

***Liquidity risk:
regulatory framework and
impact on management***



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Introduction



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The Basel Banking Supervision Committee defines liquidity as "an entity's capacity to finance increases in its volume of assets and to comply with its payment obligations on maturity, without incurring unacceptable losses".

In this regard, liquidity risk can be expressed as the probability of incurring losses through insufficient liquid resources to comply with the agreed payment obligations within a certain time horizon, and having considered the possibility of the entity managing to liquidate its assets in reasonable time and price conditions².

Financial entities are particularly exposed to liquidity risk, given the nature of their activities, which include capturing funds. It is an inherent risk in banking; however, liquidity risk had been given less attention than other risks by both entities and regulators. Until 2010, standards basically consisted of a series of non-binding qualitative principles regarding good liquidity management.

In recent years, however, the situation has changed: the financial crisis and liquidity restrictions have prompted regulators and entities to make a far-reaching analysis of liquidity risk management, with the aim of safeguarding financial stability and preventing further stress situations. On the regulators' side, this analysis has led to the development of new binding regulatory standards based on quantitative principles, which are currently being implemented.

However, these standards imply a series of macroeconomic and financial impacts which are being assessed by the regulators themselves and by the financial entities. One of the main impacts is the increased short term contracting of liquidity in the markets, leading banks and financial institutions to place even more importance on their clientele's deposits as a source of financing, an effect which is partly encouraged by the regulators themselves.

In this context, entities are developing management frameworks which consider liquidity risk from all possible standpoints: governance, organization and functions, policies and principles, methodology, stress tests, contingency plans, tools and reporting.

The object of this document is to provide a global and in depth overview of liquidity risk, to state the key questions in the current situation and the regulatory and management trends concerning this risk. For that purpose, the document has four basic objectives which are addressed in four sections, following a preliminary executive summary:

- ▶ Describe the current situation of liquidity standards, with special emphasis on the new regulation issued by the Basel Committee (known as Basel III).
- ▶ Characterize the impacts of this standard both on the real economy and on the financial sector, and identify points which could give rise to uncertainty or which the entities and the regulators are yet to agree on.
- ▶ Analyze a very important aspect of liquidity management, which is the stability and the macroeconomic dependence on deposits of financial entities, using a quantitative study with real figures and a qualitative analysis of several historical special cases which have happened recently.
- ▶ Lastly, describe how financial entities are adapting their management frameworks to this new reality, with emphasized on the most advanced practices in the sector and future points for development.

¹Basel Committee on Banking Supervision, Principles for sound liquidity risk management and supervision (2008).

²The Basel Committee distinguishes between fund liquidity risk (risk of not being able to meet expected or unexpected cash flows without affecting daily operations or the entity's financial position) and market liquidity risk (the risk of an entity not being able to close or eliminate a position without significantly reducing its price due to a market disturbance or inadequate depth). In any event, the same factors are considered to refer to both types of liquidity risk. Basel Committee on Banking Supervision, The management of liquidity risk in financial groups (2006).

Executive summary



This section provides a summary of the main conclusions drawn here in relation to liquidity risk in the financial sector. These conclusions are set out in the corresponding sections of the document.

New liquidity standards

1. Although liquidity risk was a subject that had already been addressed by banks and financial institutions, in recent years, concern about liquidity risk has increased due to, inter alia, the market circumstances caused by the financial crisis which broke in 2007.
2. In fact, as a result of the crisis, domestic and international regulators have focused their attention on liquidity (not only on solvency), and in a relatively short period of time have gone from promoting non-binding general recommendations to implementing compulsory detailed standards which include a series of metrics and quantitative indicators.
3. Most of the new liquidity regulations, including Basel III³, CRD⁴ IV, and the standards of the Bank of Spain or of the FSA⁵, have used the principles on good governance and liquidity management established by the Basel Committee in 2000 (latest update in 2008). Generally speaking, these principles state that each bank or institution is responsible for sound management of its liquidity risk, for which purpose it will have to define a strong management framework to guarantee that there is sufficient liquidity, including a buffer of high quality unencumbered liquid assets to be used to meet stress situations.

³Basel Committee, Basel III: *International framework for liquidity risk measurement, standards and monitoring* (2010).

⁴*Capital Requirements Directive* of the European Commission (2011).

⁵Financial Services Authority, the United Kingdom financial regulator.

4. One of the most relevant liquidity standards is the aforementioned Basel III Accord, published in 2010, whose most important new development is to define the 30-day liquidity coverage ratio (LCR⁶), compelling entities to have an explicit well-defined buffer of liquid assets, and another one-year stable funding ratio (NSFR⁷), designed to make the asset and liabilities term structure sustainable, as well as other liquidity monitoring tools. These ratios will be implemented progressively: the LCR will be compulsory in 2015; and the NSFR, in 2018.
5. The Basel II Accord is being adopted in the European Union through what is known as the CRD IV Directive and Regulation. The LCR and NSFR ratios form part of the Regulation, implying that they will be compulsory throughout the European Union from the time they come into force. CRD IV will be approved by the European Parliament in 2012 and the compliance of ratios follows the same schedule as Basel III.
6. Regulators such as the Bank of Spain or FSA have implemented regulations with a greater focus on liquidity reporting, which entities must regularly send to the supervisor. The FSA has also established a liquidity self-assessment process incorporating survival metrics in the event of stress scenarios; this process must be regularly performed.
9. Nonetheless, undesirable consequences are also expected to be observed in various fields. One of these is the increased demand for liquidity from central banks, the short term shrinking of liquidity in the system, a possible fall in credit activity, lower return of entities, and, at macroeconomic level, a possible fall in GDP and increased unemployment.
10. In any event, most of these effects are considered to be uncertain and difficult to quantify, and the final impact is expected to be limited once the implementation of Basel III is complete, and that in the long term the benefits will outweigh the costs.
11. On the other hand, although the new regulatory framework has been well received by the sector, certain unresolved uncertainties and reticence's remain about certain aspects of the implementation of the framework:
 - ▶ The implicit penalization on retail banking compared with wholesale banking in the NSFR weightings for the different asset types, a question which could be corrected in the process of calibrating the ratios (still in progress).
 - ▶ The market's perception of the banks and financial institutions during the transition period until the complete implementation of the new regulatory framework.
 - ▶ The restrictive nature of the definition of high quality liquid assets, which almost completely excludes securitization instruments and issues of financial entities, and the potential incentive to invest in sovereign debt.
 - ▶ The potential impacts of the regulation on the structure per se and the business model of the entities.
 - ▶ The possible secondary effect on default and on banks and financial institutions' equity situation.

Impacts of liquidity regulation

7. Pursuant to the latest QIS⁸ published (December 2010), in order to comply with the Basel III liquidity standards, the 263 banks and financial entities taking part in the QIS - from 23 countries in which Basel is applicable - will need 1.73 billion euros of liquidity to comply with the LCR and 2.89 billion euros for the NSFR.
8. The benefits of the Basel III standards are expected to be focused on increasing financial stability. The most important factors will be the greater resistance of liquidity in the short and long term, improving liquidity risk management and supervision in entities, preventing further systemic liquidity crises and reinforcing investors' confidence.

⁶Liquidity Coverage Ratio
⁷Net Stable Funding Ratio
⁸Quantitative Impact Study

Quantitative study of deposit stability

12. An essential aspect of liquidity management is the stability of deposits, which forms part of the LCR of Basel III. The regulation determines that in a liquidity stress situation, it is necessary to forecast minimum outflows at one month of between 5% and 10% of retail deposits, depending on whether they are considered to be stable or unstable. According to the study made, in the Spanish financial entities analyzed and in the observed historical timeframe, these percentages for deposit flight correspond to a stress scenario which has a probability of occurring of between 2.1% and 0.35%, respectively. In other words, the regulation applied to these entities would represent a level of confidence of between 97.9% and 99.65%.
13. There are moderate but statistically significant differences between entities, showing that an estimate by each entity of its own deposit draw-down rates would lead to more adjusted results and an internal LCR which is more in line with the entity's financing management and profile.
14. Upon analyzing how deposits behave in entities, the study reveals a systemic or aligned behavior which can account for 50% of total movement⁹. Approximately 40%¹⁰ of this systemic behavior can be explained by means of an econometric model in accordance with several macroeconomic factors: disposable income, the balance in investment funds, the saving rate, property prices and unemployment; while the remaining 10% would correspond to latent factors.
15. In an individualized qualitative analysis of the movement of deposits in different entities during the period in question (2004-2011), we observe the following:
 - ▶ In general terms, banks and financial institutions keep between a band of quarterly variations of between -10% and 10%.
 - ▶ Increases of higher than 10% are mainly due to commercial actions, such as those which are considered to be part of the "liabilities war", or through mergers and acquisitions.
 - ▶ Decreases of over 10% are not common, and in most cases are due to negative news stories suggesting the possible collapse of the bank or financial institution, such as official intervention by the supervisory authority, request for mass liquidity from the central bank or even a possible suspension of payments by the Government, which could prompt outflows of up to 30% of deposits over the course of a single quarter.
 - ▶ As far as withdrawal of deposits is concerned, the study reveals that retail customers are less sensitive to other events, such as rating downgrades or the release of moderately negative results.

⁹According to an analysis of main components.

¹⁰Corresponding to the R² of the economic model.



Liquidity risk management framework

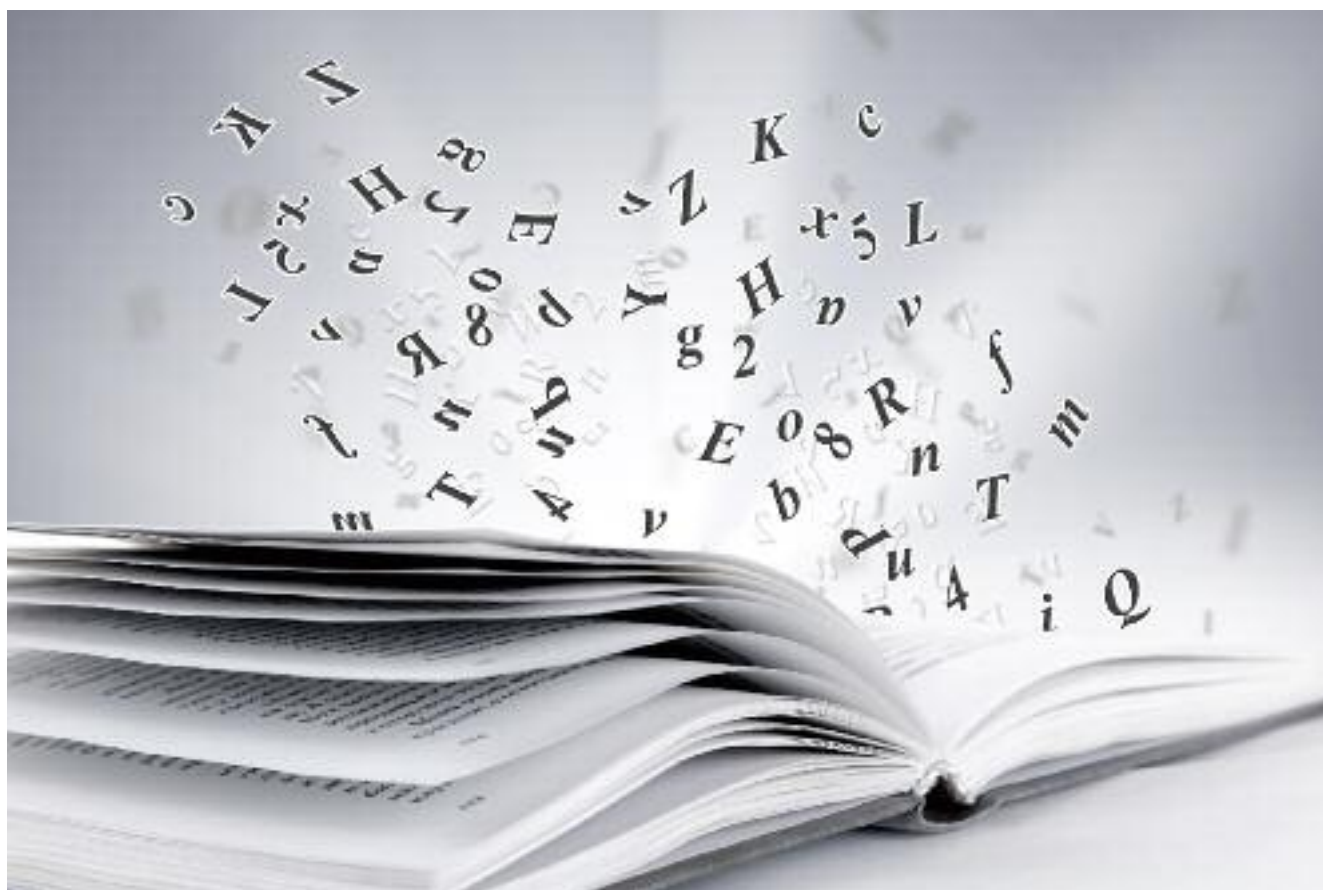
16. As a result of the aforementioned regulatory requirements and the market conditions handed down from the crisis, banks and financial institutions are substantially evolving their liquidity management frameworks. This is evident in different fields: governance; organization and functions; basic policies and principles; metrics, methodologies and limits; stress test and contingency plans; and reporting and tools.
17. Governance: in the governance structure new responsibilities are established in the definition and monitoring of the liquidity risk management framework and its relation and correspondence with appetite for liquidity risk. A governance is defined of the contingency plan and liquidity risk is added in the decision structure (limits, decisions to create new products and approval of operations with a relevant impact on liquidity). Furthermore, the structure of operating committees - in which the ALCO delegates liquidity strategies - is reinforced.
18. Organization and functions: the organizational model is built around two fundamental principles: the Senior Management's involvement so that liquidity policies are effectively implemented, and the separation of origination and management functions, on the one hand, and liquidity control and supervision, on the other, with a focus on Finance and Risks Departments, respectively. An in-depth analysis is made of aspects such as the separation of functions between the Finance Department and the Treasury in managing structural and operating liquidity, reinforcing certain management targets arising from maintaining liquidity buffers of a substantial size, or creating LVA panels (Liquidity Value Adjustment).
19. Basic policies and models: banks and financial institutions are reinforcing the execution of liquidity risk management principles (managing all relevant currencies, ensuring business continuity, keeping a buffer of liquid assets and a diversified profile of financing sources, etc.) and making progress in areas such as mechanisms for integrating the cost of liquidity in decision processes, decentralization of liquidity risk management by countries and stepping up efforts in management of inter-day liquidity and collaterals as a source of liquidity, and monitoring market indicators and the entity's own indicators.
20. Metrics, methodologies and limits: banks and financial institutions progress in integrating the management of new liquidity risk metrics and in modeling their components, improving the consistency between the different elements and developing their liquidity backtests. They evolve in setting limits both in terms of granularity and the complexity of metrics, and liquidity risk is included in the pricing of operations by means of adjustments for the liquidity value (LVA) and in internal transfer rate (ITR) mechanisms. In this latter area, banks and financial

institutions are honing their ITR systems to measure the return on their businesses more accurately and to create incentives for management policies relating to liquidity risk, implying a series of questions which include the development of curves to reflect the cost of the financing market and posing certain methodological challenges about which the sector is not yet in agreement.

21. Stress test and contingency plans: banks and financial institutions are developing liquidity methodologies and stress scenarios which they use to set appetite for risk and limits. They are also modifying their liquidity contingency plans and redefining procedures to monitor and regularly update them. Progress is also being made in developing integrated capital and liquidity planning.
22. Reporting and tools: under the new requirements, it is not only necessary to carry out new calculations; it also implies a greater demand than at present in terms of granularity and calculation frequency. Consequently, banks and financial institutions are reinforcing their information and technological infrastructure model for managing liquidity risk: this includes developing databases, calculation engines for ratios and other liquidity metrics, and control panels encompassing both regulatory and management reports. Most of the banks and institutions are still coping with the challenge of developing consistency between these tools and liquidity and solvency reporting.



New liquidity standards



In recent years, a number of supranational agencies and national regulators have published documents relating to liquidity risk, which have the following purposes.

- ▶ To propose minimum quantitative requirements in relation to liquidity risk, using a different measurement framework from that applied in other financial risks, due to the fact that higher capital availability or quality does not necessarily offset adverse effects of liquidity.
- ▶ Defining the information which the supervisor needs to assess.
- ▶ Achieving greater international harmonization in order to strengthen liquidity risk management and supervision.

This section provides a summary of the main liquidity risk recommendations and standards published by different bodies,

which have been selected on the basis of their relevance or how representative they may be:

- ▶ The Basel Committee, as the leading international authority of reference in the area of risk regulations. The Basel Committee has recently drawn up liquidity standards which are being adopted at the international level.
- ▶ The European Commission, which in CR¹¹ IV is implementing the standards proposed by Basel, which will be compulsory all over the European Union.
- ▶ The Bank of Spain, as the regulator and supervisory member of the European System of Central Banks, which has developed its own liquidity risk standards and which is adopting the Basel standards.

¹¹Capital Requirements Directive



Principles for sound liquidity risk management

In 2000, the Basel Committee published the document *Sound Practices for Managing Liquidity in Banking Organizations*, (last version in 2008), containing principles for sound liquidity management in financial entities. These practices have generally been adopted by the different local supervisors, which have added them to their own liquidity risk management regulations.

The main aspects taken into account in these principles are summarized as follows.

1. Fundamental principle for liquidity risk management and supervision (Principle 1)

The fundamental principles, from which the rest are derived, state that each bank or financial institution is responsible for sound management of its liquidity risk, for which purpose it will have to define a strong management framework to guarantee that sufficient liquidity is maintained, to cope with a series of events which could cause tensions, including events which could give rise to losses or deterioration of funding sources.

Supervisors will have to assess the sufficiency of the management framework and the liquidity position of the bank or financial institution, and will have to take appropriate measures if they detect shortcomings in this regard, in order to safeguard depositors and limit possible damages to the financial system overall.

2. Sound liquidity risk governance (Principles 2 to 4)

Banks and financial entities must clearly establish a tolerance to the liquidity risk which is appropriate for their business strategy, and, for all business activities, the costs, benefits and liquidity risks in the processes of pricing, measuring results and approval of new products.

The Senior Management will have to carry out strategies, policies and practices for managing liquidity risk in keeping with its tolerance to risk, which must be approved by the Board of Directors, and inform the latter of the evolution of liquidity.

At least once a year, the Board of Directors will have to examine and approve liquidity management strategies, policies and practices, and ascertain whether the Senior Management efficiently manages liquidity risk.

3. Liquidity risk measurement and management (Principles 5 to 12)

Banks and financial institutions must be equipped with an appropriate process for identifying, measuring, monitoring and supervising liquidity risk.

Exposures to liquidity risk and financing requirements within each legal entity, business line and currency must be actively monitored and controlled, and also between each of them, taking into account legal, regulatory and operating restrictions for transferring liquidity.

Limits must be set to control exposure and vulnerability to liquidity risk (which must be revised periodically).

It is necessary to establish early warning qualitative and quantitative indicators in order to recognize the appearance of additional risks or vulnerabilities in each bank or financial institution's liquidity position or possible financing needs.

There will be an information system designed to provide specific and prospective information on the bank or financial institution's liquidity position to the Board of Directors, the Senior Management and other competent personnel.

- ▶ The FSA¹², as a pioneering banking authority in regulating liquidity, with standards published prior to the Basel III standards, and which, generally speaking, contain more restrictive criteria.

The main characteristics of the standards proposed by these regulatory bodies are summarised as follows.

Principles drawn up by the Basel Committee for sound liquidity risk management

This is a commonly accepted set of standards for managing liquidity risk, published in 2000 (latest version in 2008) in the document *Sound Practices for Managing Liquidity in Banking Organizations*, which have been generally adopted by different national supervisory bodies. They propose that each bank or financial institution is responsible for defining a solid framework for managing its liquidity, and that it should maintain an adequate liquidity position (questions which have to be assessed by supervisors), establish its tolerance to liquidity risk and guarantee that the Board of Directors and Senior Management will be involved in the management and supervision thereof.

Furthermore, banks and financial institutions must have implemented an adequate process for identifying, measuring, monitoring and controlling liquidity risk; this will include setting limits and qualitative and quantitative indicators, an appropriate information system and a liquidity stress test model.

Lastly, banks and financial entities must have a diversified funding strategy and keep a buffer of high quality unencumbered liquid assets to cope with liquidity stress situations.

¹²Financial Services Authority

Figure 1. Liquidity ratios required by Basel III

Liquidity Coverage Ratio (s.t.) - LCR	Net Stable Financing Ratio (l.t.) - NSFR
$LCR = \frac{\text{Buffer of high quality liquid assets}}{\text{Net cash outflows in 30 days}} \geq 100\%$	$NSFR = \frac{\text{Available level of stable financing}}{\text{Required level of stable financing}} > 100\%$
Ensuring that the entity has sufficient liquid assets to meet net outflows of liquidity during 30 days, in a stress scenario.	To ensure a balanced balance sheet structure, in which stable financing needs are funded by stable liabilities.

Basel III

The Accord known as Basel III (published by the Basel Committee in 2010 after a consultative process started in December 2009) has been a landmark in terms of liquidity regulation. It develops standards to measure and control liquidity risk, leading to two ratios of compulsory compliance and tools for monitoring liquidity risk.

The purpose of the LCR (Liquidity Coverage Ratio) is to guarantee that the bank or financial institution maintains a sufficient level of high quality unencumbered liquid assets to survive a 30-day liquidity stress scenario, and the aim of the NSFR (Net Stable Funding Ratio) is to ensure that there is a balanced balance sheet structure and to limit excessive dependence on short term wholesale financing, for which purpose a minimum stable financing with a one-year horizon is defined (Figure 1).

The LCR will be compulsory in 2015, and the NSFR, in 2018, following an observation period during which any of its parameters can be calibrated.

In addition to the ratios, Basel III proposes the systemic use of other complementary monitoring tools as a basic element for supervisors to evaluate banks and financial institutions' liquidity risk (Figure 2).

CRD IV

Following the publication of several guides containing recommendations by the CEBS¹³, the European Commission is adopting the Basel III Accord in the form of a Directive and a Regulation known as CRD IV. The Directive basically reflects the basic principles published by the Basel Committee in the Sound Practices for Managing Liquidity in Banking Organisations document, while the Regulation includes, among other things, the LCR and NSFR ratios with the same definition and application schedule as Basel III.

¹³Committee of European Banking Supervisors, using its letters in English which on 1/1/2011 was integrated within the European Banking Authority (EBA).

Figure 2. Other liquidity monitoring tools required by Basel III

Contractual maturities gap	Contractual maturities gap with different time horizons: <ul style="list-style-type: none"> · With the longest possible contractual maturity in assets and shortest in liabilities. · No assumption of maintaining size neither of balance sheet nor on assets without maturity.
Concentration of financing sources	In all cases, when the exposure is over 1% of the entity's total liabilities : $A = \frac{\text{Debt with significant counterparty}}{\text{Total balance}} \quad B = \frac{\text{Debt from significant instrument}}{\text{Total balance}}$
Uncommitted available assets	Information on the amount, type and location of uncommitted assets which could be used as collateral: 1. Classified by significant currencies. 2. Estimating the required haircut on its assets by market or eligible central bank. 3. Estimating the expected monetary value of the collateral.
LCR by main currencies	Level of high quality liquid assets of each currency/Net cash outflows in a period of 30 days of each currency <ul style="list-style-type: none"> · The outflows will have to be net of foreign exchange hedging. · A currency is considered to be significant if it reaches 5% of liabilities.
Market monitoring tools	Three types of information: <ul style="list-style-type: none"> · Market information in a broad sense (equity, commodities, debt, etc.). · Information of the financial sector (equity and debt). · Specific information for each financial entity (share prices, CDS spreads, trading prices in money markets; debt prices, etc).

Impacts of liquidity regulation



Generally speaking, the financial sector has welcomed the new liquidity standards and has acknowledged the beneficial effect it will have on financial stability and on preventing new systemic liquidity crises, and in harmonizing requirements at the international level. However, there is still some uncertainty regarding specific impacts arising from the current calibration of ratios, voiced by the banks and financial institutions in their comments added to the consultative Basel III document published in 2009.

These are some of the main unresolved questions which can cause potential impacts:

- ▶ The definition of high quality liquid assets, which most entities consider to be very restrictive, as it excludes assets such as securitizations, the debt issued by financial entities (including that guaranteed by governments) or shares listed in organized markets, and which is not aligned with the eligibility criteria of the ECB and other central banks.

- ▶ The fact that the single approach on weightings in LCR and NSFR, with little margin for internal estimates, may not properly reflect the variety of financial business models and could penalize one of them.
- ▶ In particular, the fact that the weightings of the different assets types in liquidity ratios (for example, bonds against loans or credits to retail clients as opposed to wholesale clients) could penalize certain business models.
- ▶ Determining a financing scheme of short term assets with long term liabilities (implicit in the NSFR definition), which contradicts the task of converting maturities performed by the financial sector.

There are also reservations about the need to publish liquidity metrics with the stipulated granularity and frequency, which by their nature might be volatile and could have unwanted effects on the markets.



Basel III

Objective

The object of the measures proposed by Basel III is to improve the banking sector's capacity to absorb disturbances arising from any kind of financial or economic stresses, thereby reducing the risk of contagion from the financial sector to the real economy.

Main components

Basel III does not specify the qualitative elements relating to governance, policies or other procedures (such as stress tests or liquidity contingency plans) for the purpose of managing liquidity risk, given that they are already set out in the principles of Sound Practices for Managing Liquidity in Banking Organizations.

However, the main new development in the Accord is the definition of short term (LCR) and long term (NSFR) liquidity ratios, which are compulsory and other tools which must be used by entities to monitor their liquidity risk.

- **Liquidity Coverage Ratio (LCR):** a short term metric which is designed to guarantee that an entity keeps a sufficient level of high quality unencumbered liquid assets which can be converted into cash to cover its liquidity needs during a 30 calendar day horizon, in a liquidity stress scenario.

According to the standard, this scenario includes many of the disturbances which occurred during the crisis which began in 2007: partial withdrawal of retail deposits, partial loss of funding capacity not guaranteed in wholesale markets, etc.

LCR is expressed as follows:

$$LCR = \frac{\text{Buffer of high quality liquid assets}}{\text{Total net cash outflows in 30 calendar days}} \geq 100\%$$

Where:

Buffer of high quality liquid assets: the fund of assets banks and financial institutions will have to be able to use to meet their liquidity requirements. The standard defines the characteristics these assets have to have and their markets in order to be considered high quality (for example, they must be unencumbered), dividing them into two levels of liquidity in accordance with the aforesaid characteristics (a haircut is applied to the second level for it to be considered in the buffer).

Total net cash outflows in 30 calendar days: defined as the total expected cash outflows minus total expected cash inflows in the specified stress situation during the following 30 calendar days. total forecast cash outflows are calculated multiplying the valid amounts of the different categories or liability types and of the off balance sheet commitments by the rates at which they are expected to be cancelled or used. For retail deposits, these rates are 5% for stable deposits and 10% for unstable ones. Total forecast cash inflows are calculated multiplying the valid amounts of the different categories of collection rights by the rates at which they are expected to enter the bank according to the specified scenario, up to a minimum aggregated maximum of 75% of the total expected cash outflows.

According to the standard, this ratio must be higher than or equal to 100% so as to guarantee minimum short term liquidity requirements (30 days).

Various national and international bodies, with academic support, have carried out studies to analyze the impact that the regulation could have on the economy. Specifically, to assess the effects of implementing Basel III, the Basel Committee regularly analyzes quantitative impact studies (QIS) on a sample of entities which are in the process of adapting to this regulation. The latest results published¹⁶ in December 2010 refer to 263 banks from 23 countries (94 of which belong to group 1, in other words, with over 3000 million euros of capital, diversified and internationally active).

The results show that only 46% of the studied entities complied with the LCR and in order for the other 54% to comply, 1.73 billion euros of liquidity would be needed in the short term. As far as the NSFR is concerned, 2.89 billion euros of liquidity would be needed in the long term, corresponding to 57% of entities which would not comply with the ratio (Figure 4).

Beyond the QIS, various studies have been carried out in the sector and the Basel Committee has created several working groups with the aim of assessing the effects of the liquidity

¹⁶Results of the Comprehensive Quantitative Impact Study, Basel Committee, December 2010, containing data referring to 2009 year end.

Figure 4. Results of QIS on coverage ratios and liquidity requirements

Group	LCR (average)	NSFR (average)
1	83%	93%
2	98%	103%
Comments	<ul style="list-style-type: none"> ▶ Only 46% of entities comply with the LCR. ▶ For the remaining 54% to comply, 1.73 billion euros are needed. 	<ul style="list-style-type: none"> ▶ Only 43% of entities comply with the NSFR. ▶ For the remaining 57% to comply, 2.89 billion euros are needed.

NB: on 12 April 2012, the Basel Committee published the *Results of the Basel III monitoring exercise at 30 June 2011*. These indicate that the average LCR are 90% and 83% for groups 1 and 2, implying an additional short term liquidity requirement of 1.76 billion euros. The average NSFR is 94% in groups 1 and 2, implying a long term need of 2.78 billion euros.

measures proposed by Basel III; these include the MAG (Macroeconomic Assessment Group) of the Financial Stability Board and the LEI (Long-term Economic Impact Group). These effects have also been assessed in studies carried out by the IIF (Institute of International Finance¹⁷).

In general terms, the studies assess the impact of new requirements in a scenario of increased liquid assets during different transition periods, combined with extending the maturity of wholesale liabilities, and identify a series of potential effects which shall be detailed in this section.

Although there is some uncertainty as to how to quantify these effects, there is a reasonable consensus on considering certain benefits and potential risks (Figure 5).

Benefits

The main benefit of introducing the measures concerns the financial stability arising from the improvement in the banking sector's capacity to absorb disturbances arising from any kind of financial or economic stresses, thereby reducing the risk of contagion from the financial sector to the real economy, by means of the following:

- ▶ Reinforcing the resistance of banks' and financial institutions' short term liquidity risk profile, by guaranteeing that they have sufficient high quality liquid assets to withstand liquidity stress situations, and, in the long term, by creating incentives for banks and financial institutions to be continuously funded with more stable sources.

- ▶ Improvement in banks and financial institutions' liquidity risk management and supervision, by reinforcing the sector standards in this field and promoting the setting-up of complete frameworks encompassing all aspects of liquidity management.
- ▶ Consolidation of the supervisory approach to liquidity risk, through the consistent application of the same harmonized standards at international level and with the stipulated values.
- ▶ Protection against possible systemic liquidity crises; the LEI Group estimates¹⁸ a reduction from 3% to 1.6% in the probability of systemic crisis.

Potential short-term risks

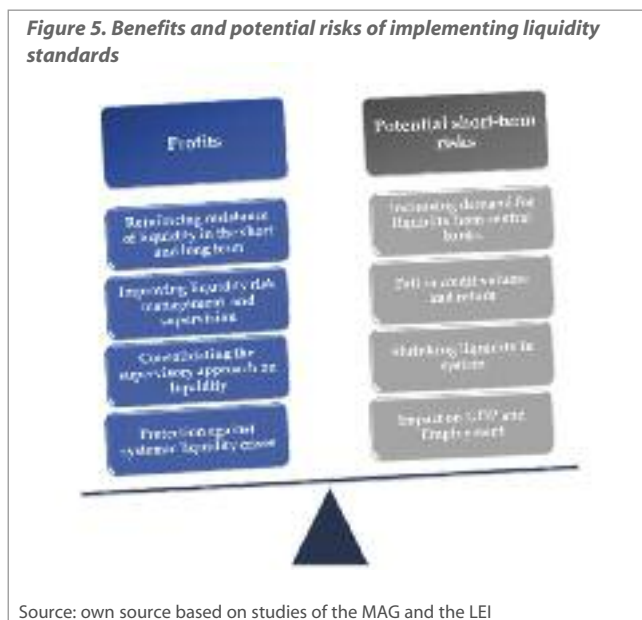
Certain risks arise, however, with potential short term impact:

- ▶ Increased demand by banks and financial institutions for liquidity of entities from central banks (short and long term), as a result of regulatory requirements.
- ▶ Shrinking in system liquidity, given that entities keep higher levels of high quality liquid assets on the balance sheet and therefore reduce the demand for assets not included in the regulatory definition of the buffer. This can be detrimental to the markets of these assets or funding in the short term.
- ▶ Possible reduction in credit volume, due to the shrinking in liquidity and banks and financial institutions' need to keep the liquidity buffer, and fall in profitability, given that in order to comply with standards, banks and financial institutions will have to invest in high quality liquid assets and thus with a lower margin.
- ▶ Possible impacts on GDP, as a result of shrinking in credit, which could in turn have consequences on the level of unemployment.

These effects are uncertain, and difficult to quantify; the final impact is expected to be limited, and that in the long term the benefits will outweigh the costs.

Observing the above point in greater depth, based on comments made within the financial sector and different studies published¹⁹, the following opposing effects may be highlighted in the fields which are most affected by the introduction of the new standards:

1. Impacts on the profitability of financial institutions.
2. Impacts on the business model of financial institutions.
3. Impacts on the financing mechanisms of financial institutions.
4. Impacts on financial stability.





5. Increased demand for sovereign debt
6. Demand for liquidity from central banks
7. Increased cost and decrease in credit volume.
8. Increased default and shrinking of GDP and employment.

Impacts on the profitability of financial entities

In order to comply with new liquidity standards, banks will have to invest in less profitable and more liquid assets, thus reducing their positions in more profitable assets, which will probably have an impact on their margins.

Furthermore, in a context in which most banks and financial institutions need to approach the market at the same time to obtain capital and liquid assets, there is a degree of uncertainty regarding how elastic the two elements may be in the short term: the higher the increase in asset prices in the event of this demand, the higher the banks' and financial institutions' costs will be to comply with the new regulatory requirements.

Impacts on the business model of financial entities

A common observation regarding the new liquidity standards is that a single weightings approach in the LCR and NSFR cannot accurately reflect the variety of financial business models and that it would therefore be advisable to have a more flexible approach which could adapt to the different business models so as not to penalize any of them.

In particular, some banks and financial institutions take the opinion that the current calibration of ratios stipulated in the standards penalize retail banking as opposed to wholesale banking, due to questions such as the weightings of the different asset types in the NSFR (for example, bonds against loans, or the 85% weighting of unencumbered credits to retail clients and small enterprises with a residual maturity of less than one year, as opposed to the 50% of wholesale credits with the same maturity).

Although these aspects could be modified during the process of calibrating the ratios - which has not yet been completed - there is thought to be little justification for the aforesaid effect given that retail banks have shown the most resistance during the crisis.

¹⁷Global association of financial institutions, which includes the 420 main banks from 70 countries.

¹⁸Basel III: Long-term impact on economic performance and fluctuations, LEI (2011).

¹⁹MAG, *Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements* (2010); Services of the European Commission, SEC (2011) 949 final, Annex X (2011); Institute of International Finance (IIF), *The Cumulative Impact on the Global Economy of Changes in the Financial Regulatory Framework* (2011); IMF, *Working Paper, WP/11/103 Macroeconomic costs of higher bank capital and liquidity requirements*, Scott Roger and Jan Vlcek (2011); Bank of Spain.

Estabilidad Financiera, Núm. 19: *Impacto macroeconómico del reforzamiento de los requisitos de capital y liquidez*, Ángel Gavilán (November 2010); Bank of Spain.

Estabilidad Financiera, Núm. 21. *El impacto de los nuevos estándares de liquidez desde el punto de vista de un banco central*, Liliana Toledo Falcón (November 2011); OECD, OECD Journal: Financial Market Trends *Thinking beyond Basel III: necessary solutions for capital and liquidity* (2010).

Basel III (cont.)

In any event, the standards state that the defined scenario for the LCR is a minimum supervisory requirement and that banks and financial institutions must carry out their own additional stress tests, considering longer time horizons.

- **Net Stable Funding Ratio (NSFR):** the idea is to limit an excessive dependence on short term wholesale financing during periods of abundant liquidity on the market, and to promote a more accurate assessment of liquidity risk of all on and off balance sheet items, neutralising institutions' incentives to finance their fund of liquid assets with short term funds maturing immediately after the 30-day horizon of the LCR ratio.

For that purpose, it establishes a minimum acceptable amount of stable financing in accordance with the liquidity characteristics of the assets and the entity's activities during a one-year time horizon.

NSFR is expressed as follows:

$$\text{NSFR} = \frac{\text{Available amount of stable funding}}{\text{Required amount of stable funding}} > 100$$

Where:

Available amount of stable funding: defined as the proportion of types and amounts of own and other funds which might be expected to be reliable sources of financing during a one-year timeframe in conditions of prolonged stress. It is calculated by assigning a factor defined by the standard to each financing category.

Required amount of stable funding: this is a function of the liquidity characteristics of the various asset types, of the off balance sheet contingencies assumed or of the activities carried out. The standard defines the factors to be applied to these elements for them to be considered as stable required financing.

- **Other monitoring tools:** as complementary measures to the liquidity ratios, Basel III proposes the systematic use of other monitoring tools:
 - Contractual maturities gap^{*}.
 - Concentration of financing sources by counterparty, by instrument or significant product, by currency and by time horizon.
 - Unencumbered free available assets.
 - LCR by significant currency.
 - Monitoring tools based on market data.

Application schedule

Even though the Basel provisions are not legally binding, its members have agreed on a common schedule for implementing the aforesaid measures:

- Reporting during observation period: from 1 January 2012, banks and financial institutions will have to report the LCR and the NSFR to their supervisors with the required frequency.
- Closing of definition: by mid 2013 the LCR definition will be closed, and by mid 2016 the NSFR definition will be closed.
- Coming into force: compulsory compliance of the LCR will come into force on 1 January 2015 and that of the NSFR on 1 January 2018.

^{*}Taken to be the difference between the contractual inflows and outflows of cash and of on and off the balance sheet securities assigned to time nodes in accordance with their respective maturities.

Given that entities had not been subject thus far to regulatory liquidity requirements, there is a certain degree of uncertainty regarding the reaction to the new regulation in entities in terms of redirecting business towards products with a greater balance between margin and liquidity. In this regard, the MAG is of the opinion that even though historically the ratio of liquid assets over total assets has not had a significant impact on credit margins, or on other macroeconomic variables, it does not necessarily imply that the new liquidity requirements will have a reduced impact.

Modification of financing mechanisms of financial entities

The LCR definition could prompt a replacement of short term unsecured demand with demand in repo, and the effect on the unsecured interbanking market in addition to the increase in the curve slope, would be a reduction in the number of participating entities and the traded volume, with feedback effects: given the lower participation on the market, it would be more difficult to find counterparties. Furthermore, a more narrow market would lead to greater volatility in interest rates, thus making the market even less attractive for agents.

On the other hand, it might become more difficult to access financing over the markets, one reason being, among others, that the positions in debt issued by financial entities could be penalised by the new liquidity ratios as they are not considered to be liquid assets.

Impacts on financial stability

The new standards can be considered to be a protective framework against potential systemic crises (the LEI Group²⁰ estimates a reduction in the probability of a systemic crisis of 3% to 1.6%), a guarantee for the individual stability of banks and financial institutions, and, ultimately, of the financial system

overall. However, there is another series of opposite effects which requires analysis:

- ▶ Joint movement of banks and financial institutions: certain studies²¹ consider that the restrictive definition of liquid assets of the LCR can increase the concentration of the same type of assets on banks and financial institutions' balance sheets. This means when faced with a systemic event, the interbanking market might not be able to comply with its function, so that the only alternative would be to liquidate assets or resort to the central bank as a lender of last resort, actions which could be prevented by regulation.
- ▶ Shadow banking: borrowers affected by the new regulation might be forced to seek alternative investors or lenders, leading to a transfer of the sector for the risks the new regulation aims to reduce, with implications in terms of market operation and financial stability.
- ▶ Market information: the fact that the markets are continuously following ratios which can have very uneven values at any specific moment, occasionally simply due to temporary factors, could have a negative impact on financial stability, leading to the question of whether entities should only provide the values of their ratios to the corresponding supervisor or if they should be published regularly.

Furthermore, certain doubts arise concerning the market's reaction during the transitional period depending on each bank or financial institution's position in complying with the requirements. If the market were to overly penalize the worst situated banks and institutions, this could compromise their viability and forcibly bring about an adjustment in the financial system which is faster than required. This would also give rise to higher macroeconomic costs.





Increased demand for sovereign debt

Due to the current definition of LCR and of the high quality liquid assets, there is expected to be a rise in demand for sovereign debt to the detriment of other assets.

On the other hand, although generally the preference for having sovereign instruments in portfolio as against other assets would improve the solvency ratio (its average risk weighting is around 0%), according to the OECD this could implement a liquidity standard which, under extreme circumstances, could have the effect of causing solvency problems.

Demand for liquidity from central banks

Even though in principle the LCR has been designed to reduce entities' dependence on the financing of the central bank, it could have the opposite effect in the short term, given that the definition of the Basel II liquid assets does not match the definition of the collaterals defined by the central banks (which is broader), nor with its valuation haircuts. By this means:

- ▶ The level 1 liquid assets would be more valuable if they are maintained on the balance sheet, as against the level 2 assets (less liquid than the level 1 ones), which would have to be discounted in the central bank to obtain liquidity.
- ▶ The rest of the assets which are eligible as collateral but not considered liquid can be used in monetary policy transactions to generate liquidity. The result would be an additional and artificial demand for liquidity from the central bank to comply with ratios or to broaden the leeway for compliance, maintaining this liquidity on the balance sheet or buying other liquid assets, such as public debt.
- ▶ Consequently, if entities were to replace the use of level 1 assets in operations with central banks with level 2 assets and eligible assets not classified as high quality liquidity, central banks would be lending liquidity with a series of lower quality guarantees.

Furthermore, as a result of the new regulatory requirements, long term financing operations will be more interesting than the other forms of financing, given that the regulation explicitly creates a stable form of financing through the NSFR. Therefore, there is expected to be a higher demand on the market and more aggressive bids for this type of financing.

CRD IV

On 20 July 2011, the European Commission published a new legislative proposal to reinforce the European banking system, known as CRD IV. Once this proposal is approved*, it will replace Directives 2006/48/EC (CRD II) and 2006/49/EC (CRD III) which, inter alia, regulated capital requirements, modes of governance and supervision applicable to credit entities and investment companies carrying out their activity in any of the Member states.

CRD IV implements the Basel III agreement in the European Union. Its main objective in terms of liquidity risks is to reinforce the corporate governance of entities' liquidity and to include liquidity risk metrics (in the short and long term) to strengthen the mediation framework for this risk.

The standard is made up of:

- A Directive, which will therefore have to be transposed to national regulations by each Member state, and which, essentially, reflects the Sound Practices for Managing Liquidity in Banking Organizations established by the Basel Committee for sound liquidity governance and management.
- A Regulation which contains the LCR and NSFR ratios, although before requiring the latter in 2018 it is proposed to carry out extensive monitoring of its potential effects.

The fact that part of the standard is going to be instrumented through a Regulation is because of the Commission's objective of ensuring that there are no divergences in the applications of the measures between the different countries of the European Union.

Thus far, no format for EU reporting has been defined in terms of liquidity, although the Regulation indicates that it will be EBA which will draft projects of technical execution standards so as to specify the uniform formats, with the corresponding instructions (frequencies, dates and terms for conveying information), and additional measures required for controlling liquidity. These proposed technical standards would have to be presented to the Commission no later than 1 January 2013.

In any event, the proposed implementation adopts the same schedule as Basel III as far as liquidity is concerned; i.e. compliance with the LCR in 2015 and the NSFR in 2018.

²⁰20LEI, *Basel III: Long-term impact on economic performance and fluctuations* (2011).

²¹Estabilidad Financiera, Núm. 21. *El impacto de los nuevos estándares de liquidez desde el punto de vista de un banco central*, Lilita Toledo Falcón (noviembre 2011).

*The expected date for this proposal to be voted by the European Parliament is 25 April 2012 in committee and 12 June 2012 in plenary sitting.

Bank of Spain

On 30 November 2011, the Bank of Spain published Bank of Spain Circular 4/2011, amending its Circular 3/2008 of 22 May, on determining and control of minimum shareholders' equity. Bank of Spain Circular 4/2011 entered into force on 31 December 2011.

This Circular includes guidelines for sound liquidity risk management and supervision. In practical terms, its contents are a transposition of the *Sound Practices for Managing Liquidity in Banking Organizations* of the Basel Committee, which in the previous version of the standard (last updated by Bank of Spain Circular 9/2010) was included in *Complementary guides to standards contained in the Circular. Rules for assessing and controlling liquidity risk*, and with Bank of Spain Circular 4/2011 have been included in the body of the standard.

The Circular also defines official reporting of liquidity risk: The monthly LQ Statements sent to the supervisor for the first time on 16 January 2012, which are a modification of the L Statements, which had been sent by banks and financial institutions since 2009 in draft version. They are:

- Scale of residual maturities (Statement LQ1.1).
- Liquid assets and issues in process (Statement LQ1.2).
- Concentration of financing sources (Statement LQ1.3).
- Risk of contingent liquidity (Statement LQ1.4).
- Cost of new financing (Statement LQ1.5).

If we compare the LQ Statements with the Basel III liquidity monitoring tools, the conclusion we may draw is that although Basel has a greater scope of analysis (it poses reporting requirements by product or significant instrument, by currency, etc.), in the common elements the reports of the Bank of Spain require a greater level of breakdown (terms of maturity, concentration percentiles, etc.). In any event, there are not enough elements contained in the LQ Statement to make a complete calculation of the LCR.

Furthermore, the Bank of Spain establishes the need to make calculations to measure liquidity risk, such as liquidity positions in the short, mid and long term, liquidity limits and buffers, the assigning of costs and benefits of liquidity to the business lines, branches and entities of the group to which they belong, etc., although their calculation procedure is not specified.

In the CEBS liquidity guides which the Executive Committee of the Bank of Spain agreed to adopt as its own* on 5 December 2011, guidelines are offered in this regard.

Increased cost and decrease in credit volume

In terms of mechanisms for conveying monetary policy, there would be expected to be an increase in banks' financing costs - banks will increase their margins to try to maintain the target ROE, which will presumably be transferred to clients, especially retail ones. The IMF calculates this increase in margins, considering a two-year application period for the measures, to be 20 bps in the US and 5 bps in the Euro Zone, assuming that liquidity requirements will be covered by an immediate increase in entities' sovereign debt; the difference between the two regions is due to the higher target ROE and the dividends payout in the US.

The sectors most affected by the reduction and greater cost of credit will be those sectors which are most dependent on bank financing, in other words, households and small and medium sized enterprises, thereby damaging economic activity. The MAG has calculated a potential reduction in credit of 3.2%.

Increased default and shrinking of GDP and employment

Shrinking in asset markets which are considered to be illiquid or short term financing could in turn have consequences on the final granting of credit, and thus on economic growth, given that a good deal of the banks and financial institutions' funding stems from these markets²².

Indeed, a fall in economic activity would imply a fall in GDP which, according to some studies, would be of between 0.13% (according to the MAG) and 3.2% (according to the IIF) in 2015, considering the joint impact of the liquidity and capital standards.

Consequently, the impact on employment is expected to be 7.5 million jobs up to 2015 and 4.1 million up to 2020 (understood to be the number of jobs below the number there would be if the standards were not implemented) over all the Eurozone, the US, Switzerland, United Kingdom and Japan, according to the IIF.

Lastly, these impacts could trigger in turn an increase in default and decline in banks' and financial institutions' capital, which would open up a gap against regulatory standards and therefore a paradoxical performance (complying with one standard would make it difficult to comply with others).

²²In fact, the OECD points out in its study that the need to keep a high level of liquid uninvested assets could increase risk in other markets.

*Guidelines on Liquidity Buffers and Survival Periods, CEBS (2009) y Guidelines on Liquidity Cost Benefit Allocation, CEBS (2010).

FSA

The FSA (Financial Services Authority) was one of the first bodies which, in the context of the economic crisis, issued a set of documents relating to adequate measuring, management, monitoring and control of liquidity risk in financial entities. The first consultations (*Review of Liquidity Requirements for Banks and Building Societies*, December 2007) were followed by a series of consultative documents entitled *Strengthening Liquidity Standards*, published between December 2008 and October 2009. As a result of the feedback received, the FSA included liquidity requirements for financial entities within its regulation (*BIPRU**). Chapter 12 of this document, published on 1 December 2009, contains the liquidity risk regulation, which was applied completely in 2010, following a transition period for adaptation to the new requirements.

The aim of the FSA is to guarantee that at any given time all financial entities have adequate liquid resources (adequate in volume and quality) to ensure that it is able to meet the payment of its obligations in market stress situations, without needing to depend on other units of its group (unless this dependence is expressly authorised by the FSA).

The most important points of the FSA liquidity regulation are as follows:

- Need for a liquidity self-assessment process (Individual Liquidity Adequacy Assessment, ILAA). This process goes beyond simple reporting and must be used by banks and financial institutions to define and quantify their liquidity buffer, to specify liquidity management and control levels, to determine the impact of stress scenarios on the entity's financing capacities and to define future liquidity requirements in accordance with strategic plans.
- Drafting and sending of a specific liquidity guide (Individual Liquidity Guidance, ILG) for each bank or financial institution, with the purpose of providing guidelines regarding the quantity and quality of the liquidity buffer and regarding the financing plan, and stress situations aligned with the real situation of the entity.
- Requirement, in addition to the LCR and NSFR ratios of Basel III, to monitor survival period and the ILG ratios, obtained using a cash flow gap and a liquidity buffer.
- Requirement of a reporting structure of entities to the regulator involving from the reporting of daily cash flows (FSA047), liquidity gaps (FSA048) and buffer (FSA050) up to the concentration of financing sources, wholesale/retail financing profile, cost (price) of wholesale financing and analysis of the information by currencies, as well as information on controls and systems. The frequency for sending these reports can vary in accordance with the entity type, its size and whether it is individual or consolidated information. In general terms, it must be sent weekly, but the FSA conducts regular capacity tests during which this information is required on a daily basis.

The additional metrics required by the FSA (the ILG ratios and the survival ratio) differ from and are more restrictive than those of Basel in several areas. Specifically, these metrics:

- Are calculated using stressed cash flows over a 3-month horizon, instead of the 30 days specified by Basel III for the LCR.
- They require a liquidity buffer subject to a specific stress determined by the regulator, with more severe restrictions regarding the recognition of liquid assets in the buffer than those specified in Basel III.
- They do not distinguish between stable deposits and less stable ones for companies.
- They do not recognise deductions in draw-down rates for the financing of wholesale clients with operating relations (custody, liquidation, cash management, etc.), which are recognised in Basel III.

The regulation has been in force since 1 December 2009, with certain transitory provisions which lasted until the end of 2010.

In general terms, it can be asserted that the FSA regulation predates and in many aspects is more restrictive than the Basel III standards.

Quantitative study of deposit stability



Within the framework for measuring liquidity risk established by Basel III and adopted by the European Commission and other international bodies and national regulators, discussed in the foregoing sections, one noteworthy element is the new liquid coverage ratio (LCR). The object of this ratio is to ensure that entities have a sufficient level of high quality liquid assets to be able to meet their liquidity requirements during a 30-day liquidity stress period. The ratio is expressed as follows:

$$LCR = \frac{\text{Buffer of high quality liquid assets}}{\text{Total net cash outflows in 30 calendar days}} \geq 100\%$$

While the assets which make up the ratio's numerator value are set out in a two-tier classification determining their representativeness as a component of the buffer, the forecast cash outflows are calculated by multiplying the valid amounts

of the different categories or liability types and the off balance sheet commitments by the rates at which they are expected to run off or be drawn-down.

To define these roll-off and draw-down rates, Basel III establishes effective values for each component, although there is the possibility of these depending upon the discretion of national supervisory authorities²³.

In particular, the denominator considers the withdrawal of retail deposits as the first component: it states that in order to calculate LCR, in a liquidity stress situation there will be an

²³Basel III, Section 51: "Although most of the roll-off rates, draw-down rates and similar factors are harmonised in the different jurisdictions as outlined herein, certain parameters will have to be determined by the national supervisory authorities. In that case, the parameters will have to be transparent and be at the disposal of the public"

outflow of retail deposits of at least 5% or 10% (depending on whether they are stable²⁴ or less stable deposits²⁵, respectively).

Given how important retail deposits are a source of financing, especially in a context of liquidity crisis, and the focus made by most regulations on less intensive use of wholesale financing, this section develops a study to analyze the stability of deposits and to assess the coverage of the draw-down rates proposed in Basel III.

Following the main conclusions and the description of the data which have been used, the study is structured around three sections, which focus on three objectives:

- ▶ Distribution analysis: determining the level of confidence represented by the draw-down rates (5%-10%) established by Basel III for retail deposits on the main Spanish financial entities.
- ▶ Systemic analysis: to describe the influence exerted by the macroeconomic environment on the stability of these entities' deposits, to determine whether such an influence exists, and, in the affirmative, to analyze what variables determine the dynamics of the draw-down rates.
- ▶ Idiosyncratic analysis: to explain, through special cases which represent the main events of liquidity crises, the reasons for the withdrawal of deposits which are not quantified in the previous section, and which, therefore, are not attributable to systemic factors.

Main conclusions of the study

The following conclusions may be drawn from the exercises set out in this section:

- ▶ Estimates established by Basel III on the deposit draw-down rate over 30 days, in comparison with the historical performance observed in a representative group of Spanish entities, with a stress scenario with an occurrence frequency of between 0.35% and 2.1%. With the individual statistical analyses based on the entities' data in isolation, estimates which are more in keeping with the individual management of each of them could be carried out.

- ▶ In order to explain the dynamics of deposit behavior, it is necessary to take into account the effects of the economic context by means of the behavior of certain indicators such as available income, balance in investment funds or unemployment.
- ▶ Nonetheless, these effects only explain the performance of deposits and are not suffice to obtain adjusted estimates of liquidity risk. In this regard, it is necessary to consider other non-systemic causes, such as the idiosyncracies of each entity, which could trigger possible crises of confidence and loss of credibility.
- ▶ The following idiosyncratic causes - which are analyzed in entities without relevant liquidity problems and also special cases - the following are particularly important:
 - The secondary effects of a liabilities war, which are understood to be non-renewed maturities of high return deposits.
 - Loss of confidence by deposit-holders due to the publication in the media of events with a serious impact on the entity's reputation and perception of solvency (not always connected with liquidity), such as announced intervention by the supervisor, a request for assistance from the central bank or even fear of a suspension of payments by the government.
- ▶ Lastly, the non-representativeness of other factors which can potentially influence deposit-holders' confidence has been observed; these include rating downgrades or the release of moderately negative results, in the explaining the dynamics of the draw-down of deposits in the analyzed entities. It is therefore concluded that customers are not sensitive to these factors.

²⁴Basel III considers stable deposits to be "those which have total cover through an efficient deposit insurance system or a public guarantee offering equivalent protection, where deposit-holders have other relations with the bank as a result of which it is high unlikely that there would be a withdrawal of deposits, or the deposits are made in operating accounts (for example, accounts where salaries are automatically deposited)".

²⁵Basel considers that less stable deposits "could include deposits not covered by an effective deposit system or public guarantee, deposits of a large amount, personal deposits with sophisticated profiles or high wealth levels, deposits which could be quickly withdrawn (for example, Internet deposits) and deposits in foreign currency, as determined in each jurisdiction".

Study data

To carry out the quantitative analyses, only public data²⁶ from seven Spanish financial entities and of the Spanish financial system overall have been used. The description and characteristics of the time series are as follows:

- ▶ Entities: the selection is based on criteria of representativeness and availability of information. Overall, the entities considered account for 50% of the volume of deposits in the Spanish financial system.
- ▶ Items: sum of the deflated balances of sight, savings and time accounts, included under retail deposits²⁷. These series are chosen with the aim of eliminating own concepts of wholesale portfolios, and elements not considered in the Basel III definition, such as creditors of the public sector, the assignment of assets and the issues of mortgage bonds. No distinction is made between stable and unstable deposits²⁸.
- ▶ Geographical field: Spain. In order to obtain clean deposit series not including the effects of mergers or acquisitions of foreign entities, only the data corresponding to the subsample of residents²⁹ of each entity have been taken into account.
- ▶ Historical depth: 2004 to 2011.
- ▶ Frequency: quarterly, this will be adjusted to monthly using a Monte Carlo method to observe the 30-day horizon of the LCR.

In short, the series selected for the study represent the relative quarterly variations³⁰ of the deflated balances of sight, savings and time accounts of the residential sector.

An initial graphic analysis (*Figure 6*) reveals certain periods in which movements were aligned between financial entities (for example, the first quarter of 2007 or the third of 2010), probably due to a systemic pattern. However, we can also observe periods of non-aligned behavior (December 2004 or December 2009) which would be due to idiosyncratic causes in each entity; therefore, independent of the macroeconomic context.

This thesis, which shall be corroborated in the sections below, shall determine whether it is necessary to perform a systemic and idiosyncratic analysis of the series in order to determine the reasons for deposit stability.

²⁶All the supporting data used in the studies are taken from the public information presented in the quarterly financial statements of the selected entities and of the Bank of Spain. Insofar as the information presented does not reflect the level of breakdown needed to exactly perform the classification indicated in Basel III, these have not been taken into account in the analyses and results shown.

²⁷Given that homogeneous data are not available, the retail deposit series has been taken into account for some entities. For entities arising from merger and absorption processes, the sum of the entities making up the merger has been considered for the period prior to the merger.

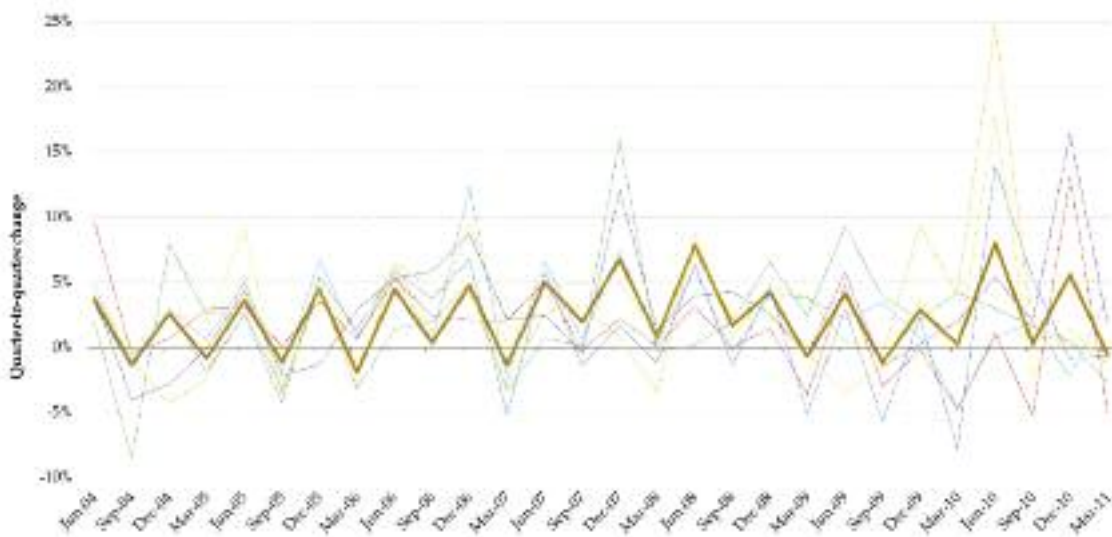
²⁸Hereinafter, the studies presented shall perform their analyses and results around two factors established by Basel III (5% and 10%), although, on the grounds of availability of information, the distinction between stable and unstable deposits has not been taken into account. The assumptions made and the results and conclusions arising from the analyses shall be taken to be applicable to both groups. It is important to note that in accordance with Basel III, because it is impossible to distinguish between these segments the entity is obliged to include all deposits with a draw-down factor of 10%.

²⁹The corresponding data of certain entities do not show the sufficient level of detail to be able to distinguish between residents and non-residents, so it has been decided to consider the aggregated figure, although in these cases it is a reasonable assumption, given that residential clients account for over 75% of the total.

³⁰The relative variation in a quarter q is:

$$\text{Var}(t) = (\text{Balance}(t) - \text{Balance}(t - 1)) / \text{Balance}(t - 1)$$

Figure 6. Series of quarterly variations in deposits volume



Source: quarterly reports of entities

Analysis of historical distribution of observed variations

The data sample described in the above section has the characteristics shown in Table 1.

Table 1. Statistics of the variations in deposits of the six entities considered in total

Statistical	Value
Number of observations	217
Average	1.83%
Typical deviation	4.69%

Based on these series, the first exercise will consist of quantifying the degree of adjustment of the Basel III deposit draw-down factors to the historical variations observed.

Accordingly, a parametric distribution is adjusted to the series of quarterly variations of the deposits and this is converted into monthly series so it can be compared with the LCR time horizon. Studying the percentiles of this distribution will make it possible to identify the level of confidence to which the regulatory ratios correspond and, therefore, give a statistical interpretation of the level of stress they reflect.

The analysis therefore consists of three steps and conclusions:

- i. Adjustment of parametric distribution to series of quarterly variations.
- ii. Conversion of the quarterly variations distribution into monthly series.
- iii. Obtaining and interpreting percentiles.
- iv. Conclusions.

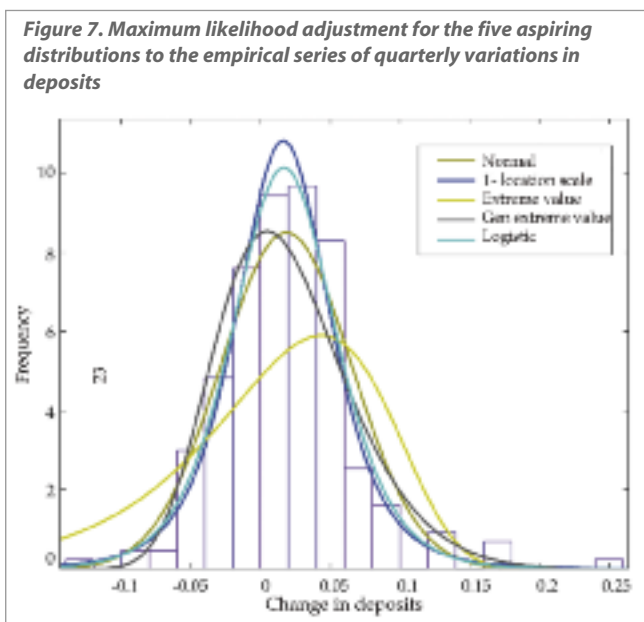
Adjustment of parametric distribution

Based on a series of quarterly relative variations in the deposits of the seven entities considered, a parametric distribution is adjusted to the historical variations. For that purpose, the normal, logistic, generalized extreme value, extreme value and t-location scale are considered, having ruled out those which because of their properties (non continuity, non negativity, monotony) are not appropriate for the nature of the data. The adjustment is carried out using the maximum likelihood method.

From the graphic analysis (Figure 7) and the likenesses study it is apparent that the distribution which best fits the data is a t-location scale with parameters of $(\mu; \sigma; \nu) = (0.016; 0.035; 4.223)$, where:

- ▶ μ is the mean adjustment distribution, which, as we might expect, is near the observed mean of 0.018.
- ▶ σ is the volatility or amplitude of the adjustment distribution.
- ▶ ν are the degrees of freedom of the adjustment distribution. Small degrees of freedom imply fatter tails, while very large degrees of freedom mean that the distribution tends to have normal parameters $(\mu; \sigma)$.

The chosen distribution is that with the highest value of the estimator of maximum likelihood, in other words, the t-location scale. The t-location is a family of distributions which contains Student's t-distribution as a particular case and which is used to model data series with few observations and heavier tails than the normal distribution, conditions which are observed in this case.



Monthly conversion of distributions

Given that the above distribution reflects the quarterly variations of deposits, in order to align the study with the term of the liquidity stress scenario posed by Basel III (30 days), it needs to be converted so it can reflect monthly variations.

For that purpose, following a Monte Carlo procedure³¹, it is concluded that the series of monthly changes in deposits follows a t-location scale distribution, but now of parameters $(\mu; \sigma; \nu) = (0.0055; 0.0164; 3.0996)$.

Figure 8 shows a comparison of the distributions of the monthly and quarterly variations in deposits of the seven entities overall.

As a result of converting the distribution into monthly data, two intuitive and expected effects have been obtained: the volatility of the distribution is reduced (associated with lower uncertainty of a short horizon) and the average value of variations.

Furthermore, with the purpose of validating the monthly distribution obtained, the confidence intervals have been calculated at 95% of the average, the typical deviation and the degrees of freedom defining it.

$$I_{0,95}(\mu)=[0.0035; 0.0077]$$

$$I_{0,95}(\sigma)=[0.0122; 0.0205]$$

$$I_{0,95}(\nu)=[1.6203; 4.3467]$$

On the basis of these confidence intervals, the sensitivity of the distribution parameters to the elimination of each entity has been measured, enabling us to estimate the generalization capacity of the distribution obtained.

Table 2 shows the results of re-estimating the monthly distribution, excluding an entity in each iteration to check how similar it is to the joint distribution.

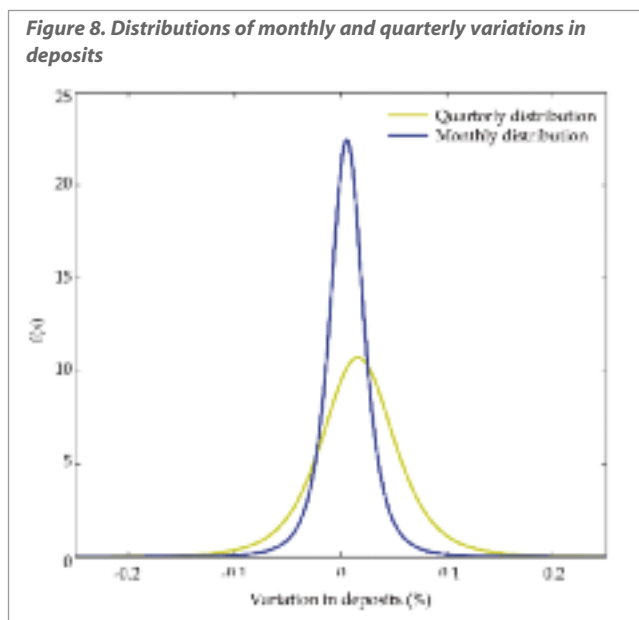
Table 2. Parameters of monthly distribution excluding each entity

Excluded entity	μ	σ	ν
Bank 1	0.0056	0.0159	3.0420
Bank 2	0.0056	0.0152	2.7533
Bank 3	0.0054	0.0169	3.1411
Bank 4	0.0054	0.0168	3.2150
Bank 5	0.0051	0.0168	3.1299
Bank 6	0.0052	0.0162	2.8967
Bank 7	0.0056	0.0163	3.0339

As we may observe, the parameters of all the marginal distributions lie within the confidence intervals estimated for the parameters of the joint distribution; in other words, eliminating any bank does not cause significant variations. It may thus be concluded that the monthly distribution obtained is strong and representative of the set of banks.

On the basis of the above results, it may be asserted that it is a robust study and that the monthly variations in deposits follow a t-location scale distribution with a mean of 0.55%, typical deviation of 1.64% and with 3.1 degrees of freedom.

³¹Given that the analytical expression which rescales the t-location scale distribution is not known, by means of an iterative process we have obtained the parameters of the monthly distribution which minimize the error between the original quarterly distribution and that obtained when converting the monthly variations obtained back into quarterly data, on a simulation base of 3,000,000 months.



Obtaining and interpreting percentiles

Based on the distribution of monthly variations, different percentiles have been calculated with the aim of studying the probabilities at which the negative variations forecast by Basel III might be expected for the group of Spanish entities considered. The values obtained are shown in *Table 3*.

Table 3. Probabilities of occurrence of the variations forecast by Basel III

Change in deposits	Probability of occurrence	Probability of non-occurrence	Comments
-10%	0.35%	99.65%	Draw-down rate of unstable deposits according to Basel III
-6.7%	1%	99%	
-5%	2.1%	97.9%	Draw-down rate of stable deposits according to Basel III
-3.3%	5%	95%	

The study shows that the regulatory coefficients are situated between the percentiles 0.35 and 2.1 of the distribution, enabling us to conclude that:

- ▶ The probability of outflows being higher than 5% is 2.1%; in other words, it would only occur 1 out of 47 times.
- ▶ The probability of outflows being higher than 10% is 0.35%; in other words, this outcome would occur only 1 out of 300 times.

Thus, it can be concluded that the deposit draw-down rates established by Basel cover a level of confidence of between 97.9% and 99.65%.

Lastly, in order to make the above conclusions specific for each one of the entities to be studied, the procedure carried out for the global total has been repeated on each one of the analysed entities, and on a series of variations of sight and term deposits of the Spanish financial system.

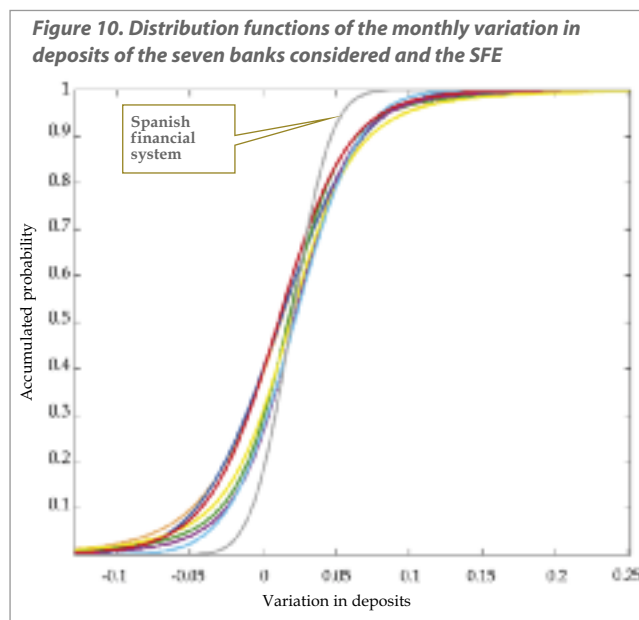
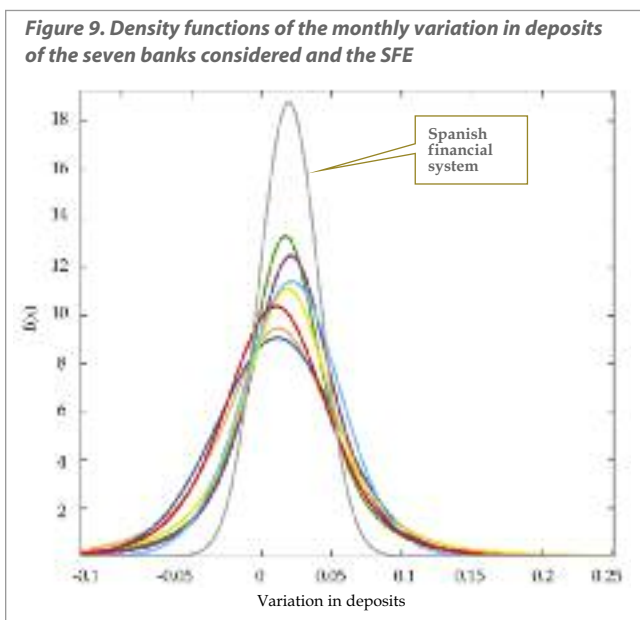
Figures 9 and 10 show the individual density and distribution functions of each of the entities considered, and *Table 4*, the probability of deposit draw-downs being greater than 5% and 10% for each of them.

Table 4. Probability of extreme variations of deposits in each bank

Bank	P(variation < -5%)	P(variation < -10%)
Bank 1	3.27%	0.61%
Bank 2	1.13%	0.01%
Bank 3	1.90%	0.51%
Bank 4	1.15%	0.29%
Bank 5	2.50%	0.64%
Bank 6	1.09%	0.45%
Bank 7	2.01%	0.35%
SFE	< 0.01%	< 0.01%

The chart shows moderate differences between the distributions of the seven banks, which are confirmed in the percentiles analysis. These are some of the most important data derived:

- ▶ While the probability of outflow of stable deposits established in the regulatory ratios (5%) stands at 2.1% on considering the seven banks overall, the individualized analysis shows a certain divergence between the banks: in some banks it increases to as high as 3.27%, while in others it falls to only 1.09%.



- ▶ In any event, from a more in-depth analysis we can deduce that with 95% confidence, outflows of deposits of over 5.7% are not observed in any banks with a one-month horizon, and with 99% confidence, these outflows are not higher than 11%.
- ▶ If the Spanish financial system is considered as a single bank, the probabilities of a variation in deposits as sudden as that described by Basel occurring are extremely remote. The reason is that the aggregated series of the financial system does not reflect the idiosyncrasy of the management of its constituent banks, and therefore it is explained by macroeconomic factors and the deposit-holders' aversion to risk (e.g. saving capacity and preference for deposits over other products).

Conclusions of the historical distribution analysis

Two general conclusions can be drawn from this first quantitative exercise:

- ▶ Estimates established by Basel III on the deposit draw-down rate over 30 days correspond, in comparison with the historical performance observed in a representative group of Spanish entities, with a stress scenario with an occurrence frequency of between 0.35% and 2.1%.
- ▶ Differences in the performance of deposit variations between the entities are sufficient to consider that an internal estimate by each bank and its own deposit draw-down rates would lead to results which are more in keeping with the internal management and the financing profile of each bank. This would suggest the opportunity of establishing a distinction between a standard method and an advanced one, based on each bank's internal experience, and analogous to the estimation of capital by IRB methods in credit risk.

Systemic analysis

Once the statistical performance of the variations in banks' deposits have been analyzed overall, it is necessary to ask to what degree these variations are common between the different banks, i.e. if they show a systemic performance, and if so, what macroeconomic factors determine their dynamics.

Therefore, in this section a macroeconomic model of the series of deposits is constructed with the purpose of characterizing the factors explaining the movements that are aligned and thus deducing what part of its behavior is systemic and what is idiosyncratic.

Theoretical framework

From an economical standpoint, we identify the key figures which can explain the systemic behavior in the evolution of the deposits of financial entities. The main ones are as follows:

Gross disposable income: one of the macroeconomic factors which has the greatest impact on the evolution of deposits is gross disposable income, not only because it is the key figure from which households' consumption and saving decisions derive, but also because of its importance in indicating individuals' expectations. In this regard, each person's increases in income can be used for different saving items, one of which is deposits, insofar as the variation is considered to be temporary or permanent.

Saving rate: related to gross disposable income, another factor which has an impact on deposits, is household saving - this variable completes the previous variable in determining households' future economic outlook according to the perception of the situation. By this means, a change of economic expectations implies a change in the saving rate, and this unmistakably triggers a variation in the same direction of the deposits in the system.

Investment funds: economic expectations act in a cyclical way on the amounts used for investment funds: the individual chooses between investment funds and deposits as a destination for his or her savings in accordance with the expected return, taxation, banks' commercial policies and economic uncertainty; they will thus need to have a significant and inverse relation.

Unemployment rate: the unemployment rate, which has increased significantly in recent years, influences the economic situation of households, whose incomes are reduced. In this regard, we can identify a twofold economic effect linked to the evolution of deposits: on the one hand, a lower available income of economic agents can be recorded, the effect being similar to that indicated in the first variable, and, on the other, an outflow of households' savings (accounts and deposits) is to be expected due to the need to turn it into consumption.

Housing prices: homes are a fundamental part of families' wealth and, therefore, one of the factors which help to explain their spending decisions. Housing prices, particularly in Spain, play an important role in the evolution of the economy. Falls in housing prices propagate property cycles to the real economy, affecting all economic agents, who see that their core investment has been devalued and react by increasing their savings (in different ways, one of which is deposits) and reducing consumption.

Therefore, the expected theoretical model which would allow the performance of deposits to be linked to the macroeconomic context could be expressed in the following functional form:

$$\Delta Deposits = \beta_0 + \beta_1 \Delta Income + \beta_2 \Delta Saving - \beta_3 \Delta Investment - \beta_4 \Delta Unemployment - \beta_5 \Delta Housing + \varepsilon$$

where the signs show the expected behavior for each variable.

Macroeconomic model

Based on the theoretical framework, macroeconomic models have been estimated which consider the observed variation in deposits as a linear combination of the five above variables (or variables reflecting similar concepts) and related time-lags.

As a mathematical model, linear regression estimated in ordinary least squares variations has been chosen. Under a statistical criterion, the selected model is - of those models with economic meaning - that which complies with the desired properties (best goodness of fit, non self-correlation of residuals and non multi-collinearity of explanatory variables).

The model obtained to estimate the quarterly variation of the balance of deposits in each quarter q is:

$$\Delta S(t) = 0,023 + 0,297 \Delta Income (t - 2) + 0,001 \Delta Saving (t) - 0,308 \Delta Investment(t) - 0,106 \Delta Unemployment (t - 1) - 0,381 \Delta Housing (t - 1) + \varepsilon$$

Table 5 shows the variables of the selected model; Table 6, its goodness of model fit and self-correlation statistics, while Figure 11 shows the graphic analysis of its estimates in the historical period considered.

Table 5. Variables of macroeconomic model

Variable ³²	Weight	Relative Weight ³³	p-value ³⁴
Income: quarter-on-quarter variation of household gross disposable income	0.297	42.7%	< 0.0001
Saving rate: quarter-on-quarter variation in net saving	0.001	9.7%	0.0412
Investment: quarter-on-quarter variation of investment funds balance	-0.308	17.6%	0.0004
Unemployment: year-on-year variation in unemployment	-0.106	14.5%	0.0134
Property: year-on-year variation of the square-metre price of free-market property	-0.381	15.5%	0.0141

Table 6. Model statistics

Statistics	Value
R ² : Goodness of fit ³⁵	38.3%
Durbin-Watson: Self-correlation ³⁶	1.925

As we may see (Figure 11), the series provided by the model softens some of the individual behaviors and registers the trends observed in each one of the periods. However, the goodness of model fit indicates that not all the behavior can be explained as caused by the macroeconomic environment and that, therefore, it will be necessary to consider the idiosyncratic causes in the assessment of any scenario.

³²Source: the series of income, saving rates and unemployment have been obtained from the National Statistics Institute (INE). The values of the investment fund series derive from INVERCO and the housing price has been taken from the Bank of Spain.

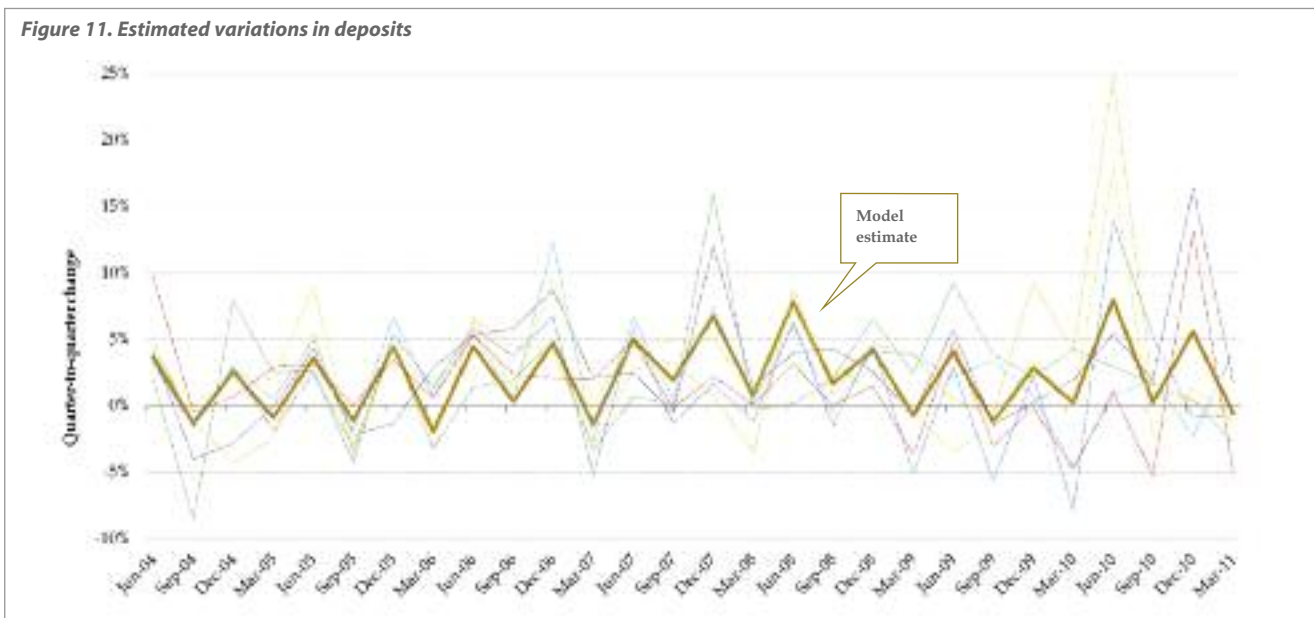
³³Calculated as the ratio between the absolute value of the standardised weight (weight by typical deviation) and the sum of absolute values of all the standardized weights.

³⁴P-values lower than 0.05 indicate the significance of all variables with 95% confidence.

³⁵R² explains simultaneous variations of all banks. Individually, the R² range between 26% and 54%.

³⁶The Durbin-Watson test rules out self-correlation by giving a value of close to 2.

Figure 11. Estimated variations in deposits



This model corroborates the initial assumptions and means we can conclude that the deterioration in disposable income and the resulting fall in savings as a result of the economic situation lead to a reduction in household deposits. Furthermore, the fall in property prices generates a lower return on real estate assets and this becomes less appealing, encouraging the search for other ways of saving.

An analysis of main components allows us to determine to what degree the movement in the series of the seven banks is common, independently of the macroeconomic variables considered, and thus making use exclusively of the variations in banks' deposits.

Table 7. Analysis of main components

Movement number	1	2	3	4	5	6	7
% of total explained movement	49.25%	19.37%	11.27%	8.95%	4.85%	4.22%	2.07%

According to this analysis (Table 7), it would be possible to build a single series which would combine the series of the seven banks and which could explain 49% of the variations in deposits, a second series which could explain an additional 19%, etc. It would be necessary to build five series to reach a percentage of 93.7%. This dispersion of data implies that it is not possible to achieve goodness of fit values much higher than those obtained in the macroeconomic model constructed in this section.

Conclusions of systemic analysis

From the systemic analysis made we can conclude that 40% of the movement in deposits can be explained by the economic context, via a macroeconomic model relating it with disposable income, the saving rate, balance of investment funds, unemployment and property prices.

Idiosyncratic analysis

On the basis of the above analysis, it can be asserted that in order to define a short term liquidity stress scenario, it is necessary to combine systemic and idiosyncratic factors.

In order to analyze causes not attributable to systemic factors, a detailed analysis is provided below of the banks in the study, as well as several special cases, which can help to explain what causes can prompt deposit outflows which are so sudden that they could trigger a bank's collapse.

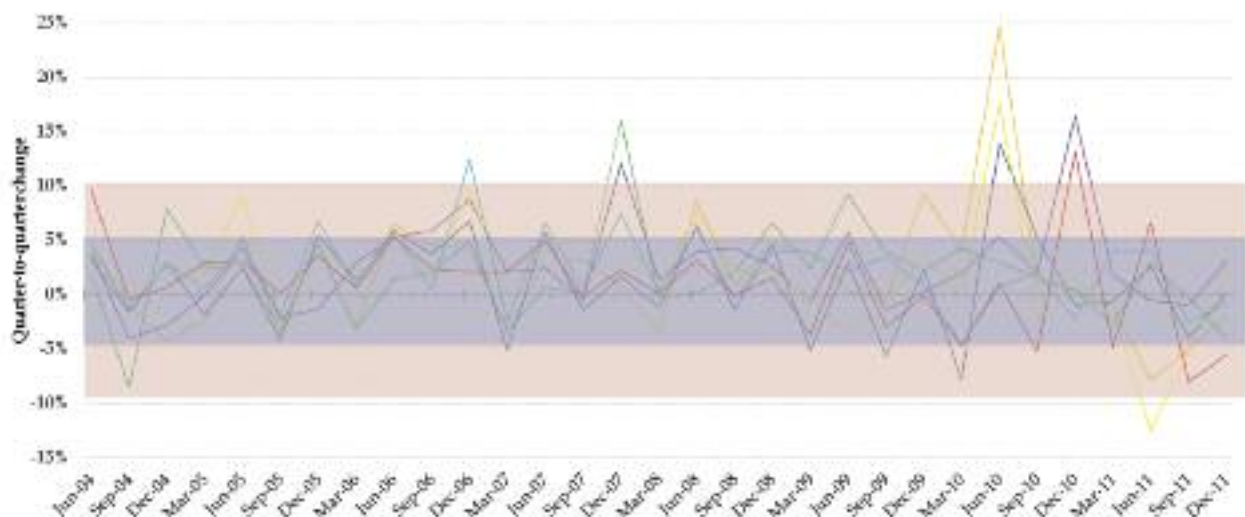
Banks which are object of study

Figure 12 displays the series of variations of the deposits of the seven banks under study. Variations which are in excess of the minimum thresholds established by the standard to identify characteristic movements of a stress scenario have been indicated under two bands³⁷.

As we can see, most of the variations in deposits occur within the interval [-10%, 10%] and between the extreme

³⁷Even though thresholds established in the standards refer to monthly variations, taking into account the availability of information these analyses have been carried out using quarterly variations. However, all the conclusions of the analysis can be extrapolated to monthly variations, given that extreme disturbances perturbaciones in lower period of time are more infrequent.

Figure 12. Series of quarterly changes in deposit volume



observations, positive oscillations are more common than negative ones, and these basically occur in the last period of the window.

There are two main reasons for the positive variations outside this interval:

- ▶ Commercial actions and launches of high-return deposits: this was heightened in periods such as 2009-2010, in the liabilities war between Spanish banks and savings banks.
- ▶ Mergers and acquisitions: throughout the studied period, the integration of the merged entities has been one of the main reasons for the most relevant positive fluctuations in the banks which emerged.

Negative quarterly variations of over 5% and 10% in these banks are due to the non-renewal of deposits in previous periods, and, generally speaking, do not have very important fluctuations. The most important ones occur in the latest period, one year after the liabilities war, and only for some of the banks.

It is also important to ask whether the draw-down of deposits shows sensitivity to other effects, such as falls in banks' ratings or the publication of moderately negative quarterly results. In order to check these hypotheses, two studies have been carried out:

- ▶ Ratings: a regression analysis of deposit variations in accordance with ratings (including temporary misalignments, bank by bank. All regressions reject the significance of the rating as a variable to explain movements in deposits, with p-values of between 0.5 and 0.9, and an R^2 which in the best case reaches 1.4%.

- ▶ Results: a second regression analysis, in this case of the deposit variations in accordance with variations in profits (including temporary misalignments) in each bank. In these cases, the significance of the results is also rejected to explain the variations in deposits, with p-values of higher than 0.4 in all banks and a maximum R^2 of 4%.

Therefore, the regressions obtained are not significant, from which we may conclude that indeed retail customers are not sensitive to these effects.

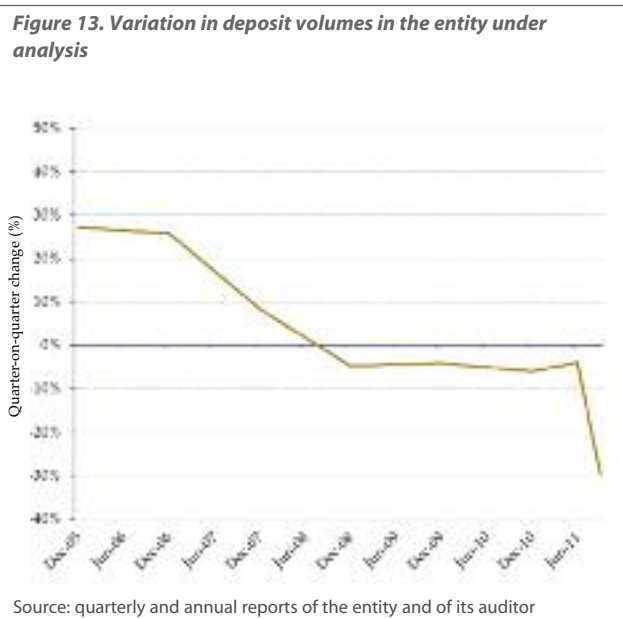
However, the entities studied are financial institutions which are overcoming the crisis without suffering considerable liquidity stresses beyond those experienced by the rest of the system, so that their performance reflects the normal development of the banking business. Accordingly, with the object of carrying out a more exhaustive analysis, and to determine the reasons for the higher instability in deposits, we shall examine three special cases with important liquidity problems.

Special cases

1. Spanish credit entity

In this section, we shall analyze a model case of substantial deposit flight due to loss of confidence by retail customers.

In *Figure 13* we can observe how up to 2007, the entity was experiencing strong economic growth, considerably increasing its market share and increasing its deposits. From 2008 on, however, it began to lose confidence by deposit-holders. This led it to compete in the liabilities war over the 2009-2010 period, offering high returns for its deposits and thus becoming indebted in the mid term.



In these circumstances, the "cold fusion" with another three credit entities got under way. However, because of the additional needs for credit required from the bail-out fund, the vote went against the integration and the merger was cancelled, thus having an important negative impact on the entity's reputation.

The entity received adverse results in the stress tests carried out by the EBA, and then the inspection by the Bank of Spain revealed an alarming lack of liquidity; however, it was the announcement that the entity was being intervened in July 2011 which prompted the huge flight of deposits. This flight, heightened by the effects of the liabilities war, triggered a 36% fall in deposits in a single quarter.

2. British credit entity

In the first half of 2007, the entity in question was the fifth ranking UK bank in mortgages and had passed all the stress tests demanded by regulators; during the next six months, however, it was affected by a serious liquidity crisis for several reasons, of which we may highlight:

- ▶ The increased distrust amongst banks due to the high exposure to collapse owing to the subprime mortgages crisis.
- ▶ Due to this crisis of confidence, the closing of volume and increased interest rates in the interbank market.
- ▶ The fact that the entity had an imbalanced liquidity structure, with excessive dependence on short term sources of financing: approximately 75% of its financing stemmed from the interbank market.

Thus, in September 2007, the entity had depleted its liquidity resources and was not able to access the interbanking market,



leading it to be bailed out by the Bank of England. On 14 September, the press covered the story, triggering a huge withdrawal of deposits during the course of a single day, estimated to be 1000 million pounds sterling, almost 5% of retail deposits.

Figure 14 displays the half-yearly variations in the entity's deposits between 2005 and 2010, clearly showing the effect which began in the second half of 2007. Consequently, share prices began to fall quickly and the UK government was compelled to issue a statement undertaking to guarantee 100% of the entity's deposits. This announcement allayed savers' fears, and on the same day the share price rose 16%.

After gradual stabilisation, in December 2007 the press announced that the bank was being nationalized, and in February 2008 it began to be treated as a public corporation, adding the bank's debt to national debt and recovering deposit-holders' confidence.

3. The Argentinean "corralito"

In 1998, Argentina began a profound recession. Economic slowdown and the gradual increase in external debt increased concerns of international investors.

According to the IMF³⁸, the main factors which caused Argentina to enter this crisis were as follows:

- ▶ Excessively lax fiscal policy.
- ▶ The inalterable convertibility system (because the exchange could not be altered, it was not possible to depreciate the peso when it was necessary).

³⁸Source: *The role of the IMF in Argentina, 1991-2002*, IMF, 2003.

Figure 14. Six-month variation in deposits of the clientele of the entity under analysis



Source: half-yearly reports of the entity

- ▶ Institutional and political factors: the considerable power held by provincial governments greatly reduced the flexibility of fiscal policy.
- ▶ External shocks: the appreciation of the dollar (making the real exchange rate rise), the crisis of Russia and LTCM³⁹ (prompting a reduction in capital flows), the devaluation of the Brazilian real (which had a negative impact on the competitiveness of exports) and the slowdown in the world economy.
- ▶ The increase in external debt, prompting an increase in the risk premium, results in an increase in interest rates.
- ▶ The crisis in the banking system in general and the loss of confidence in the currency.

In this context, banks were heavily exposed to public debt, and the perception grew that the government could be affected by a suspension of payments. Despite the measures taken by the Government, from March 2001 on this triggered a flight of deposits in banks, displayed in *Figure 15*.

As a result of this outflow of funds, which prompted a severe fall in liquidity in the system, in December 2001 the Government decided to impose a series of restrictions on withdrawals of cash in deposit accounts, which would be known as the "corralito". One of the most salient measures were bans on withdrawing over 250 pesos per week and account-holder, on transferring money abroad and the inability of banks to carry out most transactions in pesos⁴⁰. Although these measures weakened the payments system, they also slowed down the pace of withdrawal of deposits, thereby averting a collapse in the financial system.

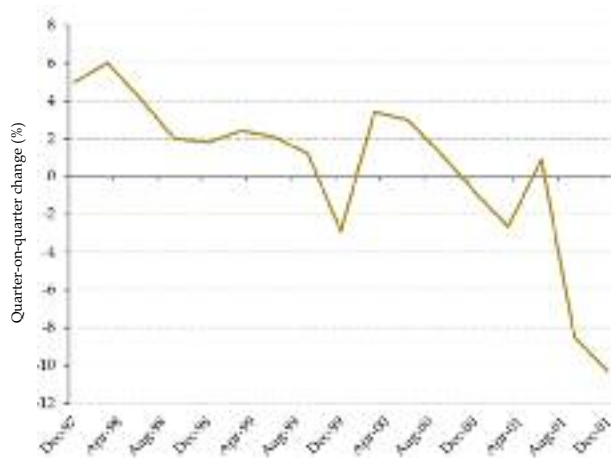
Deposit-holders' pressure to convert their banking deposits into dollars, and the difference between the free and official exchange rate brought Argentina to a dilemma between hyperinflation and the collapse of the system. However, various measures adopted by the Government (such as the deposit exchange scheme and fiscal discipline) began to create a scenario of calm and confidence, making it possible to reach an agreement with international credit agencies and to resume economic growth.

Conclusions of the idiosyncratic study

From the idiosyncratic analysis carried out, we may conclude that the main reasons for the withdrawals of deposits which were more serious than the stipulations of Basel III are the secondary effects of the liabilities war (non-renewed maturities of high yield deposits) and deposit-holders' loss of confidence caused by the publication of very negative events regarding the reputation and the perceived solvency of the bank (such as intervention by the supervisor, a request for help from the central bank, or fears of a suspension of payments by the government).

It has also been observed that deposit-holders are not sensitive to other factors which a priori might appear to be influential in their confidence, such as rating downgrades or the publication of moderately negative results.

Figure 15. Four-quarterly variation in deposits in Argentinean banks, 1997-2001



Source: Monetary and financial gazette of Argentina, Central Bank of the Argentine Republic



³⁹Long-Term Capital Management, a high-leverage speculative investment fund which collapsed and had to be bailed out by other financial entities under the supervision of the US Federal Reserve.

⁴⁰The provision stated expressly that: "Banks [...] shall not be entitled to carry out assets transactions in Pesos, or take part in future or option transactions in foreign currencies, nor arbitrate directly or indirectly with time assets in Pesos. Outstanding transactions can be converted to US dollars using the equation set out in the Convertability Act No. 23.928, with the debtor's consent". Source: Decree 1570/2001, Ministry of Economy and Public Finance of Argentina.

Liquidity risk management framework



As we have seen, the new market situation has the following characteristics: greater awareness regarding potential situations of global liquidity stress (with the corresponding rise in financing costs), the worsening of asset quality and a growing concern about optimising the financing structure and the consideration of liquidity in business decisions.

Given this situation, regulatory bodies and supervisors have forced banks to adopt liquidity risk measuring, control and reporting requirements which have a direct impact on management.

All of these factors are bringing about a change in the liquidity risk measurement, control and measurement framework, and are also causing relevant impacts on the information and technological infrastructure model.

In this section, the main elements which are in the process of changing financial entities' liquidity risk management framework shall be discussed. For that purpose, the key factors of a liquidity risk management framework shall be revised (*Figure 16*):

- ▶ Governance
- ▶ Organization and functions
- ▶ Policies and principles
- ▶ Metrics, methodology and limits
- ▶ Stress test and contingency plan
- ▶ Reporting and tools

Governance

The basic decision-making body in liquidity risk management is usually the ALCO Committee, made up of the first line of responsibility of the bank, which leads the liquidity risk analysis and the risk taking decisions and their management (including the approval of issues and securitizations plans). The Executive Risks Committee is responsible for control, approving the general limits of liquidity risk, and is able to delegate the approval and monitoring of other more operational limits to lower-ranking committees. Global entities usually have partially decentralized structures in these two areas.

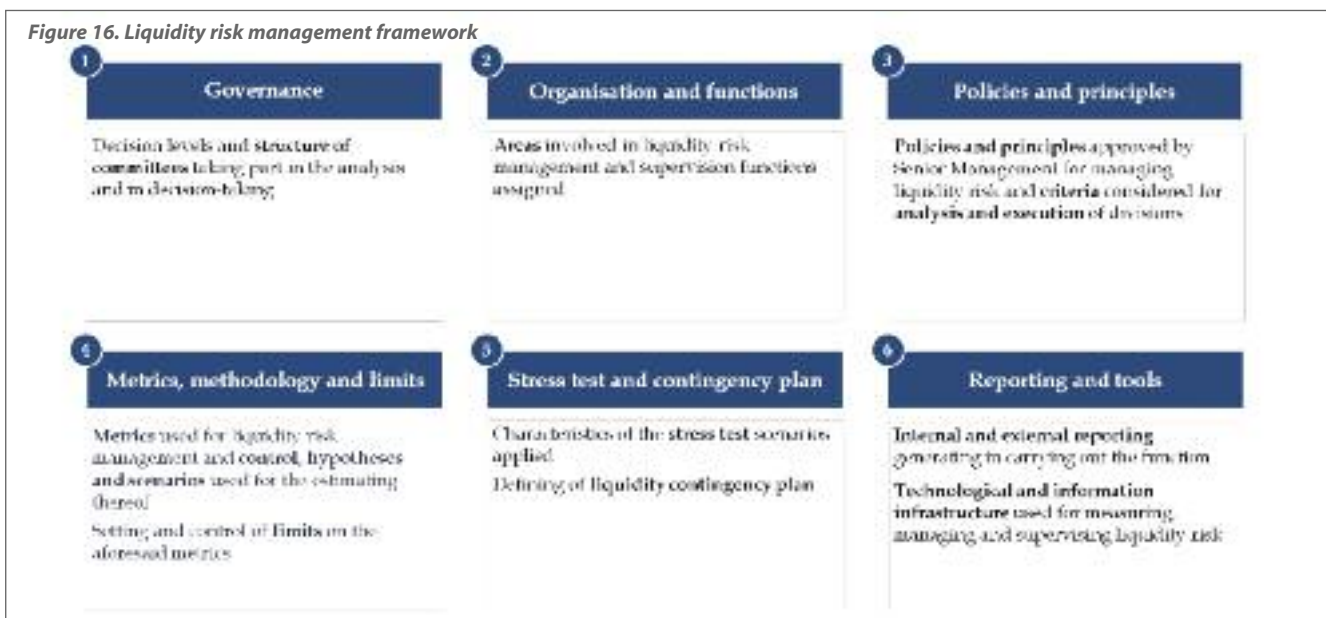
In this field, the main points of evolution which banks are following are as follows:

- ▶ First, the governance structures which sustain and ensure compliance with the defined liquidity risk management and supervision framework.
- ▶ In these governance structures, new responsibilities are defined and existing structures are heightened in certain aspects:
 - Clear governance is established regarding the preparation and approval of the liquidity risk

management framework and its relation and correspondence with appetite for this risk. The two elements must be agreed by the different areas involved and approved by the Board of Directors.

- Governance of the liquidity contingency plan establishing coordinators and a review frequency (usually at least once a year). In extraordinary cases, an executive committee is constituted (derived from the ALCO) for covering contingent liquidity situations.
 - Liquidity risk is incorporated in limits, in decisions for creating new products and in approving transactions with a relevant impact on liquidity.
- ▶ An appropriate structure of lower-ranking operating or tactical committees is reinforced (or, in some cases, it is created), in which the ALCO delegates several of its functions which, for reasons of frequency, materiality or technical character, is not assumed directly for operational reasons; these shall include:
- Frequent review of all liquidity metrics and indicators.

Figure 16. Liquidity risk management framework



- Defining calculation methodology of liquidity parameters.
- Approval of operations with impact on liquidity within defined attributes.

Organization and functions

The organizational model for liquidity risk management and supervision is based on two core principles which banks are actively reinforcing: the involvement by Senior Management and separation of origination and management from control and supervision functions.

For that purpose, the banks are putting an emphasis on the following aspects of their organization:

- ▶ Banks reinforce the internal publication of strategies and policies established by the Board of Directors in relation to liquidity risk, so that they are effectively known to all the areas responsible for liquidity management and applied on a day-to-day basis.
 - ▶ There is also a focus on guaranteeing that both the CEO and the members of the ALCO are duly informed about the bank's exposure to liquidity risk and compliance with the strategy and policies established by the Board.
 - ▶ The banks establish controls and actions to guarantee that the origination and management functions are clearly separated from the control and supervision tasks, which in turn provides appropriate control of the risk, efficiency and transparency.
- ▶ The Financial Department, more specifically Financial Management, is responsible for analyzing and managing liquidity risk in accordance with the decisions taken by the ALCO:
 - It collaborates in defining the hypotheses to be taken into account in projecting the balance and generating of the different metrics used in the management.
 - Analyzes and projects liquidity risk, prepares action proposals and presents them to the ALCO.
 - Executes the decisions taken in the ALCO, using for that purpose the Treasury (for example, delegating the operating liquidity management).
 - Prepares and executes the issues plan.
 - Controls the bank's credit curve.
 - ▶ The Risks Department identifies, measures, analyzes and controls the risk, safeguarding compliance with the risk appetite established by the Senior Management:
 - Defines the methodology for measuring liquidity risk.
 - Establishes metrics and limits in line with the risk appetite established by the Board.
 - Ensures that exposures to liquidity risk are maintained within the limits approved.
 - Monitors excesses above limits, informing the Senior Management and the rest of the areas involved.



- ▶ Work has also been done on the separation of functions between management of structural liquidity (with objectives such as ensuring business continuity and maintaining a diversified profile of financing sources) and managing operational liquidity, occasionally carried out by areas such as the Treasury, which work as profit centres and which therefore have budgets or results targets and associated operating risk limits. This poses questions which are resolved in different ways by banks in areas such as criteria for distinguishing between structural and operational liquidity (terms, products, etc.) and the necessary distribution of functions between the Financial Department and Treasury, responsibility on the direct management of issues or the direct execution capacity on the market by the Financial Department.
- ▶ Furthermore, banks are strengthening their controls so as to monitor both proper compliance with regulatory ratios and the correct fulfillment of defined policies and procedures, and the compliance with limits approved by the bank.
- ▶ Management targets deriving from the maintenance of liquidity buffers of a significant size also appear or are boosted, including:
 - Establishing measures intended to optimize the buffer per se.
 - Basic risk management between the liquidity buffer assets and the rest of the balance sheet.
- ▶ Lastly, strengthening the liquidity risk pricing function, and in some cases, setting up LVA management panels in the Treasuries.
- ▶ The management must be based on forward looking analysis of the balance sheet and the situation and market outlook (under normal and stress situations).
- ▶ There must be an appropriate buffer of liquid assets, made up of uncommitted high liquidity assets, which can safeguard the bank's survival under stress scenarios with different time horizons.
- ▶ The bank will have to have a permanently up-to-date liquidity contingency plan which can define action policies and responsibilities under stress scenarios.
- ▶ A diversified and conservative profile of financing sources will have to be maintained, based on maintaining close relations with financing suppliers (including central banks).

In addition to strengthening their compliance with these principles, the most advanced banks are evolving in several areas:

- ▶ Use of mechanisms to ensure that costs of liquidity are included in decision processes and in measuring performance.
- ▶ Greater decentralization of liquidity risk management, to comply with requirements by countries or subsidiary banks, without overlooking the consolidated vision.
- ▶ Stepping up of efforts in managing inter-day liquidity, management of collaterals as a source of liquidity, and monitoring market indicators and the own entity's indicators.

Basic policies and models

With the object of optimizing the balance sheet and the income statement, protect net interest income and capital and managing structural liquidity, banks are putting more emphasis on defining and controlling compliance with basic principles for managing and supervising liquidity risk, of which we may highlight:

- ▶ Liquidity risk must be managed for all relevant currencies at aggregate and individual level, within the limits established by the Board.
- ▶ The object of this management must be to minimize financing costs, while at the same time using a conservative criterion in order to be able to ensure business continuity in normal and stress situations.

Metrics, methodologies and limits

The review of metrics (and associated limits) used in liquidity risk management and supervision, and the methodologies and hypotheses used to estimate it, is a fundamental part of the evolution of entities' framework for liquidity risk management and supervision.

The measurement, which should be done individually for all the relevant currencies, uses the calculation of liquidity gaps (static and dynamic) at different time horizons and in the more advanced models it requires an estimate of the dynamic balance sheet evolution and financing sources models (optionalities, pre-payments, etc.).

In addition to the aforementioned gaps, the main metrics used include both internal ratios (loan to deposit, concentration of financing sources by different axes, etc.) and regulatory ratios (LCR and NSFR), as well as other measures, such as the survival period (Figure 17).

Furthermore, entities permanently monitor market conditions and own indicators of the bank, such as CDS spreads or listings of issues on the secondary market.

In this field, the main points of evolution which banks are following are as follows:

- ▶ Reinforcing different methodological assumptions used (prepayments, deposit draw-down rates, haircuts on liquid assets, etc.) and sensitivity analysis thereof.
- ▶ Increase in granularity and calculation frequency of the metrics used in monitoring risk profile and control of limits.
- ▶ Adjustment of methodologies for the calculation of the new metrics (EAD of derivatives at different time horizons, liquidity gap under new criteria, liabilities by significant counterparty at different time horizons, etc.).
- ▶ Improving consistency between different management and measuring elements (stress scenarios, contingency plan, LCR, comprehensive capital and liquidity planning, etc.).
- ▶ Design and development of backtest systems to be able to monitor model assumptions.

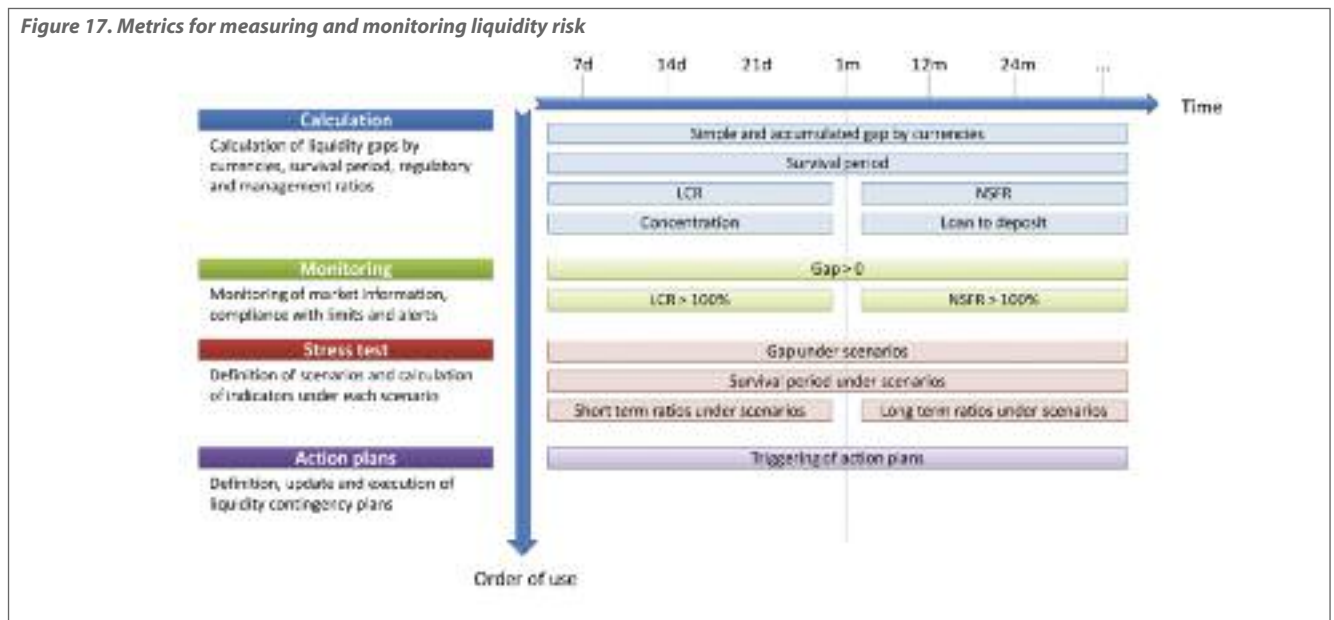
- ▶ Developing liquidity risk pricing methodologies, including LVA (Liquidity Value Adjustment) in valuation of derivatives.

One of the areas where banks are making most efforts is in the evolution of internal transfer rates systems, which in many cases are being redesigned in order to cover the need of properly transferring cost of liquidity to businesses, measuring their return with greater accuracy and encouraging management policies relating to liquidity risk. This implies the development of curves which reflect the market cost of financing and ultimately have an impact on the increase in spreads.

The main questions which have been raised with regard to transfer rates which, in light of the present situation, are being addressed by the most advanced banks are as follows:

- ▶ The selection of the "correct curve" for financing which must be used for calculating the transfer rates.
- ▶ The methodology for transferring rates, the fact that the bank's financing arises from different sources, with different prices and maturities.
- ▶ The registration and impact of uncertainty transfer rates of cash flows.
- ▶ Assessing the real cost of mitigating liquidity risk and the transfer thereof to the transfer rates.

All the above actions are useful to obtain adjusted transfer rates which can reflect the reality of liquidity costs, making the business units take part and without overlooking that the



ultimate goal is integration in the bank's effective management, from measuring incentives up to assessment of new products, including pricing of course.

Stress test and contingency plans

The stress test is an essential analysis and control tool for valuing banks' capacity to overcome liquidity stress situations. This analysis should be carried out on the basis of the criteria stipulated by the regulator and also through models developed internally.

Banks are working on developing these models and are addressing various challenges, of which we may highlight:

- ▶ The use of own and systemic scenarios and greater development of hypotheses considered in their definition, considering factors such as the following:
 - Market liquidity.
 - Customers' behavior and financing sources.
 - The impact of rating downgrades.
 - The market values of liquid and collateral assets.
 - The collateral which must be deposited for the variation of the mark-to-market of derivatives through different time horizons.
 - The interaction between liquidity requirements and the evolution of the bank's credit rating.

- ▶ The guarantee of consistency with the scenarios applied in the capital planning and the limitation of risk (appetite and limits) and with the contingency plan, which in turn will have to include variables which form part of the stress test and actions geared towards mitigating situations described in the liquidity stress tests.
- ▶ Their results will have to be analyzed by the Senior Management to identify potential weaknesses and propose measures to mitigate them to the Board.

The liquidity contingency plan will have to identify coordinators and establish action plans to manage liquidity crisis situations guaranteeing survival with different time horizons, covering the following aspects, such as:

- ▶ Definition and categorization of crisis scenarios (consistent with those used in the stress test), distinguishing their field and levels of seriousness and defining in each one of them the behavioral hypotheses of the key balance sheet items.
- ▶ Defining activation criteria for the plan using indicators and alerts.
- ▶ Clear definition of roles and functions of the coordinators of the different management and control fields (including their updated contact information).
- ▶ Variations in frequency of ordinary committees held and setting up specific crisis committees, defining each of their functions.



- ▶ Criteria and guidelines in relation to the information to be generated during the crisis and internal and external communication protocols (shareholders, rating agencies, investors, deposit-holders, press, etc.).
- ▶ Description of the map of financing sources, including contingent liquidity measures and balance sheet restructuring.

Lastly, in order to ensure its effectiveness, banks are articulating regular procedures to keep the liquidity contingency plan tested and permanently updated.

Reporting and tools

Lastly, it is also important to note that the liquidity risk information models, monitoring and reporting tools are reinforced so they can support advanced measurement methodologies, to guarantee the quality and consistency of the information, and so as to generate the management and regulatory reporting in proper time and form.

For that purpose, banks need to have tools with information requirements far higher than present ones, particularly in granularity and frequency, meaning important efforts are needed in terms of their design and development. The main elements the banks need are as follows:

- ▶ Databases that:
 - Have sufficient capacity to store very large volumes of information.
 - Enable information to be traced, in order to guarantee the auditability of the data used for managing and measuring liquidity risk.
 - Guarantee consistency in the information used by the different areas which use these data.
 - Store data with sufficient granularity to calculate the required metrics.
- ▶ Calculation engines to obtain the newly required management and regulatory metrics (including the cost of liquidity in pricing) quickly, reliably and automatically, considering that sometimes the information required for the purposes of liquidity is calculated by the credit or market risk tools.
- ▶ Control panels and reporting tools which comprise both regulatory reports (QIS, LQ Statements (Spain), FSA047, FSA048 and FSA050-54 (UK), etc.) and management reports, in accordance with different users' needs (Financial Management, Risks, etc.).

- ▶ Tools for access and exploitation of the information which have enough flexibility to cover ad hoc analyses.

Lastly, in addition to the technological implications, most financial entities face the challenge of the consistency and reconciliation between the different reporting activities (regulatory and management, credit risk and liquidity), which usually derive from different tools.

Conclusion

As we have seen, banks are engaged in a process of revision of their liquidity frameworks with the objective of adapting them to new regulatory requirements and reinforcing the management and supervision of liquidity risk, which plays an increasingly important role in business decisions.

This process has implications in different fields: governance; organization and functions; policies and principles; metrics, methodologies and limits; stress test and contingency plans; and reporting and tools. Our aim in this section has been to highlight some of the key areas which are shaping the evolution of the entities in different fields.

