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How to prevent a new global financial crisis

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HOW TO PREVENT A NEW GLOBAL FINANCIAL CRISIS¹

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Abstract

The main issue addressed in this paper is whether a new financial crisis can be avoided.

After reviewing the key elements that were present in the 2007/2009 financial crisis, there is an analysis of the regulatory reforms which took place during and after the financial meltdown. The role played in it by the shadow banking system and the regulatory reforms dealing with it deserve particular attention.

The regulatory reforms are assessed in the context of systemic risk and run vulnerability in order to recommend what should be done to prevent a new financial crisis from happening.

A revision of what has already been done and what should be done in micro and macro-prudential regulation completes the paper.

The main conclusions are:

- 1) A key issue to avoid a new financial crisis is to prevent an excessive concentration of loans in any one sector, region or kind of assets of the economy.
- 2) The role of the central bank as lender of last resort should be reassessed in light of the experience of what has been done in the context of the COVID 19 pandemic.
- 3) In order to prevent managers from taking excessive risks using other people's money, managerial compensation schemes should be changed.
- 4) Issues which have to do with the conflict of interests in the credit rating agencies are still waiting for better regulation.

Keywords: financial crisis, shadow banking system, micro-prudential regulation, macro-prudential regulation, lender of last resort, dealer of last resort.

JEL codes: G01, G21, G23.

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I. Introduction

On September 15, 2008 Lehman Brothers filed for Chapter 11 bankruptcy protection in what has been the largest bankruptcy filing in U.S. history, far surpassing previous giant bankrupts as WorldCom or Enron. As a matter of fact, it was the largest bank failure ever as well as the largest bankruptcy ever.

The collapse of Lehman, which was the oldest and fourth-largest U.S. investment bank, was followed by a global financial crisis. This deepened the contraction in economic activity that had already started in December 2007 and has been known as the Great Recession. The world economy was brought to the brink of collapse.

Between December 2007 and June 2009 U.S. GDP fell 4.3 percent while unemployment increased from 5 percent to 9.5 percent, peaking at 10 percent in October 2009. Most advanced economies followed suit. In the United States, the stock market plummeted, wiping out nearly \$8 trillion in value between late 2007 and 2009.

The main issue addressed in this paper is whether a new financial crisis can be avoided. In this respect, the former U.S. Federal Reserve Chair J. Yellen, in a lecture at The British Academy on June 2017, gave an optimistic point of view: “I do think we’re much safer and I hope that it (another financial crisis) will not be in our lifetimes and I don’t believe it will be.”

However, contrary to Janet Yellen’s hopeful assertion, Blanchard and Summers (2019: 12) claim that “financial crises will probably happen again.”

Steve Keen (2017), one of the very few economists who anticipated the last financial crisis, warns that ever-rising levels of private debt make another financial crisis almost inevitable.

The key issue is what can be done to try to prevent a new financial crisis or minimize its consequences.

As the Vice-President of the Deutsche Bundesbank Claudia Buch (2017) stated, “reducing excessive risk-taking, making crises less likely and reducing their costs should be the ambition of policymakers.”

However, it seems that these goals are far from being achieved. Adrian et al. (2018) prevent that the \$1.3 trillion global market for so-called leveraged loans may be approaching a threatening level.²

These authors remark that “yield-hungry investors are tolerating ever-higher levels of risk and betting on financial instruments that, in less speculative times, they might sensibly shun.” Even worse, underwriting standards and credit quality have worsened. “This year (for 2018), so-called covenant-lite loans account for up 80 percent of new loans arranged for nonbank lenders (so-called “institutional investors”), up from about 30 percent in 2007. Not only the number, but also the quality of covenants has deteriorated.”

² A leveraged loan is a type of loan that is extended to companies or individuals that already have considerable amounts of debt or poor credit history.

Moreover, according to a report by the Financial Stability Board, assets of collective investment vehicles with features that make them susceptible to runs have grown by around 13% a year since end-2011 (FSB, 2018: 3). It goes on warning that greater attention is needed on collecting liabilities data to better assess funding vulnerabilities although it admits that some progress has already been made (ibid: 5).

The October 2019 IMF's Global Financial Stability Report warned that "vulnerabilities among nonbank financial institutions are now elevated in 80 percent of economies with systemically important financial sectors (by GDP). This share is similar to that at the height of the global financial crisis" (IMF, 2019).

Then, the key question is to what an extent the financial system is prepared to avoid systemic risk i.e. the spreading of losses, illiquidity and/or other forms of financial distress across financial institutions with serious consequences for the economy as a whole as we witnessed in 2007/2009.

The subject of financial crisis has deserved very little attention in the economic literature during the last 50 years. Minsky (1992) together with Kindleberger (1978) were lonely voices during the years of the so called Great Moderation when the possibility of a financial crisis had been discarded and its study considered just a waste of time at least in developed countries.

After the latest financial crisis, the issue became of public interest and several accounts of the crisis and its lessons were published; among them Paulson (2010), Bernanke (2015), Geithner (2014), Gorton (2012), Pilkinton (2013), Keen (2017) and Blanchard and Summers (2017). Most of them either focus on the events which led to the financial meltdown or deal with some particular issue as the monetary or macroeconomic policies or the level of private debt. On the contrary, this paper - after reviewing the main factors behind the 2007/2009 financial crisis - is focused on what has been done up to now to avoid a new one and to what an extent those measures have or have not removed the main factors which led to the last financial crisis and what should be done to avoid a new one.

The paper is organized as follows. Section II reviews the key elements in the 2007/2009 financial crisis; Section III summarizes the main reforms which took place during and after the crisis; the role played by the shadow banking system in the financial crisis and the regulatory reforms dealing with it are the subjects of Section IV; systemic risk and run vulnerability are the contents of Section V; how to prevent financial crises is the subject of Section VI; the following Section is devoted to micro and macro-prudential regulation issues; Section VIII concludes.

II. Key elements in the 2007/2009 financial meltdown

Financial crises have been defined by Mishkin and Eakins (2015: 164) as "major disruptions in financial markets characterized by sharp declines in asset prices and firm failures".

In Beker (2016a: 45) I have asserted that "the core of the 2007/09 financial market crisis has been the discovery that many securities were actually far riskier than people originally thought they were."

In fact, the epicenter of the crisis was the meltdown in the sub-prime mortgage market that started in the United States in mid-2007, affected most of the financial industry and

eventually spread around the world triggering a global deep worldwide contraction in economic activity.

In the years previous to the crisis, the financial world had been manufacturing vast quantities of triple-rated securities with attractive yields. The star protagonist of this process was the sub-prime mortgage market.

The sub-prime mortgage market developed in the early 1990s; the government-sponsored Fannie Mae and Freddie Mac played an active role in it. By 2007 both government-sponsored enterprises represented 40% of the entire mortgage market.

In the early and mid-2000s high-risk mortgages became widely available from private lenders who funded mortgages by pooling and repackaging them into securities that were sold to private investors. Rising house prices protected lenders from losses; in case sub-prime mortgage borrowers could not make loan payments they could either sold their homes at a gain and paid off their mortgages or borrow more against higher market prices.

Securitization is the process through which loans are removed from the balance sheet of lenders and transformed into debt securities purchased by investors. In other words, it is a process through which an illiquid asset or group of assets are transformed into a financial security. The investment bank Lehman Brothers was one of the active issuers of securitized sub-primes.

The process of securitization allowed a huge amount of risky assets - subprime mortgages in the first place - to be transformed into securities that were widely considered to be safe.

Subprime mortgage securitization models relied on assumptions and historical data that turned out to be incorrect and therefore made incorrect valuations. Substantial lending to subprime borrowers was a recent phenomenon; historical data on the defaults and delinquencies of this sector of the mortgage market were scarce (Coval et al., 2009: 15). Some models were not even based on historical data because they referred to transactions for which there was no active trading market.

When the housing bubble exploded in 2007, real estate markets went down together and mortgage defaults soared. Mortgage-backed securities carried the dual risk of high rates of default due to the low credit quality of borrowers and the high level of default correlation as a result of pooling mortgages from similar geographical areas and vintages. When prices fell in the home market, subprime-related assets deteriorated and the financial crisis blew up.

What is the essence of a financial crisis? According to Furceri and Mourougane (2009: 5), “financial crises are generally characterized by a collapse of trust between financial institutions and their creditors. Increased uncertainty materializes into soaring *premia* on short-term liabilities and a squeeze on liquidity. When *premia* reach a very high level, the liquidity problem becomes a solvency and capital shortage problem, unless public authorities intervene.”

The 2007/2009 financial crisis was triggered by the discovery that many AAA-rated securities were absolutely unsafe. People rushed first to liquidate these assets and next to withdraw their money from those institutions known or suspected of holding those toxic assets.

As a matter of fact, there were four main elements which led to the 2007/2009 financial crisis:

- 1.- Irrational expectations.
- 2.- Securitization.
- 3.- “Shadow” banking system.
- 4.- Credit rating agencies.

1.1. Irrational expectations

As it happened with the different speculative manias that emerged since the 1630s Dutch tulip one, all the actors involved in the last financial crisis drama were convinced that prices – in this case house prices - could only rise.³ In fact, throughout the early 2000s, housing prices kept rising. For many homeowners, rising values made it attractive to refinance their mortgages and use their home equity to pay for other things - investment properties, remodels, cars. Bankers acted as if they believed that housing prices will rise forever. Irrationality pervaded key parts of the economic system.

Subprime mortgages were granted under the premise that background checks were practically unnecessary: a borrower in difficulties could always refinance a loan using the increased value of the house. Many subprime mortgages were "ninja" loans - standing for no income, no job, and no assets. This behavior was stimulated by the “originate-to-distribute” model implemented through a system of off-balance-sheet investment vehicles and conduits.

Historically, banks originated loans and kept them on their balance sheets until maturity. Over time, however, banks began increasingly to distribute the loans they originated.

With this change, banks limited the growth of their balance sheets but maintained a key role in the origination of loans, and contributed to the growth of nonbank financial intermediaries.

The originate-to-distribute model of lending gives banks the flexibility to change the volume of mortgages they make quickly without having to make large adjustments to their equity capital or asset portfolio.

Banks repackaged loans and passed them on to other financial investors, thereby off-loading risk. However, “to ensure funding liquidity for the vehicle, the sponsoring bank grants a credit line to the vehicle, called a ‘liquidity backstop’” (Brunnermeier, 2009: 80). Therefore, the banking system was still bearing the liquidity risk even though it did not appear on the banks’ balance sheets. But while commercial banks fully guaranteed their conduits’ borrowings they did not at the same time make any equivalent capital provision for these guarantees.

Off-loading loans allowed banks to lend while holding less capital than if they had kept loans on their balance sheets. In this way banks enhanced their return on equity while regulations regarding minimum capital ratios were bypassed.

³ Likewise, the savings and loan industry had assumed that interest rates would remain low forever. When funding costs rose dramatically in the early 1980s, nearly 750 firms failed (Greenspan, 2014: 386).

As He and Krishnamurthy (2019: 32) point out, “there was a great deal of leverage ‘hidden’ in the system” thanks to the off-loading of loans. According to these authors, this hidden leverage explains why financial market indicators did not signal a crisis as agents were unaware of the real size of leverage in the financial system.

Cheap credit and weak lending standards resulted in a housing frenzy that led to the financial crisis. Once a bank off-loaded the risk of a certain mortgage it could offer a new loan to another homeowner. The cycle restarted, fueling a housing boom. Home prices skyrocketed. That house prices would rise forever became a self-fulfilling prophecy.

1.2. Securitization

Securitization is the mechanism by which loans are turned into bonds. “The process of securitization allowed trillions of dollars of risky assets - subprime mortgages in the first place - to be transformed into securities that were widely considered to be safe” (Beker, 2016c: 45). Buiter (2009: 5/6) clearly explains how it worked:

“Uncertain future cash flows from mortgages or from business loans were pooled, securities were issued against the pool, the securities were tranching, sliced and diced, enhanced in various ways with guarantees and other insurance features. The resulting asset-backed securities were sometimes used themselves as assets for backing further rounds of securitization. Banks sold their previously illiquid loans and used the proceeds to make new loans. A ‘money machine’ had been invented.”

In fact, assembling bonds from different bond pools allowed a second round of securitization (Coval, 2009: 7). A gigantic interlinked structure of securities was thus created, which has been characterized by Brunnermeier (2009: 98) as “an opaque web of interconnected obligations.”

As Ordoñez (2018: 34) rightly asserts, “banks increasingly devised securitization methods to bypass capital requirements.”

In fact, through off-balance sheet asset management vehicles, banks were allowed to conduct lending with less capital than if they had retained loans on their balance sheets. This process enhanced the return on equity of banks, or more precisely, of their holding companies.

It is really surprising to learn how misinformed even Fed authorities and regulators were about what was going on within the financial system under their supervision before the crisis burst.

Timothy Geithner, who at the time of the crisis was President of the Federal Reserve Bank of New York, declares that

“We couldn’t foresee how the ongoing ‘run’ might evolve, and how rapidly and broadly it might spread. We had only limited knowledge about the potential severity of losses and which parts of the financial system were most exposed to losses, because of the limited reach of our supervisory authorities and the fundamental uncertainty that complicated any assessment of the likely depth of the recession and the incidence of losses (Geithner, 2019: 11).

The former Fed’s Chairman, Alan Greenspan, candidly admits that:

“We at the Federal Reserve were aware earlier in the decade of incidents of some highly irregular subprime mortgage underwriting practices. But, regrettably, we viewed it as a localized problem subject to standard prudential oversight, not the precursor of the securitized subprime mortgage bubble that was to arise several years later. On first being told in the early months of 2005 by Fed staff of the quarterly data for 2004, I expressed surprise given that our most recently official Fed data –those of the Home Mortgage Disclosure Act (HMDA) compilations for 2003- exhibited few signs of problems. I had never heard of the private source *Inside Mortgage Finance* before. But, in retrospect, those data turned out to be right” (Greenspan, 2014: 63/64).

Therefore, the then Chairman of the Fed and President of the Federal Reserve Bank of New York apparently ignored that trillions of dollars of mortgage-backed assets were a time-bomb ready for detonation under their feet. Had they known it perhaps they would have put a bit more attention on the statistics on mortgage delinquency even if they were not familiar with the source of that information as Greenspan declares.

In his defense, Greenspan - who served as Chairman of the Federal Reserve between 1987 and 2006 - goes on arguing that “in early 2007, the composition of the world’s nonfinancial corporate balance sheets and cash flows appeared in as good a shape as I can ever recall” (ibid: 37). The only thing this proves is that he was looking at the wrong indicators.

Although securitization was intended to disperse risks associated with bank lending, “in reality, securitization worked to concentrate risks in the banking sector. There was a simple reason for this. Banks and other intermediaries wanted to increase their leverage - to become more indebted - so as to spice up their short-term profit. So, rather than dispersing risks evenly throughout the economy, banks and other intermediaries bought each other’s securities with borrowed money. As a result, far from dispersing risks, securitization had the perverse effect of concentrating all the risks in the banking system itself” (Adrian and Shin, 2009: 11).

1.3. “Shadow” banking system.

Securitization became the backbone of a complex “shadow” banking system. Although shadow banks perform similar functions to those of depository banks there is a main difference: they do not rely on deposits but on securities markets to fund loans. In fact, they fund themselves in capital markets by issuing commercial paper, asset-backed commercial paper, asset-backed securities, collateralized debt obligations (CDOs)⁴ and repurchase agreements (repos). Money market funds, investment funds and some other securities lenders are the main purchasers of these instruments. “The joining together of the supply of asset-backed securities with the demand for private alternatives to insured deposits led to the shadow banking system” (Gorton and Metrick, 2012: 137).

As shadow banks do not accept insured deposits they were not subject to regulatory rules. As Ordoñez (2018: 34) points out, it was only after BNP Paribas suspended withdrawals

⁴ CDOs are securities that hold different types of debt, such as mortgage-backed securities and corporate bonds, which are then sliced into varying levels of risk and sold to investors. While asset-backed securities have as their collateral a single class of loans the securities backing CDOs consist of many different types of asset classes.

from three funds invested in mortgage-backed securities, that most of the public realized that shadow banking involved higher risks than more traditional banking.

Although the shadow banking system consists of financial institutions that look like banks, act like banks, and borrow, lend and invest like banks, they were not regulated as banks, as Roubini and Mihm (2010: 77) wisely remark.

1.4. Credit rating agencies

“Credit rating agencies were an essential input into the process of manufacturing vast quantities of triple-rated securities with attractive yields. In a period of low interest rates, they were eagerly bought up by investors unaware of the real risks they entailed.” (Beker, 2016a: 48).

Without the generous ratings assigned by credit rating agencies to subprime mortgage-backed securities these assets would not have been so highly demanded by investors.

The agencies’ overly optimistic forecasts were based on historically low mortgage default and delinquency rates. However, substantial lending to subprime borrowers was a recent phenomenon and some models used by credit rating agencies were not even based on historical data because they referred to transactions for which there was no active trading market as there is in mature markets. On the other hand, past downturns in housing prices were mainly local phenomena but when the housing bubble exploded in 2007, real estate markets went down together and mortgage defaults soared in Florida as well as in California.

The high ratings assigned by credit rating agencies explain why a huge amount of dollars were invested in what proved to be highly risky assets. “The three credit rating agencies were key enablers of the financial meltdown. The mortgage-related securities at the heart of the crisis could not have been marketed and sold without their seal of approval” (FCIC 2011, XXV). In fact, important financial institutions are not permitted to hold assets with less than an AAA rating from one of the major rating companies. There was thus a strong demand for high ratings which were generously provided by credit rating agencies to illiquid, opaque, highly risky mortgage-related securities.

III. What has been done during and after the crisis?

Following the 2007/2009 financial crisis a major process of reform of regulation and supervision of the banking industry took place. These reforms had two main aims: increasing the resilience of the financial system and overcoming moral hazard in order to avoid taxpayer losses.

The Dodd-Frank Act passed by the U.S. Congress in 2010 creates two new agencies, the Financial Stability Oversight Council (FSOC) - a committee of regulators in charge of monitoring the entire system for risks and addressing them before they do harm - and the Office of Financial Research (OFR) to support FSOC by collecting and analyzing data.

The so called Volcker rule limits bank holding companies investment in proprietary trading activities, such as hedge funds and private equity, and prohibits them from bailing out these investments. It aims to protect bank customers by preventing banks from making certain types of speculative investments that contributed to the 2008 financial crisis. By outlawing proprietary trading and restricting banks’ abilities to invest in hedge funds and private

equity funds, banks would become less risky, and less likely to require a bailout. The rule only took effect in 2015 and some changes were already made to it in 2019. One of them is that banks are no longer assumed to be engaging in banned trades when they conduct short-term transactions.

The problems generated by the “originate and distribute” model were addressed in the Dodd-Frank Act by requiring security issuers to retain no less than 5 per cent of the equity risk, so they have an incentive to more carefully choose the mortgages and other assets they include in the pool. There are some kinds of mortgages which, however, are exempted from risk retention.

The Dodd-Frank Act prohibits emergency assistance to individual firms as was done in 2008. Any emergency lending program or facility should only be for the purpose of providing liquidity to the financial system as a whole and not to a particular financial company. Specifically, the Dodd-Frank Act requires the Fed to ensure “that any emergency lending program or facility is for the purpose of providing liquidity to the financial system, and not to aid a failing financial company, and that the security for emergency loans is sufficient to protect taxpayers from losses and that any such program is terminated in a timely and orderly fashion” (Section 1101(a)(6)).

However, what may happen if a global systemically important bank needs to be resolved is still an untested issue; political costs could be deemed too high and some sort of bailout may be considered necessary in spite of the legal constraints. On the other hand, as Scott (2016b: 14) puts it, “the reality is that creditors of financial institutions will run if a large financial institution is put into resolution - better safe than sorry - and we need to be prepared to deal with that.”

Derivatives played a key role in the 2007/2008 financial crisis. In fact, they served as a vector for contagion, helping to spread the crisis throughout the financial system.

In the U.S., the regulation of derivatives is the subject of Title VII of the Dodd-Frank Act. Its purpose is granting increased access to data by regulators. The law directed the Commodity Futures Trading Commission (CFTC) and the Securities and Exchange Commission (SEC) to draft the appropriate implementing regulations. As a result of the Dodd-Frank Act, the CFTC became the main U.S. federal regulator of derivatives markets. Under CFTC regulations, counterparties to a derivative trade have now the obligation to report in real-time the trade to an approved Swap Data Repository.

IV. The shadow banking system and the post-2007-2009 regulatory reform

The 2007/2009 crisis was, in essence, a crisis of the shadow banking system.

The emergence of a large and diverse shadow banking system, prior to the crisis mainly in the U.S. and subsequent to it elsewhere around the world, deeply changed the shape of financial activity.

Pozsar et al. (2012) document that “the gross measure of shadow bank liabilities grew to a size of nearly \$22 trillion in June 2007. (...) total traditional banking liabilities in comparison ... were around \$14 trillion in 2007.”

Depository banks, regulated by the Fed, had become just the tip of the finance industry iceberg.

The shadow banking system grew, in first place, because large commercial banks found it advantageous to shift increasing amounts of their activities off their balance sheets as it allowed them to conduct lending with less capital than if they had retained loans on their balance sheets thus enhancing the return on equity of banks or, more precisely, of their holding companies.

The different institutions in the shadow banking system (Special Purpose Entities, Special Investment Vehicles, conduits, and so forth) had one feature in common: they were not regulated. However, they kept a close relationship with the regulated banking system.

The two parts of the financial system are closely linked through a network of securities lending, repos and derivatives markets. Regular banks are big players in the shadow banking system, both as collateral providers and as repo participants. Apart from this direct linkage, the risks taken by the shadow banks can also spread to regular banks via indirect channels, such as the massive sale of assets that could cause the decrease of prices of financial and real assets, as happened in 2007/2009. This deep interconnectedness between the shadow banking system and the regular banking system explains why a crisis originated in the shadow banking system had such a formidable impact on many institutions belonging to the regulated one.

The “originate-to-distribute” model developed thanks to deregulation and financial innovation allowed banks to originate a variety of loans and then transfer the risks associated with this loans to non-bank institutions. Securitization allowed bundling up several tranches of illiquid loans together and converting them into liquid financial securities apt to be sold to investors.

The clear relationship between the growth of shadow banking and the destructive 2007/2009 financial crisis led to the conclusion that shadow banking plays a too critical role to be kept unregulated.

In this respect, the post-2007/2009 crisis regulatory framework consists of trying to isolate from risk the so-called SIFIs which include not only the traditional commercial banks but also some components of the shadow banking system like investment banks or insurance companies considered to be of systemic importance.

The Dodd-Frank Act gives FSOC the authority to design as SIFI (systemically important financial institution) any nonbanking financial company that could pose a threat to the financial stability of the United States.

The Dodd-Frank Act also opens access to public liquidity funding to some shadow banking institutions such as broker-dealer subsidiaries of investment banks, as well as non-banks designated as systemically significant.

In return, FSOC has the authority to instruct the Fed to impose regulation on non-bank financial companies that present systemic risk.

However, in spite of the key role played by shadow banking in the 2007/08 crisis, most of the post-crisis reforms have been focused on traditional banks. They just reduced incentives for banks to provide the backstop support for shadow banking activities expecting this will induce more socially efficient levels of these activities. The fact is that financial reforms fail to recognize that a large part of the deposits in the financial system are no longer in the form of insured deposits but rather in the form of money market deposits and interbank

repos. For example, in the case of the U.S. financial system, non-bank institutions hold more than double the financial assets of traditional banks; in fact, non-banks hold near 60% of the financial sector total assets (D'Avernas et al., 2020).

On the other hand, international regulatory coordination is a big challenge. Regulatory arbitrage may end up concentrating the highest risks in those countries where regulation is weaker.

V. Systemic risk and run vulnerability

Systemic risk has been defined as “the disruption to the flow of financial services that is caused by an impairment of all or parts of the financial system; and has the potential to have serious negative consequences for the real economy” (BIS et al., 2009).

We speak of systemic risk as opposite to idiosyncratic risk. The latter refers to something which may result in damage to a single institution or asset without a significant impact on the rest of the economy. On the contrary, systemic risk has to do with the danger that a certain event or succession of events may result in the collapse of the whole financial system, causing a major downturn in the real economy.

The measurement of systemic risk is still in its infancy although it is a fast growing industry. Bisias et al. (2012) analyzed more than 30 systemic risk measures; Brunnenmeier and Cheridito (2019: 3, 15) criticize previous models because they do not take all channels of contagion into account and propose a practical way of measuring and allocating systemic risk.

V.1. Interconnectedness, contagion and panic

The description of events that followed Lehman's failure led me to distinguish between three different channels of transmission of a certain shock to the rest of the financial system: interconnectedness, contagion and panic (Beker, forthcoming).

The Dodd-Frank Act tries to reduce the magnitude of asset interconnectedness. On one hand the Act limits banks' credit exposure to their affiliates and to other financial institutions and provides an expanded definition of credit exposures.

On the other hand, by limiting the amount of credit that may be extended to a single borrower as well as giving regulators the possibility of capping the institution's exposure to a single significant funding the Dodd-Frank Act reduces the consequences of an eventual failure of a large financial institution.⁵

It also mandates central clearing of derivatives and other financial contracts in certain cases. In such a case, the central clearing counterparty “stands between over-the-counter (OTC) derivatives counterparties, insulating them from each other's default. Effective clearing mitigates systemic risk by lowering the risk that defaults propagate from counterparty to counterparty” (Duffie and Zhu, 2010: 2).

Scott (2016a) emphasizes the distinction between interconnectedness and contagion. He argues that interconnectedness was not a major cause of the financial crisis as no large

⁵ Dodd-Frank Act § 164 and § 165.

financial firms failed as a direct result of their exposures to Lehman Brothers. Instead, he goes on arguing, in 2008 systemic risk existed due to contagion.

The role of interconnectedness among financial institutions in transmitting financial stress has been modeled in economic theory by different authors (Allen and Gale , 2000; Gai et al., 2010).

With respect to contagion, this term was rarely used in economics before 1995, after which it occasionally appeared in articles discussing the impact of the Mexican Peso crisis on other countries in Latin America (Forbes, 2012: 4).

This should not be a surprise. Neoclassical economics was built under the assumption that information is complete, perfect and symmetric. Under these assumptions, contagion is ruled out. For contagion to exist some information failure is necessary.

Scott (2016a) characterizes contagion as a liquidity-driven phenomenon in which short-term creditors in response to informational constraints withdraw from institutions preemptively, as it happened to money market funds with no exposure to Lehman during the financial crisis.

Lagunof and Schreft (1999) show how contagion can occur even within a rational expectations framework. The paper arrives at a couple of surprising conclusions.

The first one is that the distinction between rational and irrational behavior is absolutely irrelevant. What does matter is the distinction between exuberant and apprehensive investors. Provided there is at least one apprehensive investor in the economy, total financial collapse can occur, regardless of the fundamentals and the rationality of investors. Apprehensive investors perceive a contagious financial crisis as more likely than it actually is. Given this misperception, they believe they benefit from reallocating their portfolios to preempt experiencing portfolio losses. It is this behavior that by itself initiates a contagious financial crisis. Even if the rationally exuberant investors in this economy correctly forecast that the fundamentals make financial crises unlikely, they must respond strategically to the portfolio reallocations they expect by the apprehensive investors. They choose to reallocate their own portfolios to protect themselves against losses due to the contagion the apprehensive investors initiate.

The second unexpected conclusion is that “a financial crisis that looks as if it were initiated by real shocks to the economy instead could have been caused solely by the presence of rational, but unjustifiably apprehensive, investors” (Lagunof and Schreft, 1999: 4).

These results coincide with conclusions arrived at in empirical works on financial crises (see, e.g., Kaminsky, 2003) in the sense that crises may occur despite the fundamentals being sound or may not occur despite the fundamentals being weak.

One policy conclusion Lagunof and Schreft draw from their model is about the key role that a lender of last resort may play to stop ongoing contagion by providing loans to investors who actually incur losses and are about to reallocate their portfolios initiating the first round of contagion.

A second policy conclusion is the need for monitoring lenders' portfolios in order to stimulate greater diversification and thus increase the number of shock-induced project failures needed to initiate a crisis. It is worth remarking that this was proposed almost 10

years before the great concentration of the financial system in mortgage-backed securities operations brought it close to collapse.

Panic occurs when there is an indiscriminate run in which investors withdraw their funds from any institution or market even though they have not invested in the same risks and are not subject to the same original shocks. Of course, in a world of rationality, absolute transparency and perfect information panic is quite unconceivable. But such a world is not the real world.

However important in the real world, panic has received little attention in the economics literature.

One rare exception is Kindleberger and Aliber (2011: 33) who refer to panic as equivalent to the German expression *Torchlusspanik*, “door-shut-panic”: investors crowd for fear not to be able to get through the door before it slams shut.

V.2. Policy response to systemic risk

According to Scott (2014: 10), “since the 2008 crisis, regulators have focused primarily on three policy responses to the problem of systemic risk: (i) capital requirements, (ii) liquidity requirements, and (iii) insolvent bank resolution procedures.”

The international Basel III agreement, the Financial Stability Board and Section 171 - the Collins Amendment - of the Dodd-Frank Act have increased the amount of bank capital with the purpose of ensuring that banks will be able to withstand future downturns. At the same time, higher bank capital requirements are one way of making shareholders have more skin in the game expecting this would induce them to avoid excessive risk-taking.

Capital requirements are just a first line of defense aimed at assuring creditors that financial institutions are strong enough to survive an economic shock and have capital buffers against unexpected losses.

For the time being one apparent result of the provisions on risk-weighted capital requirements has been that many banks have offloaded complex assets that attracted higher capital requirements; this allowed their assets to look much less risky to their internal models.

Liquidity is the second line of defense. While capital requirements attempt to warrant solvency, minimum liquidity requirements are supposed to assure that financial institutions hold a permanent pool of high quality liquid assets that can be sold (or pledged as collateral) to face any sudden surge of withdrawals by depositors and other short-term debt holders. As a matter of fact bank failures are usually triggered by liquidity shortages.

The liquidity requirements implemented after the crisis are analyzed in more detail below. For the time being, let me observe that, as it happens with several regulatory reforms implemented after the financial crisis, liquidity requirements apply mainly to traditional banks while, as it happened in the 2007/2009 crisis, contagion may spread far beyond the traditional banking sector.

It has been argued that private liquidity requirements will make it less necessary to resort to public liquidity through the use of central bank lender-of-last-resort authority. Consequently, the role of the Fed as lender of last resort has been restricted by the

regulatory reform in the hope that private liquidity might be a close substitute for the public one.

The Fed can make emergency loans only under a “broad” program. A Fed regulation implementing this provision requires that at least five institutions must be “eligible” for any Fed program. As Scott (2016b) rightly points out, this may mean that the Fed might have to wait for five institutions to be under attack before being able to act.

Another issue the new legislation had to tackle was the too-big-to-fail issue. This has been dealt with the creation of an Orderly Liquidation Authority (OLA). Under the OLA, the FDIC and Fed are provided tools to help resolve failing firms safely outside bankruptcy proceedings. In order to be placed into receivership under OLA, the financial company must be designated as posing systemic risk in the event of failure, and it must be in default or in danger of default. The determination is made on the eve of bankruptcy by the Federal Reserve and FDIC with final approval by the Treasury Secretary upon consultation with the President. The aim is to provide a restructuring of financial institutions in a way that ensures continuation of essential business lines, with minimum disruption and the preservation of franchise value and low cost to the public.

V.3. The central bank as dealer of last resort

In theory, in order to halt runs, central banks, acting as lenders of last resort, are supposed to lend to solvent institutions against illiquid but high-quality collateral to provide the necessary funds to pay out debts in a crisis.

However, just at the start of the 2007/2009 financial crisis, Buiter and Sibert (2007) prevented that “now that financial markets (and non-bank financial institutions) have increasingly taken over the function of providing credit and all forms of finance to deficit spending units, a credit crunch or liquidity crunch manifests itself in a different way from the world described by Walter Bagehot’s lender of last resort.” They went on arguing that the failure to match willing buyers and sellers at prices acceptable to both in the financial instruments markets demands the central bank to become the market maker of last resort.

It is important to bear in mind that “market-maker of last resort (MMLR) is not an extension of the lender of last resort (LOLR) function; it is a completely new role for the central bank” (Dooley, 2014: 128) This role is brought to the fore by the fact that credit markets are driven by trust in collateral rather than trust in banks (or non-banks). The central bank intervenes supplying its own liabilities to replace those assets whose value is under suspicion.

Li and Ma (2019) argue that in times of crisis central banks should boost the market liquidity of bank assets rather than directly lend to ‘solvent-but-illiquid’ banks. Among other things, because of the difficulty of distinguishing illiquid banks from insolvent ones. The authors emphasize that a dealer of last resort should not concern itself with the solvency of individual institutions but should focus on maintaining a ‘fair price’ of banks’ assets which can be based on the long-run fundamentals.

Li and Ma remark that, from an operational point of view, a bank that fails because of illiquidity cannot be distinguished from one that fails because of fundamental insolvency, which leaves regulators informationally constrained. Whereas in practicing market-makers

policies, instead of assessing the solvency of a bank, regulators only need to estimate the value of assets to be purchased, which can be much less informationally demanding.

As a matter of fact, the Fed played an active role as dealer of last resort during the COVID 19 crisis.

V.4. Run vulnerability

Runs are a possibility every time illiquid assets are turned into liquid assets. This is precisely the main function that banks and other financial institutions fulfill and that is why they are exposed to deposit runs or, in general, to an inability to access the debt markets for new funding. The inability to roll over debt through new securities issuances has a similar effect for non-banks to deposit withdrawals for banks.

Bao et al. (2015) define "runnables" as "pay-on-demand" transactions which embed defaultable promises made by private agents or state and local governments without explicit insurance from the federal government. "In general, the pay-on-demand feature implies that in the event of stress - caused by credit-risk concerns, large swings in short-term interest rates, or deteriorations in market liquidity - investors may exhibit bank-run-like behavior by redeeming their shares, unwinding their transactions, or deciding not to roll over their positions" (ibid.).

The ultimate reason for runs is liquidity mismatch between assets and liabilities. This is a necessary but not a sufficient condition. The other feature which makes runnable a contract is that it promises fixed values payable in full on demand on a first-come first-served basis (Cochrane, 2014: 197). For example, if I know that the withdrawal of my deposits depends on the liquidity of long term assets held by the bank and I hear that some people are withdrawing their deposits I will rush to withdraw my money before the bank's assets become completely illiquid. Other people will do the same and this will set in motion a bank run. Notice that the bank's ability to pay back deposits depends in the first place on the liquidity, not only the value, of its assets. A bank can be solvent, holding assets exceeding its liabilities under normal economic circumstances, but illiquid and therefore unable to pay back its deposits. That is why bank runs may be self-fulfilling prophecies and even "healthy" banks can fail.

Bao et al. (2015) identify a number of liabilities that fit their definition of runnables: uninsured bank deposits, money market mutual funds shares, repos and securities lending, commercial paper, variable-rate demand obligations, federal funds borrowed and funding agreement backed securities.

VI. How to prevent a new financial crisis

Bubbles are large, sustained overpricing of financial or real assets. Historically, bubbles appear associated to financial crises.

Bubbles use to appear in the initial stage of the process which ends in a crisis when the bubble bursts. For this reason the issue seems to be pretty easy: it is a matter of intervening before the bubble bursts. However, it is difficult to identify a bubble in real time and even more difficult to choose the precise moment to bring it down before it damages the whole financial system.

Fortunately, the issue is not the bubble itself but the probability that its bursting may disrupt the financial system with a huge impact on economic activity. This may happen if and only if the bubble has been fueled with credit. This is the main difference between the 2007/2009 subprime mortgage crisis and the internet one of the late 1990s. “The severity of the destruction caused by a bursting bubble is determined not by the type of asset that turns ‘toxic’ but by the degree of leverage employed by the holders of those toxic assets” (Greenspan, 2014: 9).

If so, the real issue is to avoid excessive concentration of loans in any one sector or kind of assets of the economy. The issue is not necessarily to try to identify bubbles and follow their trajectory but to prevent the financial system from being overexposed to some particular sector of the economic activity or some particular kind of asset where a bubble may develop.

The 2007/2009 crash was not caused by the housing bubble in itself but because of the deep involvement of the financial system in it.

This does not mean that a new financial crisis will necessarily have its roots in the real estate market. Quoting Greg Ip of the *Wall Street Journal*: “Squeezing risk out of the economy can be like pressing on a water bed: the risk often re-emerges elsewhere.”

It is a useless exercise trying to predict what sector the new financial crisis will come from. New vulnerabilities are likely to appear and financial institutions may very well try to find ways around the new legislation. New risks can develop out of things that do not appear initially to contain that kind of possibility. The risks of the future are unlikely to come from the precise places that they’ve come in the past. It is well known that predictions are hard, especially about the future.⁶

The only way to avoid a new crisis is to prevent the financial industry from being excessively exposed to *any* particular sector of the economy, region or kind of assets.

Central banks have now the raw material for this: for example, in the U.S., the largest bank holding companies and foreign banking organizations have to report periodically their top exposures; the same happens in Europe under the European Union large exposures regime; in India banks have to report, on a monthly basis, their 20 top exposures. With this information, each central bank can carry out a consolidated analysis of the financial sector exposure. In contrast with the dynamic sector risk-weight adjustment methodology that is employed by some central banks in emerging markets, this approach does not rely on regulatory discretion to identify risk pockets. Moreover, a by-product of this restriction may be a greater flow of credit to the underserved sectors, helping in diversifying banks’ credit portfolio and the structure of the economy.

As part of their macro-prudential policy, central banks should establish the acceptable limits of concentration risk and the mechanisms to monitor and control that the system behaves within them.

⁶ However, Frankel (2017) takes the risk and points out to three candidates: a) the bursting of a stock-market bubble; b) the bursting of a bond-market bubble; and c) geopolitical risk.

Of course, a necessary condition for the implementation of these credit limits is proper accountability of financial institutions to their regulators. Lack of transparency has been one of the flaws exposed by the financial crisis.

Managerial compensation schemes played a key role in the financial crisis. Managers who do not have “skin in the game” may be tempted to take excessive risks using other people’s money.

As I have asserted in one of the chapters of the volume written with my colleague Beniamino Moro, “compensation policies can play a useful role in reducing excessive risk-taking” (Beker, 2016b: 228).

If part of their compensation only becomes available to executives with a lag, this extends the time horizon over which their decisions are taken. Moreover, the executive compensation regime may include provisions that would force managers to return past bonuses if, for example, their decisions cause losses over the longer term.

VI.1. Risk mispricing by credit rating agencies

Credit rating agencies (CRAs) played a key role in the subprime meltdown. Without the generous ratings assigned by them to subprime mortgage-backed securities these assets would not have been so highly demanded by investors.

Mispricing of risk is an everyday phenomenon. Each time someone sells some asset at a loss it is because he or she has mispriced the risk at the time of the investment decision. The problem arises when it is a mispricing of a systemic risk i.e. a risk that may endanger the stability of the financial system as a whole. By mispricing mortgage-related securities risk the credit rating agencies allowed that trillions of dollars were invested in them by most of the financial institutions thus compromising the health of the entire financial system. Inflated credit ratings led to a massive mispricing of risk, whose correction later detonated the crisis which put in evidence the failures of the initial ratings of structured debt securities.

According to Professor Andrea Miglionico the main problems in connection with CRAs’ *modus operandi* are: “(1) the ‘issuer-pays’ business model; (2) over-reliance on ratings for regulatory purposes and on the part of investors; (3) limited competition; and (4) lack of accountability” (Miglionico, 2019: X).

In spite of their key role in the financial meltdown, CRAs emerged practically untouched after it. Although the Dodd-Frank Act devotes a whole chapter to the subject, its norms have been only partially implemented.

According to Partnoy (2017), “these reforms have had little or no impact, and ... therefore the same credit rating-related dangers, market distortions, and inefficient allocations of capital that led to the crisis potentially remain. The major credit rating agencies are still among the most powerful and profitable institutions in the world. The market for credit ratings continues to be a large and impenetrable oligopoly dominated by two firms: Moody’s and S&P. And yet credit ratings are still as uninformative as they were before the financial crisis. Simply put, credit ratings remain enormously important but have little or no informational value.”

The regulatory act created a new office within the SEC: the Office of Credit Ratings (OCR), in charge of overseeing the nationally recognized statistical rating organizations (NRSROs).

Although during these years the OCR reported several transgressions by NRSROs, civil actions based on them have been infrequent and criminal actions non-existent.

The essential problem with CRAs is that the primary sources of revenue for their ratings continue to come in the form of fees that are paid by the security issuer. The issuer-pays model raises a potential conflict of interest because the agencies are paid by the organizations whose debt they rate.

From the theoretical point of view, it has been argued that agencies cannot be tempted to provide biased ratings because this would damage the agencies' reputation. Therefore, if they expect to remain in business over a longer term they would give priority to preserving their long-run reputation as an accurate provider of ratings (White, 2018: 17).

However, as the same author admits, it is clear that "the CRAs' business model – whereby the issuers of the securities paid for the ratings – very likely did encourage the CRAs to accede (or cater) to the RMBS (residential mortgage-backed securities) issuers' desires to obtain higher ratings" (White, 2018: 13). Reputational pressures alone do not create adequate incentives to avoid biased ratings, according to the last financial crisis experience.

Another conflict of interest emerges when CRAs offer advisory services to issuers. For instance, an issuer can ask a rating agency how it would rate a financial instrument with certain characteristics, and may even ask how these should be modified to obtain a certain rating. This type of activity facilitates rating shopping, that is, it allows an issuer to identify the rating agency that would provide the most favorable rating to its financial instruments. In this way they can make sure that structured products get an AAA rating. The selection and slicing done in association with a CRA makes sure that each tranche will get the desired rating. For example, investment banks "could adjust their CDO packages to get the desired rating while minimizing the efforts to improve the quality of the package" (Darbellay, 2013: 125). For this reason, it has been argued that the formulation of ratings should be completely separated from ancillary services.

The Dodd-Frank Act also made amendments to Rule 17g-5 to deal with "rating shopping" and the potential conflict of interest that arises in an arranger-pay model; in particular, these amendments require a rating agency hired by an issuer to disclose the rating assignment and provide information to both hired and certified non-hired nationally recognized statistical rating organizations. The purpose of this amendment has been to increase the number of credit ratings extant for a given structured product promoting the issuance of credit ratings by agencies that are not hired by the arranger. In this way, the users of structured credit ratings would be provided with more views on the creditworthiness of the rated products. However, very few shadow ratings have been produced under this new mechanism.

The fact is that, in spite of the Dodd-Frank Act provisions, very little has changed neither in respect to the conflicts of interests concerning NRSROs nor to promoting increased competition in this oligopolistic market. More than a decade after the crisis to whose origin they were major contributors, "the major credit rating agencies remain among the powerful and profitable institutions in the world" (Partnoy, 2017: 1414).

VII. Micro and macro-prudential regulation

While before the global financial crisis central banks focused mainly on monetary policy and less on financial stability, they are now highly focused on the latter.

In this context, macro-prudential policy has become established as a new policy area. It does not replace the traditional regulation, often called micro-prudential; it complements it after the global financial crisis demonstrated micro-prudential regulation was insufficient to guarantee the health of the financial system as a whole. Macro-prudential policy is defined as the use of primarily prudential tools to limit systemic risk (IMF-FSB-BIS, 2016: 4).

While micro-prudential supervision focuses on safeguarding individual financial institutions from idiosyncratic risks and preventing them from taking too much risk, macro-prudential regulation has to do with the fact that financial institutions may not internalize the adverse externalities which their risk-taking behavior may generate on the economy as a whole. Macro-prudential supervision internalizes those externalities.

“Under the umbrella of Basel III, international reform of micro-prudential regulation has focused on four key areas: capital, leverage, liquidity, and resolution” (Aikman et al., 2019a: 144). Let us have a look at these four areas.

Capital. With respect to capital standards, the reforms focused on increasing - quantitatively and qualitatively - the capital maintained by banks against their risk-weighted assets exposures.

The idea is that a well-capitalized bank will be able to handle major write-downs of its assets without defaulting on its creditors and depositors. Banks are required to hold a larger portion of their liabilities in the form of equity so that they can absorb losses from a very severe shock without being forced to sell off their assets at fire-sale prices and trigger the sort of contagion that threatened the global financial system in 2007/2009.

Leverage. Besides risk-based increased capital standards, in order to constrain excess leverage Basel III has implemented a leverage ratio, which is set at a minimum level of 3 percent. This means that the ratio of the bank's core capital to its total assets should be above 3 percent.

Banks are required to fully disclose to the markets their financial leverage. In April 2016, the Basel Committee introduced an additional leverage ratio requirement for global systemically important banks.

Liquidity. In the Basel III rules, regulators have also designed global standards for the minimum liquidity levels to be held by banks. They rely on two minimum ratios. The first is a ‘Liquidity Coverage Ratio’ which is a kind of stylized stress test to ensure that a bank would have the necessary sources of high quality liquid assets (HQLA) to survive a 30-day market crisis. HQLA means assets that can be easily and immediately converted to cash at little or no loss of value.

The second is the Net Stable Funding Ratio (NSFR) which relates the bank's available stable funding to its required stable funding. The NSFR is expressed as a ratio and must equal or exceed 100%. “Stable funding” is defined as the portion of those types and amounts of equity and liability financing expected to be reliable sources of funds over a

one-year time horizon under conditions of stress. The NSFR aims to limit over-reliance on short-term wholesale funding to finance medium to long term assets and activities.

Resolution. The Dodd-Frank Act tries to reduce taxpayer exposure to loss from support in case of resolution of financial institutions. With this purpose, bank holding companies with total consolidated assets of \$50 billion or more and nonbank financial companies designated as SIFIs by the FSOC have to periodically submit resolution plans - commonly known as living wills – that must describe the company’s strategy for rapid and orderly resolution under the U.S. Bankruptcy Code in the event of material financial distress or failure of the company. In the case of Europe, ensuring the orderly resolution of failing banks with minimum impact on the real economy and the public finances is the main purpose of the single resolution mechanism instituted as one of the pillars of the European Banking Union.

VII.1. Macro-prudential regulation

The set of most significant macro-prudential measures have to do with capital buffers, stress testing, lending standards, and the shadow banking system. The issues concerning shadow banking regulation have already been analyzed in Section IV; let us move to the capital buffers, liquidity and lending standards subjects.

Capital buffers. When a solvency issue is at play, liquidity backstop is not sufficient and capital injection is required. Building and releasing capital buffers can help maintain the ability of the financial system to function effectively, even under adverse conditions. Basel III included the gradual introduction, starting from 2016, of the so called capital conservation buffer - equal to 2.5% of the risk weighted assets -, aimed at ensuring that banks keep a capital cushion to absorb the losses associated to periods of economic and financial stress. This is an automatic mechanism which allows a bank to accumulate high quality capital during good times that will be eroded by losses during bad times without limiting the normal bank’s activities.

The same idea inspired the additional countercyclical capital buffer - also introduced as part of Basel III but subject to national supervisory authorities approval -, which rises when the credit supply is above its trend and falls during phases of credit contractions. This requirement is not automatic but can be imposed on a discretionary basis by the individual national supervisors in case of excessive credit growth and according to the aggregate risk environment.

Aikman et al. (2019b) estimate what size of the countercyclical capital buffer would have allowed banks to continue lending in line with historical credit growth rates during the last financial crisis. The result is that had a countercyclical capital buffer of 4.7 percent been built-up in the run-up to the crisis, it would have ensured that banks would have had sufficient capital to avoid applying for TARP and to continue growing their balance sheets in line with the long-run average growth rate. However, the authors recognize that macro-prudential policy frameworks should be calibrated with some built-in “slack” to account for the inherent difficulty of risk assessment, particularly in real time (ibid.: 115-116).

Basel III also imposed higher capital requirements on systemically-important firms. “These capital add-ons apply to the 30 designated global systemically-important banks (G-SIBs) and the roughly 160 domestic systemically important banks (D-SIBs), to be phased-in between 2016 and 2019” (Aikman et al., 2019a: 146).

Finally, Basel III requires that total capital must be equal to at least 8% of the bank's risk weighted assets.

Stress tests. Macro-prudential stress tests aim at helping to assess the ability of the system to continue to function under a range of adverse economic and financial conditions, thereby complementing the use of early warning indicators.

The Dodd-Frank Act requires the Federal Reserve to conduct an annual supervisory stress test on SIFIs. The Dodd-Frank Act also requires these same firms to conduct their own stress tests and report the results to the Federal Reserve twice a year.

These instruments provide forward-looking information to help gauge the potential effect of stressful conditions on the ability of those organizations to absorb losses and continuing to lend. The Fed-conducted annual assessment includes a Comprehensive Capital Analysis and Review which evaluates a firm's capital adequacy and planned capital distributions.

Firms strongly depend on this assessment in order to go on with some key decisions, such as any dividend payments and common stock repurchases. If the Federal Reserve objects to a firm's capital plan, the firm may only make capital distributions that the Federal Reserve has not objected to.

The aim of the macro-prudential stress testing is to assess not just the health of a particular institution however big and interconnected it is but the resilience of the financial system as a whole.⁷ However, most macro-prudential stress tests only cover banks and their creditors, and therefore fail to capture interactions with non-banks that make up a substantial part of the financial system nowadays. In fact, non-bank components of the financial system are playing an increasing role as banking regulation induces a migration of financial activities to funds and investment vehicles of various types.

On the other hand, a key issue is whether stress tests results provide reliable information on the resilience of banks. In this respect the case of Banco Popular, Spain's fifth-largest bank, seems to give a negative answer. It passed the European Central Bank's Asset Quality Review in 2014 and the European Banking Authority's stress test in 2016; only six months later, it collapsed. As a matter of fact, Banco Santander bought it for the nominal sum of one euro after depositors withdrew money *en masse* from the failing institution.

Is this just a failure of the EU stress tests? It does not seem to be the case. Goldstein (2017) argues that stress tests currently conducted in both the United States and the European Union fall short of what is needed to promote financial stability; in particular he warns that the metrics used in the stress tests are not good enough to discriminate between healthy and sick banks.

Lending standards. Other macro-prudential instruments include those aimed at influencing lending standards -for example, through setting loan to value limits (LTV), loan to income limits (LTI) or margin requirements on collateralized borrowing in financial markets. As a

⁷ As Brazier (2017: 3) recalls, referring to the last financial crisis, "actions taken by each bank in their own interest turned the system as a whole into an amplifier of the initial shock. The system was not the sum of its parts." Therefore, the system's health is what really matters.

matter of fact, the majority of macro-prudential actions since 2010 have fallen into these lending standards category (Aikman et al., 2018: 33).

To sum up, the new financial regulatory architecture includes risk-weighted capital requirements (RWCR), the leverage ratio (LR), the liquidity coverage ratio (LCR), and the net stable funding ratio (NSFR). This system of multipolar regulation - as Aikman et al. (2019a: 163) call it - is, for some authors, over-identified. Aikman et al. defend the multiple constraint approach arguing that any individual constraint creates incentives for banks to engage in avoidance or arbitrage. A multipronged approach mitigates this risk.

VIII. Conclusions

Following the 2007/2009 financial crisis a major process of reform of regulation and supervision of the banking industry took place. These reforms had two main aims: increasing the resilience of the financial system and overcoming moral hazard in order to avoid taxpayer losses.

The main instruments of reform have been the 2009 international regulatory accord known as Basel III and the Dodd-Frank Act that the U.S. Congress passed in 2010.

However, there are certain questions which have not a clear answer.

For example, the Dodd-Frank Act prohibits emergency assistance to individual firms as was done in 2008. But what may happen if a global systemically important bank needs to be resolved is still an untested issue; political costs could be deemed too high and some sort of bailout may be considered necessary in spite of the legal constraints.

In spite of the key role played by shadow banking in the 2007/08 crisis, most of the post-crisis reforms have been focused on traditional banks. Financial reforms fail to recognize that a large part of the deposits in the financial system are no longer in the form of insured deposits but rather in the form of money market deposits and interbank repos. This transfer of risks to nonbanks can increase overall risk, especially if these financial intermediaries are outside of the regulatory perimeter but are highly interconnected with SIFIs.

International regulatory coordination is still a big challenge. Regulatory arbitrage may end up concentrating the highest risks in those countries where regulation is weaker.

It has been argued that private liquidity requirements would make it less necessary to resort to public liquidity through the use of central bank lender-of-last-resort authority. Consequently, the role of the Fed as lender of last resort has been restricted by the regulatory reform. However, the COVID 19 pandemics forced the Fed to revive several of the facilities implemented during the Great Recession and implement some new ones. Probably, this experience will indicate the need for some corrections to be made to the regulatory framework carried out after the 2007/2009 financial crisis.

The key issue to avoid a new financial crisis is to prevent an excessive concentration of loans in any one sector, region or kind of assets of the economy. Central banks have now the raw material for this: for example, in the U.S., the largest bank holding companies and foreign banking organizations have to report periodically their top exposures; the same happens in Europe under the European Union large exposures regime; in India banks have to report, on a monthly basis, their 20 top exposures. With this information, each central bank can carry out a consolidated analysis of the financial sector exposure.

In spite of their key role in the financial meltdown, CRAs emerged practically untouched after it. The essential problem with CRAs is that the issuer-pays model raises a potential conflict of interest because the agencies are paid by the organizations whose debt they rate. Another conflict of interest emerges when CRAs offer advisory services to issuers. These issues are still waiting for better regulation.

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