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# **FINANCIAL CRISIS AND NEW DIMENSIONS OF LIQUIDITY RISK: RETHINKING PRUDENTIAL REGULATION AND SUPERVISION**

by

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## **Abstract**

This paper aims to stress the importance of market liquidity for the stability of the financial system, emphasizing the pivotal role played by liquidity risk in the development of the current financial crisis, pointing out the flaws of regulation and supervision and stressing the need for their reform. We first investigate the evolution of the concept of liquidity and the nexus between the transformations of financial systems and their increased vulnerability to liquidity risks. Then we focus on the causes of the emergence of liquidity risk in the ongoing financial crisis. We point out two intertwined processes: firstly, the huge increase in financial assets stemming from the shift to an “originate-to-distribute” intermediation model; secondly, the growth of a parallel financial circuit. After this, we focus on the main lessons for regulation and supervision: first of all we address the case for adjustments to or reform of Basel 2 in view of the nexus between solvency and liquidity. Further crucial points relate to market liquidity and OTC markets, scale and scope of LLR function, architecture of supervisory authorities and perimeter of controls. Finally we stress the need for harmonization, or at least coordination, of national liquidity regimes, at least for cross-border groups.

Keywords: financial innovation, financial crisis, market liquidity risk, financial regulation, supervision

JEL: D53, E58, F37, G1, G18, G21, G24, G28

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# 1. Introduction

The aim of the paper is to stress the importance of market liquidity for the stability of the financial system and the consequences in terms of prudential regulation and supervision, in the light of the financial crisis that began in mid-2007.

We first analyze how the structural changes in the most important financial systems, and in particular the process of financial innovation, have contributed to the huge increase in financial assets as a result of two intertwined processes: firstly, the shift from the old-fashioned “originate-to-maintain” to an “originate-to-distribute” (OTD) intermediation model, which has increased banks' credit potential through the transfer of loans and credit risk to a larger group of investors. Secondly, the increasing degree of involvement of non-bank financial intermediaries which, benefiting from a loosening of the regulations, have been able to achieve a high degree of leverage on their investments in the new financial instruments.

Financial innovation and the related securitization process have weakened banks' ability to manage liquidity risk in times of financial stress. Financial innovation has made banks and the other financial intermediaries more reliant on the functioning and stability of financial markets, so that liquidity, market and credit risks have become even more correlated. Moreover, the originate-to-distribute model, combined with the consolidation and diversification of financial intermediaries' activities, has increased the interconnection of different intermediation levels, enhancing the systemic and counterparty risks.

Regulation and supervision have proved inadequate to cope with this situation and must be reconsidered at both the macro (scope and scale) and micro (instruments) level, also bearing in mind the strong links between banks' solvency and liquidity.

To focus on the main lessons to be drawn from the recent crisis, we concentrate on the most critical aspects of the present regulatory system and introduce the main reasons for rethinking liquidity regimes, in the light of the changes which have taken place in the main financial systems, and their consequences in terms of increased vulnerability to liquidity risk. The key question is: what went wrong in the prevention of the liquidity crisis and the reduction of the contagion effect, and what lessons can the regulators draw from the unfolding of the financial crisis?

The paper is divided into four principal sections. The first is devoted to defining and depicting concepts of liquidity and their evolution, focusing on the different forms liquidity risks may take. The second analyses the transformation in the principal financial systems and the consequences of these changes in terms of the growing complexity of operators' liquidity management and their vulnerability to liquidity risks. The third section focuses on the lessons for regulation and supervision arising from the financial crisis as far as liquidity risk is concerned. Finally, the main conclusions of the paper are presented.

## 2. Definition and evolution of the concept of liquidity

The difficulties in defining liquidity are clearly depicted by Crockett (2008): “Liquidity is easier to recognize than to define”, reflecting the fact that, in the recent history of financial systems, economic agents have used a large variety of financial instruments and techniques to plan and regulate their cash needs. The definition of liquidity has therefore accompanied the evolution of the concept of money, and has changed in response to the financial innovation process and, to a large extent, to the modifications in the structure and functioning of the financial system.

Financial theory has illustrated that, given the imperfection of the capital markets, the transfer of resources between economic agents and across time requires an adequate amount of risk-free financial assets in the economy: stores of value, means of transferring purchasing power generally accepted by operators. A State-provided financial asset is able to acquire the monetary function of unit of account and medium of exchange. i.e. a form of *outside liquidity* represented by a liability of the Central Bank, which has taken on the role of creating money and regulating the amount in circulation on the State’s behalf.

Financial theory also explains the role of banks as liquidity providers: their function of granting loans or holding primary debt securities issued by economic agents with funding needs is accompanied by the function of collecting resources from investors by issuing “indirect debt securities”, which by reason of their maturity, divisibility and other contractual characteristics, are considered and generally accepted as a substitute, in virtually all respects, for the legal tender (monetary base). This has led to the definition of a concept of *banking liquidity*, which includes the liabilities at sight of the banks and the liquidity produced by issuing lines of credit.

*Banking liquidity risk* is therefore associated both to banks’ ability to fulfill their obligation to depositors (borrowers) to transform their deposits into legal money (to receive cash by drawing down the credit lines), and their function of maintaining a balance between the ingoing and outgoing cash flows deriving from the management of payments made using banking money<sup>1</sup>. Means of payment are created and cash flows managed under the direction and control of the Central Banks, which guarantee the availability of the monetary base needed to sustain the ordered creation of banking money. The Central Banks also play a key role in the creation and strengthening of the infrastructures needed to settle payments within the financial system.

During the last few decades the rapid development of the financial markets, and especially the growth in the role of secondary markets in securities, has triggered a broadening of the spectrum of financial assets which can be included in the definition of liquidity. We are therefore witnessing the adoption of a concept of *market liquidity*, according to which the degree of liquidity is assessed on the basis of a number operating characteristics concerning securities markets (Bervas, 2006):

- the transaction costs as measured by the bid-ask spread of securities’ trading;
- the market depth, i.e. the volume of transactions that may be immediately executed without slippage of best limit prices;
- the market resilience, i.e. the speed with which prices revert to their equilibrium level following a random shock in the transaction flow.

The aforementioned characteristics of market liquidity are usually fulfilled by organized markets whose functioning is based both on the trading of large-issue standardized financial assets, and on the large-scale distribution to investors of high-quality information on asset trading and the issuing

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<sup>1</sup> For a recent review on banks’ role in providing funding liquidity see Strahan (2008).

agent. Furthermore the organized markets depend on the role of intermediaries in providing liquidity and trading immediacy services.

The definition of market liquidity clearly underlines the transformation that has taken place in liquidity risk, which is increasingly linked to the functioning of the market and the ability to raise the required monetary funds, either by selling financial assets held in portfolio or by issuing new financial instruments (or some mix of the two).

The changes in the cash flows associated to financial assets – and thus closely correlated with variations in the credit risk – as well as the instability in the functioning of the market itself, can jeopardize the sale of financials asset at the expected value, and the possibility of refinancing the portfolio of such assets on the market: *funding liquidity risk*. At the same time, *funding liquidity* is critical for the smooth functioning of asset trading, and it can become scarce at times of financial distress, precisely when it is most needed, as financial intermediaries hoard liquidity by cutting credit lines and/or raising margin requirements to protect themselves against counterparty risks. The *market liquidity risk* is thus aggravated by the portfolio adjustments made necessary by operators' balance sheet constraints, such as the maintenance of a given level of leverage, or the restoration of the margins required of the holders of financial assets by financiers. Therefore the inefficient provision of liquidity in financial markets “can generate a cash-in-the market pricing effect...when even the prices of safe assets can fall below their fundamental value and lead to financial fragility” (Allen and Carletti, 2008, p.11)

In the light of the definitions provided above, the important role played by liquidity risk in the development of the current financial crisis can be traced to the systematic underestimation of the growing market liquidity risk by both market agents and the supervisory authorities. The rapid rate of financial innovation, which has made it possible to securitize financial assets which were originally not tradable, such as bank loans, has fed operators' expectations to cover liquidity needs by creating new financial assets, or disposing of the financial assets they hold. Asset transferability was considered as equivalent to the ability to trade an asset, converting it into money, quickly and at low cost with little impact on its price. In the operators' view, liquidity was no longer limited to the monetary base and sight deposits, but rather included the financial market in its entirety. Therefore the definition according to which “an asset offers liquidity to the corporate world if it can be used as a cushion to address pressing needs” (Tirole, 2008) was proven by broader monetary/credit aggregates and, according to some authors (Adrian and Shin, 2007), liquidity actually consists of the total assets of financial intermediaries' balance-sheets.

### **3. Financial deepening and the increase in the liquidity risk level of financial circuits**

The emergence of liquidity risk in the ongoing financial crisis is therefore the outcome of two closely interconnected processes. The first is the greater “financial deepening” of the main economic systems, where the volume of financial assets has grown not only at a faster rate than economic activity, but also more rapidly than the liquidity created by banks in the form of deposits. Through the securitization of bank loans, financial innovation has not only encouraged greater indebtedness in the private sector, and the consequent creation of financial assets, but has also modified these assets' composition through the issue of negotiable securities on unregulated markets, giving agents the perception of a higher degree of liquidity.

The second process was the growth of a parallel financial circuit, integrated with the banking circuit, encouraged by a lower level of regulatory constraints and above all by lower capital requirements; this alternative trading circuit not only increased the volume of financial assets per unit of resources transferred to the final sectors, but also made the system more vulnerable to financial shocks.

The starting point for our analysis is the evolution of overall financial aggregates and especially their growth in relation to the trend in economic activity. Figure 1 plots the ratio between the total financial assets of the domestic sectors (non-financial private sector, financial private sector and public sector) and GDP for the euro area<sup>2</sup>, UK and the US. The indicator reveals an acceleration in financial aggregates compared to the trend in economic activity: the ratio for the period 1999-2007 increases from 6.7 to 9.1 times GDP in the United States, from 8.7 to 13.4 times in UK and from 5.4 to 8 times in the euro area. This growth becomes particularly striking from 2002 onwards in the UK and, even to a less extent, in the euro area and in the US, after the crisis that hit the financial markets at the start of the decade.

*[Insert Figure 1 around here]*

The acceleration in financial aggregates compared to GDP reflects greater total indebtedness on the part of private operators and especially the household sector. This emerges from the analysis presented in Figure 2, which shows the total credit (loans and securities) provided to households and non-financial enterprises, respectively, expressed as a ratio of GDP. In the United States the growing debt of private operators was due overall to the household sector, whose debt as a ratio of GDP increased since 1995 by about 34 percentage points, reaching the figure of 98% in 2007. This growth has been particularly striking since the end of the Nineties, and it kept on growing even during the financial crisis at the start of the present decade. For non-financial firms, the rise in indebtedness was less intense, reaching about 17 percentage points (from 54% to 72% of GDP in 2007). In the UK the increasing leverage significantly affected both the households and the non-financial enterprises sectors. At the end of the period the debt of both sectors exceeded the GDP (respectively 101% and 125% for households and non financial companies). In the euro area, the debt trend of the household sector was less dramatic, with household loans rising to 60% of GDP (55% for the main 4 countries) at the end of the period, from 47% in 1999 (46% in 1995 for the 4 euro countries), while the total value of the securities issued and loans received by European non-financial firms recorded a sharper increase in the last years, with a ratio rising from 64% in 1999 to 89% at the end of the period.

*[Insert Figure 2 around here]*

The higher ratio of financial assets to GDP and the related increased leverage of the main economic systems were fuelled by a financial circuit in which the banks and other financial intermediaries accounted for a high and increasing proportion of the total financial flows traded. This process was particularly intense since the end of Nineties. In the European area, the total share of financial assets relating to the financial sectors increased by more than 5 percentage points during the period considered: from 46.9% in 1999 to 52.3% in 2007 (Tab. 1). This increase is due to a large extent to the banks' intermediation, and in a lesser, though still significant, degree to the other categories of financial intermediaries (from 12% at the start of the period to 13.8% in 2007). There were no

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<sup>2</sup> As for euro area we consider the 15 countries for the period 1999-2007 and the 4 most important euro countries – Germany, France, Italy and Spain - for the period 1995-2007.

significant changes in the role played by institutional investors (insurance firms, pension funds and investment funds) during the period considered.

*[Insert Table 1 around here]*

The shift of financial flows towards the circuit of financial intermediaries registered in the United States and in the UK was equally intense and particularly concentrated during the present decade. In these countries the proportion of financial assets intermediated by the financial sector rose significantly: from 42.4% in 1999 to 48% in 2007 for the US and from 55% to 66% for the UK. The lion's share of this shift can be traced to the category of "other financial intermediaries": their share of the total financial assets rose from 10.5% in 1999 to 14.8% in 2007 for the US and from 5.7% to 11.8% for the UK. This confirms that the financial deepening of the Anglo-Saxon systems came about also through the non-banking financial intermediary circuit. The investment banks, hedge funds, special investment vehicles (SIVs) and conduits specializing in the creation and management of credit risk transfer instruments proved capable of seizing the growth opportunity offered by financial innovation, by using a high and growing degree of financial leverage.

Evidence of this process stems from the leverage of the largest US investment banks – measured as ratio between total assets and equity capital – which reached levels far higher than those recorded by the main commercial banks, and grew rapidly from 2002 (Tab. 2).

*[Insert Table 2 around here]*

The growth in the banking circuit and the other categories of financial intermediaries involved an expansion in use of the bond market, and the issue of negotiable instruments originating in securitization operations.

Table 3 presents the ratio between debt securities issued by the main financial and non-financial sectors as a percentage of GDP. In the period under consideration, while securities issued by non-financial firms and the public sector remained relatively stable, financial intermediaries showed an increasing dependency on the bond market. However, the roles of the banks and the other financial intermediaries in the economic areas under consideration are different.

*[Insert Table 3 around here]*

In the euro area, the banks themselves have increased their recourse to the securities market: the ratio between securities issued and GDP increased by about 10 percentage points during the period (from 26% in 1999 to 36% at the end of the period), while in the United States and in the UK non-bank financial intermediaries account for most of the increase in securities issues. The data starting since 1995 allow assessment of the long-term shift towards the increasing securitization of the financial system and the central role played by financial intermediaries as driver of this process.

This trend towards a closer symbiosis between intermediaries and market has been accentuated in recent years, as a consequence of the new phase of financial innovation, with its explosion of risk transfer instruments, which has accentuated the process of diversification of intermediaries. Banks

have been amongst the players that have diversified their operations most energetically, but even portfolio investors, such as insurance companies and pension funds, and investment banks, have diversified into areas that used to be the exclusive domain of credit originators, notably banks. Likewise, there are few substantive differences between the activities of the proprietary desks of the larger commercial and investment banks and those of smaller, independent institutional investors such as hedge funds and private equity financiers (Knight, 2004).

As a result of the increasing diversification of assets, large financial groups adopted similar business models, their activities became more interrelated, and the values of assets more correlated, with the effect that negative disclosure by one operator has contaminated others (contagion effect). Therefore, the OTD model has certainly distributed risks more broadly across the financial system, but it has simultaneously increased the homogeneity of financial portfolios, thus accentuating the systemic component of financial risk (Wagner, 2007).

In their distribution of the loans they have originated and securitized, the banks have made use of, and helped to fuel, a financial asset trading circuit based on SIVs specializing in the intermediation of new financial instruments. In the USA, the proportion of securities issued by SIVs has risen to 39% of total issues. Moreover, asset backed commercial papers account for the majority of the commercial papers issued (Fig. 3).

*[Insert Figure 3 around here]*

The innovation process went hand-in-hand with a reduction in the relative weight of customers' deposits, i.e. the bank funding component capable of guaranteeing the highest degree of stability and predictability in terms of liquidity. In the United States, the deposits/securities ratio decreased from 0.77 times in 1995 to 0.49 in 2007 (Tab. 4). The deposit disintermediation was particularly intense and concentrated in the second half of Nineties: only in the period 1995-1999 the ratio decreased by 20 percentage points (from 0.77 to 0.57). A similar more recent trend can be found in Europe, although the importance of deposits as source of funds was much higher; the ratio for the 4 main countries of euro area decreased from 3.4 in 1995 to 2.30 at the end of the period. The reduction can be traced to the growth in securities issued both by bank and by non-bank financial intermediaries. Also the UK banks registered a very intense deposit disintermediation with a ratio which decreased from 6 to 4.2 times the value of issued securities.

*[Insert Table 4 around here]*

The evolution of the financial picture outlined above emphasizes the systemic and multidimensional risk implications of an intermediation model based on the credit risk transfer. In particular the poor liquidity of credit risk transfer instruments along with the growth of financial circuits based on a higher leverage degree have accentuated the link between credit risk, market risk and liquidity risk. The sequence of the events that brought to the present financial crisis makes evident.

The OTD model has considerably expanded the credit supply, by transforming into securities the loans granted to households, even those with low solvency levels (subprime loans) and leveraged loans sourced from corporate mergers and acquisitions and leveraged buyouts. The creation of more complex, differentiated financial instruments was intended to meet the demand for a broader range of risk and return combinations, but this was at the expense of the standardization and tradability of financial assets. Thus the production of transferable financial assets through securitization – in the



form of credit risk transfer (CRT) instruments, such as Asset Backed Securities, Collateralized Debt Obligations, Collateralized Loan Obligations enabled the selling of bank loans, but did not ensure the liquidity of secondary markets.

As defaults of subprime loans started to increase at the beginning of 2007, investors began to pull back from direct investment in CRT products, as well as from the commercial paper market which backed SIV and conduit activity. Spreads in secondary markets widened firstly for subprime related products and subsequently across a range other CRT products: the price plunge reflected discount for uncertainty about future collateral performance and market illiquidity (Bank of England, 2008). The difficulties encountered by the SIVs and the other financial intermediaries in refinancing their loans through new commercial paper or bond issues led to a growth in the demands on the financial lines used by the banks themselves as guarantees. The additional liquidity was required to provide support to the SIVs and conduits they had sponsored, to enable drawing of the back-up credit guaranteed to finance M&A operations and buy outs, and also to comply with the contractual clauses incorporated in the securitization of credits (for example the credit rating downgrade clause and call features). From the commercial paper market, the liquidity shortages spread to the interbank market as banks tried to fund unexpected warehoused exposures in the leveraged loan, subprime RMBS and CDO markets. In this way a credit event turned into a liquidity event.

Simultaneously, the liquidity crisis affecting the unregulated structured securities markets was rapidly transformed into a solvency crisis affecting the banking system. The deleveraging of portfolios triggered a downward spiral in the prices of market instruments which forced write-downs of loans and securities portfolio, also due to the adoption of fair value accounting, increasing banks' degree of indebtedness and making the need to recapitalize them more urgent. Banks' higher solvency risk, and the consequent greater counterparty risk, thus led to the substantial paralysis of the interbank market and financing on the bond markets.

*[Insert Figure 4 around here]*

#### **4. The lessons for financial regulation and supervision**

The genesis and development of the current financial crisis share some common features with other financial crises, but are unique in several respects, key amongst these the liquidity shocks and tensions deriving from the more complex liquidity risk in today's markets.

In a financial context characterized by a closer nexus between credit risk, market risk liquidity risk and also counterparty risk, the current regulatory and supervisory frameworks have proved to be inadequate in the new financial environment in fully understanding the degree of interdependency of the risks affecting the various components of financial intermediation, and in monitoring the financial situations and risk-taking behaviours of individual financial intermediaries.

With regard to liquidity, the need for authorities to take a system-wide view implies the ability to give answers to the problems that have arisen from the transformation of the financial scenario outlined in section 3. The main issues are related to the following aspects, which will be analyzed in detail in this section:

- the growing interconnections between credit risk and liquidity risk against the background of the Basel 2 regulatory framework, in which the solvency rules are international in scope (although with various limitations), contrasting with the national character of liquidity regimes;

- the emergence of a market liquidity risk related to new financial products traded in OTC markets;
- the redefinition of the role of monetary policy, and of the lender of last resort function in particular, consequent on the development of CRT products and the increase in the number of categories of financial intermediaries involved in the securitization process.

### *The nexus between solvency and liquidity: rethinking Basel 2*

Solvency and liquidity regulation has traditionally been a key responsibility of bank regulators and supervisors, undertaken to preserve the soundness and financial stability of individual banks and reduce excessive exposure to macroeconomic shocks, so as to limit bail-out actions and massive liquidity injections by Central banks.

Since the end of the Eighties, prudential regulation of financial institutions has relied on capital adequacy to cope with the financial risks confronting banks. An international capital adequacy regime for credit risk (and thereafter market risk and now operative risk) has been developed by the Basel Committee on Banking Supervision within the framework of Basel 1 and, in the last decade, of Basel 2.

Liquidity risk has not been directly considered in the Basel capital adequacy framework. This approach reflects the idea that, in all events, a strong capital base should restrict the impact of liquidity shocks. As is very well known, capital adequacy may provide some reassurance to market participants, but even well capitalized banks can face severe liquidity problems in exceptionally adverse conditions (Revell 1975). Therefore, liquidity requirements must be considered as a complement of solvency ratios.

The transition from Basel 1 to Basel 2 was necessary because the growth of new financial players and their contribution to the financial innovation process, as described in the previous paragraph, require a more comprehensive, homogeneous set of rules to level the field of competition and restrict regulatory arbitrage on risk capital. Basel 2 has introduced capital requirements for off-balance sheet exposures (OBSEs) in Pillar 1, while Pillar 3 requires disclosure of the securitization process.

It may be argued that if Basel 2 had already been in place, especially in the USA, the crisis, even if not avoided, could have been less severe. However, the financial crisis revealed severe flaws in Basel 2, at a stage when it has not yet been definitively implemented, especially with regard to the role of rating agencies in the delegated monitoring process, the procyclical effect of the capital ratios regime, some aspects of the securitization process and finally the perimeter for application of the accord. The regulators are rethinking some aspects of Basel 2 in the light of the flaws which have been emerged.

While on the one hand Basel 2 limits the expansion of structured credit products traded in OTC markets, with the aim of reducing regulation-circumventing behaviours linked to securitization processes, on the other it provides only partial solutions to the liquidity problems linked to the development of the new financial products.

In fact Basel 2 introduces or reinforces a narrow set of rules addressing some liquidity risk profiles of financial intermediaries. One first aspect concerns the fact that Pillar 1 requires banks to maintain

capital to support liquidity commitments to OBSEs, even if their duration is less than one year. However these commitments are considered as senior exposures with lower capital charges for shorter maturities. In order to avoid regulatory incentives for the creation of OBSEs, banks should be required to apply higher weightings to the liquidity lines extended to securitization vehicles, thus increasing the level of capital required (Vento, La Ganga 2008).

The aim of Pillar 2 is to strengthen banks' risk management practices (Resti 2008). To this end, financial intermediaries are required to establish an internal system (Internal Capital Adequacy Assessment Process, ICAAP) to determine the total capital they need to cope with the full range of risks undertaken, among them liquidity risk, not considered in Pillar 1. Supervisory Authorities have the task of assessing the degree to which internal targets and processes incorporate the full range of risks faced by the bank: the Supervisory Review and Evaluation Process (SREP). Supervisory Authorities may require banks to increase the regulatory capital determined in Pillar 1, for two main purposes: to take into account risks not included in Pillar 1, including liquidity risk, and to cope with risks that have not been satisfactorily measured. Nevertheless, these measures feature a high degree of discretionality in the supervisory review process. The coordination of the actions envisaged by Pillar 2, through internationally accepted guidelines on both supervisory activities and liquidity risk management practices, should be a considerable step forward.

The purpose of Pillar 3 is to complement the minimum capital requirements (Pillar 1) and the supervisory review process (Pillar 2) with market discipline. To this end a set of disclosure requirements are developed to allow market participants to assess risk exposures, risk assessment processes, and therefore the capital adequacy of banks. The securitization process is amongst the areas subject to compulsory disclosure: the intention is to introduce improvements in response to the information shortfalls which emerged during the crisis. However, no specific provisions are made for liquidity risk profiles.

Fundamentally, Basel 2 acts on innovation processes in two main ways: in the first Pillar, by reducing regulatory arbitrages and strengthening capital adequacy in response to risk transfer processes, and in Pillar 3 by requiring the public disclosure of these processes. Apart from the necessary adjustments and improvements, liquidity risk is only dealt with in relation to the capital requirements linked to banks' liquidity commitments and the supervisory review process in Pillar 2, in an approach which is still based on discretionary action by the individual supervisors.

### *Liquidity risk: beyond Basel 2*

The fact remains that Basel 2 is not a regulatory instrument capable of overcoming the problem of liquidity risk, except indirectly to the extent that it deals with the relative risk profiles of risk transfer processes. The crucial problem lies in the different liquidity regimes which, unlike the regulatory frameworks for capital adequacy, have developed along national lines with different quantitative and qualitative rules and levels of disclosure. These elements are related to and affected by the national regulatory context, such as insolvency regulations, national deposit insurance schemes, and the monetary policies implemented by central banks.

A recent survey by the Basel Committee on Banking Supervision (2008a) on the state of liquidity regimes reports that, in spite of common general liquidity supervision objectives, there are differences in the national approaches due to different mixes of quantitative and qualitative rules.

In some countries, the authorities' emphasis is more on traditional quantitative approaches, with the definition of specific rules and the setting of liquidity buffers that banks are required to hold. Banks

are obliged to maintain specific minimum liquidity parameters, and to meet targets such as limits on maturity mismatches or reliance on a particular funding source, liquidity ratios, cash capital positions and long-term funding ratios.

Nevertheless, the increasing awareness that inflexible quantitative rules could be ineffective in a financial situation of stress has recently led some supervisory authorities to turn to qualitative approaches, based on reviewing and strengthening banks' internal risk management systems (Panetta and Porretta, 2008; Tarantola, 2008). Under this approach, banks are required to develop and document internal systems for the management, control, monitoring and reporting of liquidity positions, identifying specific measurements of liquidity risks, to be periodically validated by supervisors. Increasing importance is given to stress tests and contingency funding plans used to deal with stress scenarios, with indication of management responsibilities, procedures and the potential sources of liquidity adopted.

In some countries, a two-tier system emerges and different rules are set for large and small banks, with a more sophisticated, flexible approach set for the former, and more prescriptive, standardized rules for smaller banks. Usually, the intensity of supervision tends to increase for larger, more systemically important financial intermediaries, in proportion to the assumed increase in risk. In some countries, bigger banks are required to hold a larger buffer of liquid assets compared to smaller banks.

In recent years, larger banks have increased the role of scenario analysis and stress tests in evaluating risks and have developed contingency funding plans. The development of these methodologies is still at an early stage and they turn out to be heterogeneous and often based on a judgmental approach. With specific regard to liquidity risk, it emerges that stress tests carried out before the crisis failed to identify potential weaknesses and vulnerability in banks' liquidity positions (Rosemberg, 2008). The main problem was that these tests omitted critical linkages, such as those between credit risk, market risk and liquidity risk. Moreover the tests mainly focused on idiosyncratic or firm-specific shocks (Basel Committee on Banking Supervision, 2008a and European Central Bank, 2008b). The main lesson is that stress testing must focus on the combination of idiosyncratic and market-wide shocks, in order to pick up the implications of wider market disruptions. The task for supervisory authorities is to promote more standardized, rigorous, comprehensive stress testing.

Contingency funding plans are set up to outline strategies to be followed by banks in the event of stress scenarios. During the crisis they appeared to be insufficiently robust, with the inclusion of liquidity sources that proved to be unavailable in a situation of generalized stress and central bank refinancing, without considering the reputation risk arising for banks utilizing this source. On this point, the crisis revealed that there is still a "stigma" attached to central bank standing facilities: fearing that depositors' confidence could be damaged, banks may be reluctant to request central bank facilities, thus worsening interbank market conditions and increasing the risk of turning a liquidity crisis into a solvency one (International Monetary Fund, 2008a).

In all the regimes surveyed, the supervisory authorities require banks to report information on their liquidity positions. Nevertheless, public disclosure of banks' liquidity positions has also emerged as a key aspect of the financial crisis: usually public disclosure is not defined by regulatory requirements, and is limited to the disclosure required by accounting rules and the rules applicable to public traded companies.

The fragmented nature of the national liquidity regimes has made the international system more fragile and more vulnerable to systemic shocks. The authorities need on the one hand to create a

shared framework of liquidity rules and on the other to coordinate supervisory practices, with more decisive action by supervisors on the structuring and validation of the liquidity risk management techniques adopted by banks, with particular reference to systems of stress tests and contingency plans.

Another area for intervention is coordination and information-sharing between the supervisory authorities, aspects of particular importance with regard to the liquidity risk management practices of large financial groups operating across jurisdictions, sectors and subsidiaries.

A survey by the Basel Committee on Banking Supervision – The Joint Forum (2006) reports that for these intermediaries, regulations may have an impact on the definition of liquidity management risk strategies. The risk of contagion within a banking group leads national authorities to require separate pools of liquidity for each individual entity and restrict intra-group exposures. The regulatory constraints limit banks' ability to centralize liquidity risk management and their options for dealing with crisis situations, generating challenges in transferring funds and securities across borders and currencies, especially on a same-day basis.

### *Market liquidity risk*

The evolution of US and European financial systems outlined in chapter 3 stresses the importance for regulators of the increasing market liquidity risk related to the large spectrum of financial instruments originated by the securitization activity of banks and other financial intermediaries. As mentioned before, one important implication of financial innovation is that the smooth functioning of the financial system is more and more dependent on the assumption that the financial instruments held in portfolio could be traded (and new securities could be issued) even under stressed market conditions.

The problem of the liquidity of financial instruments such as CDOs and RMBSs has been aggravated by the fact that those instruments are traded in over-the-counter markets and not in organized exchanges. The importance of OTC markets for these kinds of instruments has mainly arisen from banks' double role as the securities' originators and as trading counterparties in OTC markets, allowing them to earn fees less likely in organized exchanges.

Evidence is given by Cecchetti (2007) that in the event of a liquidity crisis, exchange-based trading works more smoothly than OTC markets; moreover liquidity crises in OTC markets are more systematic in their effects. He cites the markets' different reactions to news concerning solvency difficulties of financial intermediaries, as proof of this hypothesis. A genuine financial crisis was triggered in 1998 by LTCM, which had its exposure concentrated in swap contracts traded on the OTC market. On the other hand, in 2006 the failure of Amaranth Advisors, a hedge fund specializing in energy futures, provoked a "yawn".

Organized exchanges require participants to hold margins in order to maintain positions; moreover an equivalent of capital requirement is set for non-bank participants, while the provision of a clearing house reduces the counterparty risk. Organized markets tend towards a greater standardization of financial contracts, and thanks to enhanced transparency they also create the conditions in which contracts will be more negotiable in case of distress.

Monetary and regulatory authorities are showing great interest in market liquidity and the working of OTC markets. There may be a need for the strengthening of regulation, intended to structure financial markets in a way that minimizes systemic risk. The introduction of organized exchanges,

with standardized financial contracts, for specific kinds of financial instruments may be envisaged (Eichengreen, 2008). In fact, in the present crisis, the presence of a clearing house could have reduced the counterparty risk, thus encouraging the trading of credit risk transfer instruments.

### *Scale and scope of the Lender of Last Resort function*

When financial instruments are no longer backed by liquidity and there is an increasing funding liquidity risk, the role of lender of last resort (LLR) played by Central Banks becomes crucial. Since the beginning of the crisis, Central Banks have repeatedly rapidly intervened, on the one hand by increasing the range of assets which can be considered as collateral for loans granted, and on the other by extending the types and amounts of the lines of financing of last resort available. The extraordinary intervention has been intended to support the financial institutions in distress both by offsetting the liquidity shortfall on the financial markets and by smoothing liquidity conditions in the interbank markets, thus avoiding even more severe disruptions of these markets.

With regard to liquidity support, the lesson from the recent turbulence makes it necessary to focus on two main issues: collaterals, with respect to the broadening of the variety and extension of operations' maturity, and the widening of the range of counterparties (Goodhart, 2008).

Regarding the first point, it emerged that the Central Banks best able to cope with market turbulences were those using a wider definition of acceptable collaterals. The issue is how far the range of eligible assets should be widened to include innovative, less traditional instruments. To this end Bagehot's principle (1873) is even more apt and must be borne in mind: *lend freely but at a high rate against good collaterals*.

Once the actual emergency is over, a delicate balance must be achieved between the widening of the range of eligible assets and their quality level. The issue of the quality of eligible assets is of importance in protecting the lenders, central banks, from credit and counterparty risks. Financial innovation, and in particular the spread of CRT instruments, makes it necessary to set a wider perimeter for the types of financial assets eligible as collateral for lending of last resort. The monetary policy authorities should adopt eligibility rules capable of providing incentives for banks to engage in less risky speculative lending activity and to hold "high quality" paper as collateral for credit and liquidity risk (International Monetary Fund, 2008a).

As regards the range of counterparties, in order to guarantee financial stability, during the financial crisis Central Banks intervened to meet the liquidity needs of non-bank financial institutions with no direct access to standing facilities, which in some cases were even unregulated. The scale and scope of the LLR function must be evaluated in the new context of increasing business diversification of financial intermediaries. As mentioned before, in the last few years new non-bank players have entered the credit markets, not only by distributing but also by originating structured credit products, thus contributing to the securitization of bank loans and the consequent substitution of bank deposits with tradable securities. This process enlarged the pool of financial intermediaries that transform financial asset maturities and that simultaneously face different kinds of risk: credit, market and liquidity risk. From the point of view of the monetary policy authorities and their aim of guaranteeing the orderly, efficient transformation of risks and due dates, this implies a necessary broadening of the pool of counterparties with access to LLR.

The recent experience of the massive, crucial intervention of the monetary authorities in support of the liquidity needs of banks and investment banks poses the big question of the optimal design of regulation with respect to two important levels. The first relates to the need to achieve more

uniform rules across categories of financial intermediaries: in particular, the way in which the recent crisis developed points to the need to bring the parallel financial system which has grown up during the last few years back into the fold of the rules governing financial intermediaries with monetary functions, with regard to regulation and control.

The second begs the question of the closer nexus between monetary policy, the role of LLR, and supervision with regard to financial stability (Borio 2006). Central Banks bear the overall responsibility for the stability of financial systems, with possible major implications for monetary policy. The current crisis may encourage the reconsideration of the idea that monetary policy has to stand aside as financial imbalances accumulate, and only act after the crash has occurred, by injecting liquidity into the system (Draghi, 2008). The monetary authorities could use the instruments at their disposal to restrict the build-up of financial imbalances: lean against the wind.

## **5. Conclusions**

The main lesson of the current financial crisis is that liquidity risk is once again a central topic for the stability of the financial system, due to the transformations in the functioning of financial systems which have taken place during the last few years. Financial innovation has allowed credit risk to be transferred to final investors by means of the financial market. As a consequence, the links between credit, market and liquidity risks have become tighter, while the effects of a crisis originating in any point of the financial system have become systemic. Therefore both financial intermediaries - in their risk management models – and regulators – in the structure of their controls and supervisory measures – must rethink the connection between solvency and liquidity. On the one hand, sound liquidity risk management helps to reduce the likelihood of insolvency problems. On the other hand, especially under severe market conditions, the ability of a bank to obtain liquidity may depend on its capital adequacy.

The international framework on capital adequacy can be further improved with regard to the securitization process and some liquidity profiles, but it cannot solve the problem of the fragmentation of liquidity regimes. Level-playing field and competition issues support the case for the harmonization, or at least coordination, of national regulations and supervisory practices, and for the promotion of sound, internationally consistent liquidity management practices, especially for large banks and financial conglomerates. To this end, one critical aspect deals with the development of robust stress testing and effective contingency funding plans more integrated and focused on the combination of idiosyncratic and market-wide shocks.

At the macro level, the need emerges for regulatory measures to increase the transparency and liquidity of the markets on which credit risk transfer instruments are negotiated, to guarantee more orderly conditions for the portfolio adjustments of intermediaries suffering liquidity stress. The authorities should show at least as much attention to markets' liquidity as they do to the functioning of payment systems. In other words, there should be an expansion of liquidity control, involving the functioning, and thus the efficiency, not only of the monetary market but also of the financial market.

The monetary authorities' intervention has focused on a widening of collaterals, an extension of maturities and an expansion in the number of counterparties. On this point, several issues emerge: on the one hand, the possible transfer of credit risk to Central Banks due to the enlargement of the range of eligible assets, and on the other hand, the scale and scope of their function as LLR, and the boundaries with regard to the institutions subject to regulation.

The characteristics of the recent financial crisis, with the emergence of a systemic liquidity risk, give grounds for the idea that "... in a globalised world with growing interdependencies, the general *field of vision* must be broader than in the past" (European Central Bank, 2008a, p.19) and requires a wider rethink of the design of regulation and supervision at the national and international level, with regard to the architecture of supervisory authorities, their fragmentation in some contexts, and also the boundaries of their jurisdiction. One crucial element stems from the ever-increasing integration of banks and markets, and the consequent implications for systemic risk, since it is becoming more and more difficult to isolate banking risks from capital market risks (Boot and Thakor, 2008). In a growing number of cases, the implications for bank safety of a crisis in the capital market are justifying bail-outs even of uninsured participants, including investment banks and capital market investors.

The excessive fragmentation of responsibilities, the different degree of control, or lack of it, for intermediaries in the mortgage business, under-regulation for investment banks, and the development of nearly unregulated institutions (hedge funds) were at the root of the crisis in the US.

As far as the European Union is concerned, the creation of cross-border and cross-sector financial groups, the growing integration of the financial markets (especially in the euro area), and the broader trend to globalization, are all factors demanding a thorough reconsideration of the architecture of controls. While on the one hand we are witnessing pan-European financial regulation, dictated by the EU Directives on banking-finance-insurance, on the other the approaches, practices and supervisory structures continue to be different in the various member states, with considerable fragmentation (European Central Bank, 2006). In the event of a crisis, the problem arises of adequacy of information sharing and cooperation between the various supervisors, the European Central Bank and the national Central Banks. Even greater problems arise from the management of crises affecting cross-border intermediaries.

When events started to snowball in autumn 2008, the authorities found themselves forced to deal with the shortcomings of the existing regulatory structure, and responsibilities were assigned on the basis of the specific crisis in hand, under a voluntary coordination mechanism (Ecofin, 2008): the ECB handled the liquidity crisis, while the national supervisory authorities intervened in cases of imminent insolvency, with Government rescue measures funded from the public purse. Due to the fragmentation of the supervisory authorities, in the case of cross-border groups the problems of stability and bail-outs were managed by the authorities of the various States, on the principle of cross-border sharing of the costs of the crisis and the re-nationalization of groups on the verge of insolvency (Fortis and Dexia). As things now stand, the Colleges of Supervisors (CoS) introduced within the third level of the Lamfalussy procedure in order to facilitate the coordination between national supervisors do not have power to manage the rescue of cross-border groups.

Apart from the strengthening of the third level committees, and thus of the CEBS, the proposals for amendment of the CRD also include the suggestion that the creation of CoS for cross-border groups should be made compulsory. Furthermore, the liquidity risk management of cross-border groups should be discussed and coordinated within CoS. This might be a first step towards Europe-wide supervisory structures, at least with regard to cross-border groups.



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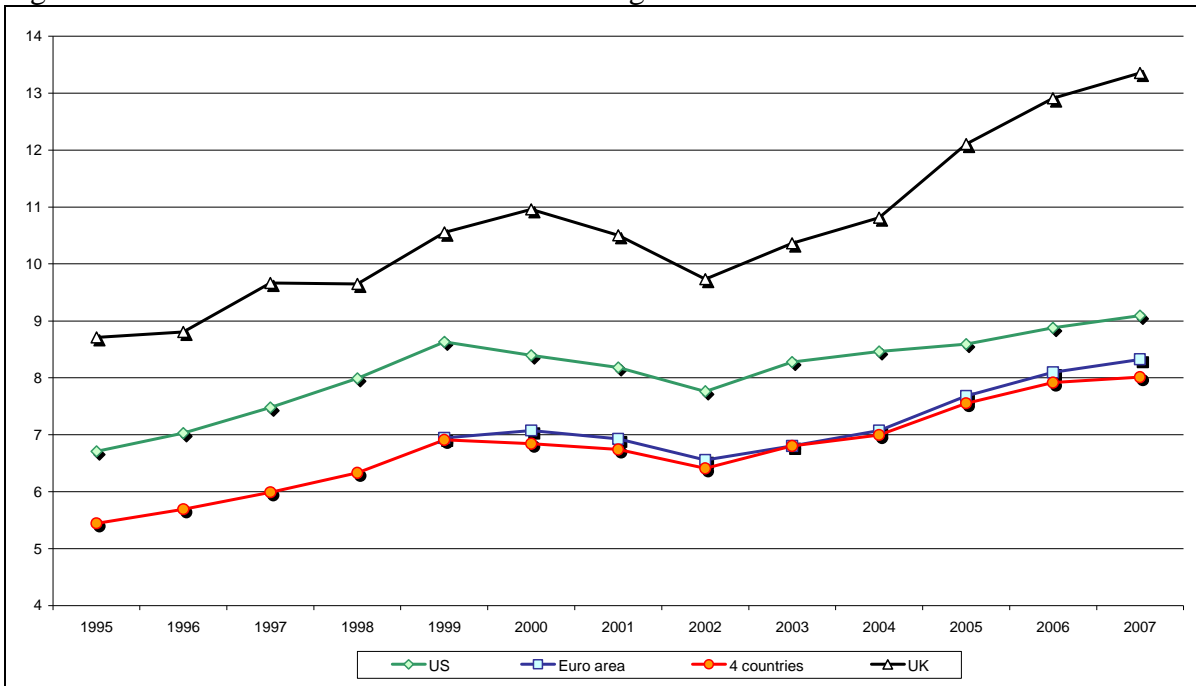
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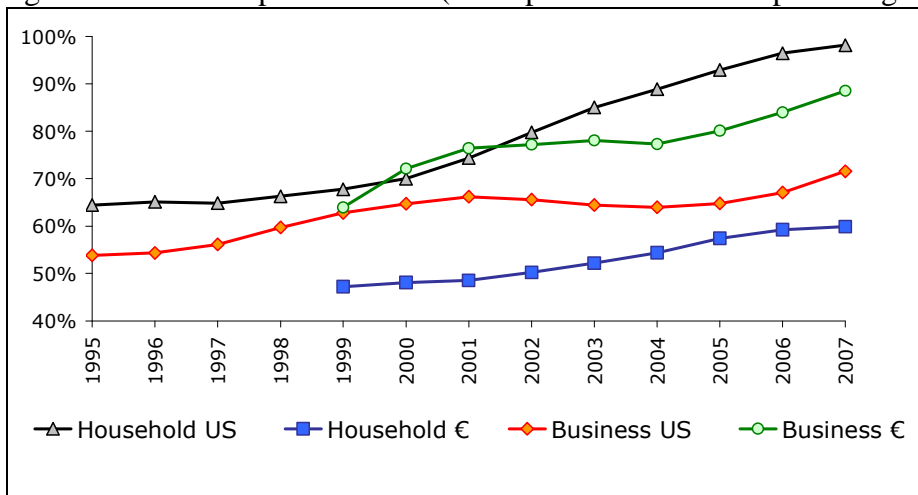
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Figure 1 - Total financial assets/GDP – Excluding rest of the world



Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area Accounts

Figure 2 – Credit to private sector (loans plus securities as a percentage of GDP)



Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area Accounts

Table 1 – Total financial assets by financial sectors (%)

Total financial assets financial sector/ Total financial assets				Total financial assets MFIs/ Total financial assets				Total financial assets Other FI/ Total financial assets				Total financial assets II/ Total financial assets				
US	Euro area	4 count	UK	US	Euro area	4 count	UK	US	Euro area	4 count	UK	US	Euro area	4 count	UK	
1995	42.2		46.9	55.9	11.7		36.2	32.1	9.6		1.2	6.1	20.8		9.5	17.7
1996	42.2		47.1	56.9	11.1		35.5	31.6	9.7		1.3	7.2	21.4		10.2	18.2
1997	42.4		47.2	57.4	10.6		34.5	31.9	9.7		1.5	7.2	22.2		11.2	18.3
1998	42.8		47.2	56.8	10.2		33.5	31.8	10.2		1.7	6.0	22.5		12.0	19.1
1999	42.4	46.9	47.1	55.1	9.4	26.7	32.4	28.9	10.5	12.0	1.9	5.7	22.5	8.2	12.9	20.5
2000	43.3	46.9	46.9	56.5	9.9	26.6	32.3	31.0	11.6	12.1	2.0	6.9	21.9	8.1	12.6	18.7
2001	44.9	48.0	47.5	58.9	10.4	27.8	32.6	33.3	13.0	12.1	2.1	8.7	21.5	8.1	12.8	16.9
2002	46.3	48.6	48.7	60.2	11.4	28.8	33.9	35.9	14.2	11.5	2.1	9.0	20.8	8.3	12.6	15.3
2003	46.5	48.7	48.7	61.5	10.9	28.2	33.0	36.5	13.9	12.0	2.5	9.5	21.7	8.5	13.2	15.5
2004	46.6	49.3	49.0	62.8	11.0	28.3	32.9	37.4	13.8	12.3	2.5	10.0	21.9	8.8	13.6	15.5
2005	46.9	50.6	49.6	64.1	11.0	28.6	33.0	37.5	14.0	13.2	2.9	11.0	21.8	8.8	13.7	15.5
2006	47.3	51.1	49.9	65.3	10.8	28.8	33.1	38.7	14.4	13.6	2.9	11.0	22.2	8.7	13.8	15.6
2007	48.0	52.3	51.1	66.0	10.9	30.1	34.6	39.0	14.8	13.8	3.3	11.8	22.3	8.4	13.3	15.1

Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area Accounts

Table 2 – Degree of financial leverage for the primary US banks (Ratio between total assets and equity capital)

	Investment banks				Commercial banks			
	Goldman Sachs	Morgan Stanley	Merrill Lynch	Lehman Brothers	JP Morgan Chase	Citigroup	BOA	Wells Fargo
1999	24.7	21.6		30.6	19.0	13.7	14.2	9.9
2000	17.2	22.1	22.8	28.9	16.9	13.6	13.5	10.3
2001	17.1	23.3	21.0	29.3	16.9	12.9	12.8	11.3
2002	18.7	24.2	18.7	29.1	17.9	12.7	13.1	11.5
2003	18.7	24.2	16.6	23.7	16.7	12.9	15.3	11.3
2004	21.2	26.5	20.0	23.9	11.0	13.6	11.1	11.3
2005	25.2	30.8	19.1	24.4	11.2	13.3	12.7	11.8
2006	23.4	31.7	21.6	26.2	11.7	15.7	10.8	10.5
2007	26.2	28.9	31.9	30.7	12.7	19.3	11.7	12.1

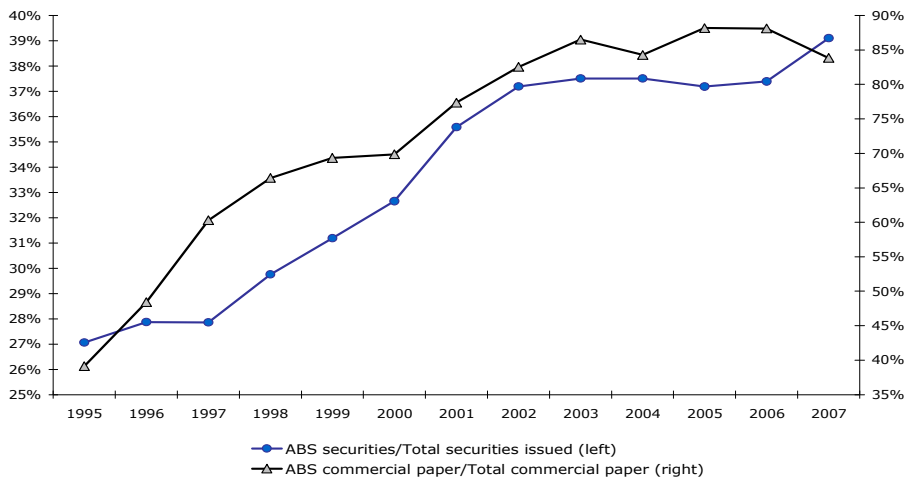
Sources – Annual reports and SEC filings

Table 3 – Securities issued as a percentage of GDP (%)

	Non-financial Business				MFIs				Other FI				GOVT			
	US	Euro area	4 count	UK	US	Euro area	4 count	UK	US	Euro area	4 count	UK	US	Euro area	4 count	UK
1995	20.5		5.9	13.6	9.2		37.8	31.1	53.7		1.0	7.9	63.2		53.9	39.8
1996	21.0		5.9	13.3	9.4		40.0	33.7	56.6		1.2	9.7	61.4		58.2	39.2
1997	22.0		5.7	14.3	10.2		41.1	36.5	58.9		1.3	10.3	58.7		58.4	40.9
1998	23.7		5.7	16.3	11.1		44.5	35.5	65.5		1.3	11.4	55.9		60.6	41.7
1999	25.1	5.9	6.0	19.7	12.2	25.9	44.8	39.1	71.7	7.3	1.7	14.4	52.4	57.7	56.2	37.2
2000	25.8	6.6	6.4	23.3	12.5	26.3	46.6	42.7	75.4	8.1	2.1	16.6	46.6	56.7	54.1	34.7
2001	27.3	7.9	7.8	23.2	12.1	27.0	48.0	44.3	82.6	8.9	2.7	18.6	46.1	56.4	54.3	30.9
2002	27.1	7.8	7.8	24.5	12.9	26.9	48.3	44.2	87.4	9.7	3.5	19.5	48.5	57.9	56.7	31.0
2003	26.9	8.3	8.5	24.7	13.3	26.9	51.1	44.0	91.7	10.5	4.9	23.1	51.0	58.7	58.9	31.3
2004	26.0	8.3	8.5	24.3	13.3	28.5	52.7	44.4	92.1	11.4	6.1	29.2	51.9	60.6	59.7	32.9
2005	24.8	8.3	8.5	27.3	13.9	31.1	55.7	48.2	94.9	13.1	8.7	36.3	52.6	61.4	60.7	35.5
2006	25.2	8.1	8.5	29.0	14.8	33.3	57.6	51.7	101.0	15.8	10.9	42.4	52.1	58.0	57.5	36.0
2007	26.4	8.2	8.6	27.8	15.6	35.6	60.9	53.7	105.2	19.2	13.1	49.5	52.8	55.5	55.3	37.0

Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area Accounts

Figure 3 – ABS Securities and ABS commercial paper in the US



Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area

Table 4 – Deposits MFIs/Securities issued by financial sectors

	US	Euro area	4 count	UK
1995	0.77		3.41	6.00
1996	0.73		3.24	5.27
1997	0.70		3.14	5.39
1998	0.63		2.92	5.39
1999	0.57	3.54	2.99	4.56
2000	0.55	3.47	2.81	4.59
2001	0.54	3.37	2.66	4.51
2002	0.52	3.26	2.65	4.48
2003	0.51	3.22	2.52	4.65
2004	0.52	3.12	2.45	4.52
2005	0.52	3.09	2.39	4.44
2006	0.49	2.92	2.36	4.36
2007	0.49	2.80	2.33	4.15

Sources - For US: Flow of Funds Accounts of the United States, Board of Governors of the Federal Reserve System, Washington D.C. 20551. For Euro Area: Quarterly Euro Area Accounts

