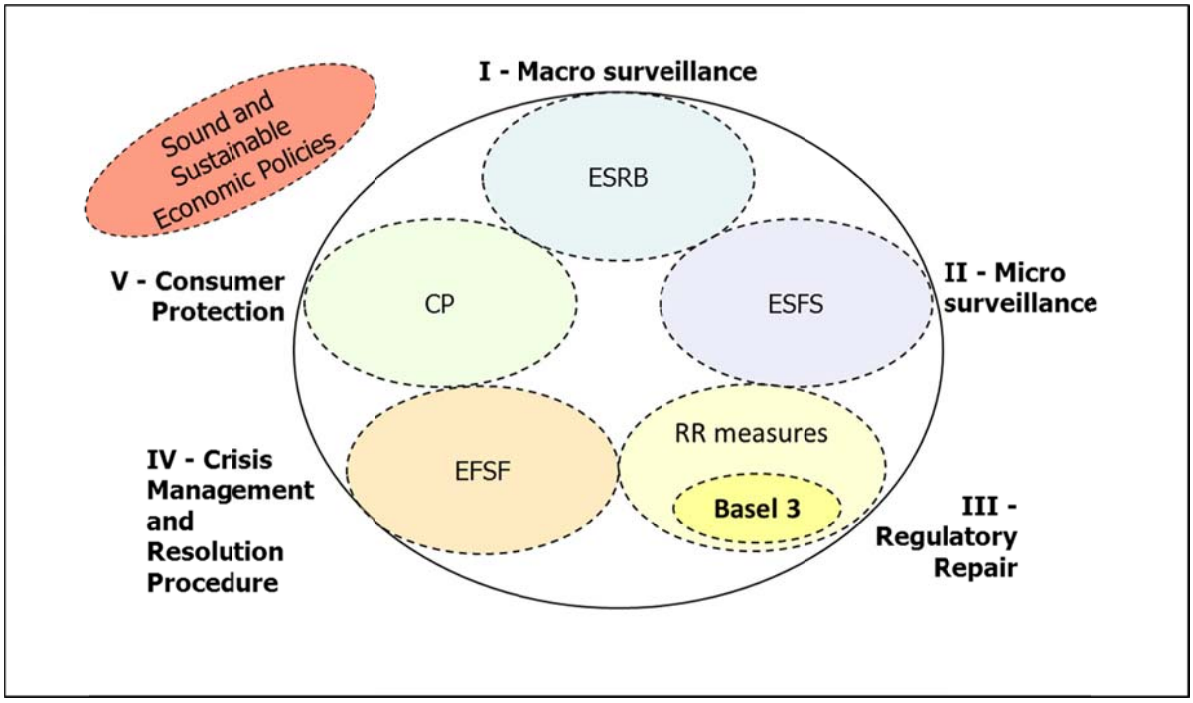


Notes: Acronyms: Financial Stability Oversight Council (FSOC); Office of Financial Research (OFR); Supervisory and Regulatory (S&R); Regulatory Reform (RR); Orderly Liquidation Authority (OLA); Orderly Liquidation Fund (OLF); Orderly Liquidation Authority Panel (OLAP); Federal Deposit Insurance Corporation (FDIC); Securities Investor Protection Corporation (SIPC); Troubled Asset Relief Program (TARP); Bureau of Consumer Financial Protection (BCFP).

The new European financial framework can also be presented as being structured around the same building blocks, which should operate in an integrated and cooperative way. The new structure is outlined in Chart 4 below[1].

[1] For a critical analysis of US and EU financial reforms see Masera (2010). In the United Kingdom, an Independent Commission on Banking was created in June 2010 and made recommendations on banking reform to the Government. See Vickers Report (September 2011).

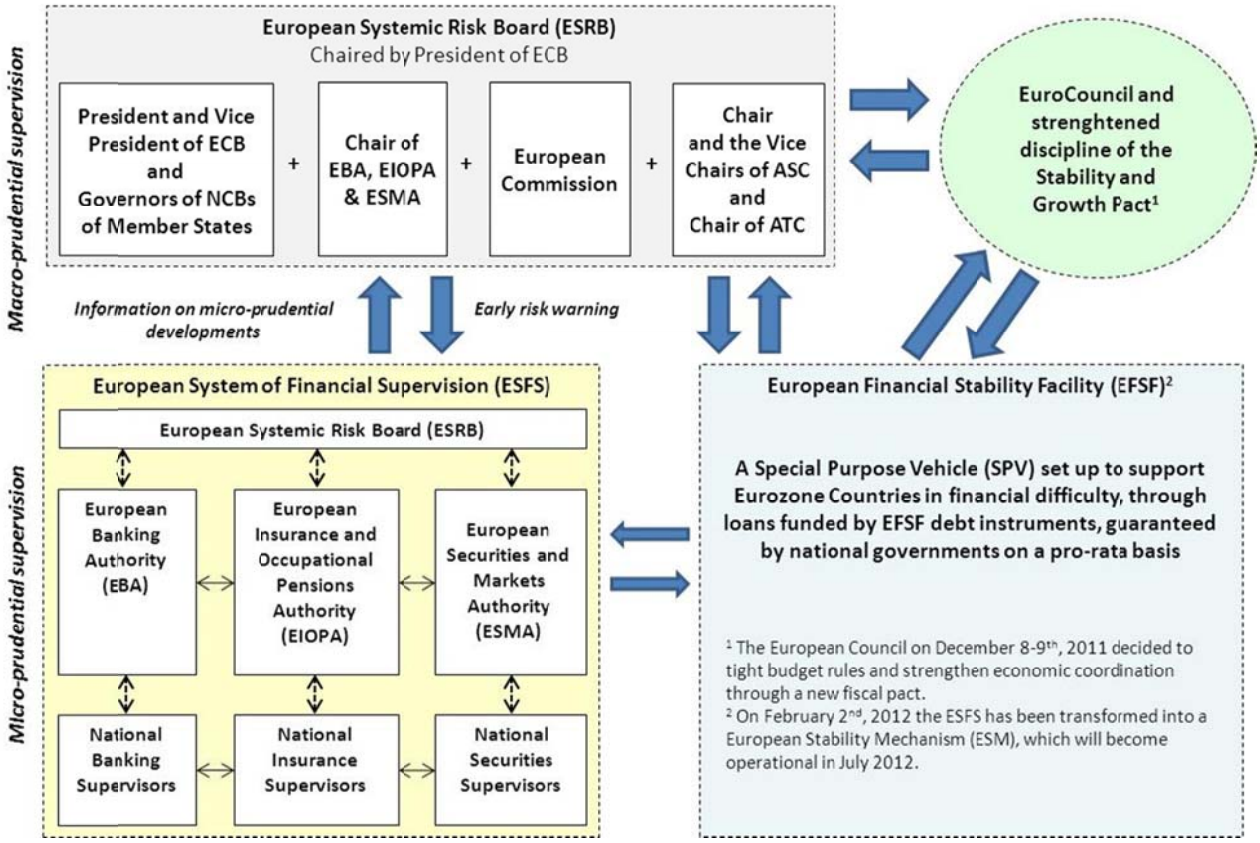
Chart 4 - The new EU framework for safeguarding financial stability



Notes: Acronyms: European Systemic Risk Board (ESRB); European System of Financial Supervision (ESFS); Regulatory Reform (RR); European Financial Stability Facility (EFSF); Consumer Protection (CP).

The new supervisory architecture, which provides the backbone for a harmonized European supervisory system, is depicted in Chart 5.

Chart 5 - The three new key institutional components of the European framework for safeguarding financial stability



Notes: Acronyms: European Central Bank (ECB); National Central Banks (NCBs); Advisory Scientific Committee (ASC); Advisory Technical Committee (ATC).

2.2. The (sorry) state of implementation of financial regulatory reform

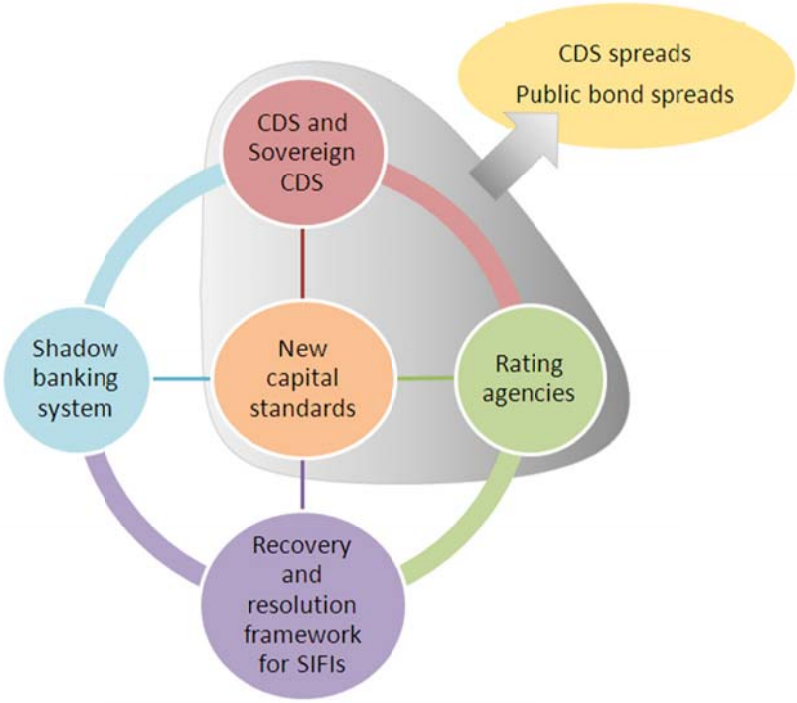
In the US, the comprehensive and bold design of the Dodd-Frank Act is grinding to a halt. The rulemaking process through secondary legislation can be summarised by reference to a *Davis Polk Report* published on the occasion of the one-year anniversary of the passage of Dodd-Frank (July 21st, 2011). As of that date, secondary regulators had completed only 13% of the rulemaking requirements contained in the Act (51 completed out of the 400 required). Most deadlines required within the first year have been missed: the US Commodities Futures Trading Commission missing 83%; the Securities and Exchange Commission missing 82%, and bank regulators missing 63%. Large substantive areas of regulatory reform remain without implementation as of today.

In the EU, the holistic approach indicated by the de Larosière Report has not been implemented (Chart 6). The crisis management and resolution block, in spite of the Commission efforts, is completely absent. Regulation of credit default swap (CDS) and sovereign CDS (CDSS) should take place in 2012; the implementation of effective reform for rating agencies is still uncertain, although ESMA is now working on the *CRA3 Proposal*. The stress tests of EBA and the capital

directives move forward, in a destabilising way, according to the arguments developed here (§3) on endogenous risk and on the other weaknesses of Basel 3. The unique condition to enforce a comprehensive integrated financial reform packages seems lost. A reflection on this issue is appropriate, to explore causes and remedies.

Beyond the commonly cited causes of (i) technical difficulties of implementation and (ii) regulatory capture, a third area should be explored: conflicts of interest of the monetary and fiscal authorities. In Europe, two aspects deserve attention. To start with, there is an inherent conflict between the Ecofin Council and the European System of Central Banks in the bail-out processes of banks, and notably of debt holders. The second point refers to the union of monetary/banking powers in the European System of Central Banks: monetary policy, banking regulation, microprudential supervision. This cumulation is clearly at odds with the Trias Politica doctrine[2] about the separation of the three fundamental powers (legislative, executive, judicial). The theory was in the first place applied to the state, but refers more generally to models of governance of complex systems.

Chart 6 - Regulatory reform: the need for a holistic approach to the new capital standards



[2] Montesquieu (1748).

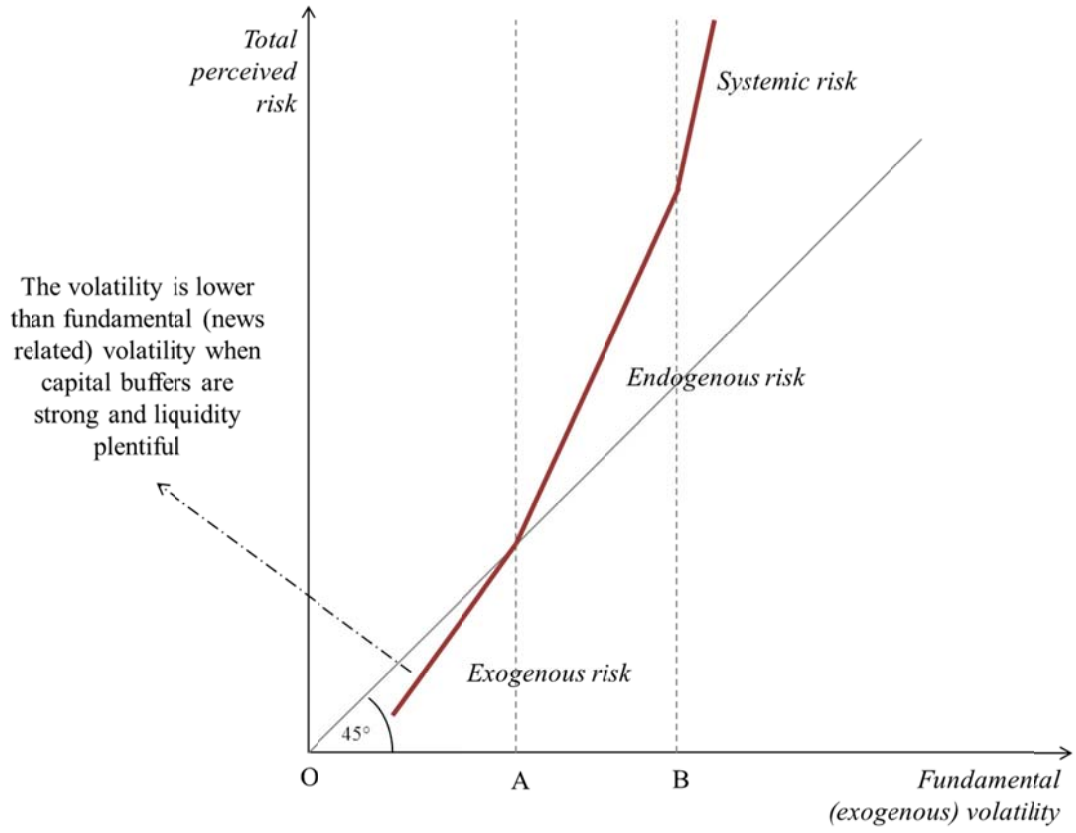
3. EXOGENOUS VS. ENDOGENOUS RISK, THE BASEL STANDARDS AND DERIVATIVES/ SECURITIES MARKETS

3.1. Exogenous and endogenous risk in financial systems

The relationship between exogenous, endogenous and total perceived risks is illustrated by reference to a highly simplified graphical presentation (Chart 7), where:

- *exogenous (fundamental) risk* is the risk driven by "news", i.e. unanticipated changes in economic fundamentals (game against nature);
- *endogenous risk* is the "unexplained" volatility due to non-fundamental factors such as: perverse incentive structures, serially correlated belief structures and risk control methodologies, trend and herding behaviour;
- *systemic risk* is the risk encountered when stress exceeds the coping capacity of the system, which enters a state of overload leading to breakdown. Market failures imply that uncertainty replaces risk. In this situation, irrational behaviour can occur and amplify the likelihood of system breakdown.

Chart 7 – Total perceived risk and fundamental volatility



Points *A* and *B* along the horizontal axis are two points of discontinuity: the section *OA* depicts good and normal market conditions, where risk can be measured on the basis of "traditional" models, under the assumptions of efficient and rational markets. However, as will be shown below, in this state of the world regulated financial intermediaries act as shock absorbers, so that exogenous risk is underestimated, hence the total risk curve lies below the line of exogenous risk (fundamental volatility).

As we move from *A* to *B*, endogenous risk becomes relevant. Stress "conditions", set off by fundamental factors, characterise financial markets. The progressive growth of endogenous risk is consistent with rational behaviour, as explained by two main – not inconsistent – theoretical models:

(i) Kurz's theory of rational belief (1997), based on a general equilibrium model of market overshoot, where the distribution of serially-correlated belief systems is the primary driver of market volatility (a "technical" approach);

(ii) Danielsson & Shin's studies on endogenous risk (2003, 2011), where market volatility is shown to depend also on the outcome of interaction between market participants (a "fundamental" approach). Existing models which treat risk as a fixed exogenous process produce inaccurate predictions.

In times of crisis, endogeneity becomes of paramount importance, if agents become more homogeneous in their strategies, precisely because they use similar, faulty, risk modelling. As the crisis develops, the processes driving the underlying data undergo structural breaks. The assumption of stationarity of the underlying stochastic processes is violated. Additionally, data used to estimate forecasting models before the crisis become an unreliable basis to estimate risk[3].

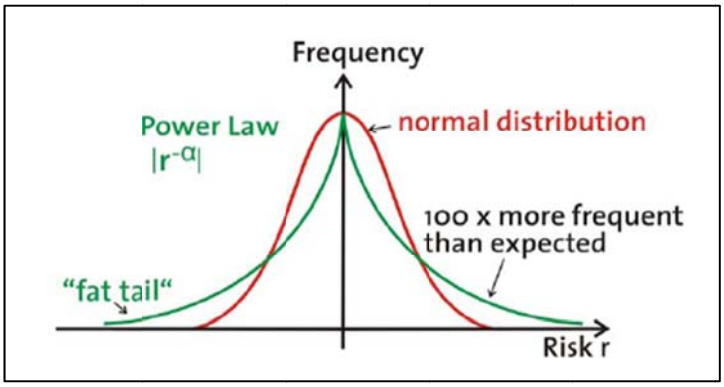
Both approaches have evident implications for the regulatory framework, as will be indicated below. It must be noted that the concept of endogenous risk considered so far does not require the assumption of irrational markets and behavioural economics [Shiller (2011), Becker (1968) and Kahneman 2003)]. What is posited is that the *Efficient Market Theory* does not hold. Strong efficiency assumes that there is well-defined, stable, mapping which converts fundamental news (such as GDP growth, fiscal and monetary policies, default rates…) into security pricing.

In the endogenous risk framework the mapping breaks down, because of the non-stationary, self-correlated re-pricing of fundamentals. In this framework non-linearities between causes and effects become predominant. Strong interactions and converging behaviours of economic agents change the "fundamental" statistical distributions characterising market under normal conditions.

[3] Instances where endogenous risk developed into systemic risk can be regarded: the Market Crash of October 1987, the 1998 LTCM bail out and the 2007-2009 financial crisis.

More specifically, there is a shift from normal-shaped distributions to truncated power laws (heavy tail distributions/extreme value theory) (Chart 8). These changes are especially relevant for the risk evaluation of financial structures based on derivatives. Basel rules lead to strong interactions and common responses of market participants, amplified by VaR models, which turn out to be incorrect. As a result, volatility is magnified, leading to "tipping points" and to extreme events.

Chart 8 – Power laws and heavy-tail distributions



Source: Helbing (2010).

When in Chart 7 we move beyond *B*, systemic risk is encountered. In this situation, widespread market failures become present. Rational responses of market participants are highly correlated (the only thing that goes up in bear markets is correlation, as the old saying goes), but irrational behaviour also occurs. Measurable risk gives way to Knightian uncertainty. Credit and liquidity risks are intertwined. The Bagehot distinction no larger applies, and the *lender-of-last resort* function of the central bank to provide base liquidity becomes fundamental to prevent financial and economic systemic breakdown. As Keynes put it "markets can remain irrationally priced far longer than you or I can remain solvent".

3.2. Fundamental flaws of the cornerstone of financial regulation

The assumption behind the Basel standards – the cornerstone of financial regulation in past 25 years – is that the coping capacity of the financial system is represented by bank capital. Hence the conclusion is reached that increasing risk must be countered by higher safety margins. Capital requirements represent the buffering capacity of the system.

But, as we have indicated, the flaw of this approach lies in neglecting that (i) endogenous risk in the financial system is of paramount importance, especially in conditions of stress; (ii) the same

capital rules and imposed risk measurement models – notably VaR – on all banks worldwide multiply endogenous risk and can ultimately lead to systemic risk and market breakdown.

The problems posed by endogenous risk in finance can be illustrated by comparing weather and financial risk modelling and forecasts. In both instances, when stress conditions are anticipated, precautionary safety measures are required. However, in the former case, the forecasts and the safety arrangements taken ex ante to improve the coping capacity of the system do not affect the meteorological outcome. In the financial world, traditional financial forecast models (VaR) and the capital safety standards increase total risk, beyond the fundamental thresholds.

The risk forecast affects and determines the subsequent outcome: in the extreme case, prophecies can become self-fulfilling. As was indicated, this is the result of:

(i) inaccurate modelling of volatility;

(ii) the non-stationarity of underlying stochastic models;

(iii) the homogenisation of risk aversion and buying/selling strategies.

The paradox is that, in conditions of stress, the attempt to increase buffering capacity of the system by raising capital of the banks creates more risk and can precipitate a vicious circle of system destabilisation[4].

A simple way to show these points is offered below through leverage and VaR.

We start with a stylised bank balance sheet, to define leverage.

[1] $$A = E + D$$

where: A = assets; E = (accounting) equity (risk capital) and D = liabilities (debt).

Leverage is given by:

[2] $$L = \frac{A}{E} = 1 + \frac{D}{E} \quad .$$

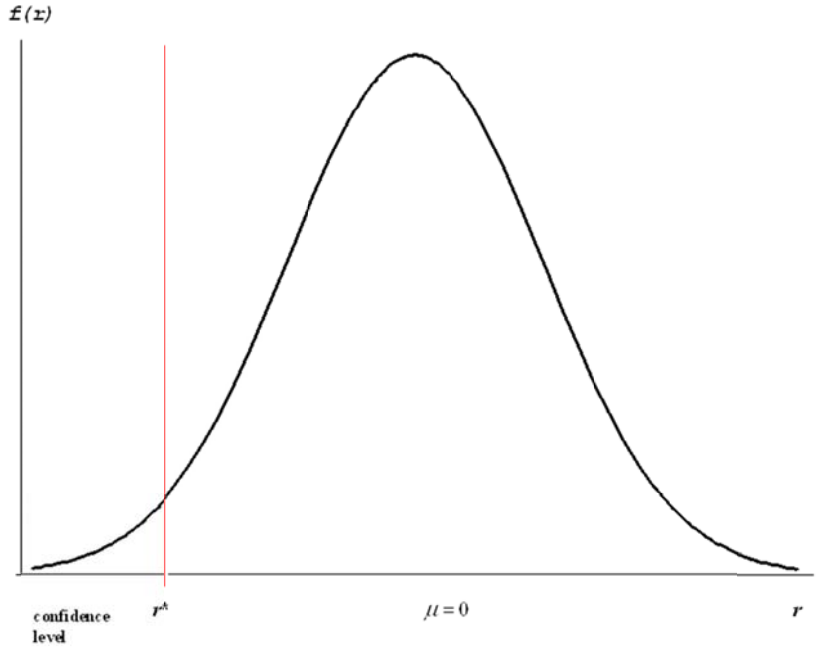
Next we define VaR as the maximum loss that a bank with assets A can withstand to its equity before going bankrupt, given a confidence level (c):

[3] $$VaR_c = -r * A = E_c$$

where r is the return on assets.

[4] See Danielsson, Shin *et al.* (2011).

Chart 9 – VaR estimation



where: [4] $$\Pr(r < r^*) = \int_{-\infty}^{r^*} f(r)dr = 1 - c\,.$$

By normalising the probability distribution, assuming the validity of the *central limit theorem* and by shifting from probabilities to critical values, the VaR can be expressed as:

[5] $$v_c = \frac{E_c}{A} = \frac{VaR_c}{A}\,.$$

From the above, assuming normality, we can calculate the level of leverage ($L=A/E$) that is consistent with non-bankruptcy, at the level of confidence c:

[6] $$L_c = \frac{A}{E_c} = \frac{A}{VaR_c} = \frac{1}{v_c}\,.$$

The required level of leverage, at the confidence level c, is measured by the VaR per unit of assets. The *Risk Weighted Assets* (RWAs) (unexpected loss) of the bank under consideration can be defined as:

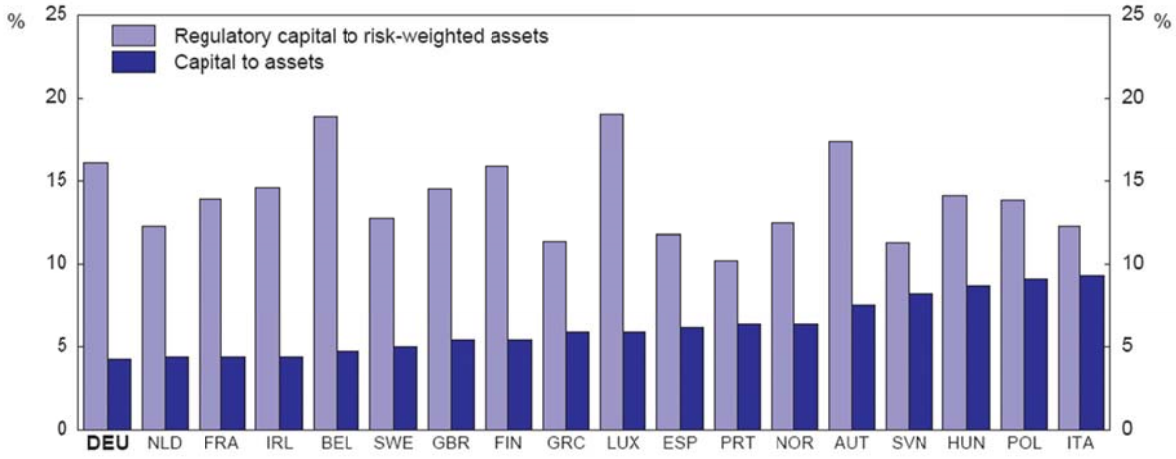
[7] $$RWA(A) = VaR$$

and therefore minimum required capital is given by:

[8] $$E = mRWA$$

where m is the Basel ratio. The difference between leverage ratios and Basel RWA ratios in Europe for the year 2010 are shown in Chart 10.

Chart 10 - Leverage ratios and Basel RWA ratios in Europe, 2010.



Note: Capital is balance sheet equity (paid-in capital plus reserves).
Source: IMF, *Financial Soundness Indicators.*

From [6], [7] and [8] we obtain:

[9] $$E = mVaR\,.$$

In sum, the required capital is proportional to negative volatility in the short run. When financial stress prevails, the growth rate of capital is linked to the growth rate of volatility, while endogenous perceived risk becomes preponderant.

The Basel rules impose similarity, by giving to all banks fundamentally the same models of risk, and by requesting common binding constraints on equity against RWAs. The *one-size-fits-all* approach of capital regulation does not allow banks to have independent risk appetites and positions. More specifically, the VaR approach constrains also risk-neutral financial institutions to act as if they were risk-averse and homogenises behaviours and beliefs. The inherent risk of tight coupling and contagion is heightened with adverse destabilising macroeconomic consequences[5].

In good times and when capital buffers are high, volatility is lower than warranted by fundamental developments, since banks act as shock absorbers. At the onset of a crisis due to adverse fundamental developments, the opposite occurs. Banks become risk amplifiers and endogenous risk prevails, as indicated in Chart 7.

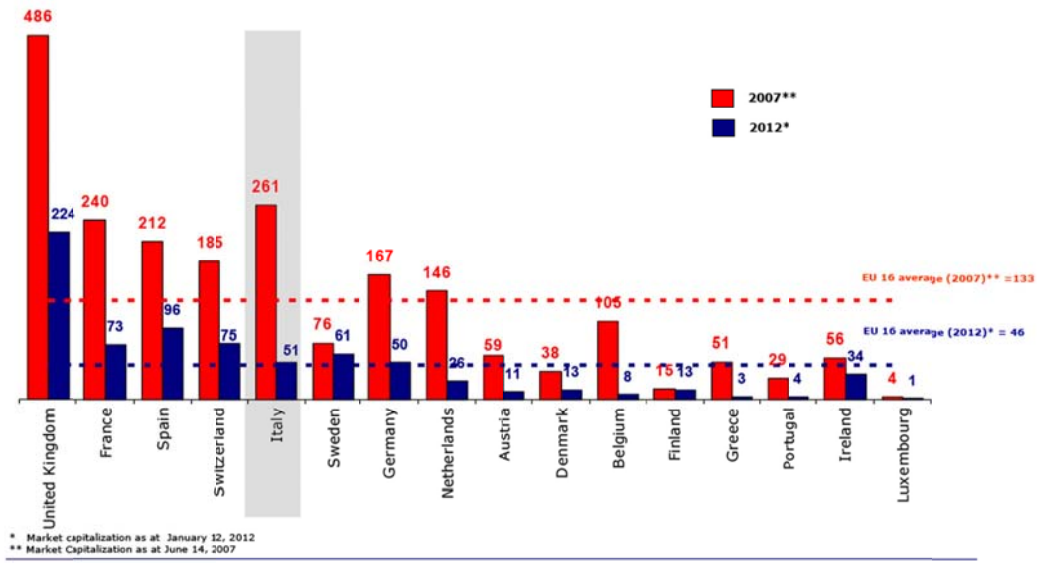
Differential regulatory capital weights in the financial system, and the existence of non-capital regulated entities, create incentives for banks to capital arbitrage and to reconfigure credits as capital market instruments. The incentives are enhanced by the possibility to short credit (including sovereign exposures) and shift financial promises, through the use of credit derivatives. The OtT (*Originate to Transfer*) banking model is an instance of this process aimed at circumventing RWA

[5] See Barone-Adesi (2009) and Appendix.

capital rules and passing the promises to the shadow banking system[6]. The Basel regulatory framework does not correctly address this issue. Through ever changing and more complex OtC (*Over the Counter*) derivative structures capital inherently achieves higher leverage. This will only be partially corrected in Basel 3 through reference to the unweighted balance sheet.

The problem is compounded because the promises of non-bail out of banks by monetary authorities are time inconsistent. With no recovery and resolution framework in place in Europe to cope with SIFIs banking crisis management[7], on the one hand, banks' debt holders have little incentives to monitor the risk behaviour of banking firms; on the other, banks themselves act in the belief that governments and central banks will bail them out in case of crisis. The more widespread is the belief that creditors will be protected, the more relevant the issue of moral hazard (wrong incentives) becomes. Evidence of the relevance of this point is offered by the different market signals which can be obtained from empirical evidence of price-to-book (*Tobin's q ratios*), as against CDS funding spreads of banks[8]. The latter reflect the assessment of the default probability on debt, which takes into account the implicit bail out guarantees. The former gauge more directly the possibility of default, but they amplify volatility, because the price of bank stocks is being especially subject to endogenous risk influence (Chart 11).

Chart 11 - Banking capitalisation by European Country: 2012* versus 2007**
(EU15+Switzerland; all European listed banks; bn. €)



Source: *European Banking Report* (EBR), January 2012.

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[6] On these points see Blundell-Wignall and Atkinson (2010), Mazzoni (2012a) and Zadra (2012).

[7] For an analysis of this issue, reference is made to Masera and Mazzoni (2011) and Boccuzzi (2011).

[8] See Mazzoni (2012b).

The existence of wrong incentives endangers the stability of financial system and contributes to systemic risk. The Basel emphasis on accounting capital distracts attention from the market price of equity as an early highly sensitive indicator of *Prompt Corrective Action* (PCA)[9] in an effective early remediation regime.

When endogenous risk sets in, credit and securities markets drift together. Liquid assets (including government paper in the Eurozone) become illiquid. Solvency and liquidity risks become intertwined, also as a result of mark-to-market accounting rules. Often assets are valued independently of the maturity of the debts that finance them. Fair value accounting requires that market prices represent the reference point for valuing securities and liquid assets. The rule works well in normal times, when exogenous risk prevails. In stressed periods, the current accounting standards can therefore become destabilising. Distressed sales of (il)liquid assets in exchange for monetary base lead to asset value scaling down and higher capital requirements. Often, in parallel, given the objective difficulty of challenging pricing by traders, abuse can occur and uncertainty on banks' balance sheets is magnified[10].

In this situation, supervisors should be empowered to give indications to bank auditors on pre-determined non-market parameters (mark-to-model, indexes, …) to value complex illiquid assets, in terms of the interaction process between the SREP (*Supervisory Review and Evaluation Process*) and the ICAAP (*Internal Capital Adequacy Assessment Process*).

3.3. The management of liquidity through reserve requirements

In order to disentangle liquidity management from the capital/solvency control mechanism, and with a view to improving the coping capacity of the system through two reinforcing pillars, a renewed consideration of reserve requirements is advocated.

Let us focus on a traditional commercial bank. We use the same prototype balance sheet symbols, where D stands now for deposits, which are subject to reserve requirements. From the definition of leverage we have:

[10] $$L = 1 + \frac{D}{E} \quad .$$

We assume that:

[11] $$R = \rho D$$

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[9] The on-going discussion in the US on this matter is summarised in the Report to Congress on PCA by the Financial Stability Oversight Council (December, 2011).

[10] An analysis of liquidity risk in its various facets is developed in Masera (2009a). The unique features of monetary base reserves are outlined.

and therefore:

[12] $$L = 1 + \frac{R}{\rho E} \ .$$

As [12] shows, two control variables are now available: reserves (in terms of nominal amount and required ratio to deposits[11]) and capital.

The point made here is that reserves are certainly liquid assets that satisfy the orthogonality condition. Their opportunity cost to the banking system is not market determined, as in the case of equity, but can be set by the central bank. The coping capacity of the system depends on two buffers without putting all the burden on accounting capital. Under extreme stress, fiscal and monetary authorities can better coordinate their stability interventions.

More specifically, and especially within a framework of separation between *utility* and *casino banking*, the VaR induced macro procyclicality of leverage under strict Basel rules[12] can be dampened, and capital and *Base Money Reserves* (BMR) can be used as two complementary instruments for prudential policy. This is shown below through a prototype model applied to bank *A*. The bank's assets are defined as follows:

[13] $$Assets = R + S$$

where R = *Base Money Reserves* (BMR) and S = risky assets (i.e. loans, trading book securities, etc.). The bank's liabilities are defined as follows:

[14] $$Liabilities = E + D$$

where E = equity and D = deposits. The amount of BMR is determined according to [11], while the amount of capital is a positive function of the bank's RWA. This means that capital increases when: (i) the investments in risky assets, S, increases; (ii) the risk of risky assets, σ_s, increases:

[15] $$\frac{\partial E(S, \sigma_S)}{\partial S} > 0$$

and

[16] $$\frac{\partial E(S, \sigma_S)}{\partial \sigma_S} > 0 \ .$$

From previous identities it is easy to show that, for a given level of bank's asset size, a higher amount of BMR (i.e. a higher ρ) reduces the capacity of the bank to invest in risky assets:

[17] $$S = Assets - R$$

and

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[11] I do not enter here into the distinction between required and excess reserves. As Chart 12 indicates, the latter are now predominant. Interest can be paid by the central bank on both aggregates. See Fed (2012).

[12] See Appendix.

[18] $$\frac{\partial S}{\partial \rho} = \frac{\partial S}{\partial R} \times \frac{\partial R}{\partial \rho} < 0 .$$

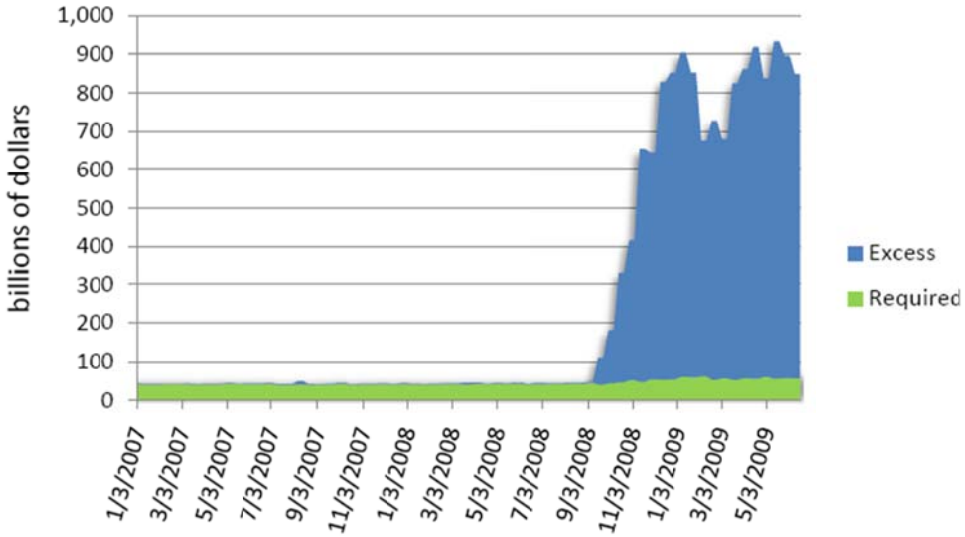
It follows that:

[19] $$\frac{\partial E}{\partial \rho} = \frac{\partial E}{\partial S} \times \frac{\partial S}{\partial \rho} < 0 .$$

This means that for: (i) a given size of assets/liabilities and (ii) a given level of riskiness of a bank's assets, σ_S, a higher requirement in terms of BMR reduces (i) the investment in risky assets (*S*) and (ii) the level of bank's RWA and, consequently, the capital needed (*E*).

This simple argument shows that capital and BMR requirements can be used as two complementary prudential policy instruments and jointly contribute to assure investors and depositors confidence in banks. The advantage of this approach would also consist in providing framework to stabilise the huge volume of excess reserves created by the Fed (Chart 12) and more recently also by the ECB (see § 4.3 below).

Chart 12 - United States: aggregate reserves of depository institutions



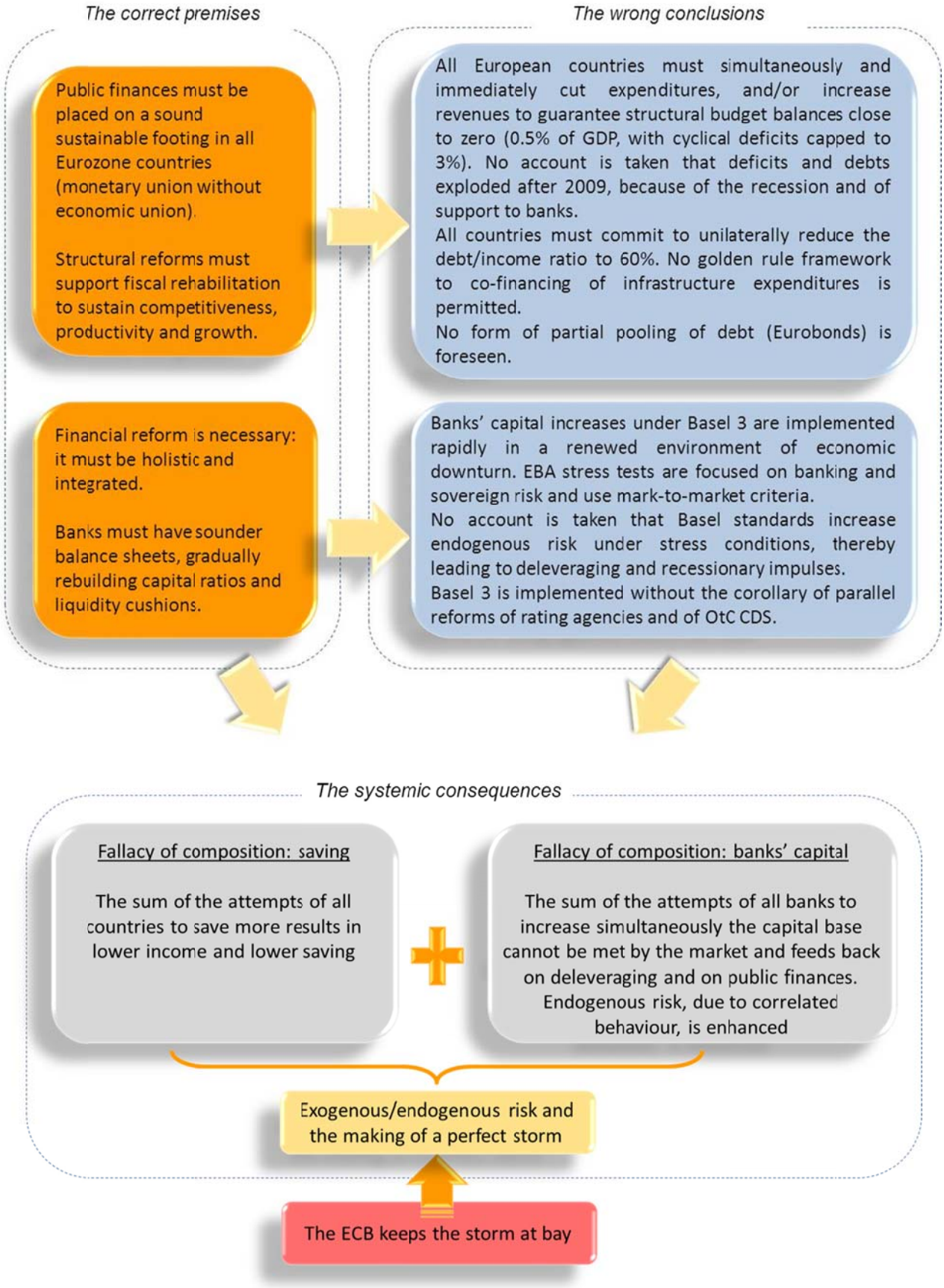
Source: Keister and McAndrews (2009).

4. THE DESTABILISING LOOP BETWEEN SOVEREIGN AND BANK RISK IN THE EUROZONE: ECONOMIC POLICIES, MARKET DYNAMICS AND FINANCIAL REGULATION

4.1. The intertwining of sovereign and bank stress: the vicious circle in the Eurozone.

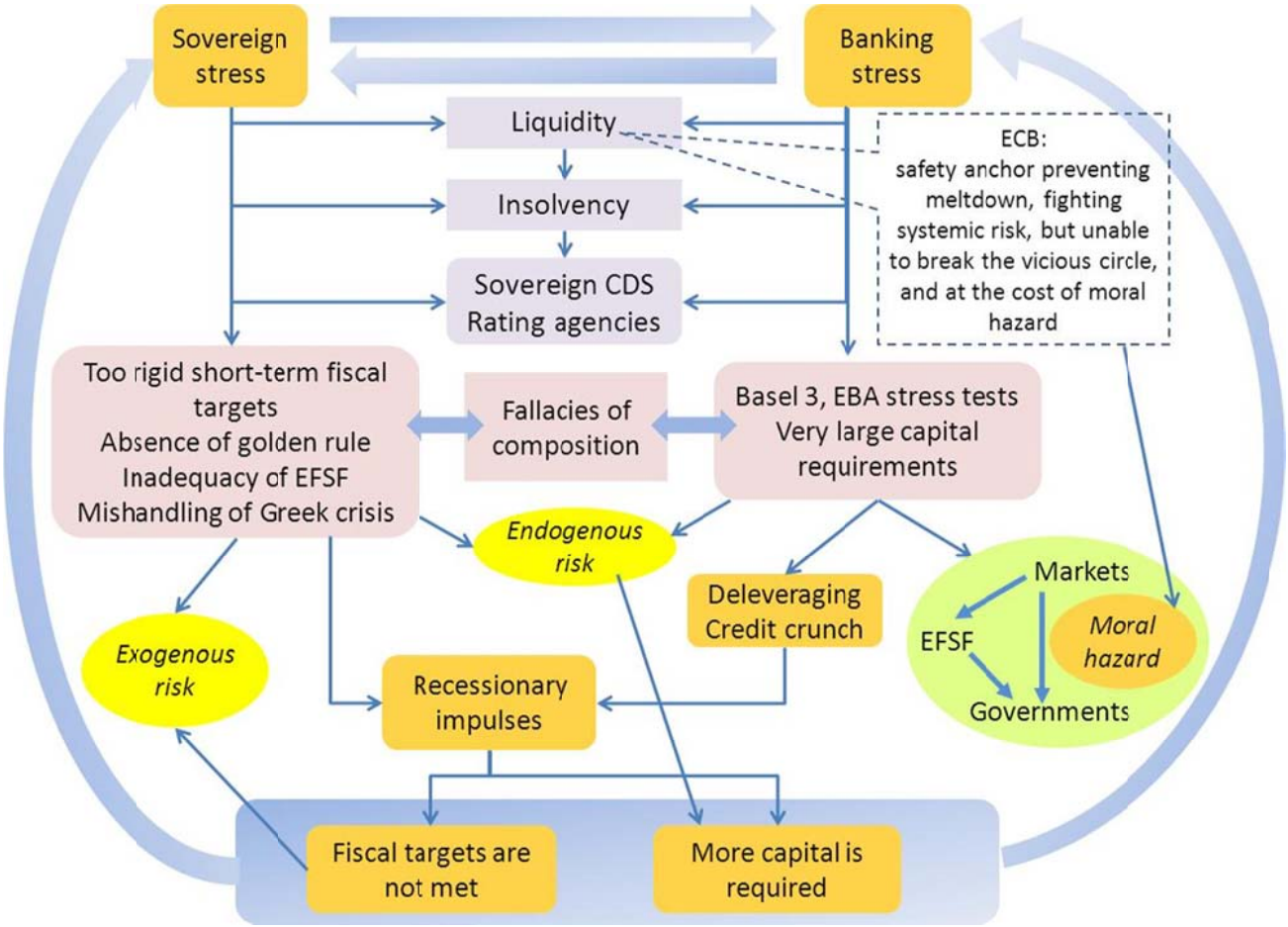
The analytical framework presented in the previous paragraph is used to shed light on the current European paradox: from correct premises to wrong conclusions of economic policy and financial regulation. A synthesis of the key points and links is offered in Chart 13.

Chart 13 – The European paradox: from correct premises to wrong conclusions



Two fallacies of composition can destabilise the system: Chart 14 highlights the main links behind a scenario of systemic risk.

Chart 14 – The intertwining of sovereign and bank stress: the vicious circle and the making of a systemic risk scenario in the Eurozone



4.2. Fiscal adjustment or destabilisation (exogenous risk)?

Two preliminary questions should be answered:

- a wrong diagnosis? The cause of debt to income deterioration in Europe after 2007: fiscal profligacy or excessive credit to the private sector and banks' bail-outs (Table 1)? The case of Greece should not have been generalized;
- a wrong sequel? The European Financial Stability Facility was conceived to bail-out countries in difficulty and crowded out the Resolution Fund for banks, whose current deadline is July 2013, but with many question marks, despite the determination of Commissioner Barnier.

Table 1 – Selected advanced economies: financial sector support, cumulative net direct cost (2007 – July 2011).

(Percentage of 2011 GDP unless otherwise indicated) [1]

	Direct support	Recovery	Net direct support
Belgium	5.7	0.3	5.4
Ireland [2]	40.6	2.6	38.0
Germany[3]	13.2	0.8	12.4
Greece	5.8	0.4	5.4
Netherlands	14.0	8.8	5.1
Spain[4]	3.0	0.9	2.1
United Kingdom	6.7	1.1	5.7
United States	5.1	2.0	3.1
Average	6.8	1.8	4.9
In $US billions	1,722	452	1,270

Sources: Country authorities; and IMF staff estimates.

Note: Fiscal outlays of the central government, except for Germany and Belgium, for which financial sector support by subnational governments is also included.

[1] Cumulative since the beginning of the crisis—latest available data, ranging between end-December-2010 and end-July 2011.

[2] Direct support does not include asset purchases by the National Asset Management Agency (NAMA) as these are not financed directly through the general government but with government guaranteed bonds.

[3] Direct support includes the estimated impact on public debt of asset transfers to newly created government sector entities (11¼ percent of GDP), taking into account operations from the central and subnational governments.

[4] Direct support includes total capital injections by the FROB until end-July as well as projected capital injections for Banco CAM (¼ percent of GDP).

Source: IMF, *Fiscal Monitor*, September 2011.

Moral hazard in respect of both sovereign debt and banks remains unresolved: even the simple idea that individual credit tranches that the EFSF borrows and passes on to recipient countries could be raised at different interest rate levels met with considerable difficulties. In the meantime, the preferred creditor status created a vicious loop: while Irish banks were again bailed-out with public money through the EFSF, the bail-out of Greece and Ireland represented also a rescue plan in disguise for some systemic banks.

There can be no question on the need to restore sustainable public finances in the Eurozone (and elsewhere, notably in the United States). The question is: can mistakes of the past decades be corrected in the very short run through expenditure cuts, tax increases and structural reforms? The fallacy of composition may be at work: the attempt to increase government (and country) savings in the short run may result in a depression of economic activity, with less saving and less income; hence higher debt/income ratios.

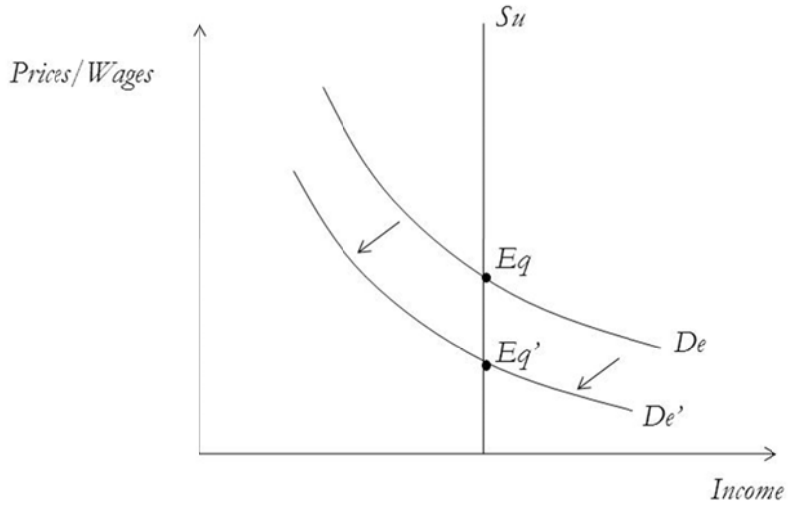
Additionally, structural reforms (notably employment deregulation; more competition in the single market, especially in the area of services; adjustments in pension systems…) may imply short term adjustment costs. Sustainable public finances require an appropriate balance between interest

rates on government debt and growth rate of national income. If recessionary forces and debt fears set in, the short-term balance tilts towards unsustainable solutions, with a perverse impact on agents' behaviour and expectations.

The implicit current policy model (Model 1)

Behind the idea that the Eurozone crisis may be solved by imposing restrictive fiscal policies there is a policy model based on the assumptions of: (i) flexible wages/prices, (ii) efficient financial market, and (iii) rational expectations/behaviour. In this framework market failure is not allowed and an inherent tendency to full employment is assumed (Chart 15).

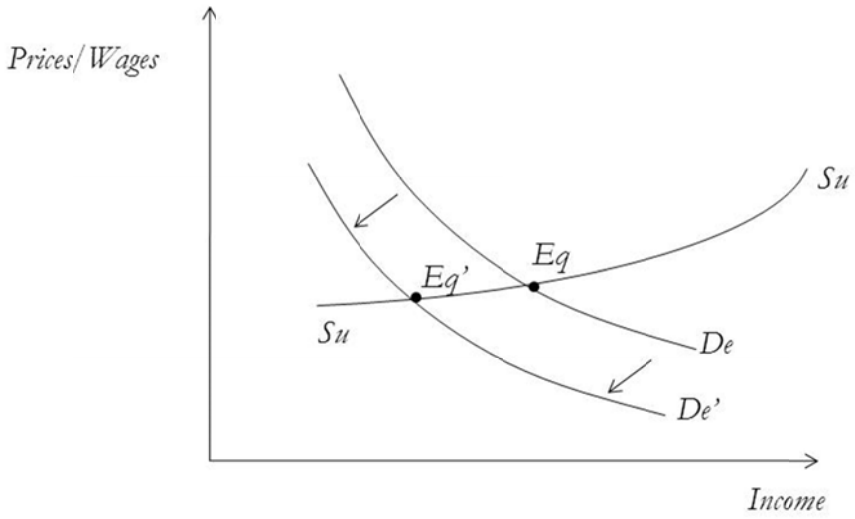
Chart 15 – The implicit current policy model (Model 1)



The fallacy of composition paradigm (Model 2)

During the current crisis we have understood that some of these hypotheses are flawed. In fact, a market failure is possible in a framework characterised by: (i) rigidities in the price/wage system, (ii) financial markets not perfectly efficient, and (iii) not fully rational expectations/behaviours.

Chart 16 – The fallacy of composition paradigm (Model 2)



In terms of Model 2, there is a fallacy in assuming that what holds for each individual also holds for the sum of all individuals. Attempt by every economic agent to increase saving may result in less saving by the economy as a whole, as a result of less consumption, less investment, less output and employment (Chart 16).

The sustainability of public debt for a country which cannot monetize its debt is represented by the following condition:

$$\frac{PB}{Y} \geq \frac{i-g}{1+g} \times \frac{D}{Y}$$

where *i* is the average nominal rate of interest on debt (D), and *g* is the nominal rate of growth of the economy. For governments with high *D/Y*, swings in market confidence may be of crucial importance. More generally, there is a high exposure to rising interest rates and falling GDP (Y).

In Model 1 expenditure cuts, tax increases and structural reforms make adjustment possible: higher primary balance, lower *i*, same *g*.

In Model 2 expenditure cuts, tax increases and structural reforms may prove ineffective in the short run, fundamentally because *g* tends to 0 or becomes negative, while the rate of interest on public debt increases, hence it becomes more difficult to improve the primary balance and to restore market confidence. Fiscal contraction makes the recession worse and derails growth (the Greek economy is expected to shrink by around 10% in 2011-2012, after a contraction of 6% in 2009-2010)[13].

[13] The Debt/GDP ratio, as a result of shrinking the income side of the equation went from 110.7% in 2008 to 163% in 2011 and is projected to reach 170% this year. Debt restructuring has become unavoidable.

In this model the time horizon of adjustment measures becomes crucial to ensure the feasibility of fiscal rehabilitation. A fundamental question: is the current conventional wisdom, accepted also by the ESRB (and the ECB), correct?

The advantages of a resolution fund approach pre-funded by a system of *ex-ante* risk sensitive fees paid by the industry and by reserve requirements in monetary base, (Masera and Mazzoni, 2010): reduction of the moral hazard, segregation of the funds raised *ex-ante* in a vehicle not correlated with banks' assets and default risk.

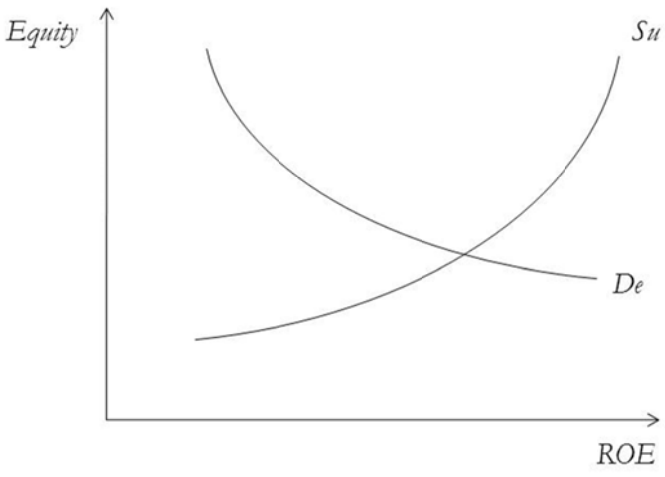
4.3. Bank capital rules: adjustment or risk amplification (endogenous risk)?

Bank capital conventional model: demand

Equilibrium can always be achieved in a conventional model of bank capital. Banks' management faces a trade-off between Return On Equity (ROE) and Equity demanded.

For a given level of RWA, banks' management will decide its optional demand of capital by maximizing its value function. A trade-off problem must be solved: risk-adjusted returns will be maximized. Higher levels of equity decrease non risk-adjusted returns ROE (Chart 17). At the same time, higher levels of equity reduce the probability of default (and therefore banks' risk). The final effect in terms of risk-adjusted returns depends on the elasticities to equity of both ROE and Probability of Default (PD).

Chart 17 – Bank capital: conventional model (Model 1)



Assumption: given RWA

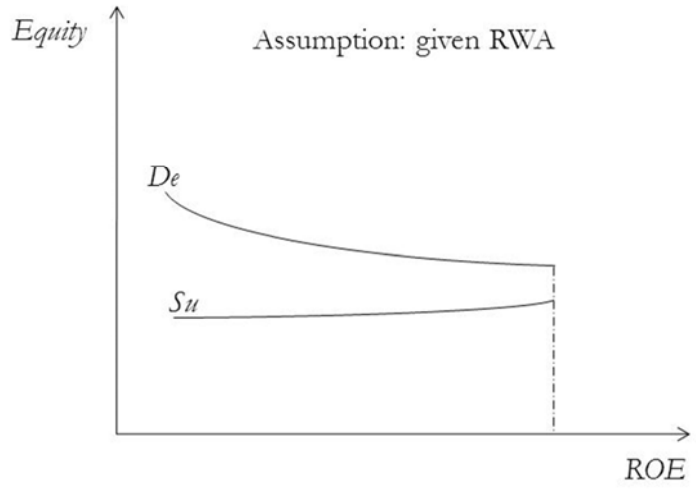
Bank capital conventional model: supply

Supply of equity is positively correlated to returns. For a given level of RWA, higher levels of ROE increase the supply of equity. This is true if the increase of ROE is mainly determined by an increase of the profitability of the bank and not only by a reduction of the equity. In the latter case, the positive effect on ROE will be more than offset by an increase of the PD and therefore by a reduction of risk-adjusted returns, which will reduce the supply of equity.

Bank capital: fallacy of composition

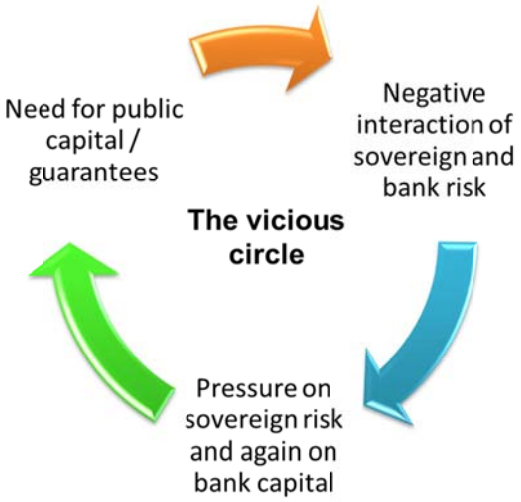
Market supply of equity is constrained, especially during a financial crisis. Market price of risk increases (investors' risk appetite reduces). The supply curve for equity downward shifts and flattens (i.e. for a given level of ROE, investors will offer less capital than before because of their increased reluctance towards risk). Higher capital requirements imposed by regulators determine an exogenous floor on equity demanded by banks. This floor produces an upward shift of demand (for a given level of ROE, stringent capital requirements impose an extra-burden in terms of capital which is not optimal on a risk-adjusted basis). The consequence is market failure (Chart 18).

Chart 18 – Market supply of equity is constrained (Model 2)



In this framework, banks attempt to de-lever their balance sheets from the assets side: credit contraction and hence debt reduction. They attempt to recapitalise through less credit and retained earnings. But, at the aggregate level, this means less credit, less growth (or recession), more bad loans, more capital required. In countries with sovereign debt difficulties recession and downgrading of public debt (and automatically of banks themselves and all other economic entities in the country affected) multiply the pressures on banks (Chart 19).

Chart 19 – The vicious circle



The bank capital issue and its destabilising impact are compounded by the endogenous/systemic risk considerations already illustrated. Warnings by the International Monetary Fund (€200-300 billion of new capital required) and stress tests required by EBA marking to market government debt held by banks multiply endogenous risk and amplify destabilising market dynamics.

The wrong Basel approach to liquidity risk in banks and the endogenous risk implications for liquidity and solvency risks would have led to a perfect storm/systemic risk situation, had it not been for the crucial interventions of the ECB.

The escalation of monetary ease by the ECB is based on:

(i) direct purchases of public debt in the secondary market (SMP – *Securities Market Programme*);

(ii) GIPS Central Bank money creation through Target 2;

(iii) repurchase operations with bank/sovereign debt as collateral (LTRO – *Long Term Refinancing Operations* 2009-2010-2011). The €489 billion, December 2011, may be followed shortly by another injection of even greater amount.

4.4. How can the perfect storm be avoided?

The Eurozone is at crossroads. The difficulties of the monetary union have created a unique opportunity. There is the realisation (and widespread agreement) that:

(i) monetary union must be completed by economic union, and ultimately political union;

(ii) the economic union must be based on sound and sustainable fiscal policies in all countries;

(iii) structural reforms are required to improve flexibility and competition inside the Union and in a global market economy;

(iv) banks must have a sound capital base, reduce leverage and improve, in a structural way, liquidity positions;

(v) the ECB has become fully aware that monetary and financial stability are joint objectives, when systemic stress is faced. Its liquidity support has prevented the meltdown of the Eurozone.

But, according to the analytical framework developed here, (i) if fiscal adjustment and austerity measures are too sudden, without reference to the role of co-financed network infrastructure investments; (ii) if the issue of debt is not, partially and in perspective, dealt with Eurobonds; (iii) if the ESFS is not transformed, so as to make it possible for the ECB to provide monetary base financing to the ESM, and (iv) if the Greek default is not adequately dealt with, to avoid contagion, the real recessionary forces can continue. Exogenous risk would remain high and it would spill into growing endogenous risk.

We come to the second set of necessary adjustments, mainly in terms of financial regulation: (i) if banks are requested to cope with continuing extra capital (Basel 3 and EBA stress testing); (ii) if the capital standard is not restricted, with temporary circuit breakers enacted; (iii) if the liquidity issue of banks is not dealt with in a different approach (reserve requirements in monetary base); (iv) if complementary and proportional regulation is not enacted, alongside the reform of the banks' capital standards (CDS, rating agencies, shadow banking), the deleveraging/endogenous risk processes would continue and, in combination with the attempt to fix immediately fiscal imbalances, the setting of systemic risk would be increasingly difficult to check by the ECB.

Last, but certainly not least, the growing moral hazard which is created by the implicit/explicit government guarantees to bank bondholders and depositors, and the surreptitious deposit swap function fulfilled by the ECB, cannot represent the basis for a sound and sustainable financial recovery. It is therefore necessary to introduce a bank recovery and resolution framework[14].

5. CONCLUSIONS

The strains in the Eurozone are rooted in flaws in the construction of a monetary area without economic and fiscal unification: fiscally sovereign countries without monetary sovereignty. There is now a growing recognition of the need to fix these problems.

[14] On this point, see Masera and Mazzoni (2011).

Underlying Eurozone public finance fundamentals are relatively good, with the exception of Greece, which is now technically in a default situation. Public debt to GDP is, on average, lower in the Euroarea, compared to the US and the UK. The comparison is even better when it is extended to private debt.

The costs of a Eurozone meltdown would be very large, not only to peripheral economies, but also to core countries, and principally to Germany. A stable and relatively strong Euro is in the interest of the US and of China. The creation of the Euro was not only due to economic considerations, but mainly to the political will to advance European integration. This will has been persistently proved to be more determined than Eurosceptics believe.

The ECB - whose liquidity injections have eased investors concerns (i.e. the escalation of endogenous into systemic risk) and prevented the fall of the Euro - is also proving to be much more effective and pragmatic than could be expected, in view of its narrow mandate, albeit at the cost of moral hazard.

In spite of all these positive factors, this paper makes the case that economic and financial strains may become unsustainable unless policy and regulatory corrective measures are rapidly taken:

(i) the austerity route in the short run should not lead to exceedingly tight fiscal policies within the Eurozone, feeding the recession and enhancing exogenous risk. The correct calibration of fiscal consolidation is fundamental, as well as the right mix between monetary and fiscal impulses. If growth does not resume fiscal stabilisation cannot be achieved.

Germany and the Eurocouncil should steer the right course between the Scylla of monetary excess (risk of inflation) and the Charybdis of disproportionate austerity (risk of recession). The lessons of the Weimar Republic (1919-1933) must not be forgotten. By 1924 stabilisation of the German currency after hyperinflation had been achieved. The immediate causes of the end of democracy in Germany were the economic policies of drastic cuts to government and social spending, during the years of the Great Depression, enacted by Chancellor Heinrich Brüning in 1930-32, which created massive unemployment and strong discontent from working and middle-classes alike;

(ii) regulatory policies – notably Basel 3 enactment and EBA stress tests – should be reviewed, with the introduction of circuit breakers to defuse the destabilising spiral of endogenous risk. Complementary measures should be in place, notably, reform of the reserve requirement framework; review of OtC CDS markets and of credit agencies[15]; introduction of recovery

[15] Belated steps are being made on these two fronts, under pressure from the European Parliament. See European Council (2012), ESMA (2012) and Barnier (2012). It is of fundamental importance that the measures to be taken are consistent with the Basel framework.

and resolution schemes for banks based on prompt corrective action and fee-related systemic risk contributions, to reduce moral hazard; changes to the EFSF to permit recapitalisation of banks in critical periods and under strict rules.

These conclusions are shaped in the framework based on the distinction between exogenous and endogenous risk. The latter comes from behaviours and shocks from within the financial system, which can have amplifying ripple effects leading to systemic risk. Financial regulation, microsurveillance and macroprudential policies should take into account that risk forecasting models, when used for regulatory purposes and under stress, can become unreliable. Black&Scholes and Gaussian copula functions, when are used to model the risks of derivatives structures, and VaR techniques, which are behind the Basel standards, break down under stress and create additional stress.

APPENDIX:

PROCYCLICAL DYNAMICS OF LEVERAGE

Y is the level of economic activity of country *I*. *A(Y)* is the value of the assets of representative bank *B* in *I*. We can assume that:

[1] $$\frac{\partial A(Y)}{\partial Y} \geq 0 .$$

As the cycle improves, profitability and value of assets increase. We define the VaR of bank *B* assets as:

[2] $$VaR(A,\sigma,q,T) = \inf\left\{Loss \geq 0 : \Pr\left[A(0) - A(T) \geq Loss\right] < q\right\}.$$

The RWAs of bank *B* can be defined as:

[3] $$RWA(A) = VaR(A,\sigma,q,T) = \inf\left\{Loss \geq 0 : \Pr\left[A(0) - A(T) \geq Loss\right] < q\right\}.$$

As a result, equity is given by equation [4]:

[4] $$E(A) = c \times RWA(A) = c \times VaR(A,\sigma,q,T)$$

where *c* is a given prudential multiplier of country *I*. We define the *leverage* of the bank *B* as:

[5] $$L = \frac{A}{E(A)} = \frac{A}{c \times VaR(A,\sigma,q,T)} .$$

We consider now the partial derivative of *L* (*leverage*) with respect to *Y*:

[6] $$\frac{\partial L}{\partial A} \times \frac{\partial A}{\partial Y} = \frac{E(A) - \frac{A \partial E(A)}{\partial A}}{E(A)^2} \times \frac{\partial A}{\partial Y} = \frac{c \times VaR(A,\sigma,q,T) - A \times c \times \frac{\partial VaR(A,\sigma,q,T)}{\partial A}}{\left[c \times VaR(A,\sigma,q,T)\right]^2} \times \frac{\partial A}{\partial Y} =$$
$$= \frac{1 - \varepsilon_A^{VaR}}{c \times VaR(A,\sigma,q,T)} \times \frac{\partial A}{\partial Y}$$

where: [7] $$\varepsilon_A^{VaR} = \frac{\partial VaR(A,\sigma,q,T)}{\partial A} \times \frac{A}{VaR(A,\sigma,q,T)} .$$

From [7] we have that leverage of bank B increases with the level of economic activity if and only if the elasticity of the VaR with respect to assets ε_A^{VaR} is less than unity. This condition is generally respected, if we take into account that assets volatility can be written as follows:

[8] $$\frac{\partial \sigma}{\partial Y} = \frac{\partial \sigma}{\partial A} \times \frac{\partial A}{\partial Y} \leq 0 .$$

From [8] we have that volatility decreases when the cycle improves, and *vice versa*. Given that:

[9] $$\frac{\partial VaR(A,\sigma,q,T)}{\partial \sigma} \geq 0$$

when the cycle improves A increases and the VaR tends to increase, but, at the same time, σ declines, by reducing the VaR per unit of asset invested. The condition that ε_A^{VaR} is generally less than unity is, therefore, respected.

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