FINANCIAL STABILITY REVIEW

Issue 46

Spring
2024

BANCO DE ESPAÑA
Eurosistema

FINANCIAL STABILITY REVIEW SPRING 2024

Issue 46

https://doi.org/10.53479/37656

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BASEL CORE PRINCIPLES FOR EFFECTIVE BANKING SUPERVISION: AN UPDATE AFTER A DECADE OF EXPERIENCE

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https://doi.org/0.53479/37653

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BASEL CORE PRINCIPLES FOR EFFECTIVE BANKING SUPERVISION: AN UPDATE AFTER A DECADE OF EXPERIENCE

Abstract

The Basel Committee on Banking Supervision's Core Principles for Effective Banking Supervision (BCPs) are a universally applicable minimum standard for sound prudential regulation and supervision of banks and banking systems. Supervisors use these principles to assess the quality of their regulatory and supervisory frameworks, while the International Monetary Fund (IMF) and the World Bank use them, as part of their Financial Sector Assessment Programme, to assess the efficacy of the banking supervision framework and supervisory approach in each jurisdiction. Since they were first introduced in 1997, the BCPs have undergone two revisions (in 2006 and 2012). In April 2024 the Basel Committee on Banking Supervision published a modification of the standard to account for developments over the last decade, the impact of structural trends in the sector and the lessons learned from previous implementations of the core principles. This article takes a look at the key aspects of this update, the main changes of which refer to new risks, such as climate-related financial risks and the digitalisation of finance, operational resilience, non-banking financial intermediation, financial risk, risk management practices, and systemic risk and macroprudential oversight.

Keywords: Basel Core Principles, prudential regulation, banking supervision, financial sector assessment.

1 Introduction

When the German firm Wirecard was first floated on the Frankfurt Stock Exchange in 2005, there was nothing to indicate that it would go on to take centre stage in a major financial scandal that would years later trigger the downfall of the President of Germany's Federal Financial Supervisory Authority (BaFin). The case laid bare a series of shortcomings, including issues with supervisory reporting on related party transactions, a weakness that had previously been identified by the International Monetary Fund (IMF) in its Detailed Assessment of Observance on the Basel Core Principles for Effective Banking Supervision (known as the Basel Core Principles or "BCPs") (IMF, 2016). Subsequently, the German authorities acknowledged these issues and strengthened BaFin's powers.[1]

The BCPs are a cornerstone of sound banking regulation and supervision within the Basel Committee on Banking Supervision (BCBS) global standards. Unlike the other frameworks issued by the BCBS, which must be implemented in full by all internationally active banks in

1 See BaFin (2021) for further details of these greater supervisory powers.

member jurisdictions, the BCPs are universally applicable, and are therefore applied across all jurisdictions (whether BCBS members or not) and all banks (whether internationally active or not). With this in mind, they cater to a variety of banking systems and a broad spectrum of banks.

The BCPs provide a structure that takes the multi-faceted nature of banking supervision into account. Although this set of minimum standards is not binding, it is expected to be implemented by all jurisdictions, which should help make the global financial system more robust. It is worth noting here that the BCPs do not incorporate the Basel III standards directly, except in the case of internationally active banks (where they are incorporated by cross-referencing the Basel framework).

Prudential authorities use the BCPs as a benchmark for assessing the suitability of their regulatory and supervisory frameworks, and to identify the measures needed to ensure best supervisory practices. They are also used by the IMF and the World Bank to assess the efficacy of countries' banking supervision systems as part of their Financial Sector Assessment Programmes (FSAP).[2] A study of the IMF's assessments of compliance with the BCPs revealed that, despite the progress made in the key regulatory reforms, there is still much to be done before the BCPs are properly implemented in full.[3]

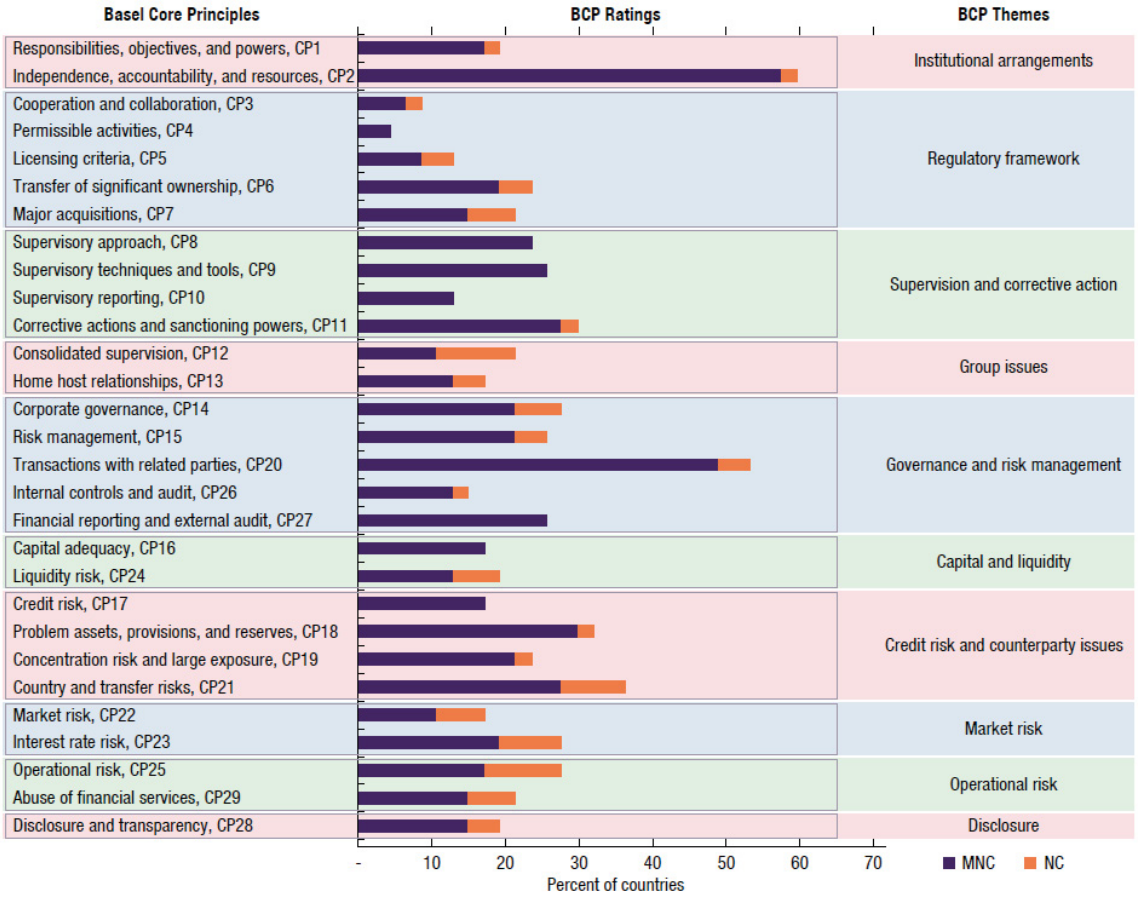
Chart 1 shows the extent of non-compliance with each principle by the group of jurisdictions assessed. Notably, more than half of the jurisdictions failed to satisfactorily comply with the standards of independence, accountability and resources (BCP2) and transactions with related parties (BCP20). Moreover, one-third of the jurisdictions, for instance, lack powers and effective supervisory processes to identify and take timely corrective actions (BCP11), while the framework for the management of problem assets (BCP18) also revealed shortcomings.

Given how important the BCPs are for promoting effective supervisory practices, these standards will inevitably evolve over time in response to global financial developments, emerging risks and trends, and changes in the global regulatory landscape. Initially unveiled in 1997, the BCPs were expanded in 1999 with the publication of the methodology to ensure that the degree of compliance by jurisdictions is assessed as objectively and uniformly as possible. They were then revised on two further occasions: in 2006 the principles were reviewed (partly as a result of the major changes entailed by the new Basel II guidelines) and

2 The FSAPs are conducted jointly by the IMF and the World Bank in developing countries and emerging markets, and by the IMF individually in advanced economies. The FSAPs provide a broad, detailed analysis of how resilient a country's financial sector is and include financial institution stress testing, an assessment of the crisis management framework and an evaluation of financial sector supervision and regulation. As far as the latter is concerned, the core sectoral principles issued by the relevant international supervisory bodies are used to assess the efficacy of supervisory and regulatory systems. In addition to the BCBS' BCPs, these include the Insurance Core Principles of the International Association of Insurance Supervisors (IAIS) and the Objectives and Principles of Securities Regulation of the International Organization of Securities Commissions (IOSCO).

3 In 2021 staff from the IMF published a paper setting out the main conclusions drawn from its assessments of BCP implementation, analysing the 47 assessments conducted between 2012 and 2019 to identify the progress made and the areas in which further efforts are needed (Dordevic, Ferreira, Kitonga and Seal, 2021).

Chart 1
BCP compliance by thematic group

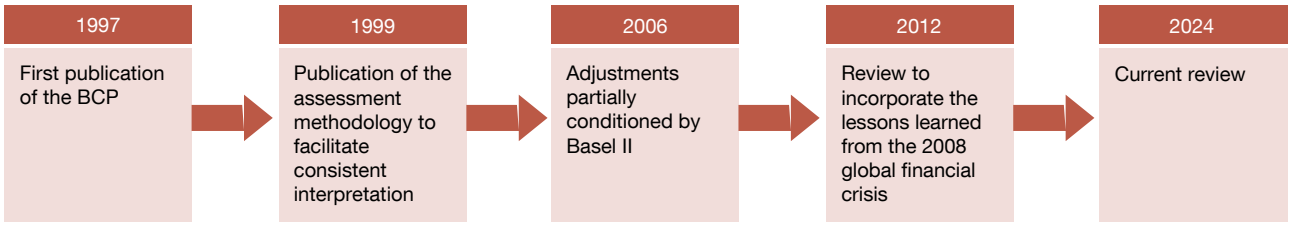


SOURCE: Dordevic, Ferreira, Kitonga and Seal (2021).
NOTE: MNC means "Materially non-compliant"; and NC means "Non-compliant".

the assessment methodology was developed in greater detail. Later, in 2012, further guidance was given to the supervisors, while also improving the minimum banking supervision standards, taking on board the lessons learned from the 2008-2009 global financial crisis (BCBS, 2012). In April 2022, more than one decade on from the previous update, the BCBS agreed to conduct a review to assess the changes needed to the core principles themselves, as well as whether it was necessary to revise the preconditions and the assessment methodology. To this end, it set up a temporary task force comprising representatives from both BCBS and non-BCBS member jurisdictions, as well as the IMF and the World Bank. Figure 1 shows the main milestones in the evolution of the BCPs since they were first conceived.

This article looks at the scope of the recent BCP review (Section 2), identifying the main changes made (Section 3) and briefly discussing how the BCPs were used in the IMF's latest FSAPs for Spain and the euro area (Section 4), before finishing with some conclusions (Section 5).

Figure 1
BCP Chronology



SOURCE: Devised by authors.

2 Scope of the review

The review was guided by the overarching principle of maintaining the simplicity, flexibility and universal applicability of the BCPs. Similarly, the BCPs continue to be outcome-oriented rather than prescriptive on process, and jurisdictions are therefore free to adopt the processes best suited to complying with a particular principle. For instance, although the BCPs refer to the attributions, functions and powers that a banking supervisor should have, they remain neutral as to each jurisdiction's institutional framework, without prescribing a particular form of organisation. This approach makes sense given that, as already noted, the BCPs are universally applicable, and should therefore be fit for use by a broad range of supervisors operating in very different jurisdictions.

Moreover, it explains the changes made in relation to the proportional application of the BCPs. As in the previous revision of the BCPs, the concept of proportionality underpins all of the assessment criteria, even if it is not always directly referenced. The introductory section of the latest version of the BCPs reinforces these expectations of proportionality, explaining how the concept of proportionality should be understood and applied in practice. This takes on even greater importance since, unlike in other frameworks, there is no gradual phasing in of the implementation of the BCPs. Instead, compliance with the BCPs is assumed at the moment of publication. Moreover, this is of particular relevance considering that this revision includes issues (such as climate-related financial risks) where banks and supervisors' knowledge is still evolving.

The new BCPs include changes to both content and structure, to this end drawing on a variety of inputs, including the impact of recent structural trends (e.g. the digitalisation of finance, climate-related financial risks, changes to the regulatory perimeter, etc.) on the banking system, regulatory and supervisory developments since the BCPs were updated in 2012 (e.g. the creation of new supranational supervisors,[4] additional information on proportionality,

4 The revision was seen as an ideal opportunity to address the issue of shared responsibility between national and supranational systems in key areas of banking supervision. This aspect has been important for the European Union since the Single Supervisory Mechanism (SSM) was set up in 2014.

remote working) and both the lessons learned by jurisdictions during the implementation of the 2012 BCP update and the expertise gleaned from the IMF and World Bank FSAPs since 2012. Meetings were also arranged with supervisors and industry throughout the process to gather feedback from a broad range of stakeholders.

Moreover, the new publication testifies to the efforts made by the BCBS and other financial sector standard-setting bodies, such as the Financial Stability Board (FSB), in revising the different standards issued since 2012, to incorporate the relevant improvements in terms of supervision and regulation and structural trends. Suffice it to say that the new BCPs cite over 30 new reference documents.

In short, post-revision changes have been made to the following thematic areas:

— New and emerging risks, encompassing the digitalisation of finance and the impact of new technologies and climate-related financial risks.

— Operational resilience, including a greater emphasis on cyber risk, business continuity plans and third and fourth-party risk management, as well as on concentration risk.

— Non-bank financial intermediation, such as banks' direct exposures to leveraged funds and the broader implications for financial stability.

— Financial risks, including the reforms to capital, liquidity and funding adequacy; leverage requirements; the prudential treatment of accounting provisions; credit risk (including securitisations); market risk, and derivatives/securities financing transactions.

— Risk management practices, corporate governance, disclosure, risk culture, remuneration policies, data governance and stress testing.

— Systemic risk and macroprudential oversight, including the frameworks for identifying and overseeing systemic risk and the application of macroprudential measures.

In addition to making the content of the standard more robust, the current revision also improves its presentation. Thus, the introductory sections have been amended significantly to make them easier to understand and ensure that the key messages can be identified and clearly grasped. At the same time, a new section explaining some of the terms used repeatedly throughout the BCP has now been included for ease of understanding and to ensure that substantive requirements previously scattered throughout the document are now included in the main body of the text.

Lastly, it is worth noting that the content of the preconditions for effective supervision has not been modified, nor has the assessment methodology, and only minor modifications to

these sections are proposed. First, the BCPs retain the six preconditions identified in 2012 that can shape how effective supervision is.[5] These preconditions (which are considered necessary to achieve the supervision goal) generally fall outside the control of supervisors, who should therefore work together with governments and/or the relevant authorities to address any issues identified. Although the BCP assessments conducted by the IMF and the World Bank in the FSAPs are not expected to verify the extent to which such preconditions are met, they should nonetheless include an opinion as to whether the weaknesses in these preconditions hinder effective supervision. Second, the methodology for assessing the extent to which the principles have been observed includes guidelines as to how this should be evaluated and graded.[6] Nonetheless, the primary goal of the evaluation is not to assign a "grade", but rather to identify areas needing attention in each jurisdiction. As noted above, the methodology itself is based on a proportional approach, enabling supervisors to tailor their processes and actions to the size, complexity and risk profile of the supervised institutions.

3 The core principles and the 2024 amendments

These minimum standards are made up of 29 high-level principles divided between what is expected of supervisors and what is expected of banks (see Table 1). Thus, Principles 1 to 13 address supervisory powers, responsibilities and functions, focusing on effective, forward-looking risk-based supervision and the need for early intervention. Principles 14 to 29 cover supervisory expectations of banks, emphasizing the importance of good corporate governance and risk management, as well as compliance with supervisory standards.

Each principle includes certain essential criteria that are needed to satisfy that principle. Some principles also include additional criteria, which include more sophisticated requirements and represent suggested best practices to which countries with more complex banking systems should aspire. With this in mind, these criteria will only be assessed in those jurisdictions that so request. While no new principles have been added in the latest revision, the content of all of the existing ones has been changed to varying degrees. In certain cases, some additional criteria have been upgraded to the category of essential. From now on, such criteria will therefore have to be assessed before a particular principle can be deemed to have been fully complied with. In other cases, this enhancement has taken the form of the addition of new assessment criteria.

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5 These six requirements or preconditions are: sound and sustainable macroeconomic policies; a well-established framework for financial stability policy formulation; a well-developed public infrastructure; a clear framework for crisis management, recovery and resolution; an appropriate level of systemic protection (or public safety net); and effective market discipline.

6 Each principle can be graded four ways: i) Compliant: in general, when all essential criteria are met without any significant deficiencies, ii) Largely compliant: only minor shortcomings that do not raise any concerns about the authority's ability and intent to achieve full compliance with the principle within a prescribed period of time; iii) Materially non-compliant: if there are severe shortcomings and evidence that supervision has clearly not been effective, that practical implementation is weak, or that the shortcomings are sufficient to raise doubts about the authority's ability to achieve compliance; and iv) Non-compliant: if there has been no implementation of the principle, several essential criteria have not been complied with, or supervision is manifestly ineffective.

Table 1
Core Principles for effective banking supervision (2024)

Basel Core Principles	
Supervisory powers, responsibilities and functions	Prudential regulations and requirements
BCP1- Responsibilities, objectives and powers	BCP14- Corporate governance
BCP2- Independence, accountability, resourcing and legal protection for supervisors	BCP15- Risk management process
BCP3- Cooperation and collaboration	BCP16- Capital adequacy
BCP4- Permissible activities	BCP17- Credit risk
BCP5- Licensing criteria	BCP18- Problem exposures, provisions and reserves
BCP6- Transfer of significant ownership	BCP19- Concentration risk and large exposure limits
BCP7- Major acquisitions	BCP20- Transactions with related parties
BCP8- Supervisory approach	BCP21- Country and transfer risks
BCP9- Supervisory techniques and tools	BCP22- Market risk
BCP10- Supervisory reporting	BCP23- Interest rate risk in the banking book
BCP11- Corrective and sanctioning powers of supervisors	BCP24- Liquidity risk
BCP12- Consolidated supervision	BCP25- Operational risk and operational resilience
BCP13- Home-host relationships	BCP26- Internal control and audit
	BCP27- Financial reporting and external audit
	BCP28- Disclosure and transparency
	BCP29 - Abuse of financial services

SOURCE: BCBS (2024).

The main changes introduced are analysed in the following sections (by thematic area), without entering into detail on the content of each principle and its implementing criteria.

3.1 Climate-related financial risks

Climate-related financial risks have been included in the BCPs, recognising their importance, given the impact they can have on the safety and soundness of banks and their additional implications for financial stability. The decision was taken not to include a new principle, but rather to take a cross-cutting approach to include such risks within the existing principles that may be affected, at all times bearing in mind that such modifications should be in line with the principles for the efficient management and supervision of climate-related financial risks (BCBS, 2022).

Particular changes were introduced in the consultative document published in July 2023 to explicitly reference climate-related financial risks and to promote a principles-based approach to improving supervisory practices and banks' risk management. Under the amendments to the principles of supervisory approach and supervisory reporting (BCP8 and BCP10), supervisors are required to consider climate-related financial risks in their methodologies and supervisory processes, and to have the power to require banks to submit information that allows for the assessment of the materiality of climate-related financial risks. The adjustments

to the principle on risk management process (BCP15) require, first, that banks have in place comprehensive risk management policies and processes for all material risks (including climate-related financial risks), recognising that such risks may materialise over variable time horizons that go beyond the traditional capital planning horizons, and, second, that suitable measures be applied to manage such risks when they are material. The adjustments to the principle on internal control and audit (BCP26) call on banks to consider climate-related financial risks as part of their internal control framework. At the same time, bank and supervisory practices may consider climate-related financial risks in a flexible manner, given the degree of heterogeneity and evolving practices in this area.

Given the importance of climate-related financial risks, the feedback received during the public consultation revealed widespread support for their inclusion in the BCPs.[7] Nonetheless, views differed as to how to do this. Broadly speaking, banks stressed that it was important to treat such risks as part of the existing categories (credit risk, market risk, operational risk, etc.), rather than as a separate risk. Others noted that, given how new this issue is and the progress still being made in this area from the standpoint of both supervisors and banks, some of the proposals will be hard to apply, particularly for emerging economies and low income countries. Lastly, various climate-related and environmental non-governmental organisations pushed for stricter requirements, asking that they be more prescriptive and even, in some cases, expanding the scope to include concepts such as biodiversity.

The text ultimately approved has struck a reasonable balance between the different viewpoints: climate-related financial risks have been included explicitly, while also bearing in mind the current state of play in a still developing field. The specific changes made following the public consultation notably include: first, the term "climate-related financial risk" has been defined with a view to making the concept easier to understand. Moreover, although the language proposed in the consultation has been maintained for most of the principles, some particularly significant modifications have been made concerning the requirements relating to the risk management process (BCP15).[8] Thus, although the need for scenario analysis and stress testing to reflect climate-related financial risks remains an essential criterion of BCP15, the language has now been made more flexible to allow for a more proportionate application of the requirements, thereby recognising the differing degrees of progress and complexity in these areas.

3.2 Operational resilience and digitalisation

Innovation driven by technology and the digitalisation of finance is changing both customer behaviour and the way in which banking services are provided. New products, new participants and the use of new technologies entail both opportunities and risks for supervisors, banks

7 The feedback received on the BCP consultative document can be found at the following link on the Bank for International Settlements website (BCBS, 2023b).

8 BCBS (2023a).

and the banking system. Meanwhile, banks are increasingly dependent on third parties for the provision of technological services, thus creating additional points of cyber risk, as well as possible concentrations across the entire system. As information and communication technologies evolve, the banking sector, as one of the most highly digitalised sectors, is continually faced with challenges of cyber risk.

Operational resilience seeks to ensure that banks are better equipped to be able to withstand, adapt to and recover from serious operational risks, such as those stemming from cyber incidents or technological failures, but also those deriving from pandemics or caused by natural disasters. As a result, the far-reaching modifications and additions to BCP25 primarily concern what is referred to as "operational resilience", as opposed to the 2012 version, which was limited to "operational risk". Despite forming part of the same principle, a distinction is drawn in the BCPs between the concept of operational resilience, which refers to the planning and continuity of critical business activities, and the concept of operational risk management, which seeks to minimise the economic impact resulting from inadequate (or failed) processes, persons or internal systems, as well as from external events. This second definition includes legal risk, but excludes strategic and reputational risk.

Besides, in terms of how the consequences of digitalisation can be incorporated within risk management for banks and supervisors, BCP15 on risk management process was already broad enough to cover the digitalisation-related risks to banks. However, modifications have been made to emphasise the dependence on third-party technology service providers. Indeed, access to information is one of the key aspects for ensuring effective supervision. With this in mind, together with the new BCP25 on operational resilience, the revision of BCP1 (referring to supervisory responsibilities and powers) grants supervisors access to the necessary information, including records that are held by relevant service providers and that can be accessed either directly or through the supervised bank.

3.3 Non-bank financial institutions

Financial intermediation has changed significantly since the last review of the BCPs, driven by rapid advances in FinTech and the proliferation of non-bank financial intermediaries (NBFIs). NBFIs complement banks in providing financial services, but their activities may also affect the stability of the financial system through their interconnections with banks.

During the consultation process, some participants called for explicit regulation of NBFIs. The BCPs were not amended to that effect, as they were designed to apply to institutions designated as banks. However, in response to the growing importance of NBFIs, there is a more explicit recognition in BCP8 (supervisory approach) that supervisors should remain vigilant to the risks arising from the activities of NBFIs and their potential impact on the banking system. In addition, some perhaps less substantive amendments have been introduced in BCP4 (permissible activities), mainly aimed at strengthening supervisory expectations in monitoring the risk that transactions with different NBFIs may pose to banks. The group-wide

supervisory approach has also been strengthened by explicitly stating in BCP10 that the supervisor has the power to request certain information, including information related to transactions with NBFIs. Expectations have likewise been strengthened for banks. BCP15 (risk management process) now states that banks must have adequate risk management policies and processes for, among others, step-in risk.[9] Furthermore, BCP17 (credit risk) explicitly recognises that transactions with NBFIs may give rise to counterparty risk. In short, the reviewed BCPs continue to focus on banks and supervision, while simultaneously strengthening expectations about them to take into account the growing importance of NBFIs and the risks they may entail for the banking sector.

3.4 Financial risks

The main trends and developments of the last decade have played an important role in this review. However, particular attention was also paid to some of the reforms undertaken by the BCBS to address the weaknesses that came to light during the 2008-2009 crisis, but which had not been included in the 2012 review, or at least not fully, as more experience was needed with their application. A case in point is the need for a non-risk-based measure. The aim of this measure is to complement risk-based approaches, restricting leverage in banks and, by extension, in the banking system. To cover this aspect, BCP16 (capital adequacy) now includes among its essential criteria that supervisors should have the power to impose this type of non-risk-based measure. However, this requirement has been introduced in a flexible manner. Consequently, the measure as defined in Basel III is not required (except for internationally active banks). Instead, the principles are flexible and allow for a wide range of leverage indicators and controls. It should be noted that many jurisdictions, despite not yet having adopted Basel III, already have a long track record of using leverage measurement tools. In short, the principle raises awareness of the importance of leverage and requires that it be monitored in all jurisdictions, offering the measure designed by the BCBS merely by way of example.

With respect to credit risk, the reviewed BCP17 places greater emphasis on risks related to securitisation transactions and counterparty credit risk. Since the 2012 review, the BCBS has published many recommendations and documents on the risks involved in these transactions and the treatment they should be afforded.[10] For this reason, the review focuses more explicitly on the appropriate treatment of risk arising from certain securitisation structures and requires banks to have a comprehensive and ongoing understanding of the characteristics and potential risks of their securitisation transactions. It is also clarified that the concept of securitisation includes not only traditional securitisations, but also synthetic securitisations. The definition of counterparty credit risk has also been fine-tuned, bringing it into line with BCBS standards.

9 The risk that a bank will provide financial support to an unconsolidated entity in distress, in the absence of or above and beyond any contractual obligation to provide such support.

10 For example, some aspects of their treatment were reviewed and some definitions clarified in BCBS (2014b).

Furthermore, as established in BCP18 (problem assets, provisions and reserves), banks must have adequate policies and processes for the early identification and management of problem assets and the maintenance of adequate provisions and reserves. This stems from the new role assigned to expected credit loss (ECL) provisions. In the aftermath of the global financial crisis, G20 leaders, regulators and prudential authorities urged accounting standard setters to improve standards and practices relating to provisioning and the calculation of financial asset impairments. A more forward-looking approach was taken at the international level. The accounting model for loan loss provisioning, in the standards of both the International Accounting Standards Board (IASB) and the US Financial Accounting Standards Board, is now based on expected credit losses rather than on incurred losses. Thus, BCP18 has been amended to incorporate specific aspects relating to expected credit losses, such as the definition of credit loss or a wide range of indicators to detect a significant increase in credit risk. These changes take into account the idiosyncrasies of national accounting systems and are consistent with the BCBS Guidance on credit risk and accounting for expected credit losses published in December 2015 (BCBS, 2015).

In BCP19 the treatment of concentration risk and large exposure limits has been adjusted to align it with the large exposure framework that the BCBS designed in 2014[11] and the definition of connected counterparties in particular. The extent of concentration risk has also been clarified. The identification of connected counterparties posing a shared risk is the most significant and complex change to this principle. Properly understanding and applying the concept of group of connected counterparties (in particular the situation of economic interdependence between borrowers) is a major challenge for both institutions and supervisors. This is by no means easy, due to the combination of objective and subjective situations and to the scarcity of available information. Moreover, the additional criterion relating to the calculation of large exposure limits – which is a requirement on which the different jurisdictions may opt to be assessed in the FSAPs – has been made more stringent. In particular, this calculation is now based on Tier 1 capital (instead of total equity, as stipulated in the 2012 BCPs).

In the other principles dealing with financial risks (BCP21, BCP22, BCP23 and BCP24) only minor editorial changes have been introduced for the most part. In the case of liquidity and interest rate risk in the banking book, the changes are not conceptual but seek to make the 2012 proposals more stringent and universal, by turning additional criteria into essential criteria (for example, the disclosure requirement for encumbered assets).

3.5 Corporate governance and risk management practices

A new BCP14 on corporate governance was introduced in the 2012 review, as it became clear during the global financial crisis that weaknesses in banks' corporate governance could pose significant risks to banks and to the banking system as a whole. Indeed, good corporate governance underpins effective risk management and public confidence in individual banks

11 BCBS (2014a).

and the banking system. The 2024 review leaves BCP14 largely unchanged, although it introduces some changes to underline the importance of good corporate governance. For example, it includes the idea that corporate governance policies and processes should cover corporate culture and values and fit and proper processes. It also emphasises that the composition of banks' boards of directors should take into account diversity considerations, experience and skills, and that their independence and regular renewal should be promoted.

Moreover, a new essential criterion has been introduced into BCP15 (risk management process), focusing on data aggregation. One key lesson from the great financial crisis was that banks' IT systems and data architecture were inadequate to support financial risk management. To address this, the expectation has been introduced that a bank should have the ability to aggregate data and conduct reporting commensurate with its risk profile and systemic importance.

3.6 Business model sustainability

Changing macroeconomic conditions and structural developments that may affect the banking sector make it crucial for banks to adapt their business models so that they remain sustainable over the medium and long term. Potential adverse structural trends (e.g. digital innovation and demographic change) highlight the importance of assessing the soundness of banks' business models. The BCPs have been revised to give greater prominence to the concept of sustainability of banks' business models, understood as their ability to design and implement sound, forward-looking strategies to generate sustainable returns over time. This concept has now been explicitly included, while maintaining a generic approach ensuring universal application. Similarly, targeted reviews have been introduced to more explicitly recognise the supervisory implications of new business models (BCP8), including for banks' risk management (BCP15). While the ultimate responsibility for designing and implementing sustainable business strategies lies with a bank's board of directors, supervisors also play an important role, since assessing the soundness of banks' business models is a key component of effective supervision.

3.7 Systemic risk and macroprudential oversight

The last decade has reaffirmed the importance of applying a system-wide macro perspective to the supervision of banks, to help identify and analyse systemic risks and take preventive action to address them. Adopting this broader perspective of the financial system was already part of many of the 2012 principles, and this has now been strengthened. To this end, it has been decided not to incorporate a specific principle on macroprudential issues, but rather to strengthen existing requirements by harnessing the experience of jurisdictions in macroprudential policy and oversight. The approach followed has carefully avoided prescribing one type of institutional organisation to the detriment of another, since, as explained above, the application of the BCPs should be universal and should therefore be possible under the different institutional frameworks in place in the different jurisdictions.

In particular, this review has strengthened aspects relating to cooperation in BCP3 and to the relationship between home and host supervisors in BCP13. The importance of close cooperation, both at the national and international level, between the various authorities responsible for banking/financial supervision and for macroprudential policy and financial stability, is thus emphasised.

In addition, amendments have been incorporated to clarify the role of the supervisor in the risk identification and mitigation process in the financial system (in particular the BCP8 supervisory approach and the BCP9 supervisory techniques and tools). The supervisor is required to have a process in place to assess whether banks are systemically important in a national context and to identify, monitor and assess typical bank behaviour that may adversely affect stability.

In addition, in BCP16 on capital adequacy an additional criterion has been added, enabling supervisors (or the relevant authority) to require banks to hold additional capital that can be released in the event of systemic shocks and thus have sufficient resources to be able to weather adverse economic conditions. This buffer could include sectoral capital requirements, in line with the principles issued by the BCBS in 2019 for the operationalisation of the sectoral countercyclical capital buffer.[12]

3.8 Related parties

The principle governing related party transactions (BCP20) has been significantly strengthened, mainly through the enhanced definition of related party. The assessments conducted by the IMF and the World Bank found compliance with this principle to be weak. Indeed, it is the second least observed principle (see Chart 1), with significant shortcomings due to overly restrictive definitions of related party. Poor supervision of exposures to related parties can lead to both financial deterioration and outright abuses by banks (for example, concealing the final beneficiary of the transaction) (Chatain, Caruso, Dohotaru, Krause and Ortiz, 2023).

Despite the lack of relevant BCBS standards or guidelines, the definition of related parties, the approval process for granting and managing related party transactions and the associated reporting requirements have all been strengthened. As the introduction of a broad definition of related parties will substantially reinforce this principle, flexibility is included to exempt certain transactions within the banking group from requirements that prevent such transactions from being carried out on more favourable terms than with unrelated counterparties, and from the obligation to apply limits, deductions or guarantees, where the supervisor considers that this is consistent with sound risk management across the group.

12 BCBS (2019).

3.9 The institutional framework and the supervisory approach

In the 2012 review of the BCPs, the principles relating to the institutional framework (BCP1 and BCP2) were changed to ensure that the supervisor was equipped with appropriate capacities and powers, as well as to ensure that its governance, means and functioning encouraged it to use them. The latest review introduced clarifications and some improvements, showing that these principles remain broadly valid.

First, BCP1 now includes a general reference to those countries that have transferred supervisory tasks from a national supervisor to a supranational one, such as the SSM led by the ECB. The SSM did not exist at the time of the previous review of BCPs and the assessment methodology only envisaged national supervisory systems. The new text points out the importance of a clear distribution of roles and responsibilities between supervisors, which should be enshrined in the law and made available to the public.

In addition, supervisors' accountability has been strengthened through increased transparency. To this end, legislation (BCP1), supervisory priorities (BCP2) and the summary of the process for the identification of systemically important institutions (BCP8) need to be published in a timely manner. Some issues directly related to the supervisor's work that have been addressed in BCBS documents in recent years, such as the measurement of supervisory impact, have not been included in the BCPs.

Moreover, a clearer distinction is now drawn between the existence of supervisory powers and their timely exercise through the use of appropriate tools. Corrective measures are a clear example of this: BCP1 provides for the power of the supervisor to take corrective action, while BCP11 clarifies that it should take such measures pre-emptively when necessary.

Minor changes have also been introduced in BCP2 with the aim of improving the exercise of the supervisor's tasks: for example, establishing a clear internal distribution of competences and delegation of functions, or considering risks and emerging practices in the planning of staffing needs.

Finally, with regard to techniques and supervisory tools (BCP9), the supervisory approach must be regularly reviewed to ensure that it remains fit for purpose. Regarding the implementation of corrective measures, the supervisor is required to be able to simultaneously implement corrective measures and sanctions, and to have a policy on their publication (BCP11).

3.10 Licenses

As regards licensing criteria (BCP5), the fit and proper assessment of members of the governing bodies and senior management must now also verify that they have sufficient availability and time to perform their functions. In addition, the supervisor must reassess their suitability if a

significant event occurs (such as a change of control) or information comes to light that affects such suitability.

4 The IMF's assessment of the BCPs in Spain and the euro area

As is well known, in 2014 the institutional architecture of financial supervision changed substantially in Spain and in the other countries of the banking union,[13] as it ceased to be exercised exclusively by the national competent authorities (NCAs) in each country and became the responsibility of the SSM, under the responsibility of the ECB.[14] Since then, the IMF's assessments of the efficiency of the banking supervision system under the FSAP have had to adjust to this new institutional reality, which further complicates the analysis. The scope of the work (i.e. which institution is being assessed, the ECB or the NCA) and the type of institutions whose supervision is under review (significant institutions (SIs), less significant institutions (LSIs) or both) have become particularly relevant.

Thus, in the context of Spain's 2017 FSAP, the IMF published a technical note on the supervision of Spanish banks, for which it used, among other inputs, a self-assessment of the BCPs provided by the authorities (IMF, 2017). Although this technical note covered aspects relating to both SIs and LSIs, it focused on the Banco de España's remit, powers and functions and placed greater emphasis on the supervision of LSIs. In this note, the IMF issued a number of recommendations, but it did not publish a detailed qualitative assessment of the BCPs or assess each principle individually.

Subsequently, in 2018, the IMF completed the first assessment of the implementation of the BCPs in the euro area. A detailed compliance report (IMF, 2018) was published, grading each principle[15] against the revised criteria and methodology issued in 2012. It should be noted that the ECB chose to be assessed and rated against both the essential criteria and the additional criteria. The IMF's assessment focused exclusively on the ECB, as it is the body ultimately responsible and is in charge of the functioning of the SSM. In addition, the review only covered SIs, although it was noted that, to the extent that regulation and practices were harmonised across SSM countries, the assessment of the supervisory environment for SIs may provide a useful picture of the regulation and supervision of LSIs, indirectly supervised by the ECB. In this jurisdiction, each principle is graded for the euro area as a whole, and no country-specific grades are provided. However, the accompanying detailed qualitative assessments include comments on relevant country specificities.

Broadly speaking, the 2018 report recognised the merits of the ECB's supervisory system, with a clear mandate, independence from both the national governments of member countries

13 It currently comprises the 20 euro area countries and Bulgaria.

14 For the SSM to carry out its tasks, a distinction was drawn between significant institutions, directly supervised by the ECB, and less significant institutions, supervised by the NCAs under the oversight of the ECB.

15 BCP29 on abuse of financial services, which includes money laundering and terrorist financing, was not assessed, as these matters are not within the SSM's remit.

and industry, well-defined processes and methodologies, and committed staff, laying the foundations for forward-looking, pre-emptive and evenhanded supervision. However, areas for improvement were also identified and some principles were graded as "materially non-compliant".[16] Given the time that has elapsed since then, some of the issues identified in the report have already been addressed and proposals have been put forward for others that, if adopted, would address or mitigate the weaknesses identified. For example, some internal processes have been revised and streamlined, and supervisory transparency has increased; an amendment to the European Capital Requirements Directive has also been agreed allowing the supervisor to oppose the acquisition by an institution of a significant holding in an undertaking before it takes place.

Finally, it should be noted that in 2024 the IMF has been working on two new FSAPs, one for Spain and one for the euro area as a whole, in which the BCPs will be used to analyse the quality of banking supervision and regulation (although a detailed BCP assessment will be conducted only in the latter case). Each of these FSAPs is at a different stage. In the case of Spain, work started at the beginning of 2023 and was close to finalisation at the time of writing. Here, the assessment of specific aspects of LSI supervision is based on the 2012 version of the BCPs. In the case of the euro area, work started in 2024 and, therefore, the assessment will be based on the 2024 version of the BCPs.

5 Concluding remarks

The BCPs constitute a set of internationally agreed measures to improve the quality of regulatory and supervisory frameworks in all types of jurisdictions and all types of banks worldwide. The 2024 revision seeks to ensure that the balance between simplicity, flexibility and universal application is preserved. The principles can be considered de facto minimum standards covering a wide range of areas, including, inter alia, supervisory responsibilities, powers and resources, risk management procedures and capital adequacy. However, the BCPs enable supervisors to tailor their processes and actions to the size, complexity and risk profile of the supervised institutions.

As outlined in the previous sections, the principles are regularly reviewed and updated to ensure they maintain their quality and effectiveness. At the same time, a degree of stability is needed to avoid uncertainty in their application. The latest review has shown that the BCPs are a "living" standard that stands the test of time. However, it also reflects the structural changes and lessons learnt in their implementation and evaluation since their last update, which justify the adjustments made. Indeed, compared with previous reviews, which significantly changed the content of the BCPs, the 2024 review mainly updated them, taking

16 The principles on major acquisitions (BCP7), corrective and sanctioning powers of supervisors (BCP11), capital adequacy (BCP16), transactions with related parties (BCP20), country and transfer risks (BCP21) and liquidity risk (BCP24) were graded as materially non-compliant.

into account new developments and vulnerabilities in the financial system and regulatory and supervisory developments.

In short, the update of BCPs has struck a reasonable balance between maintaining their universal applicability and increasing the demands on supervisors and banks in certain areas. This is very important, as a general application of the principles, while not an absolute guarantee that banking crises will not occur, contributes to strengthening the supervisory framework and the resilience of institutions and, ultimately, to enhancing financial stability at the national and global level. In this respect, an important incentive for the proper and effective implementation of the BCPs is the regular assessment of countries' compliance by the IMF and the World Bank.

REFERENCES

BCBS. (2012). *Core principles for effective banking supervision.* https://bis.org/publ/bcbs230.htm

BCBS. (2014a). *Supervisory framework for measuring and controlling large exposures.* https://www.bis.org/publ/bcbs283.pdf

BCBS. (2014b). *Revisions to the securitisation framework.* https://www.bis.org/bcbs/publ/d374.pdf

BCBS. (2015). *Guidance on credit risk and accounting for expected credit losses.* https://www.bis.org/bcbs/publ/d350.pdf

BCBS. (2019). *Guiding principles for the operationalization of a sectoral CCyB.* https://www.bis.org/bcbs/publ/d487.pdf

BCBS. (2022). *Principles for the effective management and supervision of climate-related financial risks.* https://www.bis.org/bcbs/publ/d532.htm

BCBS. (2023a). *Consultative document. Core principles for effective banking supervision.* https://www.bis.org/bcbs/publ/d551.htm

BCBS. (2023b). *Comments received on the consultative document "Core principles for effective banking supervision".* https://www.bis.org/bcbs/publ/comments/d551/overview.htm

BCBS. (2024). *Core Principles for effective banking supervision*. https://www.bis.org/bcbs/publ/d573.pdf

Bundesstalt für Finanzdienstleistungsaufsicht. (2021). *After Wirecard: more powers for BaFin.* https://www.bafin.de/SharedDocs/Veroeffentlichungen/EN/Fachartikel/2021/fa_bj_2106_FISG_en.html

Chatain, Pierre-Laurent, Ezio Caruso, Matei Dohotaru, Solvej Krause and Juan Ortiz. (2023). "No More Sweet Deals: The Need to Reform Banks' Related Party Transactions". *World Bank, Financial Sector Advisory Center and Financial Stability and Integrity Unit.* https://star.worldbank.org/publications/no-more-sweet-deals-need-reform-banks-related-party-transactions

Dordevic Ljubica, Caio Ferreira, Moses Kitonga and Katharine Seal. (2021). "Strengthening Bank Regulation and Supervision. National Progress and Gaps". *IMF Departmental Paper* No. 2021/005. https://www.imf.org/en/Publications/Departmental-Papers-Policy-Papers/Issues/2021/03/15/Strengthening-Bank-Regulation-and-Supervision-National-Progress-and-Gaps-50012

IMF. (2016). *Germany: Financial Sector Assessment Program-Detailed Assessment of Observance on the Basel Core Principles for Effective Banking Supervision.* https://www.imf.org/en/Publications/CR/Issues/2016/12/31/Germany-Financial-Sector-Assessment-Program-Detailed-Assessment-of-Observance-on-the-Basel-44020

IMF. (2017). *Spain: Financial Sector Assessment Program-Technical Note-Supervision of Spanish Banks.* https://www.imf.org/en/Publications/CR/Issues/2017/11/13/Spain-Financial-Sector-Assessment-Program-Technical-Note-Supervision-of-Spanish-Banks-45397

IMF. (2018). *Euro Area Policies: Financial Sector Assessment Program-Technical Note-Detailed Assessment of Observance of Basel Core Principles for Effective Banking Supervision.* https://www.imf.org/en/Publications/CR/Issues/2018/07/19/Euro-Area-Policies-Financial-Sector-Assessment-Program-Technical-Note-Detailed-Assessment-of-46107

How to cite this document

Alonso, Asunción, Danae Durán, Belén García-Olmedo and María Antonia Quesada. (2024). "Basel core principles for effective banking supervision: an update after a decade of experience". *Financial Stability Review - Banco de España,* 46, Spring. https://doi.org/10.53479/37653

REVISITING THE ESTIMATION OF THE COST OF EQUITY OF EURO AREA BANKS

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https://doi.org/10.53479/37654

The authors belong to the Financial Stability and Macroprudential Policy Department and are grateful to Carmen Broto, Javier Mencía, Carlos Pérez Montes and an anonymous referee for the comments received. Contact form for comments.

Abstract

The aim of this article is to estimate the cost of equity for a large sample of euro area banks. To this end, the authors consider several estimation methodologies falling under two main approaches: (i) multi-factor time-series models of stock market returns; and (ii) dividend discount models. It is found that, at country level, the estimates of the various models display a similar time variation, but differences in levels can be substantial. The relationship between the different cost of equity estimates and bank observables is relatively weak. Estimates from dividend discount models show a somewhat more robust relationship with bank fundamentals, while those from factor models do so more clearly only for larger banks. A combined measure built as a simple average across models also shows a moderate association with fundamentals. Overall, the results highlight the uncertainties inherent in cost of equity estimation and the importance of considering different alternative models.

Keywords: Cost of equity, bank profitability.

1 Introduction

The cost of equity (COE) is the return investors expect for holding the equity of a company. It is a key determinant of firms' funding costs. In the case of banks, COE impacts their ability to raise new capital, constraining their intermediation capacity and limiting credit provision to the real economy. From a regulatory point of view, COE is a key measure for assessing the cost to banks of an increase in capital requirements. Unlike the cost of debt, COE is an unobserved quantity that needs to be estimated. A range of different approaches to estimating COE has been proposed. These approaches can sometimes yield significantly different estimates, and there is no certainty as to which methodology is the most appropriate in any given case.

This paper aims to analyse various COE estimation methodologies and apply them to a sample of euro area banks. These methodologies can be broadly grouped into two categories: i) factor analysis of stock market returns, and ii) dividend discount models. The first category is based on arbitrage theory, and has recently been used by Adrian, Friedman, and Muir (2015), Altavilla et al. (2021), Kovner and Van Tasseel (2022) and Zsurkis (2022), among others. These methods are backward-looking, drawing on the co-movement of past firm returns with a series of common risk factors to produce COE estimates. The second category is based on discounting the future cash flows of a firm. It has recently been used in Mohanram and Gode (2013), Altavilla et al. (2021) and Dick-Nielsen, Gyntelberg and Thimsen (2022), among others. This approach is forward-looking and, in principle, is able to better account for current market expectations. However, it depends crucially on analysts' forecasts, which can entail sizeable errors.

In this paper, several of the most widely used models from each category are estimated. Within the first group (factor analysis of stock market returns), the two most popular factor models are considered – the capital asset pricing model (CAPM) and Fama and French (1993) (FF) –, analysing both the constant and the time-varying cost of risk. In terms of dividend discount models, the paper focuses on those based on Fuller-Hsia (1984) and Ohlson and Juettner-Nauroth (2005), and the free cash flow to equity model of Altavilla et al. (2021). A comparison is made between the results of these models and their combinations across European and Spanish banks over the last two decades, from 2000 Q4 to 2023 Q3. It is found that the different model estimates show similar time variation over the entire sample period, although the differences in levels can at times be substantial, underscoring the uncertainty inherent in COE estimates.

In addition, the relationship between the COE estimates and bank fundamentals is examined. The findings are broadly in line with previous findings on the association between bank characteristics and COE. For the best performing models, a higher CET1 ratio tends to be associated with lower COE, while the opposite holds for higher NPLs and interbank deposit ratios. The results, however, depend on the econometric specification and the choice of COE model. Overall, dividend discount models, particularly the free cash flow to equity model of Altavilla et al. (2021), yield COE estimates which show a somewhat stronger association with bank fundamentals. Meanwhile, groups of banks based on observable characteristics are also analysed. It is found that factor models tend to perform better for larger banks, while the performance of dividend discount models is less dependent on bank size. Specifically, factor models identify a much clearer negative (positive) impact of CET1 (NPL) ratios on COE for larger banks.

The rest of the paper is organized as follows. In Section 2 the various COE estimation approaches considered are described. Section 3 sets out the main empirical results and Section 4 details the conclusions drawn.

2 Methodology

2.1 Factor models: using historical market returns to estimate COE

The models in the first class are based on a multi-factor approach. The underlying idea is that the market returns of a firm can be broken down into a purely idiosyncratic component, and a component that depends on how exposed a firm is to a number of risk factors. Since investors can diversify away the idiosyncratic component of the return (by including many other firms in their portfolio), the only relevant component for pricing is the one dependent on exposure to common risk factors. Hence, in this setting, the COE is the weighted sum of the prices of the risks to which an asset is exposed, where the weights capture the sensitivity of that asset to each factor, usually quantified as a regression coefficient.

The simplest model in this class is the capital asset pricing model (CAPM) (Sharpe 1964, Lintner 1965), which can be shown to apply provided certain relatively restrictive conditions

are met, and which features a single risk factor. The CAPM is famed for its simplicity and continues to be popular among academics and practitioners (see, for example, Kovner and Van Tasseel (2022) and references therein). However, it does yield some clear pricing anomalies.[1] The model of Fama and French (1993) adds two additional risk factors, resolving some of the issues with the CAPM.[2]

Within multi-factor models the COE is estimated in two steps. In the first step the returns of a firm (y_{it}) in excess of the risk-free rate (r_t) are regressed on a constant (α_i) plus the risk factors (X_t):

$$y_{it} - r_t = \alpha_i + \beta'_{i,t} \cdot X_t + \varepsilon_{it} \quad [1]$$

Here the coefficients (β'_i) are the loadings that quantify the exposure of the returns of a firm to the risk factors. In the second step, the COE of a firm is calculated by simply multiplying the estimated loadings by the price of risk of each risk factor (λ):

$$COE_{i,t} = \hat{\beta}'_{i,t} \cdot \lambda_t + r_t \quad [2]$$

Both the sensitivity of the returns of the firm (the estimated factor loadings $\hat{\beta}'_{i,t}$) and the price of risk (λ_t) may vary over time. In this paper, in order to estimate factor loadings that can vary over time, (1) is estimated using overlapping 1-year windows (based on weekly returns). This approach is simple and transparent and affords sufficient flexibility.[3] Since the factors used are market returns (see below) the price of risk can be computed as the expectation of the factors. To obtain prices of risk that can vary over time, weighted means with backward-looking exponentially decaying weights are calculated.

2.2 Dividend discount models: using forward-looking information to estimate COE

The models in the second class estimate a firm's COE using the relationship between its price and the expected dividends, as follows:

$$P_{i,t} = \sum_{k=1}^{\infty} \frac{E_t\left[D_{i,t+k}\right]}{\left(1 + COE_{i,t}\right)^k} \quad [3]$$

1 For example, firms with low market capitalization or high book-to-market value tend to have systematically higher returns than those predicted by the CAPM.

2 The Fama and French (1992) model explains a larger share of the cross-sectional variation in stock returns than the CAPM, at the cost of somewhat greater complexity and a lack of microfundations.

3 The overlapping window method to estimate time-varying betas has been used, for example, in Kovner and Van Tassel (2022). An alternative means of obtaining time-varying loadings, used recently in Altavilla et al. (2021), is to estimate (1) with the dynamic conditional beta approach of Engle (2016). This approach can in principle yield estimates that respond more rapidly to changes over time; in fact, Altavilla et al. (2021) argue that the dynamic conditional beta approach yields more timely estimates than using 2-year overlapping windows. However, a 1-year window is a good compromise between timeliness and efficiency, and the added complexity of the dynamic conditional beta approach arguably outweighs the potential gains in timeliness.

where $P_{i,t}$ is the price of firm i at time t, and $E_t\left[D_{i,t,t+k}\right]$ is the expectation at time t of the dividends at time $t+k$. In other words, the COE is the discount rate that investors apply to the expected dividends in order to value the firm. Since the long-term expectations of dividends are extremely uncertain, different models approximate them in different ways.

An early example of a model in this class that yields a particularly simple COE formula is that of Fuller and Hsia (1984). In their work, it is assumed that the growth rate of the dividends takes an initial value g_0 and evolves linearly to a value of g_L after H periods. This approach, applied to the general European stock market and combined with a CAPM to obtain COE values for the banking sectors of different countries, has been used in European Central Bank (2016) and Fernández Lafuerza and Mencía (2021).

A more recent related model was proposed by Ohlson and Juettner-Nauroth (2005). It also starts with (3), but assumes that the extraordinary growth in expected earnings above a benchmark, based on current earnings discounting dividends, itself grows at a constant rate g_L. A simplified version of this model is obtained assuming $g_L=0$ and ignoring dividends, as in Easton (2004).

More recently, Altavilla et al. (2021) employed another method of this type, which they refer to as the free cash flow to equity method (FCFE). Here, rather than discounting expected dividends, as in (3), the whole free cash flow (unretained earnings after tax) is discounted. Further details on the four dividend discount models used can be found in Annex 1.

3 Empirical analysis

This section describes the empirical implementation of the models detailed above. The resulting COE estimates are compared and analysed in terms of their relationship with bank fundamentals.

3.1 Data

The COE of euro area banks is estimated using several datasets. For the factor models, data on equity returns, market capitalization and risk-free rates are obtained from Refinitiv.[4] The factors used in the factor models come from the Kenneth R. French online database.[5] For the dividend discount models, use is made of analyst consensus forecasts of dividends and earnings per share up to 4-years ahead, as well as realised dividends, earnings per share and share price, for individual banks from the Institutional Brokers' Estimate System (I/B/E/S)

4 The Euro-Mark weekly deposit rate is used as a risk-free proxy.

5 See https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. In the cases of the HML and SMB factors, data in euros is not obtained immediately. To this end, the 6 size and book-to-market sorted portfolios (available in the Fama-French database) are used as the starting point, before converting them at daily frequency into euros. Weekly returns of these 6 portfolios are subsequently calculated. Finally, the formulas available on the Kenneth R. French online database are used to compute the HML and SMB factors in euros.

database (Refinitiv Eikon). Long-term expected nominal GDP growth data from Consensus Economics are used to proxy the long-term earnings growth (g_L). Thus, an unbalanced panel dataset is assembled containing 89 listed banks from 15 euro area countries (see Annex 2). The sample of banks differs slightly across COE models due to data availability. The COE is estimated weekly in the case of factor models and monthly in the case of dividend discount models, and the mean value for the quarter is taken. The sample period runs from 2000 Q4 to 2023 Q3. For the analysis of bank fundamentals (described in Section 3.5) the COE data is combined with quarterly balance sheet data obtained from S&P Global Market Intelligence.

3.2 Factor models

In the factor approach, the two most frequently used models are considered: CAPM and Fama and French (1993) (hereinafter FF). The main difference between the two is the number of factors included in the analysis. The following three factors are considered:

1 The excess return of an overall European stock market index.[6]

2 The high-minus-low factor (HML). This factor quantifies the additional return for firms with high book-to-market value. It is calculated as the spread between firms with high and low book-to-market value ratios (below the 30th and above the 70th percentile).

3 The small-minus-big factor (SMB). This factor can be interpreted as a size factor, as it captures the stock return spread between small and large firms (below the 10th and above the 90th percentile), with size measured by market capitalisation.

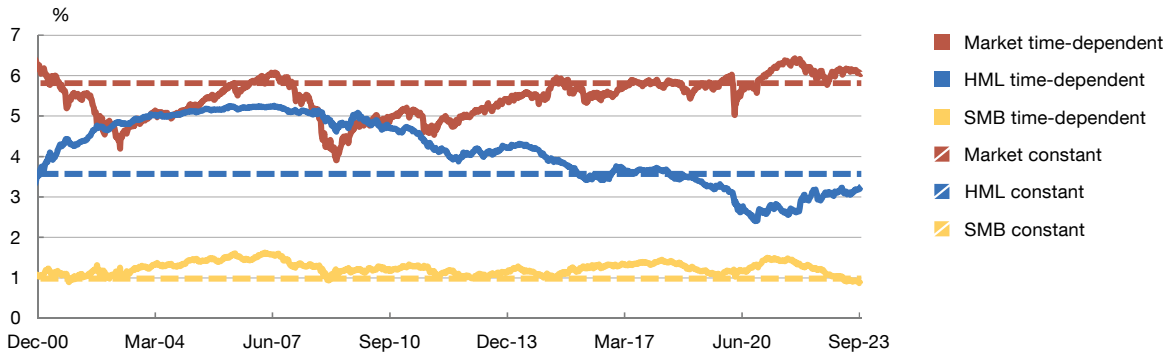
The CAPM includes the first factor only, while the FF model includes all three factors simultaneously. Since all the factors are portfolio returns, the price of risk corresponding to each factor is simply the expected value of the factor. In order to allow for the possibility that the price of risk might change over time, a time-dependent variation of each model is considered where the price of risk is computed as a weighted mean of past values of the factor, with an exponentially decaying weight.[7]

Chart 1 shows the estimated time-varying prices of risk in comparison to their constant counterparts. Notably, the price of risk of the market factor increased steadily in the run-up to the 2008 financial crisis, before falling sharply and then returning to historical values around 2015. The price of risk of the HML factor was above trend between 2001 and 2015, and then

6 For consistency, the market index from Fama French is considered. Given that it is expressed in dollars, this index must be converted back into euros, transforming the frequency from daily to weekly. In any event, it is very similar to the Stoxx 600 Europe Index, as the correlation between the weekly returns of these two indices is about 98%.

7 The formula is $\lambda_t = (1-\gamma)^t \lambda_0 + \gamma \sum_{i=1}^{t} f_i (1-\gamma)^{t-i}$, taking λ_0 equal to the unweighted mean in the complete sample. The decay parameter γ is set to 0.00044186, so that the weight decays to 0.1 after 100 years. A low value is chosen for the decay parameter to avoid prices of risk that change sign over time and to consider a small variation around the constant price of risk baseline.

Chart 1
Cost of risk associated with the different factors



SOURCE: Devised by authors using data from the Kenneth R. French online database.

declined steadily until very recently, suggesting a market preference for growth stocks in the last few years. The SMB factor, meanwhile, shows very minor variations in comparison to its time-invariant version, suggesting that the size premium changed little over time.

When computing the loadings in equation (1), weekly returns exactly equal to zero are dropped, as they are mostly due to public holidays or database updating delays. Returns at percentiles 0.1 and 99.9 are further winsorized to limit the influence of outliers that can be attributed to limited liquidity in some stocks and periods.

3.3 Dividend discount models

Dividend discount models depend crucially on the short and long-term growth of expected earnings. The short-term growth rate in earnings, g_s^{earn} (see Annex 1), is calculated as the geometric average of 4-year ahead growth (based on analysts' expectations) in earnings per share.[8]

In the Fuller Hsia (1984) model, g_0 corresponds in principle to the expected short-term growth rate in dividends. Although such data are available in the I/B/E/S database, they are found to be somewhat volatile and are often missing, so the expected growth rate of earnings, g_s^{earn}, is used instead. The time the growth rate of dividends takes to change from g_0 to g_L is set to 5 years. The estimated short-term growth rate of earnings, g_s^{earn}, can sometimes be highly volatile, leading to implausible COE values. To avoid this problem, g_s^{earn} is winsorized at 0 and 100% (yearly growth rate). Further, the time series of g_s^{earn} for each bank is smoothed with an exponential filter.[9]

8 $g_s = \sqrt[3]{E[Earn_{t+4}] / E[Earn_{t+1}]}$. If four-years ahead expectations are not available, the corresponding formula with three (if available) or two-years ahead is used. If no expectation data are available, the realized growth with respect to twelve months prior is used.

9 The formula is the same as that shown in footnote 5. The value of the decay parameter used is 0.1746, so that the weight decreases to 0.1 after 12 months.

In the Free Cash Flow to Equity (FCFE) model of Altavilla et al. (2021) a value of retained earnings equal to 10% is assumed (a somewhat small value). Indeed, for the sample of banks for which data are available, the median of this value between 2006 and 2023 is close to 70%. Given that this period was characterized by significant increases in capital requirements, the projected value going forward is likely to be lower. An intermediate choice is therefore made to set it at 40%.

For the long-term growth rate, g_L, the expected nominal long-term (from six to ten-years ahead) GDP growth of the euro area (obtained from Consensus Economics) is used.

3.4 Aggregate results

Chart 2 reports aggregate time series at the euro area level of the estimated results of eight COE models: four factor models and four dividend discount models. The factor models are the CAPM and FF specifications with constant and time-varying prices of risk. The dividend discount models are based on Fuller Hsia (1984), Ohlson and Juettner-Nauroth (2005), a simplified version of the latter based on Easton (2004), and a free cash flow to equity model (FCFE) used in Altavilla et al. (2021).

Across the four factor models the trend is broadly similar, with marked increases associated with the GFC, the European sovereign crisis and the monetary policy tightening from mid-2022 onwards. However, the FF models pick up more variation in COE in the first half of the sample, and somewhat less in the second half, suggesting significant time variation in the loadings of factors other than the market factor.[10] The magnitude of FF models also appears larger than that of CAMP models, due to these banks having a positive average exposure to the HML factor (i.e. they behave as value stocks).[11] The time-varying specifications yield results very close to those with a fixed price of risk, with some differences in crises such as the GFC and the European sovereign debt crisis.

The estimates from the dividend discount models show similar time-series variation relative to the factor models, but they reveal a more abrupt rise and fall around the 2008 crisis, and a somewhat more stable pattern thereafter. The Fuller Hsia (1984) model tends to deliver lower estimates. Overall, it is found that the aggregate results from the different models have similar time-series variation, but their levels can differ substantially, by over 5 percentage points.

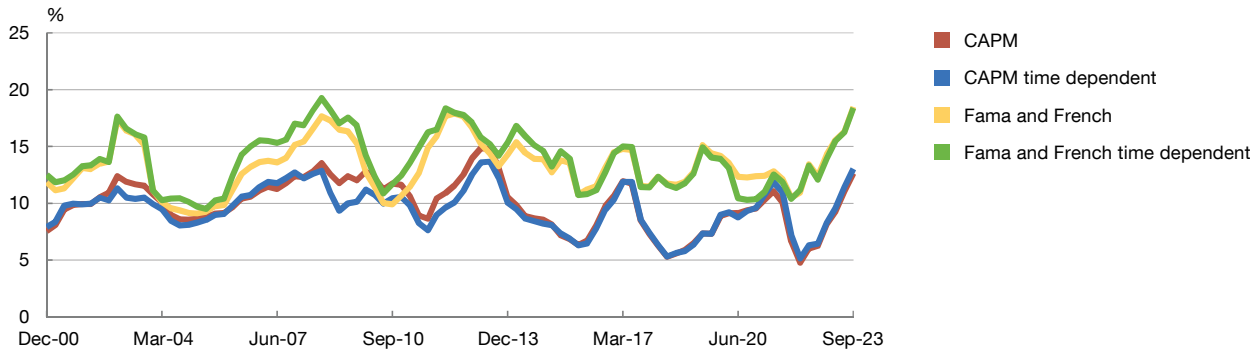
In order to obtain a single COE measure, the average across the eight models considered is computed. Mohanram and Gode (2013) show that taking the simple mean of COE across

10 Since the market factor is present in both the CAPM and the FF model, the differences over time in the variability of FF versus CAPM estimates, observed both with constant and time-varying costs of risk, can be attributed to changes over time of the other loadings. In fact, the within-bank standard deviation (across time) of the loadings of the HML and SMB factors have a mean of 1.0 (median 0.9), while that of the market factor is 0.5 (median 0.5).

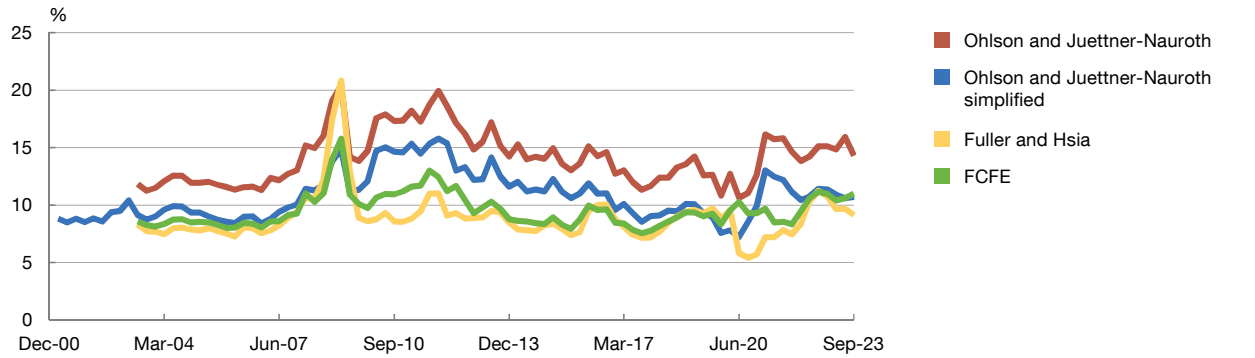
11 The median of the loadings over the HML factor is 0.8, and the mean is 1.1; for the SMB factor, which has a smaller price of risk (see Chart 1), the median is 0.3 and the mean 0.4.

Chart 2
Distribution of factor and dividend discount models

2.a Factor models of COE across the EU



2.b Dividend discount models of COE across the EU

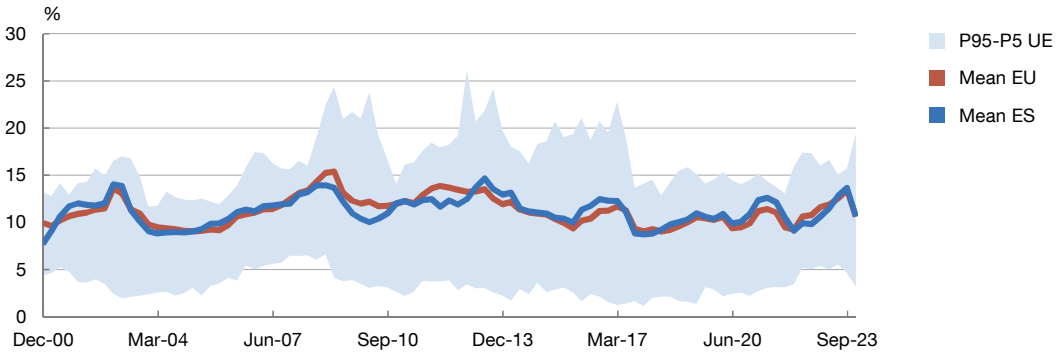


SOURCE: Consensus Economics, Datastream, Refinitiv Eikon.

several model estimates yields a more accurate estimate with lower measurement error. The averaging approach is also taken in Dick-Nielsen, Gyntelberg and Thimsen (2022) and Altavilla et al. (2021). Chart 3 displays the time evolution of this measure for the euro area and Spanish banks, as well as a confidence interval based on the variation across banks.

The first observation is that the average COE estimate is smoother than the individual COE estimates. Secondly, there is significant dispersion across banks in each period and limited differences between the results for Spain and the EU as a whole. During the observation period, the aggregate COE of Spanish banks was remarkably close to that of the average for the euro area. It was somewhat below the mean during the GFC, but rose slightly higher during the sovereign debt crisis. Notably, with the onset of the COVID-19 pandemic, the COE of Spanish banks increased more than for their peers in the euro area. However, this trend reversed with the start of the 2022 monetary policy tightening. Most recently, the COE of the euro area started rising again, while that of Spanish banks did so at a slightly faster pace.

Chart 3
Distribution of COE models



SOURCE: Consensus Economics, Datastream, Refinitiv Eikon.

3.5 Determinants of COE

Previous research has suggested that several bank characteristics (in particular, bank solvency, soundness of asset portfolio, bank size and profitability) are correlated with COE. For instance, better capitalised banks may benefit from a lower COE (Dick-Nielsen, Gyntelberg and Thimsen, 2022, ECB, 2011), while banks with higher credit risk may be faced with a higher COE, related to a perception of worse asset quality. The relationship between COE and bank size is less clear due to counterbalancing factors associated with the latter, such as implicit state guarantees and complexity.

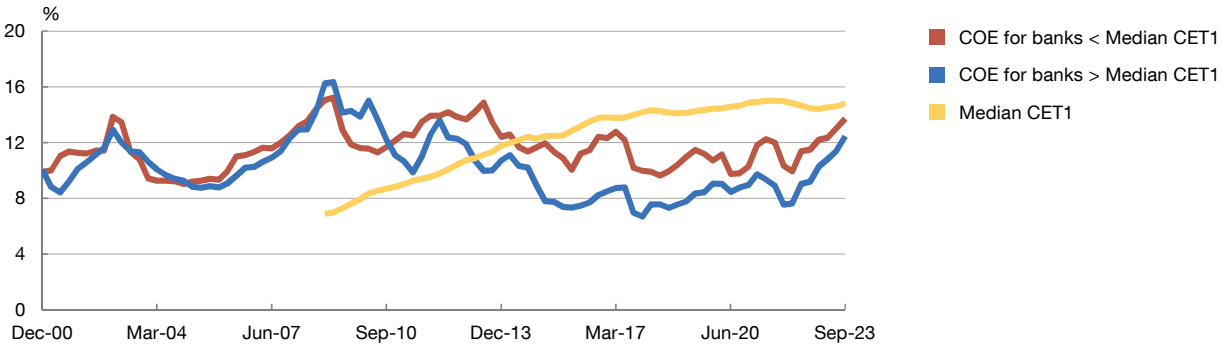
Chart 4 plots the distribution of the average COE for different subsamples of banks, split by the median of balance sheet characteristics.[12] Panel 4.1 shows that banks with above-median CET1 ratios and profitability tend to have lower COE, which is in line with the results from the literature. It is notable that the positive trend in profitability over the most recent years (blue line) has not been reflected in lower COE estimates, as was the case in previous cycles. One possible explanation may lie in investors' uncertainty over the temporal effect of this recent improvement in ROE and the associated risks. In terms of asset quality, as expected, banks with higher than median NPL ratios have a higher COE, although the difference is narrower than in the case of CET1 and profitability. In the case of size of bank assets, the difference between the COE of banks of above-median and below-median asset size is more volatile, with larger banks generally tending to have a higher COE, bearing out the complexity argument.[13] These associations are analysed in more details with a panel regression below.

12 For each bank the across-time mean value of each balance sheet item is calculated, followed by the computation of the between-bank median value of balance sheet items and the split of the sample of banks by these values. The data are available from 2008 Q1.

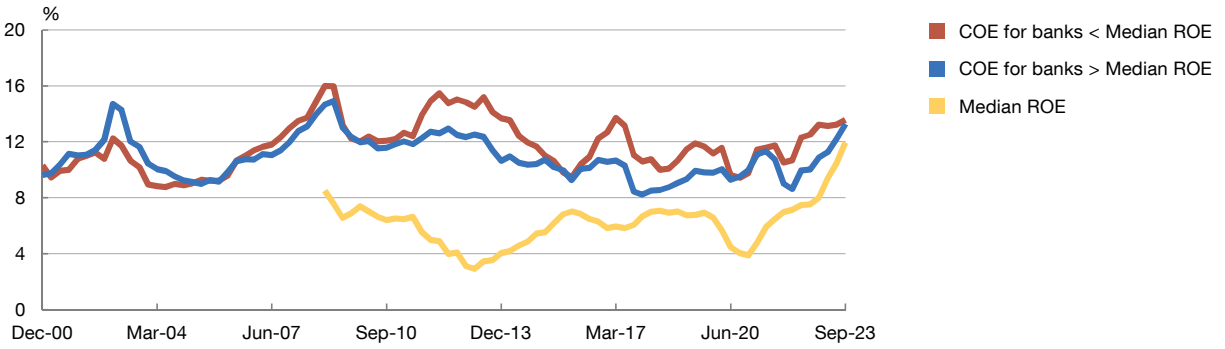
13 Note that the differences are clearer in the latter part of the sample, where information about the balance sheet items is available. This may be due to the fact that the split is based on information for that sub-sample only.

Chart 4
Average COE and bank characteristics - CET1 and RoE

4.a COE by median CET1



4.b COE by median RoE



SOURCES: Consensus Economics, Datastream, Refinitiv Eikon, SNL Financial.

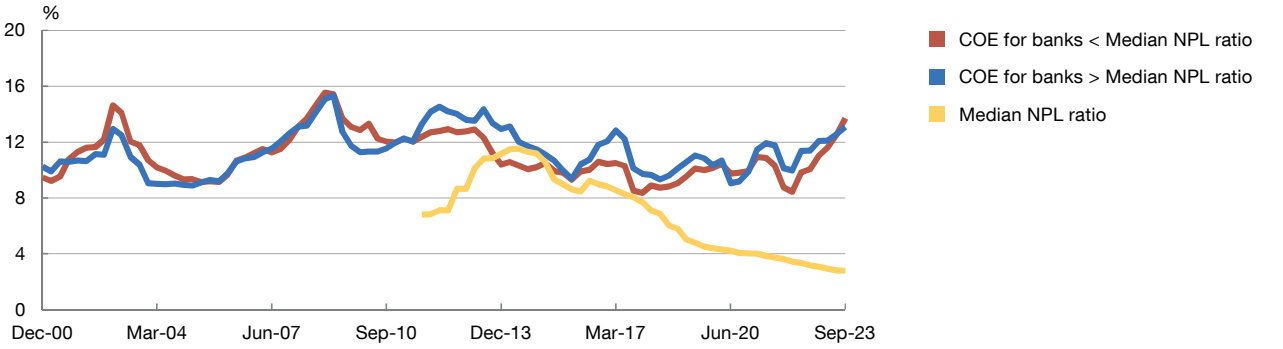
Two linear fixed-effects (FE) econometric specifications are estimated. The first includes interactions of country and time dummies (year-quarter) in order to capture country-specific characteristics that vary across time, such as overall economic activity or sovereign premia. The second specification accounts for bank FE as well as an overall time trend.[14] In both specifications standard errors are robust to serial correlation (clustered at bank level) and heteroscedasticity.

The COE estimates are combined with quarterly bank-level data on the following balance-sheet items. First, each bank's solvency is proxied using the ratio of its core capital, common equity tier 1 (CET1), to its risk-weighted assets. The expectation is that higher capitalization should be associated with lower COE. Second, credit risk is proxied using the non-performing (NPL) loans-to-total loans ratio. It is expected that banks with higher NPL ratios will have a higher COE, given the worse quality of their assets. Third, banks' funding structures are captured by interbank deposits over total assets. Compared to retail deposits and other more stable sources of funding, banks that rely more on interbank deposits are expected to have a

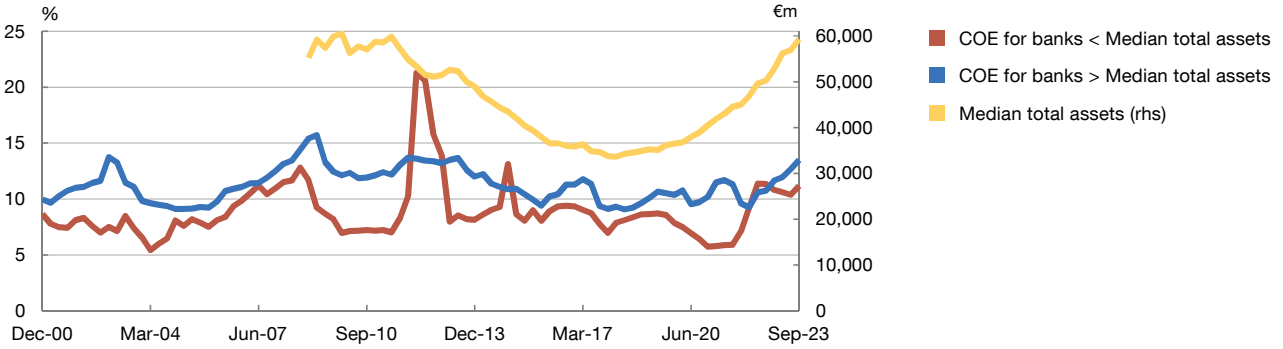
14 Additionally, models with country-time fixed effects interactions and bank fixed effects (FE) have been estimated. However, the statistical power is very limited due to the modest bank-time variation in the data.

Chart 5
Average COE and bank characteristics - NPL ratio and total assets

5.a COE by median NPL ratio



5.b COE by median bank size



SOURCES: Consensus Economics, Datastream, Refinitiv Eikon, SNL Financial.

higher COE. Lastly, the cost-to-income ratio is used as a proxy of operational efficiency. Higher operating expenses as a proportion of income should be reflected by a higher COE.[15] As a control, the log of assets is included as a measure of bank size. Observations with negative estimated COE are dropped, as such implausible values are likely due to measurement error or high-stress events, where no equity investment in a bank can be expected.[16]

Tables 1 and 2 show the results for the factor and dividend discount models, respectively. The estimated signs on bank fundamentals are generally in line with the theoretical predictions described above. However, the size of the estimates largely depends on the COE model selection and empirical specification, and statistical significance is generally weak.

The signs of the coefficients for CET1 are negative, as expected, suggesting that higher capitalization reduces the COE of new emissions. In particular, a 1 pp increase in the CET1 ratio

15 As robustness checks, the leverage ratio and ROA have also been used, as substitutes of the CET1 and cost-to-income ratios, respectively. The results from all specifications are consistent and are available upon request.

16 The observations with negative values in terms of the CET1 ratio and cost-to-income were also dropped.

Table 1
Factor models

Variables	CAPM				Fama French (1993)			
			Time-dependent				Time-dependent	
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
CET1 ratio	-0.155	-0.035	-0.153	-0.037	-0.217	-0.058	-0.223	-0.037
	(0.095)	(0.054)	(0.094)	(0.053)	(0.148)	(0.086)	(0.149)	(0.088)
NPL ratio	0.021	0.079*	0.020	0.075*	0.070	0.113**	0.078	0.116**
	(0.091)	(0.042)	(0.089)	(0.040)	(0.136)	(0.056)	(0.142)	(0.055)
Interbank deposit rati	0.010	0.002	0.008	0.001	0.019	0.125	0.018	0.109
	(0.042)	(0.034)	(0.041)	(0.032)	(0.067)	(0.089)	(0.066)	(0.086)
Cost-to-income ratio	-0.003	-0.006	-0.003	-0.006	0.004	-0.023*	0.004	-0.022*
	(0.010)	(0.007)	(0.010)	(0.007)	(0.013)	(0.012)	(0.013)	(0.011)
Log (assets)	0.758***	1.615**	0.757***	1.456**	1.331***	2.027**	1.251***	2.453**
	(0.141)	(0.683)	(0.140)	(0.648)	(0.194)	(0.961)	(0.194)	(1.031)
N bank-obs	880	1,047	880	1,047	881	1,047	881	1,047
N banks	57	59	57	59	58	59	58	59
Adjusted R2	0.538	0.596	0.527	0.589	0.589	0.605	0.589	0.609
Time FE		Yes		Yes		Yes		Yes
Time-Country FE	Yes		Yes		Yes		Yes	
Bank FE		Yes		Yes		Yes		Yes

SOURCE: S&P Global Market Intelligence and devised by authors.
Note: Specification [1] includes country-time fixed effects. Specification [2] includes bank and time fixed effects. Robust standard errors, clustered by bank, in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

is associated with a 0.2-0.3 pp decrease in COE. However, this effect is statistically significant in only two specifications for the dividend discount models. Conversely, the coefficients for NPL ratios are positive, confirming that higher realized credit risk is likely to increase the COE. Moreover, this finding is statistically significant in the bank and time FE specification of factor models and the country-time FE specifications of several dividend discount models.

A positive and significant effect of interbank deposits is obtained in most specifications, particularly in dividend discount models, and is also in line with the theoretical predictions. This suggests that relying more heavily on interbank financing increases COE. Conversely, the estimates of the cost-to-income ratio are not statistically significant in most specifications.

Comparing performance across COE models, the results indicate that dividend discount models tend to show a somewhat stronger relationship with bank fundamentals.[17] Among these, the free cash flow to equity (FCFE) model of Altavilla et al. (2021) displays the best performance, while the one based on Fuller and Hsia (1984) performs worst. This finding may be due to the fact that the Fuller and Hsia (1984) model explicitly relies on dividends as the only form of shareholder compensation, while the FCFE model includes all after-tax un-retained

17 To ensure comparability across models, robustness checks have been performed with the same sample across models. The results are qualitatively very similar and are available upon request.

Table 2
Dividend discount models

Variables	Ohlson and Juettner-Nauroth (2005)				Fuller Hsia (1984)		FCFE	
			Simplified					
	[1]	[2]	[1]	[2]	[1]	[2]	[1]	[2]
CET1 ratio	-0.242	-0.104	-0.119	-0.223	-0.201**	-0.052	-0.302*	0.202*
	(0.157)	(0.182)	(0.160)	(0.189)	(0.085)	(0.075)	(0.153)	(0.102)
NPL ratio	0.165**	-0.030	0.253***	-0.011	-0.084*	-0.006	0.120**	0.020
	(0.072)	(0.055)	(0.068)	(0.054)	(0.048)	(0.023)	(0.046)	(0.021)
Interbank deposit ratic	0.159**	0.402***	0.226***	0.378***	-0.017	0.066**	0.203***	0.150***
	(0.064)	(0.116)	(0.081)	(0.121)	(0.030)	(0.030)	(0.033)	(0.044)
Cost-to-income ratio	0.069	0.043	0.032	0.040	-0.006	0.005	0.054*	-0.022
	(0.051)	(0.080)	(0.048)	(0.073)	(0.012)	(0.010)	(0.029)	(0.015)
Log (assets)	-0.454	3.727	-0.271	3.672	-0.326	-0.256	-1.041***	-0.671
	(0.316)	(3.269)	(0.308)	(3.677)	(0.213)	(1.320)	(0.296)	(1.427)
N bank-obs	655	832	670	847	914	1079	795	975
N banks	38	44	39	45	50	56	49	54
Adjusted R2	0.381	0.411	0.409	0.469	0.289	0.401	0.384	0.672
Time FE		Yes		Yes		Yes		Yes
Time-Country FE	Yes		Yes		Yes		Yes	
Bank FE		Yes		Yes		Yes		Yes

SOURCE: S&P Global Market Intelligence and devised by authors.
Note: Specification [1] includes country-time fixed effects. Specification [2] includes bank and time fixed effects. Robust standard errors, clustered by bank, in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

profits. The use of share repurchases as pay-out methods may make COE estimates that rely solely on dividends less accurate. Specifications including bank fixed effects show a somewhat less clear association between COE estimates and bank fundamentals. This indicates that time invariant differences between banks are quite relevant when it comes to explaining COE. It might also be due to limited time variation in balance-sheet variables in the sample.[18]

The estimates of bank size are positive and highly significant in factor models, while negative and only occasionally significant in the dividend discount models. These findings are in line with Altavilla et al. (2021) and Kovner and Van Tassel (2022). As discussed above, there are two hypotheses regarding the association between bank size and COE. On the one hand, the too-big-to-fail literature (e.g. Goel et al (2019), Kelly et al. (2016) and Gandhi and Lustig (2015), among others) suggests that larger banks may get a discount on their COE thanks to implicit state guarantees. On the other hand, bank size also reflects complexity. For instance, previous research shows that larger institutions tend to display lower overall efficiency scores (Huljak et al, 2019). In addition, Demsetz and Strahan (1997) argue that while large banks may perform better than smaller banks in terms of risk diversification, this may be not enough to compensate

18 Note that balance sheet data are only available from 2010 and are often missing for many banks (on average, a bank has complete data for 19.4 quarters).

Table 3
Results for mean COE across models

Variables	All models		Factor models		Dividend discount models	
	[1]	[2]	[1]	[2]	[1]	[2]
CET1 ratio	-0.226**	-0.055	-0.185	-0.043	-0.233*	-0.044
	(0.096)	(0.050)	(0.120)	(0.064)	(0.118)	(0.071)
NPL ratio	0.143***	0.053**	0.048	0.096**	0.139***	-0.015
	(0.053)	(0.026)	(0.114)	(0.047)	(0.048)	(0.036)
Interbank deposit ratio	0.042	0.124***	0.016	0.060	0.094**	0.191***
	(0.050)	(0.032)	(0.054)	(0.056)	(0.045)	(0.044)
Cost-to-income ratio	-0.002	-0.011	0.001	-0.014	-0.003	0.002
	(0.016)	(0.010)	(0.011)	(0.009)	(0.033)	(0.021)
Log (assets)	0.370*	1.863***	1.032***	1.874**	-0.301	0.449
	(0.189)	(0.647)	(0.162)	(0.765)	(0.283)	(1.582)
N bank-obs	1,143	1,298	884	1,049	915	1,080
N banks	68	71	58	59	50	56
Adjusted R2	0.308	0.475	0.560	0.619	0.175	0.359
Time FE		Yes		Yes		Yes
Time-Country FE	Yes		Yes		Yes	
Bank FE		Yes		Yes		Yes

SOURCE: S&P Global Market Intelligence and devised by authors.
Note: Specification [1] includes country-time fixed effects. Specification [2] includes bank and time fixed effects. Robust standard errors, clustered by bank, in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

for the higher risk associated with greater leverage or riskier lending.[19] As a result, the relationship between bank size and COE is less clear (Kovner and Van Tassel, 2022). Bank size may also affect the association between COE and bank fundamentals. This issue is explored by interacting every bank observable with a dummy based on bank assets.[20] The findings indicate that the negative association between COE and higher capitalisation holds predominantly for larger banks (see Annex 3). The same can be said of the NPL ratio in the case of factor models.[21] These results indicate that factor-based COE estimates tend to be more strongly related to bank fundamentals for larger banks. This may be due to the fact that larger banks' stock returns (due to their higher liquidity, inclusion in indexes and greater scrutiny by analysts) are closer to the no-arbitrage ideal implicit in factor models. It is also possible that the common factors considered are less relevant for smaller banks, which are more affected by local developments.

Finally, Table 3 displays the association of bank fundamentals with a COE averaged across models. The aggregate approach also offers evidence of some association between COE and

19 Bank size can increase risk-taking incentives due to implicit too-big-to-fail subsidies, or by reducing charter value, see De Niccolo (2000).

20 Every bank fundamental is interacted with a dummy that takes a value of one if the average assets of the bank are equal to or larger than the median, and zero otherwise. For details, see the Annex 3.

21 The relationship with the interbank deposits ratio only holds for smaller banks in the case of factor models and generally applies irrespective of size in the case of dividend discount models.

bank characteristics. In particular, the coefficients of the capital ratio, NPLs and the interbank deposit ratio are statistically significant, especially in the aggregate for the dividend discount models (country-time FE specification). Overall, bank fundamentals explain around one-third of the variation in COE estimates.[22]

4 Conclusions

Several methods for estimating the COE of euro area banks have been analysed in this article. At the aggregate level it is found that, while they tend to yield similar results in terms of time evolutions, such methods can lead to significant differences in levels, often in the order of five percentage points. At the individual level, COE estimates from dividend discount models tend to show a relationship with fundamentals (solvency, credit risk, funding profile) more in line with expectations than those based on factor models. Factor model estimates show a clearer relationship with bank observables for larger banks. Overall, the findings of this study underscore the uncertainties inherent in COE estimation and the importance of considering several alternative methodologies.

22 Using a Shapley value decomposition of the coefficient of determination, the CET1 ratio accounts for 11.5%, the NLP ratio for 11.2%, the interbank deposit ratio for 5.7%, the cost-to-income ratio for 0.3%, and bank size for 6.2% of this explained variation.

REFERENCES

Adrian, Tobias, Evan Friedman and Tyler Muir. (2015). "The cost of capital of the financial sector". Staff Reports, 755, Federal Reserve Bank of New York. https://doi.org/10.2139/ssrn.2706614

Andreeva, Desislava, Maciej Grodzicki, Csaba Móré and Alessio Reghezza. (2019). "Euro area bank profitability: where can consolidation help?". *Special feature in Financial Stability Review,* European Central Bank, November, pp. 107-118. https://www.ecb.europa.eu/pub/financial-stability/fsr/special/html/ecb.fsrart201911_01~81377050be.en.html

Altavilla, Carlo, Paul Bochmann, Jeroen De Ryck, Ana-Maria Dumitru, Maciej Grodzicki, Heinrich Kick, Cecilia Melo Fernandes, Jonas Mosthaf, Charles O'Donnell and Spyros Palligkinis. (2021). "Measuring the cost of equity of euro area banks". Occasional Paper Series, 254, European Central Bank. https://doi.org/10.2139/ssrn.3797125

Couaillier, Cyril, Maria Dimou and Conor Parle. (2023). "Banks' capital distributions and implications for monetary policy". *ECB Economic Bulletin,* 6/2023. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2023/html/ecb.ebbox202306_07~526229cbee.en.html

De Nicoló, Gianni. (2000). "Size, charter value and risk in banking: An international perspective". International Finance Discussion Paper, No. 689, Board of Governors of the Federal Reserve System. https://doi.org/10.17016/IFDP.2000.689

Dick-Nielsen, Jens, Jacob Gyntelberg and Christoffer Thimsen. (2022). "The Cost of Capital for Banks: Evidence from Analyst Earnings Forecasts". *The Journal of Finance,* 77, pp. 2577-2611. https://doi.org/10.1111/jofi.13168.

Easton, Peter D. (2004). "PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital". *The Accounting Review,* 79, pp. 73-96. https://doi.org/10.2308/accr.2004.79.1.73

Engle, Robert F. (2016). "Dynamic conditional beta", *Journal of Financial Econometrics,* 14(4), pp. 643-667. https://doi.org/10.1093/jjfinec/nbw006

European Central Bank. (2011). "Common equity capital, banks' riskiness and required return". *Financial Stability Review,* December, pp. 125-131. https://www.ecb.europa.eu/pub/pdf/fsr/art/ecb.fsrart201112_01.en.pdf

European Central Bank. (2016). "Recent developments in the composition and cost of bank funding in the euro area". *ECB Economic Bulletin,* 1/2016, pp. 26-44. https://www.ecb.europa.eu/pub/pdf/other/eb201601_article01.en.pdf

Fama, Eugene F., and Kenneth R. French. (1993). "Common risk factors in the returns on stocks and bonds". *Journal of Financial Economics,* 33, pp. 3-56. https://doi.org/10.1016/0304-405X(93)90023-5

Fernández Lafuerza, Luis, and Javier Mencía. (2021). "Estimating the cost of equity of financial institutions". *Revista de Estabilidad Financiera - Banco de España,* 40, pp. 49-66. https://repositorio.bde.es/handle/123456789/16733?locale=en

Fuller, Russell J., and Chi-Cheng Hsia. (1984). "A simplified common stock valuation model". *Financial Analysts Journal,* 40(5), pp. 49-56. https://doi.org/10.2469/faj.v40.n5.49

Gandhi, Priyank, and Hanno Lustig. (2015). "Size Anomalies in U.S. Bank Stock Returns". *The Journal of Finance,* 70, pp. 733-768. https://doi.org/10.1111/jofi.12235

Goel, Tirupam, Ulf Lewrick and Aakriti Mathur. (2019). "Playing it safe: global systemically important banks after the crisis". *BIS Quarterly Review,* September, pp. 35-47. https://www.bis.org/publ/qtrpdf/r_qt1909e.htm

Huljak, Ivan, Reiner Martin and Diego Moccero. (2019). "The cost-efficiency and productivity growth of euro area banks". ECB Working Paper Series, No. 2305, European Central Bank, Frankfurt am Main, August. https://doi.org/10.2139/ssrn.3430356

Kovner, Anna, and Peter Van Tasseel. (2022). "Evaluating Regulatory Reform: Banks' Cost of Capital and Lending". *Journal of Money, Credit and Banking,* 54, pp. 1313-1367. https://doi.org/10.1111/jmcb.12875

Lintner, John. (1965). "The valuation of risky assets and the selection of risky investments in stock portfolios and capital budgets". *Review of Economics and Statistics,* 47, pp. 13-37. https://doi.org/10.2307/1924119

Mohanram, Partha, and Dan Gode. (2013). "Removing predictable analyst forecast errors to improve implied cost of equity estimates". *Review of Accounting Studies,* 18, pp. 443-478. https://doi.org/10.1007/s11142-012-9219-2

Ohlson, James A., and Beate E. Juettner-Nauroth. (2005). "Expected EPS and EPS growth as determinants of value". *Review of Accounting Studies,* 10, pp. 349-365. https://doi.org/10.1007/s11142-005-1535-3

Sharpe, William F. (1964). "Capital asset prices: a theory of market equilibrium under conditions of risk". *The Journal of Finance,* 19, pp. 425-442. https://doi.org/10.1111/j.1540-6261.1964.tb02865.x

Zsurkis, Gabriel. (2022). "Determinants of cost of equity for listed euro area banks". Working Papers, No. w202209, Banco de Portugal. https://www.bportugal.pt/sites/default/files/anexos/papers/wp202209.pdf

Annex 1 Dividend discount models

As detailed in the main text, dividend discount models start from the following basic formula:

$$P_{i,t} = \sum_{k=1}^{\infty} \frac{E_t\left[D_{i,t+k}\right]}{\left(1+COE_{i,t}\right)^k} \qquad [A.1]$$

The different models differ in how expected future dividends are approximated. In the Fuller and Hsia (1984) model it is assumed that expected dividends initially grow at a rate g_0, which decreases linearly to a value of g_L after H periods. Under those assumptions, Fuller and Hsia (1984) derive an approximated formula for COE in (3), as follows:

$$COE_{i,t}^{FH} = \frac{D_{i,t}}{P_{i,t}}\left[1+g_0+H\left(g_L-g_0\right)\right]+g_L \qquad [A.2]$$

The Ohlson and Juettner-Nauroth model (2005) also starts with (A.1), but adds the following assumption:

$$\frac{E_t\left[EPS_{t+k+2}\right]-E_t\left[EPS_{t+k+1}\right]-COE_t\left\{E_t\left[EPS_{t+k+1}\right]-E_t\left[D_{t+k+1}\right]\right\}}{E_t\left[EPS_{t+k+1}\right]-E_t\left[EPS_{t+k}\right]-COE_t\left\{E_t\left[EPS_{t+k}\right]-E_t\left[D_{t+k}\right]\right\}} = \gamma, \forall k \geq 1$$

In the expression above, $ROE_t\left\{E_t\left[EPS_{t+k}\right]-E_t\left[D_{t+k}\right]\right\}$ is the expected (at time t) return between t+k and t+k+1 of the earnings retained at t+k, which can be seen as a benchmark growth rate. $E_t\left[EPS_{t+k+1}\right]-E_t\left[EPS_{t+k}\right]$ is the expected growth or earnings over that same period. Thus, the model assumes that the expected earnings above the benchmark itself grow at a rate $\gamma-1$. Moreover, assuming that $\frac{E_t\left[D_{t+k}\right]}{E_t\left[EPS_{t+k}\right]} = C$ for $k \geq T$, with T being some future date, and $C \geq \left(1+COE_t-\gamma\right)/COE_t$, it can be shown that

$$\gamma = \lim_{k\to\infty} \frac{E_t\left[EPS_{t+k+1}\right]}{E_t\left[EPS_{t+k}\right]} \equiv 1+g_L$$

Based on these assumptions, together with (A.1), it can be shown that the COE takes the following expression:

$$COE_{i,t}^{OJ} = A_{i,t} + \sqrt{A_{i,t}^2 + \frac{E_t\left[EPS_{t+1}\right]}{P_{i,t}}\left(g_s^{earn}-g_L\right)}, \qquad A_{i,t} \equiv \frac{\left(g_L + \frac{E_t\left[D_{i,t+1}\right]}{P_{i,t}}\right)}{2} \qquad [A.3]$$

With $g_s^{earn} \equiv \frac{E_t[EPS_{t+2}] - E_t[EPS_{t+1}]}{E_t[EPS_t + 1]}$ being the short rate growth rate of the earnings per share. Further, assuming $g_L = 0$ and ignoring dividends, as in Easton (2004), a simplified version of the Ohlson and Juettner-Nauroth (2005) formula is obtained:

$$COE_t^{OJS} = \sqrt{\frac{E_t[EPS_{t+1}]}{P_{i,t}} g_s^{earn}} \qquad [A.4]$$

More recently, Altavilla et al. (2021) propose another method of this type, which they refer to as the free cash flow to equity method (FCFE). Their starting point is a variation of (3):

$$P_{i,t} = \sum_{h=1}^{\infty} \frac{E_t[FCFE_{t+h}]}{\left(1 + COE_t^{FCFE}\right)^h} \qquad [A.5]$$

Where $FCFE_{t+h}$ is the free cash flow to equity at time $t+h$, which is further modeled as:

$$FCFE_{t+h} = \begin{cases} (1-RE)(1-\tau)EPS_{t+h}, \text{ if } EPS_{t+h} \geq 0 \\ EPS_{t+h}, \text{ if } EPS_{t+h} < 0 \end{cases} \qquad [A.5]$$

with RE being the fraction of profits retained, τ the tax on profits and EPS_t the earnings per share at time t. They further assume that for h>7 years, $E_t[FCFE_{t+h}]$ grows at a constant rate g_L. Based on these assumptions and given values for $P_{i,t}$ and earnings expectations, (A.5) is an equation on COE_t^{FCFE}. Adding up the terms from h=7, the following is obtained:

$$P_t = \sum_{h=1}^{6} \frac{E_t[FCFE_{t+h}]}{(1 + COE_t)^h} + \frac{E_t[FCFE_{t+7}]}{(COE_t - g_L)(1 + COE_t)^6} \qquad [A.6]$$

For $h = 1,...,4$, for which earnings expectations are available from the I/B/E/S database, equation (A.5) is used to evaluate $E_t[FCFE_{t+h}]$. The marginal tax rate, τ, and the retained earnings share, RE, are fixed at 26.84% and 40%.[1] For $h = 5,6,7$, it is assumed that $E_t[FCFE_{t+h}]$ grows a rate that exponentially approaches g_L that is $E_t\left[FCFE_{t+4+j}\right] = E_t\left[FCFE_{t+4+j-1}\right]\left(1 + a^j g_s\right)$, with $a = \sqrt[3]{\frac{g_L}{g_s}}$, and $j = 1,2,3$. As noted above, beyond $h = 7$, $E_t[FCFE_{t+h}]$ is assumed to grow at a constant rate g_L. $E_t[FCFE_{t+h}]$ is also assumed to grow at the rate g_s for $h<5$ when expectations are not available. If one-year-ahead expectations are not available, the realized growth from 12 months prior is used.

Multiplying both sides of (A.6) by $(COE_t - g_L)(1 + COE_t)\wedge 6$, a polynomial equation of 7th order in $1 + COE_t$ is obtained. The equation simplifies to one of 6th order, once

1 Altavilla et al. (2021) use a value of 10% for retained earnings. Empirically, the median of this value in the 2006-2023 period is found to be 67%. Given that this period was characterised by important capital requirement increases, the appropriate value to project forward is likely smaller, but 10% is found to be rather small. An intermediate value of 40% is therefore chosen.

$E_t\left[FCFE_{t+7}\right] = (1+g_L)E_t\left[FCFE_{t+6}\right]$ is used. The equation is solved numerically with a Newton-Rapson method, starting with a value of 10%.

Note that the Fuller-Hsia formula (A.2) depends crucially on the current dividend yield. It does not appear in the simplified Ohlson and Juettner-Nauroth formula (A.4) or the FCFE formula (A.5), while it appears as expectation, together with earnings expectations, in formula (A.3). Thus, the Fuller-Hsia formula is more sensitive to dividend pay-out policy, and will tend to produce lower COE estimations if, for example, dividends are reduced in favour of share buybacks. The current trend towards more share buybacks at euro area banks (Couaillier, Dimou and Parle, 2023) could therefore make the Fuller Hsia model less appropriate.

Annex 2 Sample of euro area banks

Table A.2.1
Sample of euro area banks

Austria	Addiko Bank; Bank für Tirol und Vorarlberg; BAWAG Group; BKS Bank; Erste Group Bank; Oberbank; Raiffeisen Bank International; Volksbank Vorarlberg.
Belgium	Dexia; KBC Group.
Cyprus	Bank Cyprus Holdings Public; Hellenic Bank Public.
Estonia	AS LHV Group, Coop Pank AS
Finland	Aktia Pankki Oyj; Ålandsbanken; Alisa Pankki Oyj; Evli Pankki Oyj; Nordea Bank Abp; Oma Säästöpankki Oyj.
France	BNP Paribas; CRCAM de Toulouse 31; CRCAM Paris et IDF; CRCAM d'Ille-et-Villaine; CRCAM du Morbihan; CRCAM de Nord de France; CRCAM Brie Picardie; CRCAM du Languedoc; CRCAM Atlantique Vendee; Crédit Agricole; Natixis; Société Générale.
Germany	Aareal Bank; Comdirect bank; Commerzbank; Deutsche Bank; Deutsche Pfandbriefbk; Merkur PrivatBank; ProCredit Holding; Varengold Bank AG; UmweltBank AG
Greece	Alpha Bank; Attica Bank; Eurobank Ergasias; National Bank Greece; Piraeus Financial Holdings.
Ireland	AIB Group Plc; Bank of Ireland Group Plc; Permanent TSB Grp Hldgs plc.
Italy	Banca Carige; Banca Finnat Euramerica; Banca Generali; Banca IFIS; Banca Monte dei Paschi di Siena; Banca Popolare di Milano; Banca Popolare di Sondrio; Banca Profilo; Banca Sistema; Banco BPM Società per Azioni; Banco di Desio e della Brianza; Banco di Sardegna; BPER Banca; Credito Emiliano; FinecoBank; illimity Bank; Intesa Sanpaolo; Mediobanca Banca di Credito Finanziario; Poste Italiane; UniCredit ; Unione di Banche Italiane.
Lithuania	AB Siauliu Bankas.
Netherlands	ABN AMRO Bank; ING Groep; Van Lanschot Kempen.
Portugal	Banco BPI; Banco Comercial Português; Banco Espírito Santo.
Spain	Banco Bilbao Vizcaya Argentaria; Banco de Sabadell; Banco de Valencia; Banco Popular Español; Banco Santander; Bankia; Bankinter; CaixaBank; Liberbank; Unicaja Banco.
Slovakia	OTP Banka Slovensko; Tatra banka; Vseobecna uverova banka.

SOURCE: Own elaboration.

Annex 3 Results interacting observables with median assets dummy

Table A.3.1
Determinants of the COE by bank size

Variables	COE models							
	CAPM(1)	CAPM(2)	FF(1)	FF(2)	OJN(1)	OJN(2)	FH	FCFE
CET1 ratio								
* Small	-0.079	-0.078	-0.080	-0.091	0.177	0.232	-0.158*	-0.278
	(0.091)	(0.090)	(0.132)	(0.133)	(0.231)	(0.201)	(0.079)	(0.205)
* Large	-0.256***	-0.252***	-0.473***	-0.457***	-0.901***	-0.842***	-0.400***	-0.418*
	(0.077)	(0.076)	(0.102)	(0.104)	(0.181)	(0.198)	(0.144)	(0.226)
NPL ratio								
* Small	0.017	0.017	0.086	0.086	0.198**	0.286***	-0.146***	0.014
	(0.120)	(0.117)	(0.188)	(0.193)	(0.079)	(0.061)	(0.044)	(0.054)
* Large	0.105**	0.101**	0.204**	0.216***	0.194	0.294**	-0.003	0.235***
	(0.051)	(0.050)	(0.078)	(0.077)	(0.120)	(0.110)	(0.043)	(0.069)
Interbank deposit ratio								
* Small	0.077*	0.075*	0.107*	0.103*	0.160*	0.201**	0.041	0.279***
	(0.042)	(0.041)	(0.058)	(0.060)	(0.085)	(0.079)	(0.043)	(0.057)
* Large	-0.016	-0.018	-0.001	-0.003	0.199**	0.234**	-0.004	0.199***
	(0.028)	(0.028)	(0.051)	(0.048)	(0.098)	(0.102)	(0.041)	(0.050)
Cost-to-income ratio								
* Small	-0.023	-0.023	-0.037	-0.036	-0.013	-0.065	0.009	0.096**
	(0.026)	(0.026)	(0.026)	(0.027)	(0.064)	(0.047)	(0.014)	(0.047)
* Large	-0.005	-0.006	0.001	0.002	0.080	0.075	-0.034*	0.035
	(0.009)	(0.009)	(0.013)	(0.013)	(0.056)	(0.056)	(0.019)	(0.023)
Log (assets)								
* Small	0.467*	0.474*	0.574*	0.568*	-1.802***	-1.616***	-0.370	-1.013
	(0.241)	(0.239)	(0.296)	(0.297)	(0.427)	(0.454)	(0.407)	(0.769)
* Large	0.719***	0.721***	1.131***	1.066***	-0.653*	-0.703*	0.084	-0.613
	(0.167)	(0.167)	(0.229)	(0.233)	(0.379)	(0.365)	(0.245)	(0.366)
N bank-obs	880	880	881	881	655	670	914	795
N banks	57	57	58	58	38	39	50	49
Adjusted R2	0.569	0.558	0.631	0.628	0.415	0.456	0.321	0.407
Time-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

SOURCE: S&P Global Market Intelligence and devised by authors.
Note: Results from country-time FE regression. Each bank characteristic is interacted with a dummy that is equal to 1 if the average assets of the bank are equal to or larger than the median, and 0 otherwise. The coefficients are standard errors reported for "small" and "large" groups of banks. "Small" refers to banks with average assets below the median (dummy=0). "Large" refers to banks with average assets larger than or equal to the median (dummy=1). In CAPM and FF models, specifications (1) and (2) refer to the constant and time-varying cost of risk, respectively. OJN stands for the Ohlson and Juettner-Nauroth (2005) model, and specifications (1) and (2) refer to the exponential and simplified versions, respectively. FH stands for the Fuller Hsia (1984) model. FCFE stands for the free cash flow to equity model of Altavilla et al. (2021). Robust standard errors, clustered by bank, in parentheses. *** p<0.01, ** p<0.05, *p<0.1.

How to cite this document

Fernández Lafuerza, Luis, and Mariya Melnychuk. (2024). "Revisiting the estimation of the cost of equity of euro area banks". *Financial Stability Review - Banco de España,* 46, Spring. https://doi.org/10.53479/37654

THE EURO AREA BANKING SECTOR AND MREL: A CHALLENGE FOR MEDIUM-SIZED BANKS?

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https://doi.org/10.53479/37655

The authors belong to the Directorate General Financial Stability, Regulation and Resolution and are grateful for the comments received from Irene Gómez, Sara Larraga, Elisa Llorente, Francisco González, Sergio Mayordomo and an anonymous referee. E-mail address for comments: maria[dot]pollos[at]bde[dot]es.

THE EURO AREA BANKING SECTOR AND MREL: A CHALLENGE FOR MEDIUM-SIZED BANKS?

Abstract

The introduction of the Minimum Requirement for Own Funds and Eligible Liabilities has meant that euro area banks – including some smaller banks that had no previous experience on the debt markets – have had to issue more debt. At end-October 2023, large issuers still accounted for the bulk of issuance, but the number of issuances made by medium-sized banks had increased. These banks can achieve a lower issuance cost than their larger peers, by placing bonds that have a lower level of subordination and a shorter maturity, and thanks to their good financial ratios. However, certain challenges remain, such as their poorer credit ratings and the uncertainty regarding market capacity to absorb a larger volume of issuance by medium-sized banks.

Keywords: Minimum Requirement for Own Funds and Eligible Liabilities (MREL), Bank Recovery and Resolution Directive, unsecured debt, banking sector, subordination, subordinated debt.

1 Introduction

The funding structure of a large proportion of European – and Spanish – banks has historically been characterised by a high share of deposits and a lower share of wholesale funding. This is still true for Spanish banks, despite the increase in wholesale funding observed in the run-up to the global financial crisis, when unsecured debt issuances amounted to around 10% of the banking sector's balance sheet (Martín-Oliver, 2013). In addition, unsecured debt was used mostly by larger banks, which were better known to investors and more familiar with the debt issuance process. For example, at end-2015, of the Spanish significant institutions, all those with a balance sheet over €100 billion had issued debt instruments, whereas banks with smaller balance sheets were less active. In consequence, the ratio of unsecured marketable debt to total liabilities was much higher at the larger banks.

It was at that juncture, when access to debt markets was uneven, that the loss absorption requirement – the Minimum Requirement for Own Funds and Eligible Liabilities (MREL) – was established across the European Union (EU). MREL is applicable to all EU banks, unlike Total Loss-Absorbing Capacity (TLAC) which is applicable only to global systemically important institutions (G-SIIs). The MREL requirements were introduced in response to banking crises which, in the absence of an adequate and uniform crisis management framework, tended to be managed through taxpayer-funded bail-outs. Under the MREL regulations, banks were allowed to meet these requirements with their own funds and liabilities with maturity of more than one year, including marketable debt instruments and other eligible liabilities, provided that they complied with a number of conditions deemed necessary for loss absorption and bank recapitalisation in the event of a crisis.

Overall, this crisis management strategy was expected to generate a series of benefits, although it was recognised that it could also pose some challenges (Avgouleas and Goodhart, 2014). Notable among the expected benefits would be the build-up of funds for loss absorption and recapitalisation, and enhancement of market discipline on banks. Various authors have documented increases in the price of loss-absorbing instruments relative to those of other comparable instruments (Lewrick, Serena and Turner, 2019; Cutura, 2021; Schäfer, Schnabel and Di Mauro, 2016; Koetter, Krause, Sfrappini and Tonzer, 2022). This suggests that the loss-absorption framework is credible.

The main difficulties arising from the introduction of the MREL framework included the potential costs for the banking sector of generating loss-absorbing capacity (Koetter and Nguyen, 2023). This was especially significant for banks that had no previous experience in the issuance of debt instruments (Restoy, 2016). Indeed, the banking sector overall recorded high issuance needs, estimated at around €117 billion, including €47 billion in subordinated debt (Laboureix, 2017). These difficulties were probably less severe for large banks, as they had greater experience in debt markets and it was easier for them to meet the fixed costs associated with debt issuance. By contrast, the challenges were more acute for smaller banks, which might face constraints on market access or, if they were able to access the market, investor demands for higher returns.

This article examines euro area banks' issuance of potentially MREL eligible debt instruments in the period from October 2018 to October 2023. This is a highly topical issue given that, since January 2024, compliance with MREL requirements has been fully binding following the end of the initial transitional period.[1] The analysis draws on a granular and comprehensive database, constructed by combining the Centralised Securities Database (CSDB) of the European Central Bank (ECB) and data from private providers.[2] This database makes it possible to examine both the volume and the cost of issues, and also, when combined with banks' financial reporting, differences by bank size. It thus complements the information on compliance with MREL requirements provided by the Single Resolution Board (SRB) (Single Resolution Board, 2024) or the European Banking Authority (EBA) (European Banking Authority, 2023) and other analyses of banks' issuance and cost of funding (SRB, 2023a; European Commission, 2023; Klaus and Sotomayor, 2018). Our analysis is limited to significant institutions (SIs) according to the size criterion, that is, those with a balance sheet over €30 billion. A distinction is drawn between the largest institutions, comprising G-SIIs, top-tier banks (those with assets over €100 billion), other Pillar 1 banks (also called fished-out banks)[3] which, selected by the resolution authorities, have subordination requirements for the purposes of compliance with MREL equivalent to top-tier banks, and all other banks with balance sheets of between €30 billion and €100 billion, hereafter referred to as "medium-sized banks".

1 With only a few exceptions based on Article12k(1) and 12k(7) of Regulation (EU) No 806/2014 of the European Parliament and of the Council (the Single Resolution Mechanism Regulation (SRMR)).

2 Eligibility ultimately depends on verification that the instrument in question meets all the eligibility criteria.

3 Banks designated by the relevant resolution authority that are not subject to Article 92a of Regulation (EU) No 575/2013 and that are part of a resolution group whose total assets are lower than €100 billion, and which the relevant resolution authority has assessed as reasonably likely to pose a systemic risk in the event of failure, in accordance with Article 45c(6) of Directive 2014/59/EU.

The results show that, for the period analysed (October 2018 to October 2023), most of the MREL eligible debt issuances were made by large banks, with no increase in the share of issuances by medium-sized banks. However, the number of medium-sized banks issuing debt instruments did increase. Analysis of the cost of issuance shows that, in the euro area overall, medium-sized banks pay a lower coupon on their fixed-rate issuances than large banks, even controlling for financial conditions at the time of issuance. The lower issuance cost for medium-sized banks is partly because their debt instruments have shorter maturities and a lower level of subordination. It is also because medium-sized banks that are able to issue such instruments on the market have better capital, liquidity and cost-to-income ratios and this, according to econometric estimates, helps to moderate their cost of funding. These results differ somewhat across jurisdictions. In Spain, for instance, the cost of funding for medium-sized banks is higher than for large banks. This can only be partially explained by their poorer cost-to-income ratio and their similar capital level compared with large banks. It may be associated with the relatively lower level of development of the Spanish market, which may restrict the investor base for medium-sized banks, as access to international markets is typically limited to large entities.

Nevertheless, the conclusions drawn in this article should be considered with a certain degree of caution, for several reasons. First, no account is taken of the fixed costs incurred by banks throughout the issuance process, which may be expected to be more difficult to absorb for medium-sized banks than for larger ones. Second, the analysis only covers the cost of issuance of fixed-rate instruments, leaving out a significant portion of MREL-eligible bonds.[4] Third, there are significant caveats that prevent an analysis of how the cost of issuance has evolved over time, given that during most of the period under review interest rates were low, and in such a setting the differences in this cost are smaller than in a high interest rate scenario. Lastly, the results could differ if banks with a balance sheet of less than €30 billion (the balance sheet size threshold used) were analysed, as they are more likely to face greater difficulties in accessing unsecured debt markets.

The remainder of the article is structured as follows. Section 2 presents the MREL framework in simplified terms. Section 3 describes the data used in the analysis. Section 4 presents a comparative analysis of market access for large and medium-sized banks. Lastly, Section 5 sets out the conclusions.

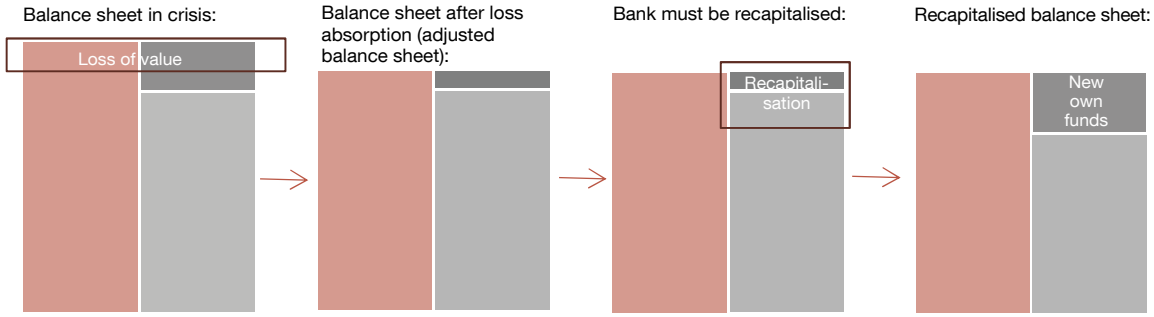
2 The MREL framework[5]

The EU resolution framework, laid down in Directive 2014/59/EU (the Bank Recovery and Resolution Directive, (BRRD)), requires that banks maintain a sufficient amount of own funds

4 Owing to data availability and given that fixed-rate instruments account for 63% of the debt instruments issued for which information on coupon value is available (5,659 bonds). The remainder are flexible-rate bonds (floating-coupon and interest rate-linked instruments) (27%), zero-coupon bonds (6%) and others (stepped-coupon and inflation-linked instruments) (3%). Fixed-rate instruments make up 62% of those issued by large banks, and 70% of those issued by medium-sized banks.

5 The framework described here refers to the external MREL to be met by the resolution entity. The specificities of the internal MREL to be met by subsidiaries, if any, are not included (Article12g of the SRMR). Neither is the methodology for the calibration of MREL for banks with a multiple point-of-entry approach, nor the requirement for banks for which the resolution authority envisages winding up under normal insolvency proceedings as a preferred tool over resolution proceedings.

Figure 1
Simplified process of loss absorption and recapitalisation



SOURCE: Devised by authors.

and debt that can absorb losses and can be converted into equity in order to recapitalise the bank should it fail.[6] The aim being that, in the event of a banking crisis that endangers financial stability, rather than public funds being injected, the bank's shareholders and creditors should be the first to bear losses during a bank resolution, so that the bank may return to business as usual (either by itself or after having been acquired by a third party). This requirement, MREL, is set by the resolution authority and is independent of the capital requirements[7] to which banks are also subject and which are determined by the supervisory authority under the solvency framework (for more details on the regulatory framework, see Annex 1).

MREL, regulated in Article 12 of the SRMR, is calibrated on a consolidated basis for the resolution group, in terms of: the resolution group's weighted assets (MREL-TREA, where TREA (Total Risk Exposure Amount) is the risk exposure obtained by applying the capital requirement methodology, i.e. synonymous with risk-weighted assets (RWAs)); and the denominator of the leverage ratio (MREL-LRE (Leverage Ratio Exposure), defined in the solvency framework). Banks must comply with both requirements – MREL-TREA and MREL-LRE – simultaneously.

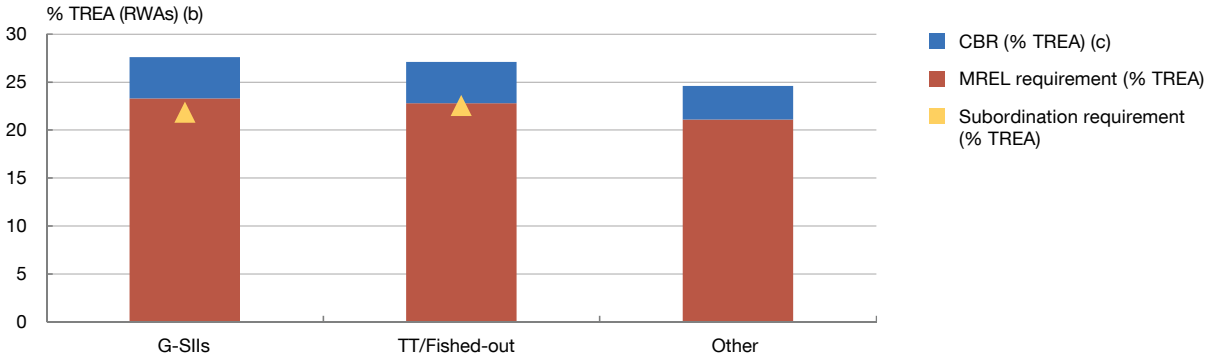
MREL is based on internal loss absorption and subsequent recapitalisation (see Figure 1), so its calibration comprises two components. The first is the loss absorption amount (LAA), which coincides with the capital decision set by the supervisor; thus it is assumed that the losses that a bank would absorb in a crisis are those defined in the solvency framework. The second component is the recapitalisation amount (RCA), which is calculated to determine the capital that a bank would need following the absorption of losses. The calculation of the RCA also stems from the bank's capital decision, which is applied to the bank's balance sheet total, less a series of downward adjustments that can be expected to have a greater impact on medium-sized banks, given that their preferred resolution tool is usually the sale of business (see Annex 1).

6 Pursuant to Article 32 of the BRRD, a bank must be considered as failing or likely to fail when it infringes or is likely in the near future to infringe the requirements for continuing authorisation, when its assets are or are likely in the near future to be less than its liabilities, when it is or is likely in the near future to be unable to pay its debts as they fall due, or when it requires extraordinary public financial support.

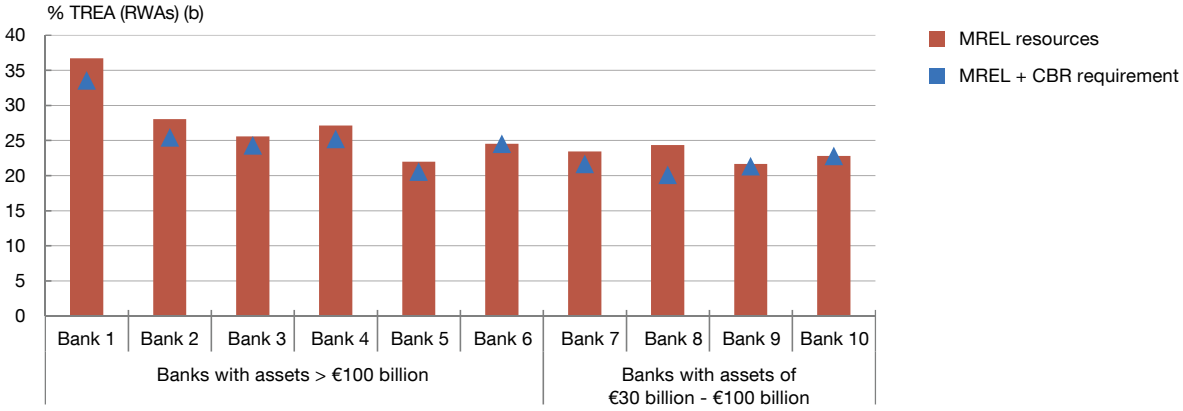
7 European Commission Regulation (EU) No 575/2013 (Capital Requirements Regulation (CRR)).

Chart 1
MREL in the EU and in Spain

1.a MREL requirement for G-SIIs, top-tier/fished-out and other banks (a)



1.b MREL requirement and resources in Spain (ten largest banks)



SOURCES: EBA MREL Dashboard Q2 2023 (Chart 1.a). Banco de España calculations and data reported by banks (Templates M_02.00) for 2023 Q2 (Chart 1.b).

a The chart shows the RWA-weighted averages for each class: G-SIIs; top-tier banks (those with total assets measured for the resolution group over €100 billion); and "Other", which are all banks other than those in the two previous classes, including those with assets under €30 billion for which the resolution authority has set resolution as the preferred strategy rather than winding up under normal insolvency proceedings. These "Other" banks are not subject to the subordination requirement, save for exceptions.
b TREA: Total Risk Exposure Amount.
c CBR: Combined Buffer Requirement. The CBR must be met with CET1 additional to that used to comply with MREL-TREA.

In consequence, in the EU overall the MREL requirements amount to around 23% of RWAs,[8] with medium-sized banks being subject to slightly lower MREL requirements than large banks (see Chart 1.a). The pattern for Spain is similar (see Chart 1.b).

To meet their external MREL banks may use their resolution group's own funds, calculated using the solvency framework methodology. They may also use liabilities, whether or not marketable instruments, provided that they are eligible liabilities[9] and that they meet the criteria laid down in the regulations.[10] In order to be eligible, the liabilities must be issued

8 Calculated as the average weighted by the TREA of each bank. Where a bank's MREL-LRE requirement is higher than its MREL-TREA requirement, MREL-LRE converted to the percentage of TREA is used to calculate the overall requirement.
9 Article 72a(2) of the CRR.
10 Article 12c of the SRMR.

directly by the bank[11] to counterparties outside the resolution group, they must not be directly or indirectly funded by the bank and they must have a residual maturity of more than one year. Moreover, they must include a contractual clause that recognises the power of the resolution authority to make a write-down or conversion, they must not be subject to netting agreements and they must not have contractual clauses allowing early redemption or repayment by the holder or the issuer that make the residual maturity less than one year, or accelerated future payments of interest or principal, or changes in the interest or principal payments according to the bank's credit quality. Nor may they be derivatives or collateralised (secured) liabilities. Accordingly, the following are MREL eligible instruments (provided they comply with the above-mentioned characteristics): CET1, AT1, Tier 2, subordinated liabilities,[12] senior non-preferred debt,[13] senior (unsecured) debt, non-covered non-preferred deposits[14] and structured notes.[15]

In Spain, the type of funds used to comply with MREL differs between large and medium-sized banks. Compared with large banks, medium-sized banks tend to rely more on own funds (see Chart 2.a); indeed, own funds account for around 82% of the funds used by medium-sized banks to meet their MREL requirements, compared with 65% for large banks. It should be noted that in order to comply with the solvency requirements, which, as a general rule, will coincide with the LAA component of MREL, banks must use the funds required by the solvency regulations, i.e. CET1, AT1 and Tier 2. The breakdown of eligible liabilities (see Chart 2.b) shows that medium-sized banks use more senior liabilities than large banks.

These features of the composition of MREL for medium-sized banks may be explained by two factors. First, the difficulties medium-sized banks face accessing debt markets may explain why they use own funds more than debt to meet their MREL. This issue is explored in Section 4 below. Second, the greater weight of senior debt at medium-sized banks may reflect the fact that they are not subject to the subordination requirement applicable to the largest banks (G-SIIs, top-tier and other Pillar 1 banks), which must meet a portion of their MREL with subordinated liabilities, that is, liabilities ranking below those that could be excluded from loss

11 Or exceptionally by subsidiaries of the resolution group, in accordance with Article12c(3) of the SRMR.

12 These are subordinated liabilities that are not recognised as own funds, for instance, subordinated instruments that are not AT1 or Tier 2 eligible but that are MREL eligible, or instruments that are Tier 2 eligible but have a maturity of less than five years (and more than one year to be MREL eligible).

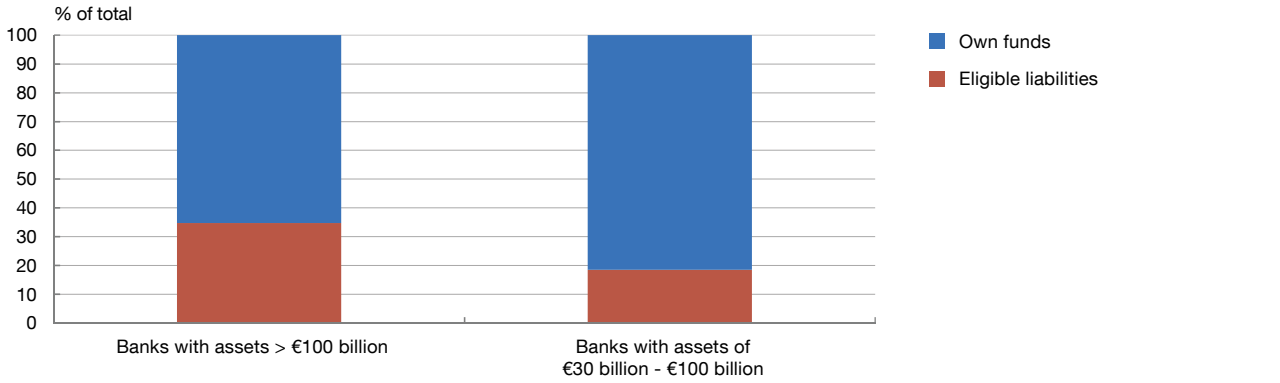
13 A credit category introduced in Spain by the 14th Additional Provision of Law 11/2015 of 18 June 2015 on the recovery and resolution of credit institutions and investment firms, in compliance with Directive (EU) 2017/2399 of the European Parliament and of the Council. These are debt instruments that meet a number of conditions, ranking above subordinated claims but below all other ordinary claims.

14 These are deposits other than deposits of micro, small and medium-sized enterprises and natural persons, provided they meet the eligibility criteria established in the regulation (for instance, they must have residual maturity of more than one year and must not allow early repayments).

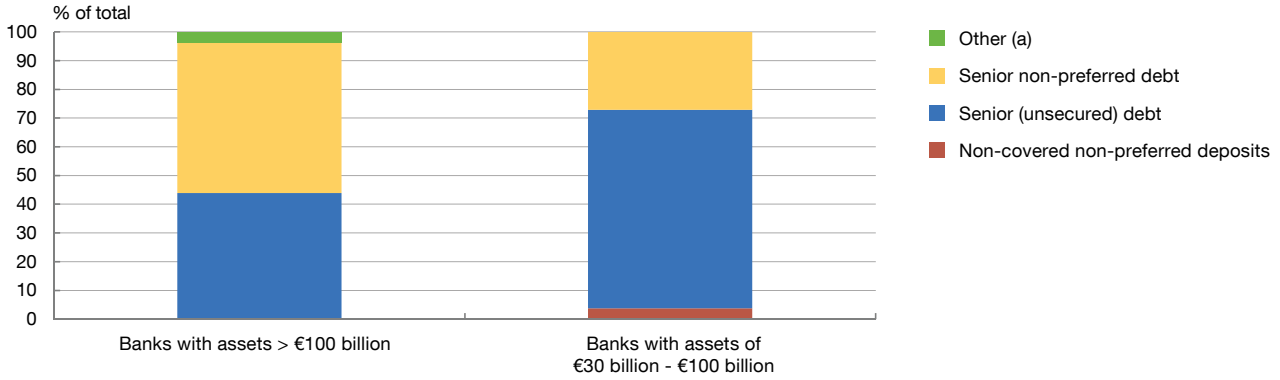
15 Structured notes are MREL eligible if the conditions set out in the SRB's MREL policy are met: if the principal amount of the liability relating to the debt instrument is known at the time of issuance, is fixed or increasing and is not affected by an embedded derivative and can be valued on a daily basis by reference to a liquid and active market for an equivalent instrument without credit risk, in accordance with Articles 104 and 105 of the CRR; or the debt instrument includes a contractual term specifying that the value of the claim in the event of insolvency and resolution of the issuer is fixed or increasing and is not higher than the amount of the liability initially paid. The amount of the eligible liability, if any, shall be equal to the principal or to the fixed or increasing amount referred to in the first of the above conditions.

Chart 2
MREL composition, by balance sheet size: Spain

2.a Composition of MREL resources of large and medium-sized banks



2.b Composition of MREL eligible liabilities (not own funds) of large and medium-sized banks



SOURCE: Banco de España calculations drawing on Templates M_02.00, M_03.00 and M_04.00 for 2022 Q4.

a "Other" are subordinated liabilities (not recognised as own funds).

absorption as they are protected by regulation.[16] Medium-sized banks are not subject to subordination requirements, although there are exceptions to this rule, for example, if there is deemed to be a high risk of creditors being worse off.[17]

3 Data

To analyse banks' market access we use a database constructed by combining CSDB data and additional information from private data providers, such as LSEG Eikon and S&P Capital IQ Pro.

16 By default, the subordination requirement for large banks is set at 8% of their total liabilities and own funds. This threshold may be raised (if the resolution authority determines that impediments to resolvability exist) or reduced (depending on the analysis of no creditor worse off (NCWO) risk, i.e. the risk that creditors may face greater losses as the result of a bank resolution procedure than had the bank entered into normal insolvency proceedings).

17 The EU resolution framework provides appropriate safeguards to ensure that the affected shareholders and creditors will not be worse off in resolution than in the event that the bank had entered into normal insolvency proceedings (the no creditor worse off (NCWO) principle).

The CSDB is compiled by the ECB as part of the European System of Central Banks, which also includes the national central banks of all EU Member States regardless of whether or not they have adopted the euro as their currency. The CSDB provides data on all capital, hybrid and debt instruments issued by EU residents. It has been reported monthly since October 2018, and we accessed data up to October 2023. It includes a broad range of attributes on the type of instruments issued, in addition to some information on the issuers. The CSDB covers all issuances across the Eurosystem.[18] To perform the analysis, the CSDB data are enriched with the issuance cost and other variables for the instruments drawn from LSEG Eikon.

Next we applied a series of filters to the instruments accessible in the CSDB to identify MREL eligible debt instruments issued by significant institutions. First, we identified instruments issued by banks and deposit institutions.[19] Second, we excluded issues of ordinary shares and certain instruments that are not eligible for MREL as they are secured funding instruments. Third, we disregarded instruments with an original maturity of less than one year. To ensure data quality, we performed manual checks on the sample of instruments resulting from applying these filters to Spanish banks, concluding that there were no omissions or incorrect classifications. Fourth, we disregarded bonds issued by less significant institutions (those with total assets under €30 billion).

Lastly, we disregarded instruments with an original maturity of less than two years, given that the issuances intended to cover MREL requirements usually have longer maturities to avoid refinancing risk (we take into account that, in order to be eligible, they must have a residual maturity of at least one year), as well as instruments with a volume of less than €25 million, owing to their lower economic relevance.

Overall, the sample examined is composed of 6,635 unsecured instruments, comprising 5,730 bonds issued by 44 large banks and 905 bonds issued by 50 medium-sized banks (see Charts 3.a and 3.b). The bonds are mostly euro-denominated (69%), but also include bonds denominated in other currencies, notably the US dollar (17%). To analyse the cost, this article focuses on the 3,580 unsecured fixed-rate instruments issued by large banks (2,992 instruments) and medium-sized banks (588 instruments), of which 67% are denominated in euro and 14% in US dollars.

In performing the analyses, we constructed a synthetic bond by aggregating the volume of all issuances from the same issuer, provided that they have the same maturity, level of subordination and year of issuance, irrespective of whether they were issued domestically or internationally.

The database was supplemented with financial information on issuers obtained from S&P Capital IQ Pro. Specifically, we examined the following financial ratios:

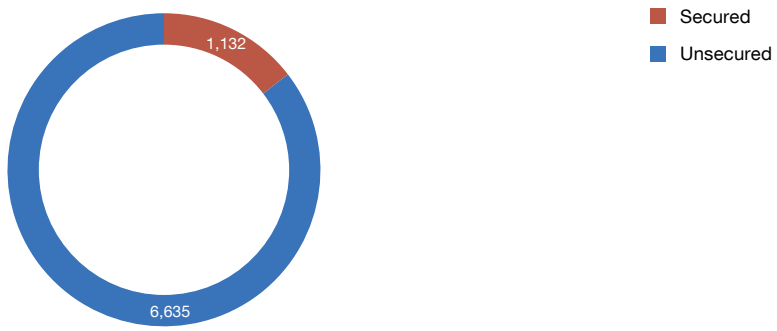
18 The CSDB also provides incomplete information on issuances outside the euro area, including those made by foreign subsidiaries of euro area banks. Given the focus on euro area resident issuers, these are excluded from this analysis.

19 We disregarded those where the issuer's sub-sector was not codes 122, 12202 or 12203.

Chart 3

Breakdown of debt instruments issued by the euro area banking sector (a)

3.a Number of debt instruments: secured vs. unsecured



3.b Number of unsecured debt instruments, by level of subordination

SOURCES: CSDB, LSEG Eikon, Datastream and S&P Capital IQ.

a The sample contains issuances by euro area medium-sized (total assets of €30-100 billion) and large (total assets of more than €100 billion) deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. Data for the period October 2018-October 2023.

b "Residual" includes unsecured structured notes (203); certificates of deposit/commercial paper (528) and uncategorised issuances (923).

— Return on Equity (ROE): this ratio is calculated as net profit divided by equity (average for the last two year-end figures).

— Common Equity Tier 1 (CET1) ratio: CET1 is the highest quality of regulatory capital. It typically includes shares, retained earnings and other reserves. The CET1 ratio shows the ratio between a bank's CET1 capital and its risk-weighted assets.

— Non-performing loan (NPL) ratio: a loan is considered non-performing when more than 90 days have passed without the borrower paying the principal or the interest, or when it is considered non-performing for other reasons. The NPL ratio is calculated as the ratio of NPLs to total loans of the bank in question.

— Cost-to-income ratio: this indicator calculates the ratio of income earned to the expenditure necessary to earn such income in a specific period.

— Liquidity coverage ratio (LCR): the LCR is the percentage resulting from dividing a bank's stock of high-quality liquid assets by the estimated total net cash outflows in a period of liquidity stress lasting 30 calendar days.

Lastly, we obtain information from LSEG Eikon on the issuer's Moody's credit rating.

4 Issuance of MREL eligible debt instruments

Degree of debt market activity

Large banks are significantly more active in issuing MREL eligible debt instruments, and account for 81% of the amount issued and for 77% of the number of issues in the period under review. Large issuers' greater share of the market total – in terms of both the number of issues and the volume issued – remains within the same ranges throughout the time series (see Chart 4.a). Despite their lower share of the total, European medium-sized banks have gradually gained market access. Specifically, there were 17 medium-sized issuers in 2018 and, with the exception of 2020, there have been over 30 in the following years (see Chart 4.b). This trend has been similar in the case of Spanish banks. In October 2023 six medium-sized banks had outstanding instruments, compared with only two in October 2018.

These patterns suggest that medium-sized banks may suffer some debt market access constraints, although they could also be related to a different funding profile. The upward trend in the number of medium-sized issuers is likely related to the need to comply with the MREL requirements, given the context of ample liquidity in the period 2018-2023.

Issuance cost

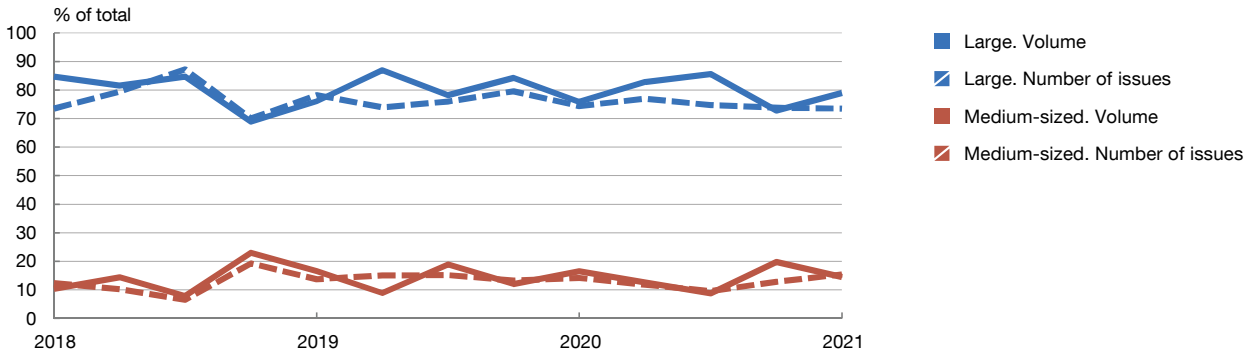
Next we examined the cost of debt issued by large and medium-sized euro area banks, looking at fixed-rate instruments.[20] Debt issued by medium-sized banks has a lower cost than that issued by large banks (see Chart 5.a). The cost is lower when considering both the median value and the weighted average.

This is partly because medium-sized banks have opted to issue instruments with a lower level of subordination; senior debt accounts for around 50% of the volume issued by large banks, a percentage that rises to 85% for medium-sized banks which, as mentioned above, do not have a subordinated MREL requirement (see Chart 5.b). In addition, large banks issue a non-negligible share of AT1 and T2 instruments which, due to their higher level of subordination and, therefore, probability of absorbing losses in the event of a potential resolution, are particularly costly.

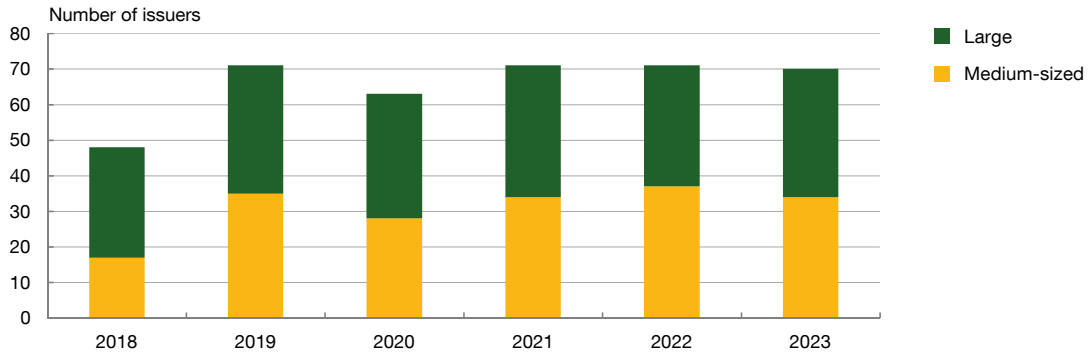
20 See footnote 3.

Chart 4
Overview of the debt issuance market (a)

4.a Volume issued and number of issues, by issuer size (b): euro area



4.b Issuers, by issuer size (b): euro area



SOURCES: CSDB, LSEG Eikon, Datastream and S&P Capital IQ.

a The sample contains unsecured issuances by euro area deposit institutions (privately-owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. The sample includes the residual specified in Chart 3.b. Data for the period October 2018-October 2023.
b Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.

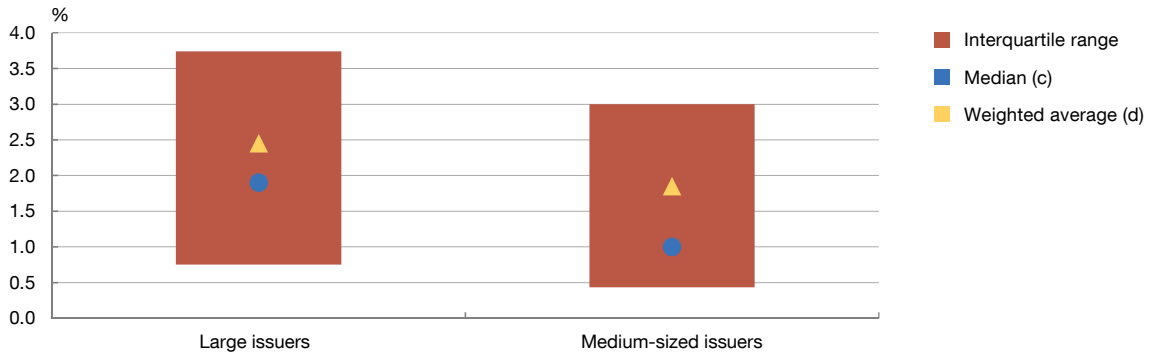
This lower issuance cost for medium-sized issuers is also related to the shorter maturity of their bonds, as the coupon required by investors usually increases with maturity,[21] because investors typically require a term premium. Indeed, in the euro area as a whole large banks' bonds have a median maturity of seven years, compared with just five years for those of medium-sized banks. This difference can also be observed when comparing the weighted average (see Chart 6.a). This pattern is broadly similar across all the jurisdictions analysed. Throughout the period under review, differences in maturity have not had a major impact on issuance cost, but they have become more important following the increase in interest rates: in 2023 the spread between the coupon required on a ten-year and a five-year bond was

21 As mentioned in Section 3, instruments with an original maturity of less than two years have been excluded from the analysis, to focus the study on MREL eligible bonds of economic importance (instruments cease to be eligible for MREL when their residual maturity is less than one year).

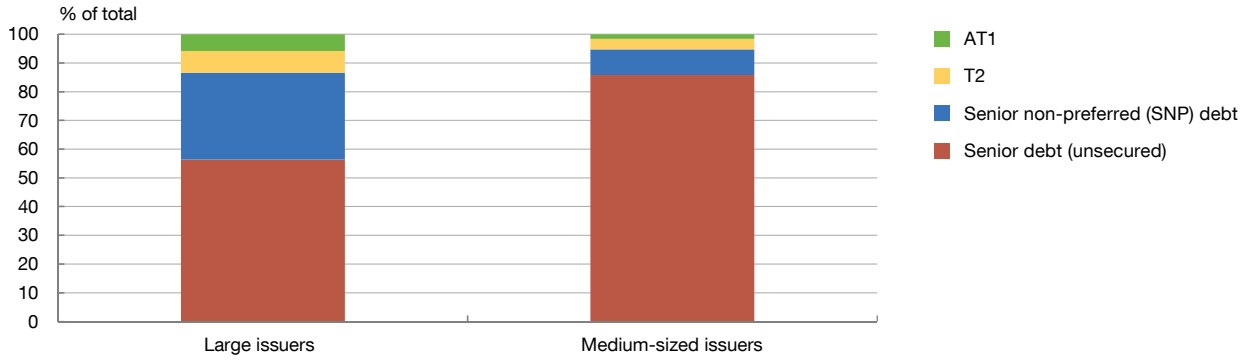
Chart 5

Issuances by large and medium-sized banks: coupon and volume issued, by level of subordination (a)

5.a Coupon, by issuer size (b): euro area



5.b Volume issued, by level of subordination and issuer size (b): euro area



SOURCES: CSDB, LSEG Eikon, Datastream and S&P Capital IQ.

a The sample contains unsecured fixed coupon issuances by euro area deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. The sample includes the residual specified in Chart 3.b. Data for the period October 2018-October 2023.
b Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.
c The median values are highlighted in yellow where there is no statistically significant difference between the medians of the two groups (medium-sized and large) at a significance level of 0.05.
d The average is weighted by volume issued.

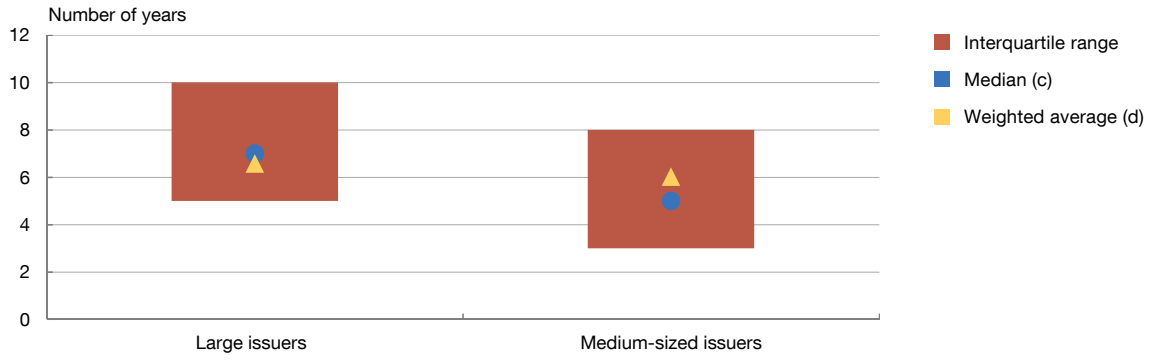
around 90 basis points for senior bonds, which is the deepest category. Nor are the differences in issuance cost associated with the fact that large banks issue proportionally more non-euro-denominated debt than medium-sized ones.

To examine whether the positive spread between the cost of bonds issued by large banks and those issued by medium-sized banks is due exclusively to differences in the level of subordination, maturity and year of issuance, we performed a linear regression which uses the instrument's coupon (cost) as the dependent variable and its issue date, level of subordination and bond maturity (years) as explanatory variables. The analysis of the unexplained fraction of the coupon (hereafter, "residualised coupon") shows that, even controlling for the aforementioned explanatory variables, the positive spread between the issuance costs of large and medium-sized issuers remains.

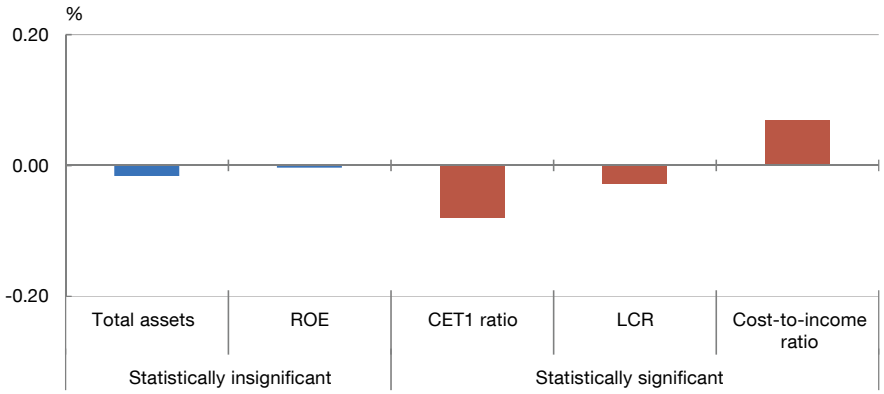
Chart 6

Issuances by euro area large and medium-sized banks: maturity (a) and coupon determinants

6.a Maturity, by issuer size (b)



6.b Impact of bank variables on issuance coupon (e)



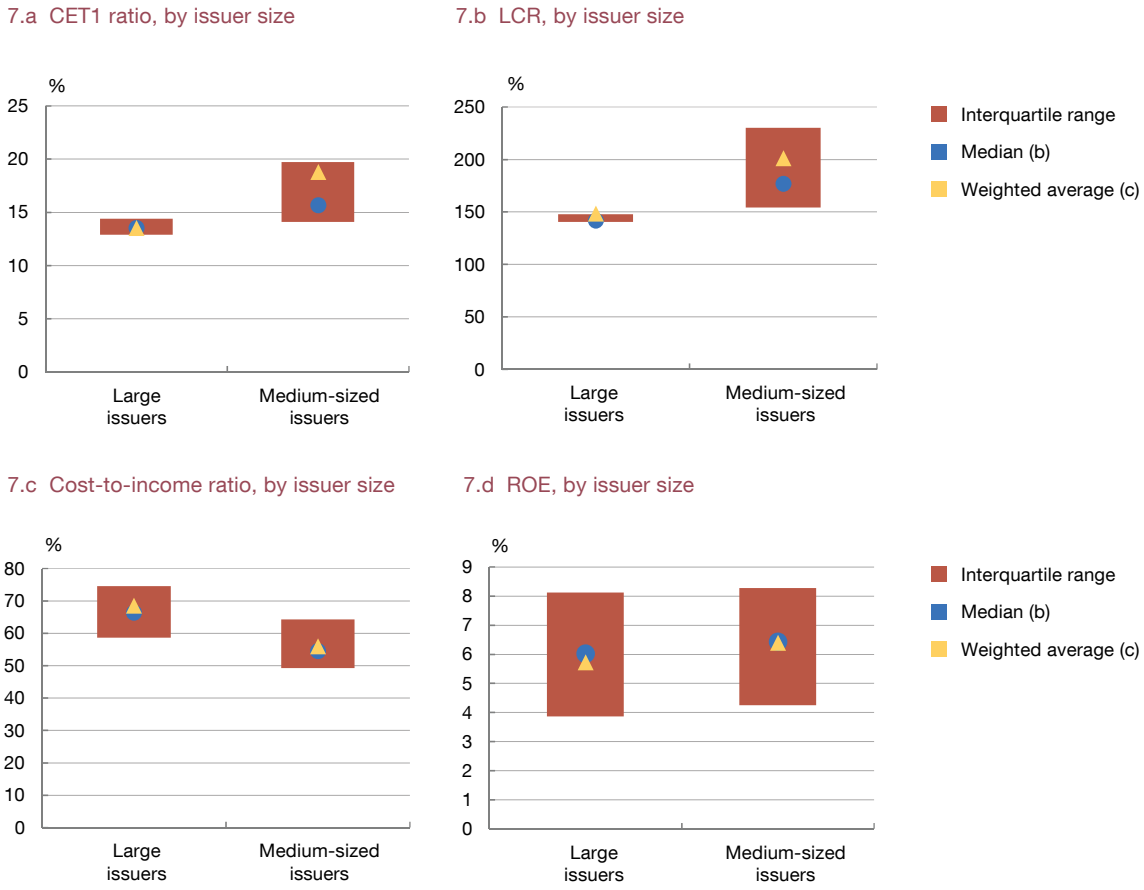
SOURCES: CSDB, LSEG Eikon, Datastream and S&P Capital IQ (Chart 6.a); Banco de España calculations (Chart 6.b).

a The sample contains unsecured issuances by euro area deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. The sample includes the residual specified in Chart 3.b. Data for the period October 2018-October 2023.
b Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.
c The median values are highlighted in yellow where there is no statistically significant difference between the medians of the two groups (medium-sized and large) at a significance level of 0.05.
d The average is weighted by volume issued.
e The impact is defined as a one standard deviation increase in the standardised variables analysed. We perform a linear regression that uses the coupon as the dependent variable and as explanatory variables the logarithm of total assets, the bond's original maturity, a dummy variable indicating whether or not the bond is a senior bond, the lagged annual real GDP growth rate, lagged inflation, the overnight index swap (OIS), the sovereign spread and the Tier 1 capital ratio, the LCR, ROE and cost-to-income ratio. The sample used contains (unsecured) senior debt instruments and senior non-preferred (SNP) debt instruments issued in euro at a fixed rate by deposit institutions resident in Germany, Austria, Belgium, Spain, Finland, France, Greece, Italy, Ireland, Portugal and the Netherlands (without excluding any issuer due to its balance sheet size), with a maturity of two years or more and a volume equal to or greater than €25 million for the period October 2018-October 2023. The logarithm of total assets, ROE and lagged inflation are not statistically significant, whereas the other variables are.

To drill down into the analysis, next we studied the impact of the issuer's financial characteristics on the issuance cost. The linear regression analyses show that this issuance cost is lower for banks with stronger financial ratios: the higher the CET1 ratio or the LCR the lower the coupon, and the higher the cost-to-income ratio (i.e. the lower the efficiency of the bank in question) the higher the coupon. By contrast, the size of the bank, measured by volume of assets, and its profitability have no significant effect on the issuance cost (see Chart 6.b).

Chart 7

Euro area large and medium-sized issuers: financial ratios (a)



SOURCES: CSDB, LSEG Eikon, Datastream and S&P Capital IQ.

a The sample contains euro area deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank) that have issued uncovered bonds with a maturity of two years or more and a volume equal to or greater than €25 million in the period October 2018-October 2023. Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.
b The median values are highlighted in yellow where there is no statistically significant difference between the medians of the two groups (medium-sized and large) at a significance level of 0.05.
c The average is weighted by volume issued.

Differences in the financial characteristics of medium-sized and large issuers may contribute to banks' different financial costs. Medium-sized issuers have a higher CET1 ratio than large banks (see Chart 7.a). The LCR of medium-sized banks is also higher than that of large issuers, which is reflected both in a higher average weighted by volume issued and in the median value (see Chart 7.b). Medium-sized issuers are also more efficient, according to their cost-to-income ratio (see Chart 7.c) and they have higher ROE ratios (see Chart 7.d), although this variable has no significant effect on the issuance cost. The conclusions are robust, both by average weighted by volume issued and by the median value; the median tests indicate that this difference is statistically significant.

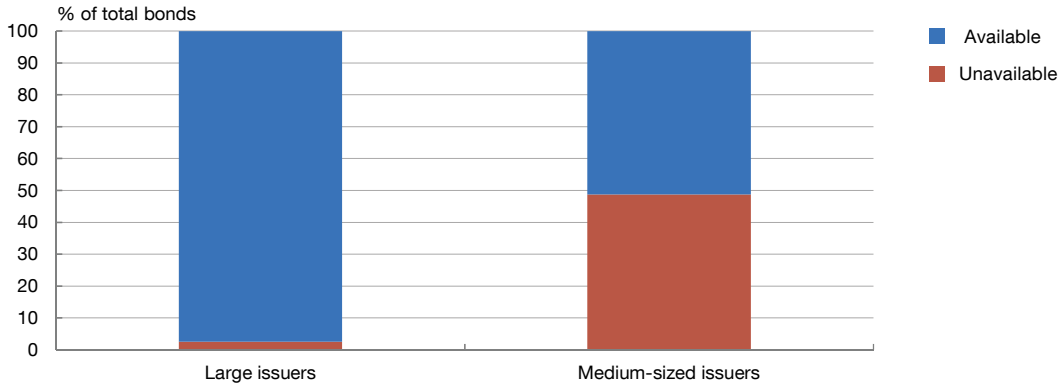
Market access challenges: credit rating

Medium-sized banks still face certain challenges when accessing debt markets, including three credit rating-related constraints. First, according to data from Moody's for the euro

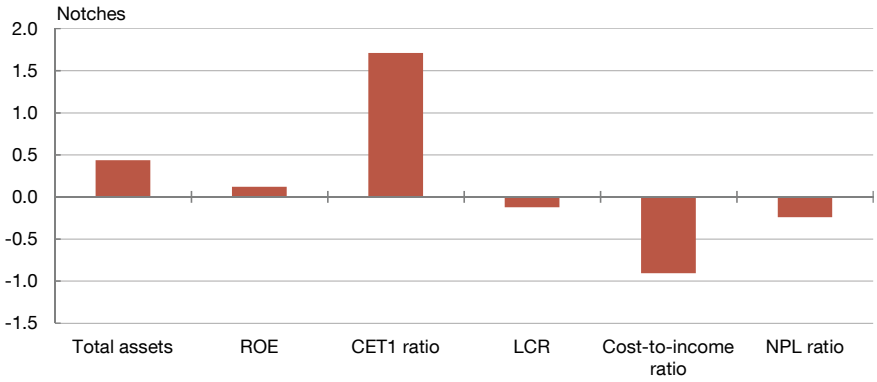
Chart 8

Euro area large and medium-sized issuers: credit rating (a)

8.a Availability of the issuer's credit rating, by balance sheet size (b)



8.b Impact of bank variables on the issuer's credit rating (c)



SOURCES: CSDB, LSEG Eikon, Datastream, S&P Capital IQ and Moody's.

a The sample contains unsecured issuances by euro area deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. The sample includes the residual referred to in Chart 3.b. Data for the period October 2018-October 2023.

b Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.

c The impact is defined as a one standard deviation increase in the standardised variables analysed. We perform a linear regression that uses the issuer's credit rating as the dependent variable and the issuer's total assets, ROE, CET1 ratio, LCR, cost-to-income ratio and NPL ratio as explanatory variables. All the variables are statistically significant at a significance level of 0.01. We use the Moody's credit rating with a numerical equivalence, where "AAA" equals 20 and "CA" equals 1, and the notch is a unit between rating levels.

area, bonds issued by medium-sized banks without a credit rating account for a large percentage of the total, with some cross-jurisdiction differences. By contrast, there are virtually no bonds issued by large banks without a credit rating (see Chart 8.a), a feature common to all the jurisdictions analysed. This reflects the high percentage of medium-sized issuers without a credit rating (58%). Second, for the sub-set of issuers with credit ratings, medium-sized banks have worse ratings than large banks (a median value one notch lower). Indeed, 25% of medium-sized issuers have credit ratings below investment grade. Lastly, the linear regression analysis shows that credit ratings improve with issuer size, even when taking into account the impact of issuers' financial characteristics on the rating (see Chart 8.b).

The fact that the larger the bank the better the credit ratings may be explained, first, by large banks being better known by investors, as they have a longer track record on debt markets and a higher issuance frequency, and there being, therefore, more information available on their capacity and willingness to repay. There is less information available on medium-sized banks and this poses problems of information asymmetry, in terms of both adverse selection (i.e. the actual risk profile of the bank) and moral hazard (in other words, how the bank will behave once the funding has been obtained).[22]

Cross-jurisdiction differences

The results of the analysis of the funding costs show some cross-jurisdiction differences. It is noteworthy that in Spain medium-sized banks' funding costs are higher than those of large banks. This is unrelated to potential differences in the level of subordination, maturity and year of issuance (see Chart 9.a). It may be partly explained by Spanish medium-sized banks having worse cost-to-income ratios than large banks, and not having better solvency ratios (see Chart 9.b). This is, however, only a partial explanation, as the linear regression analyses confirm that Spanish medium-sized banks pay a higher coupon than other large and medium-sized euro area banks, even when taking into account macroeconomic variables and issuers' financial ratios.[23] One aspect that could explain this would be the shallower depth of the Spanish domestic market, as smaller banks typically find it difficult to issue on international markets. This is an avenue for future research.

5 Conclusions

European banks must hold a sufficient amount of capital and debt instruments that can absorb losses and, where necessary, be converted into equity in order to allow for the proper implementation of the resolution plan by the resolution authorities.

The MREL framework quantitatively sets the percentage (both in terms of risk-weighted assets and of leverage ratio exposure) required of EU credit institutions. This has raised doubts about medium-sized issuers' ability to access debt markets, considering that they do so less frequently, with smaller issuances that have a lower level of subordination.

Using highly granular data on unsecured debt issuances by euro area credit institutions, we find that:

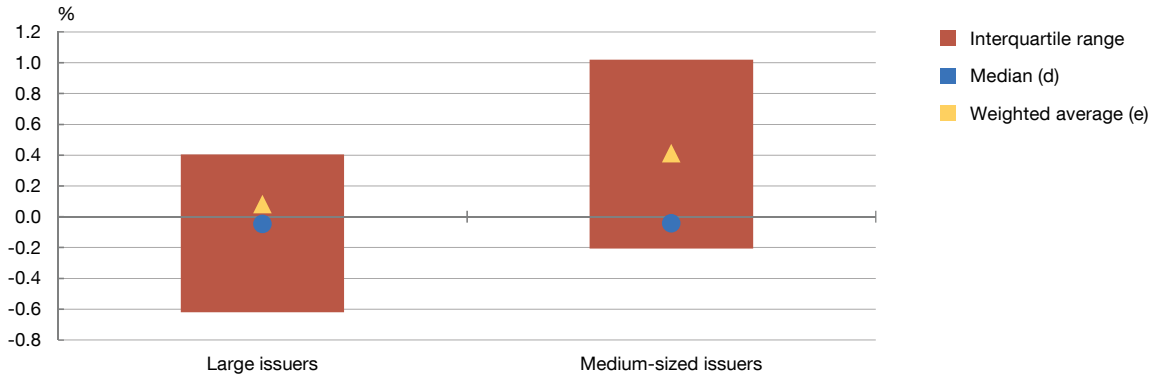
22 This may be linked to other circumstances, such as medium-sized banks having higher NPL ratios than large banks, although these ratios have been declining in recent years for all European banks (Laviola, 2023). Data limitations prevent a formal analysis of this hypothesis.

23 The linear regression model specified in Chart 6.b is used, adding as an explanatory variable a dummy that takes a value of 1 for the medium-sized banks in each country.

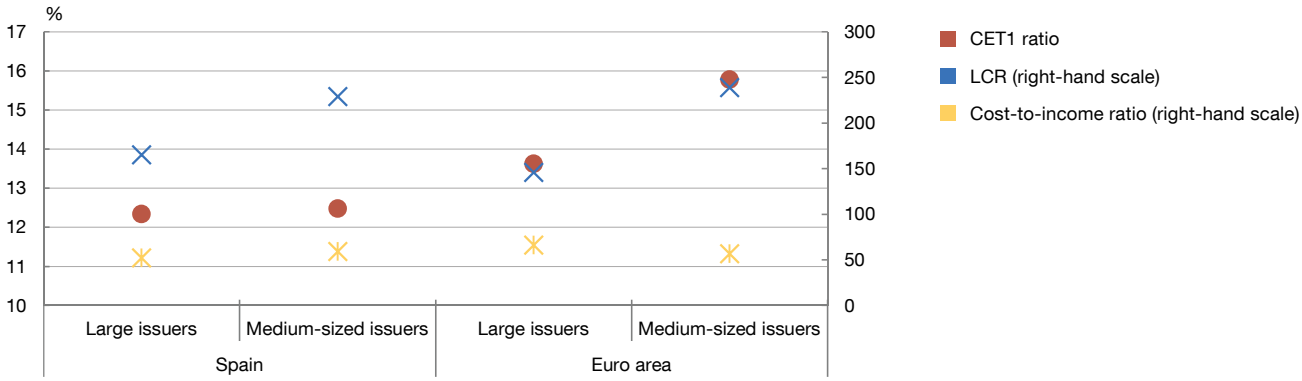
Chart 9

Spanish banks' issuance cost and issuer fundamentals (a)

9.a Residualised coupon (b), by issuer size (c): Spain



9.b Median value of financial ratios, by issuer size (c): Spain vs. euro area



SOURCES: SDB, LSEG Eikon, Datastream and S&P Capital IQ.

a The sample contains unsecured fixed coupon issuances by euro area deposit institutions (privately owned domestic institutions and those controlled by foreign capital and excluding the central bank), with a maturity of two years or more and a volume equal to or greater than €25 million. The sample includes the residual specified in Chart 3.b. Data for the period October 2018-October 2023.
b The "residualised coupon" or unexplained fraction of the coupon is the residual resulting from the linear regression of the coupon on maturity (years), level of subordination and issuance date.
c Large issuers have total assets of more than €100 billion and medium-sized issuers have total assets of €30-100 billion.
d The median values are highlighted in yellow where there is no statistically significant difference between the medians of the two groups (medium-sized and large) at a significance level of 0.05.
e The average is weighted by volume issued.

— The issuance market is dominated by large issuers, which have a better credit rating in the sample analysed.

— Potentially as a result of the needs established by the MREL requirements, since 2018 there has been a rise in the number of medium-sized issuers, which have taken advantage of the low interest rate environment.

— Euro area medium-sized issuers bear lower issuance costs than large banks; this is partly associated with the shorter maturity and lower level of subordination of their bonds.

— The issuance cost differences are also explained by the fact that medium-sized issuers have better solvency, liquidity and cost-to-income ratios than large banks.

— Some cross-jurisdiction differences exist: in Spain, medium-sized banks bear higher issuance costs than large banks, amid worse cost-to-income ratios and similar solvency ratios.

— Medium-sized banks still face some challenges in accessing debt markets, most notably their poorer credit ratings.

The findings suggest that, when building up their MREL capacity, medium-sized banks are consistently gaining market access, although certain challenges persist.

One question, looking ahead, would be whether markets would be able to absorb larger scale debt issuance by medium-sized issuers or by smaller issuers that were also subject to a resolution framework in the face of a potential crisis event.

REFERENCES

Avgouleas, Emilios, and Charles A. Goodhart. (2014). "A critical evaluation of bail-in as a bank recapitalisation mechanism". Discussion Paper Series, 10065, Centre for Economic Policy Research. https://cepr.org/publications/dp10065

Cutura, Jannic A. (2021). "Debt holder monitoring and implicit guarantees: Did the BRRD improve market discipline?". *Journal of Financial Stability,* 54, 100879. https://doi.org/10.1016/j.jfs.2021.100879

European Banking Authority. (2022). "EBA Quantitative MREL Report". Accessed on 5 March 2024. https://www.eba.europa.eu/sites/default/files/document_library/Publications/Reports/2022/1031193/EBA%20MREL%20shortfalls%20Report.pdf

European Banking Authority. (2023). "EBA MREL Dashboard Q2 2023". Accessed on 5 March 2024. https://www.eba.europa.eu/sites/default/files/2024-01/17a0a1a7-1cd8-4e91-9ca1-33f1382387f9/MREL%20Dashboard%20-%20Q2%202023.pdf

European Commission. (2023). "Commission Staff Working Document/Executive Summary of the Impact Assessment Report Accompanying the Proposals for a Directive of the European Parliament and Council amending Directive 2014/59/EU as regards early intervention measures, conditions for resolution and financing of resolution action (...)". Accessed on 14 February 2024. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52023SC0226

Klaus, Benjamin, and Beatriz Sotomayor. (2018). "Box 7. Bond funding of euro area banks: progress in the issuance of loss-absorbing instruments". *ECB Financial Stability Review,* November. https://www.ecb.europa.eu/press/financial-stability-publications/fsr/focus/2018/pdf/ecb~d14cd1ab51.fsrbox201811_07.pdf

Koetter, Michael, Thomas Krause, Eleonora Sfrappini and Lena Tonzer. (2022). "Completing the European Banking Union: Capital cost consequences for credit providers and corporate borrowers". *European Economic Review,* 148, 104229. https://doi.org/10.1016/j.euroecorev.2022.104229

Koetter, Michael, and Huyen Nguyen. (2023). "European Banking in Transformational Times: Regulation, Crises and Challenges". IWH Studies, 7/2023, Halle Institute for Economic Research. https://hdl.handle.net/10419/280432

Laboureix, Dominique. (2017). "6th Industry Dialogue: 2017 MREL Policy". Single Resolution Board. https://www.srb.europa.eu/system/files/media/document/20171120_6th_industry_dialogue_item_2_mrel_dominique_laboureix.pdf

Laviola, Sebastiano. (2023). "The evolution of NPLs in Europe: regulatory perspective and market developments". Speech for the NPL Conference, Naples. https://www.srb.europa.eu/en/content/sebastiano-laviolas-speech-evolution-npls-europe-regulatory-perspective-and-market

Lewrick, Ulf, José María Serena and Grant Turner. (2019). "Believing in bail-in? Market discipline and the pricing of bail-in bonds". BIS Working Papers, 831, Bank for International Settlements. https://www.bis.org/publ/work831.htm

Martín-Oliver, Alfredo. (2013). "Financial integration and structural changes in Spanish banks during the pre-crisis period". *Financial Stability Review - Banco de España,* 24, pp. 109-123. https://repositorio.bde.es/bitstream/123456789/11463/1/ref2013246.pdf

Restoy, Fernando. (2016). "The challenges of the European resolution framework". Closing address of the Conference 'Corporate governance and credit institutions' crises', Mercantile Law Department, UCM (Madrid). https://www.bis.org/review/r161220d.pdf

Schäfer, Alexander, Isabel Schnabel and Beatriz Weder di Mauro. (2016). "Bail-in Expectations for European Banks: Actions Speak Louder than Words". Discussion Paper Series, 11061, Centre for Economic Policy Research. https://cepr.org/system/files/publication-files/DP11061.pdf

Single Resolution Board. (2023a). "Small and Medium-Sized Banks: Resolution Planning and Crisis Management Report for Less Significant Institutions in 2022 and 2023". https://www.srb.europa.eu/system/files/media/document/2023-10-03_LSI-Small-and-medium-sized-banks-2022-2023.pdf

Single Resolution Board. (2023b). "Minimum Requirement for Own Funds and Eligible Liabilities (MREL)". https://www.srb.europa.eu/system/files/media/document/2023-05-15_SRB_MREL_Policy_2023_final%20_clean.pdf

Single Resolution Board. (2024). "SRB MREL Dashboard Q3.2023". Accessed on 22 February 2024. https://www.srb.europa.eu/system/files/media/document/2024-02-12_MREL-dashboard-Q3-2023_0.pdf

Annex 1 MREL regulatory framework

Key features of the MREL regulatory framework

Because it is a directive, each Member State transposes the Bank Recovery and Resolution Directive (BRRD) into its national legislation. The BRRD was transposed into Spanish legislation by Law 11/2015, Royal Decree 1012/2015 and Royal Decree-Law 7/2021 which regulate the early intervention and resolution processes for credit institutions and investment firms in Spain.

Law 11/2015 establishes the legal regime of the Spanish executive resolution authority (FROB) and has the ultimate objective of protecting financial stability while minimising the use of public funds. In addition, it confers on the Banco de España the role of preventive resolution authority tasked with drawing up resolution plans for the institutions under its competence for bank resolution (less significant institutions). In addition, the Banco de España collaborates with the Single Resolution Board (SRB) in those tasks with which it is entrusted in relation to significant institutions and institutions with cross-border activity, which are the SRB's direct responsibility. This distinction between the field of competence of the SRB and that of the national resolution authorities (NRAs) – the Banco de España, the National Securities Market Commission and the FROB are Spain's NRAs – stems from the Single Resolution Mechanism Regulation (SRMR),[1] which is directly applicable in the euro area. The Single Resolution Mechanism is the second pillar of the banking union, alongside the Single Supervisory Mechanism, the prudential supervision pillar. Therefore, the SRB is the authority that sets the MREL target of significant institutions, which are the focus of the analysis in this article.

Recapitalisation amount

The recapitalisation amount (RCA) is calibrated based on the capital decision set by the supervisor. A series of upward adjustments are applied to this decision,[2] including a market confidence charge, for the MREL calibrated in terms of total risk exposure amount (MREL-TREA), together with downward adjustments intended to factor in balance sheet depletion during resolution (Single Resolution Board, 2023b).

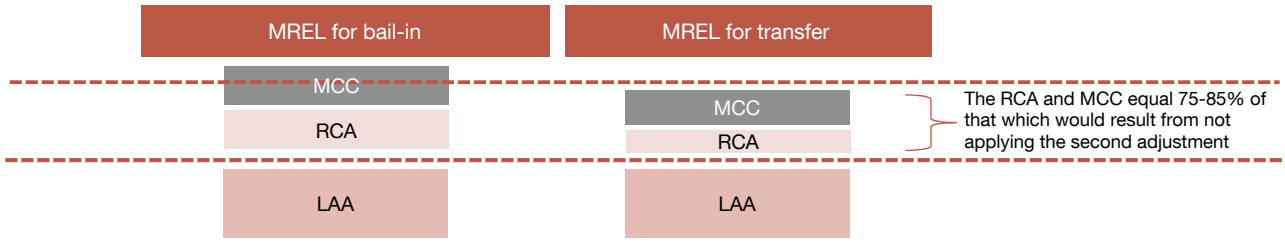
The first adjustment reflects the balance sheet depletion arising from the absorption of losses incurred in the crisis and is applicable to all institutions, irrespective of the resolution tool that the authority establishes as the preferred resolution tool in the institution's resolution plan.[3] The second adjustment only affects institutions whose preferred resolution strategy is the

1 Regulation (EU) No 806/2014 of the European Parliament and of the Council.

2 On the basis of Article 12d(3) of the SRMR.

3 Specifically, total assets are generally adjusted by an amount equal to the LAA (plus the combined buffer requirement for the MREL-TREA), with a limit of 10% of total assets.

Figure A1.1
MREL requirement: bail-in vs. transfer



SOURCE: Devised by authors.

transfer tool (sale of business to a third party via the acquisition of shares or assets and liabilities, the creation of a bridge institution and/or the application of the asset separation tool) and reduces the balance sheet (once the first adjustment has been applied) by a factor of 15%-25% (see Figure A1.1). The specific adjustment factor is determined on the basis of the institution's expected marketability in the event of a crisis, by interpolating the marketability of the institution compared with the sample of all the institutions under the SRB remit. It is greater the smaller the bank's size (measured by total assets), the lower its level of impairment (measured by the ratio of non-performing exposures net of allowances over total assets), the larger its depositor base (measured by the ratio of covered deposits to total assets) and the lower the level of uncertainty on the valuation of its activities (measured by the ratio of Level 3 assets to total assets).

This second downward adjustment to the RCA (which results in a lower MREL calibration) should affect medium-sized banks, whose preferred resolution strategy is typically the sale of business, more than large banks, whose preferred resolution tool tends to be bail-in (European Banking Authority, 2022).[4]

How to cite this document

Ibáñez, Lucía, Miguel Kruse, María Pollos, José María Serena and Miquel Tarí. (2024). "The euro area banking sector and MREL: a challenge for medium-sized banks?". *Financial Stability Review - Banco de España,* 46, Spring. https://doi.org/10.53479/37655

4 This adjustment is applied to the RCA after the adjustment for loss absorption.

A METHOD FOR REDUCING CREDIT SCORES' SENSITIVITY TO ECONOMIC CONDITIONS

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https://doi.org/10.53479/37652

The authors belong to the Directorate General Banking Supervision. They are grateful to Lola Morales, María Jesús Espinosa and Fátima Abaitua for their assistance with data collection and preparation, and to Sergio Gavilá and an anonymous referee for their helpful comments and suggestions. Contact form for comments.

Abstract

The cyclicality of credit risk capital requirements has been a matter of concern for banking regulators, supervisors and the industry for years. The sensitivity to economic conditions of the probability of default (PD) grades to which credit exposures are assigned is often one of the most relevant sources of such cyclicality. Moreover, it is often assumed that a grade assignment method with a high differentiation capacity inherently leads to a high sensitivity to economic conditions. In order to challenge this assumption and foster further research – but with no intention of setting any expectation or recommendation for financial institutions – this article explores a methodology aimed at limiting the sensitivity to economic conditions of a pre-existing score while maintaining its differentiation ability, by adding a module to it. This module subtracts an amount which reflects the estimated effect of economic conditions. This allows the original and the adjusted scores to coexist and be used for different purposes. After testing that the methodology works on a synthetic dataset, its effectiveness is confirmed on a real dataset obtained from Banco de España internal sources. The results indicate a significant reduction in the variability of PD and risk weights when comparing a PD calibration of the original score with a PD calibration of the adjusted score.

Keywords: Scoring methods, grade assignment dynamics, probability of default, risk-weighted assets, cyclicality.

1 Introduction

1.1 Credit risk capital requirements: cyclicality and risk sensitivity

From a solvency perspective, the main aim of the regulatory framework is to ensure that institutions hold an amount of capital which is sufficient to ensure their financial stability over time. To this end, the regulatory approach is to ensure that the capital level of an institution at any time is sufficient to absorb unexpected losses, even in the occurrence of extremely severe adverse conditions and regardless of the current state of the economy.

It is therefore desirable for capital requirements not to fluctuate cyclically with the economy. Otherwise, a deterioration in the economic environment would increase risk-weighted assets (RWAs) at a time when the economy is in great need of continued lending support. Conversely, in good economic times, capital requirements would fall, reducing institutions' resilience to economic downturns. This is clearly undesirable from a prudential point of view.

A second fundamental desired feature is that capital requirements should be risk sensitive, i.e. they should vary over time in a way that reflects changes in the riskiness of the institution's portfolios.

Combining these two features is one of the greatest difficulties in determining capital requirements. Indeed, in order to have capital requirements that are reactive to changes in riskiness but not to cyclical patterns, the effects related to changes in the economy need to be disentangled from unrelated effects. This issue has been a focus of regulatory and supervisory attention since the Basel II[1] accords of 2004.

1.2 The role of grade assignment dynamics (GAD) in internal ratings-based (IRB) models

Under the IRB approach for credit risk, institutions assign each obligor to a rating grade or pool. Obligors with similar default risk should be assigned to the same grade or pool, and obligors with different default risk to different grades or pools. As a result of the PD calibration, each grade or pool is univocally mapped to a PD. Grade or pool assignments must be reviewed as updated and relevant information about the obligor becomes available. However, the PD of the grades or pools remain constant over time until ongoing monitoring identifies a need to recalibrate them. Moreover, according to the regulatory framework, these grade PDs are intended to reflect long-term credit risk, and should therefore be relatively stable.

To obtain a portfolio's IRB capital requirements for credit risk at a specific date, each obligor in the portfolio is given a PD equal to that of the grade or pool to which the obligor is assigned at that date. These PDs are then used as inputs to the regulatory formula that calculates the capital requirement for each exposure. As a result of this framework, the PDs of the obligors in the portfolio, and thus the average PD of the entire portfolio, will vary essentially as a result of changes in the grades or pools to which the obligors are assigned, regardless of the method used to derive the PDs of the grades or pools.

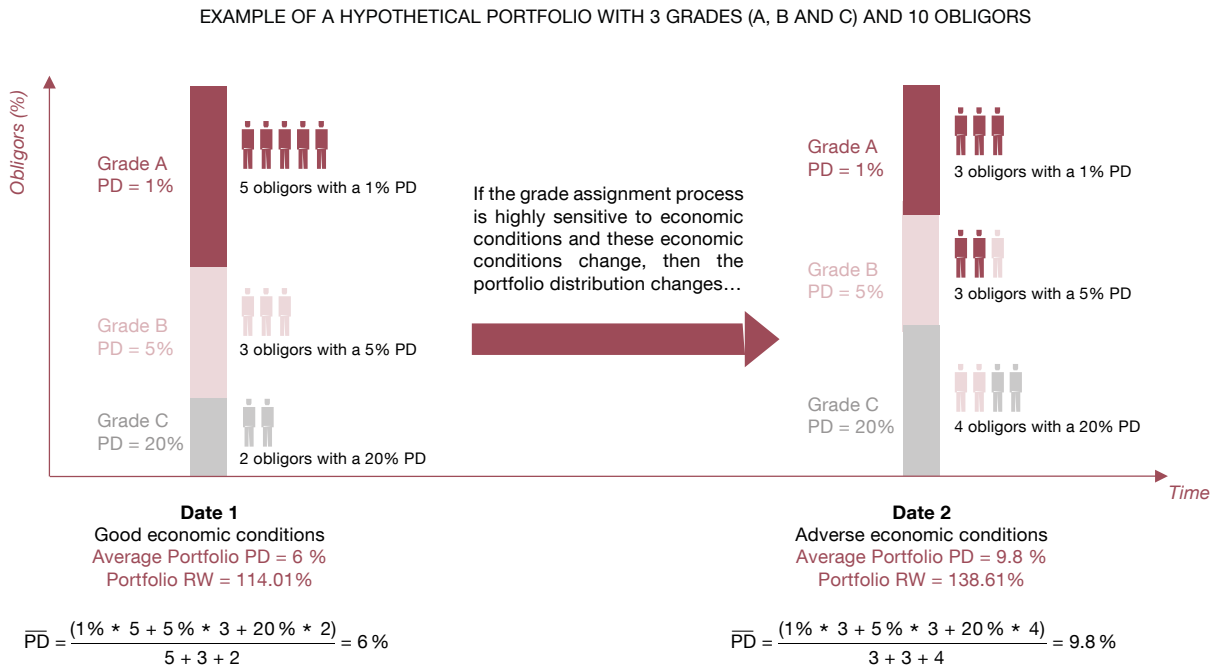
In particular, if the grade assignment process is highly sensitive to economic conditions, changes in the state of the economy will tend to make obligors/facilities migrate in the same direction. In other words, obligors/facilities will tend to migrate to better grades (with lower PD estimates) during upturns and to worse grades (with higher PD estimates) in adverse economic conditions. These cyclical migrations will lead capital requirements to behave cyclically, increasing in bad years and decreasing in good years. Figure 1 below attempts to illustrate this.

In the example shown in Figure 1 we have a portfolio with 10 obligors and 3 grades (A, B and C). At date 1, when economic conditions are good, 5 obligors are assigned to grade A, 3 obligors to grade B and 2 obligors to grade C. The average portfolio PD is 6% and the portfolio risk weight (RW)[2] is 114.01%. Let us now assume that some time later, at date 2, these economic conditions worsen (and nothing else changes). If the grade assignment process is highly

1 BCBS (2004).

2 RW computed in accordance with Article 153 of Regulation (EU) No 575/2013 by assuming: loss given default (LGD)=45%, maturity (M)=2.5, sales<€5 million, 10 obligors each of them with the same exposure amount.

Figure 1
The role of grade assignment dynamics



SOURCE: Banco de España.

sensitive to economic conditions, obligors would migrate to worse grades. The new portfolio distribution would have 3 obligors in grade A, 3 obligors in grade B and 4 obligors in grade C. The average portfolio PD is now 9.8% and the portfolio RW is 138.61%. The average portfolio PD therefore changes from 6% to 9.8% and the portfolio RWs from 114.01%. to 138.61%, simply as a result of a change in macroeconomic conditions and not because of idiosyncratic or structural changes. The observed volatility in macroeconomic conditions impacts the average portfolio PD (+63.3% relative increase), which ultimately impacts the RW (+21.6% relative increase) and hence capital requirements.

The cyclicality of capital requirements is not the only consequence of grade assignment dynamics. As different institutions' grade assignments differ in their level of sensitivity to economic conditions, PDs (and hence RWAs) across institutions will exhibit variability which is not driven by their intrinsic portfolio risk level. This can be an unwarranted source of variability across institutions.

These important consequences of GAD, which are especially relevant for institutions operating in jurisdictions characterised by large economic fluctuations, have been a major source of concern for the different parties involved (regulators, supervisors and industry).

It is worth noting that, at the macro-prudential level, the regulatory framework includes a countercyclical capital buffer aimed at mitigating regulations' system-wide pro-cyclical effects. Its inclusion was motivated by the lessons learnt during the financial crisis. This buffer

seeks to address situations in which system-wide risks build up during times of excessive aggregate credit growth. It is set at the level of the country where the exposures are located and is activated in times of excessive credit growth. It should however be noted that situations of excessive credit growth do not necessarily cover all the circumstances where the economy follows a cyclical pattern with an effect on the risk drivers used to assign obligors to grades, as the latest economic developments have shown. This, together with the level at which it operates, makes the countercyclical capital buffer insufficient to prevent capital requirements from varying cyclically at the micro-prudential level as a result of GAD, or to prevent IRB capital requirement differences across institutions from being unduly affected by different levels of grade assignment's sensitivity to cyclical effects.

In this context, it is very important to have techniques available to perform grade assignments that do not change significantly as a result of fluctuations in economic conditions. This clearly poses a challenge for institutions, since they are required to design risk-sensitive grade assignment processes that take into consideration as much relevant information about the obligors as possible.[3] This leads institutions to consider, among others factors, risk drivers that fluctuate with economic conditions, and these fluctuations are ultimately transmitted to the grade assignments. Here is where the aforementioned difficulty in discerning cyclical vs non-cyclical effects during the grade assignment becomes clear, as it would be desirable for grades to vary in line with changes in the exposure's characteristics that do not result from cyclical effects. The European Central Bank's (ECB) supervisory expectations, as set out in paragraph 105 of the current ECB Guide to internal models[4] (Credit Risk chapter), clearly illustrate this tension, by requiring that *"[…] the rating/grade/pool assignment process should also adequately anticipate and reflect risk over a longer time horizon and take into account plausible changes in economic conditions […]"* while stressing that *"[…] this does not mean that grades remain stable over the longer time horizon in the event of changes in the risks that are specific to the obligor […]".*

However, this tension is not just a result of regulatory requirements. Indeed, institutions often use internal grades for different management purposes. For those that require a longer-term perspective, insensitive grade assignments would be desirable. Conversely, more sensitive assignments would be more adequate for shorter-term management purposes. Having a single grade assignment process would necessarily be suboptimal in at least one of these perspectives. By contrast, having different grade assignment processes for different purposes would increase complexity. In this regard, regulations require that the assignment process used for regulatory purposes be integrated within the institution's risk management and decision-making activities, including credit approval and internal capital allocation, and stipulate that any deviation of regulatory processes from management processes must be duly justified.

3 According to Article 171 of Regulation (EU) No 575/2013, "an institution shall take all relevant information into account in assigning obligors and facilities to grades or pools".

4 ECB (2024).

The approach typically adopted to address these seemingly conflicting requirements is to strike a balance between risk sensitivity and cyclicality, in other words, to seek a minimum sufficient compromise in terms of risk sensitivity so that the grade assignment is not overly sensitive to economic conditions.

1.3 The goal

While there is some research on approaches that attempt to influence PD dynamics during risk quantification (see, for instance, Carlehed and Petrov, 2012, or Rubstov, 2021), the literature on approaches that limit cyclicality in the risk differentiation function is scarce. An exception is found in Rubstov and Petrov, 2016, where a method is proposed to define "floating" grades that removes systemic effects from the scores.

This article falls within the latter type of approaches. Therefore, it does not discuss or address the way in which, given a scoring method, PDs are obtained for its grades. The aim of this article is to explore a possible methodology to limit the sensitivity to economic conditions of the scores assigned using an existing scoring method, while maintaining their risk differentiation ability. The scores would coexist with an adjusted version of them, allowing different assignment dynamics to be considered for different risk management purposes. The adjusted scores can then be used as input to any PD calibration method.

By no means should this article be interpreted as an expectation or recommendation for institutions to follow this particular methodology. Its intention is to foster and promote the development and availability of such techniques, and to test the feasibility of institutions obtaining grade assignments which are sufficiently stable to changes in economic conditions. It is up to the institutions to develop and implement the methodologies that better suit their needs, while complying with the requirements and expectations.

Section 2 below elaborates on the proposal from a theoretical perspective. Sections 3 and 4 use synthetic and real data, respectively, to test the proposal. Some concluding remarks are presented in Section 5.

2 Deriving the idiosyncratic component of a scoring method

It is commonplace within the industry to use scoring methods which synthesise all (or almost all) of the relevant information to rank credit exposures[5] according to their risk of default into a single numerical value, called *score.* Even though macroeconomic indicators are generally not considered explicitly when obtaining this score, economic conditions can still influence the assigned scores. This is due to the interdependence between the state of the economy and many of the risk drivers that are typically considered. For example, a company's turnover

5 Exposure is understood to mean obligor or facility. For the sake of simplicity, it will be referred to as obligor from now on.

or financial ratios (commonly used risk drivers for corporate portfolios) are usually affected by the macroeconomic environment.

The application of a scoring method over time generates a dataset of obligor scores for different dates. Given that obligors enter/exit the portfolio as time goes by, not all obligors are present at all dates. Together with their default flags, this constitutes the basic historical information needed for PD estimation purposes. The score of obligor i at date t within the dataset is denoted as $s_{i,t}$.

Let c_t be a time series for the dates available in the dataset. Natural ways of defining c_t would be centrality measures of the scores of the obligors in the portfolio at date t, such as the mean or the median of the individual scores. Then, $s_{i,t}$ can be expressed as the sum of c_t plus the deviation from it:

$$s_{i,t} = c_t + \left(s_{i,t} - c_t\right)$$

Or, replacing $s_{i,t} - c_t$ with $e_{i,t}$, as:

$$s_{i,t} = c_t + e_{i,t}$$

It may be that c_t is related to some economic indicators $m_1, ..., m_M$, allowing a meaningful regression to be obtained for certain coefficients $\beta_0, ..., \beta_M$, as:

$$c_t = \beta_0 + \sum_{j=1}^{M} \beta_j m_{j,t} + \varepsilon_t$$

where ε_t denotes the residuals of the regression.

If this is the case, inserting this expression of c_t into the previous equation gives:

$$s_{i,t} = \beta_0 + \sum_{j=1}^{M} \beta_j m_{j,t} + \varepsilon_t + e_{i,t}$$

From the previous expression, the scores in the dataset can be split into two components:

$$s_{i,t} = s_t^m + s_{i,t}^*$$

The first component,

$$s_t^m \overset{\text{def}}{=} \beta_0 + \sum_{j=1}^{M} \beta_j m_{j,t}$$

represents the systemic effect on the score centrality measure c_t of the economic conditions reflected by the set of indicators $m_{j,t}$.

The second component,

$$s^{*}_{i,t} \overset{def}{=} \varepsilon_t + e_{i,t}$$

is the sum of (i) the part of the score centrality measure c_t that is not explained in terms of economic indicators (residuals of the regression), plus (ii) the deviation of the score of obligor i from the centrality measure c_t. This term, which is the component of the scoring method that is free from the influence of the considered economic indicators, can also be expressed as:

$$s^{*}_{i,t} = s_{i,t} - \left(\beta_0 + \sum_{j=1}^{M} \beta_j m_{j,t} \right)$$

This expression represents an alternative scoring method (adjusted score) which can be used to obtain scores for any exposure (not only for the ones included in the dataset, but also for exposures outside this dataset, including those observed at any date t not considered when performing the linear regression against macroeconomic indicators). This adjusted score depends on all the inputs and parameters that were already necessary to obtain $s_{i,t}$ with the original scoring method, plus the inputs $m_{j,t}$ (namely, the economic indicators at date t) and parameters β_j. This adjusted scoring method must necessarily be performed in two steps. First, a scoring method, s, is developed. In the second step, the β_j parameters are determined.

This second step includes the identification and selection of the economic indicators to be used ($m_{j,t}$). The selection of economic indicators needs to be done on a case-by-case basis, as it is highly dependent on the specifics of the particular scoring method used, such as the country where the exposures are located, the sector to which they belong and other characteristics of the exposures within the scope of application of the score. This article does not attempt to provide any guidance on how to select the economic indicators or a list of indicators that should be used. Any reference to specific economic indicators made here must be understood as one of a wide range of possible choices.

A practical difficulty in the application of this scoring method is the availability of the values of $m_{j,t}$ at the time of the grade assignment, as these are likely to be economic indicators whose actual values become known with some delay. One way to tackle this is to use lagged indicators when conducting the regression. The use of these lagged indicators is often reasonable, as it usually takes some time for changes in economic conditions to materialise in changes in the inputs to the scoring method. Alternatively, forecasts of the economic indicators could be used.

The advantage of this approach is that the adjusted scores can be expected to be less reactive to changes in the economic conditions represented by the indicators $m_{j,t}$. Hence, calibrations based on them would lead to more stable PD dynamics.

Moreover, an interesting property of this alternative scoring method is that for one particular date t, s^* has the same discriminatory power as the original s. This is because the score of every single obligor within the portfolio at that particular date t is shifted by the same amount, $\beta_0 + \sum_{j=1}^{M} \beta_j m_{j,t}$. Therefore, the rank order of the obligors is not affected by the proposed transformation.

From an operational perspective, the method could be easily implemented in the risk differentiation phase by using an ad hoc GAD-control module during the score generation process. This GAD-control module would complement other modules such as the commonly used quantitative and/or qualitative ones. This has the advantage of producing two scores, $s_{i,t}$ and $s^*_{i,t}$, with the same capacity to rank obligors by their risk of default. The score before the application of this GAD-control module would be more sensitive to changes in macroeconomic conditions, which could be an advantage for short-term management purposes or when quantifying the deterioration of financial instruments under IFRS9 accounting principles. Conversely, the score after the application of the GAD-control module would be less sensitive to changes in macroeconomic conditions, a desired feature for IRB PD models and other long-term management purposes. The straightforward link between these two scores would help IRB institutions to meet the use test supervisory expectations.

It is worth noting that the monitoring of this GAD-control module must be part of the regular monitoring of the overall scoring method. In particular, it must be assessed whether the identified economic indicators and their weights need to be updated in light of newly available information, namely recent unadjusted scores and economic indicators.

So far, it has been assumed that all the relevant information to assess the risk of default of an obligor is included in the synthetic score s. However, this is not always the case. In some circumstances, additional information which is deemed relevant is added on top of credit scores when assigning obligors to the final grade or pool scale of the rating system (for example, pools defined as a combination of the sector and score buckets). The proposed methodology is still valid in these cases (i.e. it can still reduce cyclical PD dynamics), as long as the additional risk drivers that are added on top of the resulting adjusted score s^* are (to some extent) insensitive to changes in macroeconomic conditions.

Lastly, an important remark needs to be made about the centrality measure c_t. In situations where the portfolio composition in terms of credit quality has remained stable over the dates from which the data is available, the variability of c_t only reflects the systemic effects on the score. However, where the portfolio composition has changed over time, the systemic effect in c_t will be blurred by these portfolio shifts. In this case, it might be more difficult to identify the effect of the economic environment on c_t. In these situations, techniques can be used to neutralise this effect from the centrality measure c_t. For the sake of simplicity, this discussion is omitted in this article, leaving it as an area for further research in the future.

The following sections describe the results of applying the proposed methodology to both a synthetic dataset and to actual data.

3 Application to synthetic data

In this section, a synthetic reference dataset is created that is used to test the method described in the previous section.

3.1 Data preparation: calibration dataset

A non-retail portfolio composed of 50,000 obligors observed over 24 years is simulated in an economy that follows a perfectly cyclical pattern, with each cycle lasting for 8 years. For the sake of simplicity, it is assumed that obligors either remain in the portfolio or are replaced by equivalent ones. The dataset contains information about the following variables: gross domestic product (GDP) growth in the year prior to each date, score of each obligor at each date, and its default flag.[6]

GDP growth in the year prior to each date is assumed to follow a deterministic and cyclical path, ranging between -0.05 and 0.05 (see Chart 1).

To simulate the scores of the obligors at each date, a target series of their means, c_t, is first simulated, as $c_t = 1 + 5g_t + \varepsilon_t$, where g_t is the GDP growth in the year prior to t and ε_t is simulated from a normal distribution with a zero mean and a standard deviation of 0.05.

The scores of individual obligors in year 1, $s_{i,1}$ are then simulated under a normal distribution with a mean of c_1 and a standard deviation of 0.35.

For the following years the score is obtained in two steps. First, a component representing a change in the score for obligor-idiosyncratic reasons (simulated from a normal distribution with a zero mean and a standard deviation of 0.05) is added to the previous year's score for each obligor i:

$$s_{i,t+1}' = s_{i,t} + \xi_{i,t}$$

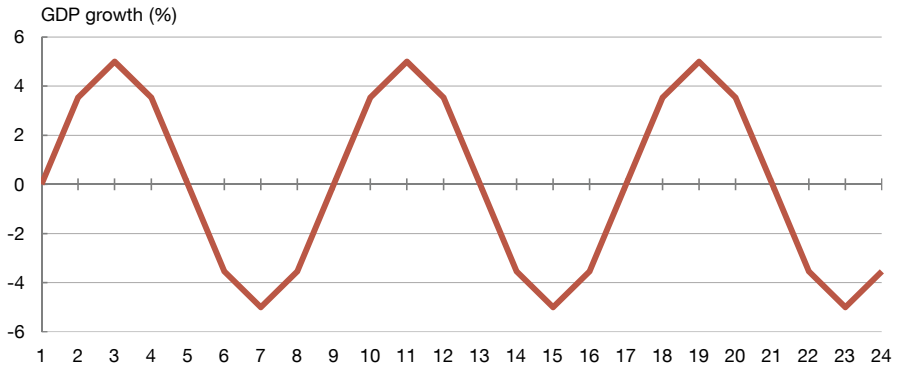
where $\xi_{i,t}$ is simulated from a N(0, 0.05). These scores are then normalised, rescaled and shifted so that their average is c_{t+1} and their standard deviation continues to be 0.35 (hence preventing the distribution from spreading away from its mean due to the idiosyncratic component). The simulated scores are thus expressed as:

$$s_{i,t+1} = c_{t+1} + \frac{s_{i,t+1}' - \mu_{t+1}^{s'}}{\sigma_{t+1}^{s'}} 0.35$$

where $\mu_{t+1}^{s'}$ and $\sigma_{t+1}^{s'}$ denote the sample mean and standard deviation of $s_{i,t+1}'$.

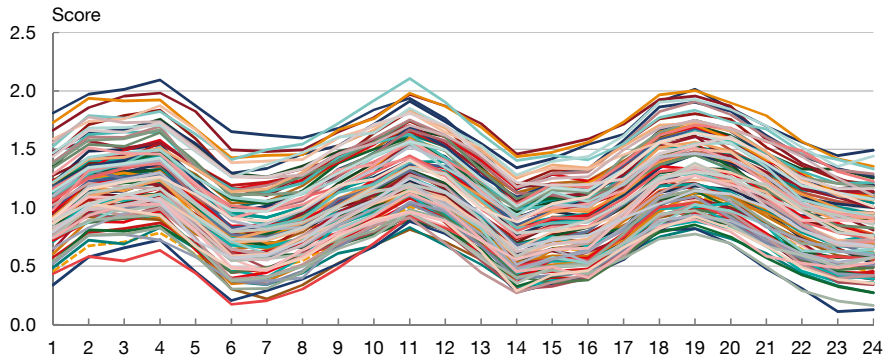
6 12-month forward-looking default flag. For the sake of simplicity, the term default flag is used.

Chart 1
GDP growth per year (synthetic data)



SOURCE: Banco de España.

Chart 2
Score of the first 100 obligors (synthetic data)



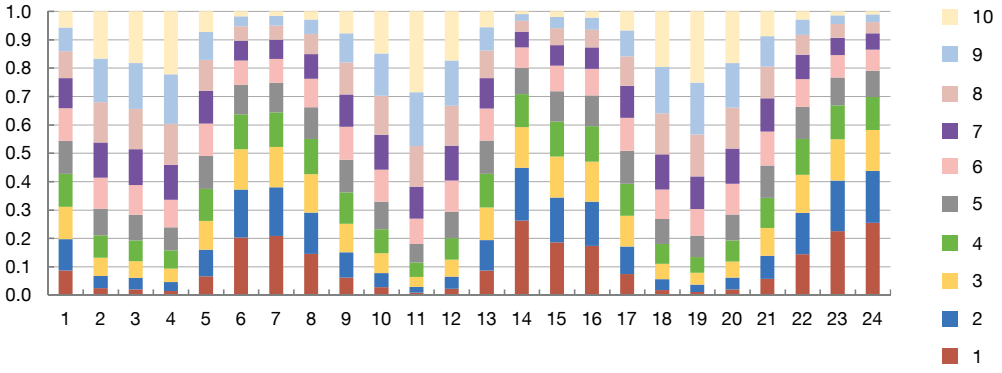
SOURCE: Banco de España.

Charts 2 and 3 provide further details on the simulated scores. Chart 2 shows that the scores behave cyclically while simultaneously being affected by idiosyncratic changes. In Chart 3, score buckets are defined as deciles for the total dataset, including all years. The chart shows the proportion of observations in these score buckets per year, and how they shift significantly in line with GDP growth.

To simulate the default flags, a default probability is simulated for each obligor and date by assuming a logit shape dependent on the score:

$$p_{i,t} = \frac{1}{1+e^{-(\alpha_0 - s_{i,t})}}$$

Chart 3
Proportion of observations by decile and year (synthetic data)



SOURCE: Banco de España.

where α_0 is chosen so that the probability of default of an obligor with a score equal to the mean is 0.05.[7] Default flags are then simulated for each record in the database based on the previous probability of default. Charts 4 and 5 show the simulated one-year default rates (DR). As expected, default rates vary according to both economic conditions and the score.

3.2 Adjusted score

In addition to the aforementioned score, an adjusted score is obtained by following the indications in Section 2. In particular, this score would be calculated as:

$$s^{*}_{i,t} = s_{i,t} - \left(\beta_0 + \beta_1 \times GDP_t\right)$$

where β_o and β_1 are the coefficients of a linear regression of the series of original score centrality measures[8] c_t against the GDP of the year to which the observation corresponds, denoted GDP_t.[9]

3.3 IRB PD estimation

Firstly, grades are defined as the deciles of the (cumulative) distribution of obligors across scores. This process generates one set of *original grades* (grades based on the original score) and one set of *adjusted grades* (grades based on the adjusted score).

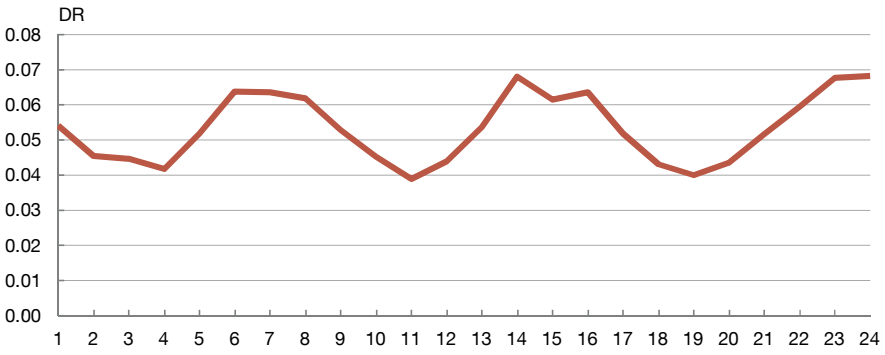
---

7 This entails that the previous equation for such an obligor would be $0.05 = \frac{1}{1+e^{-\left(\alpha_0 - \overline{s_{i,t}}\right)}}$, which can be solved for α_0 to obtain that $\alpha_0 = -\ln\left(\frac{1}{0.05} - 1\right) + \overline{s_{i,t}}$, where $\overline{s_{i,t}}$ denotes the average of all the scores at all dates.

8 In this case, the centrality measure used is the mean.

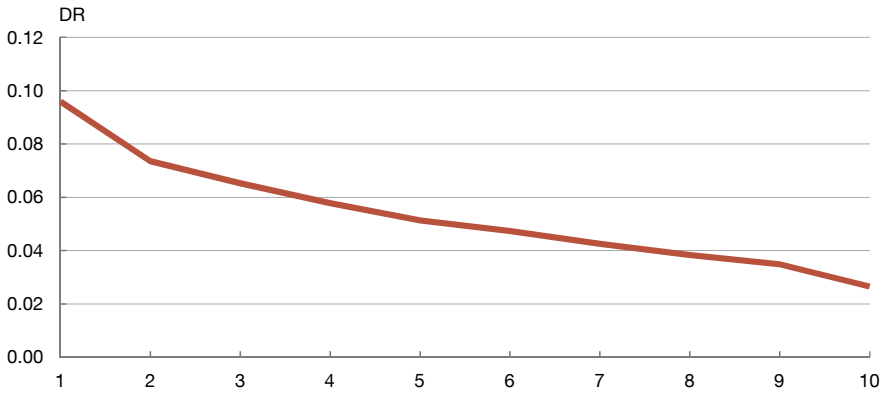
9 For simplicity, no lagged indicators are used in the synthetic example.

Chart 4
Average one-year default rate by year (synthetic data)



SOURCE: Banco de España.

Chart 5
Average one-year default rate by score decile (synthetic data)

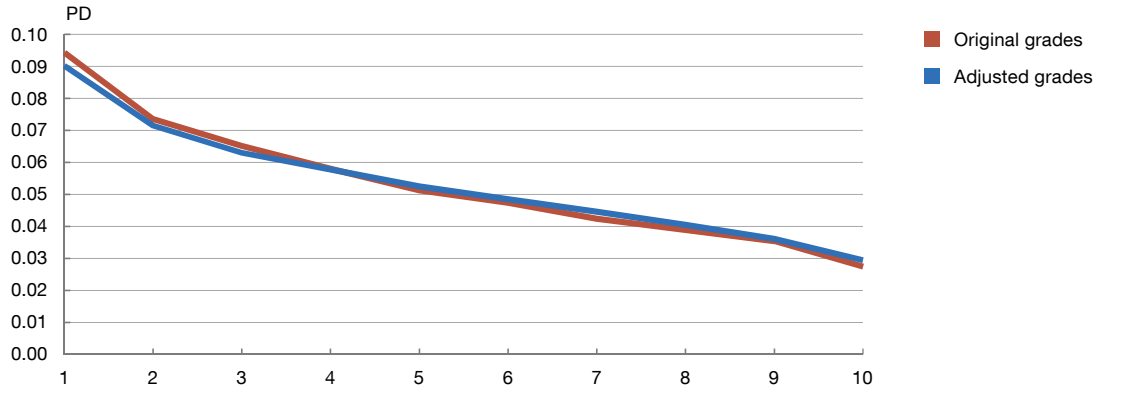


SOURCE: Banco de España.

Secondly, two different calibrations are obtained at grade level (where the PD for each grade is calculated as the observed average default rate by grade),[10] one using the original grades and a second one using the adjusted grades. Chart 6 shows the results of the aforementioned calibration processes. It can be observed that the resulting estimates by grade are quite similar.

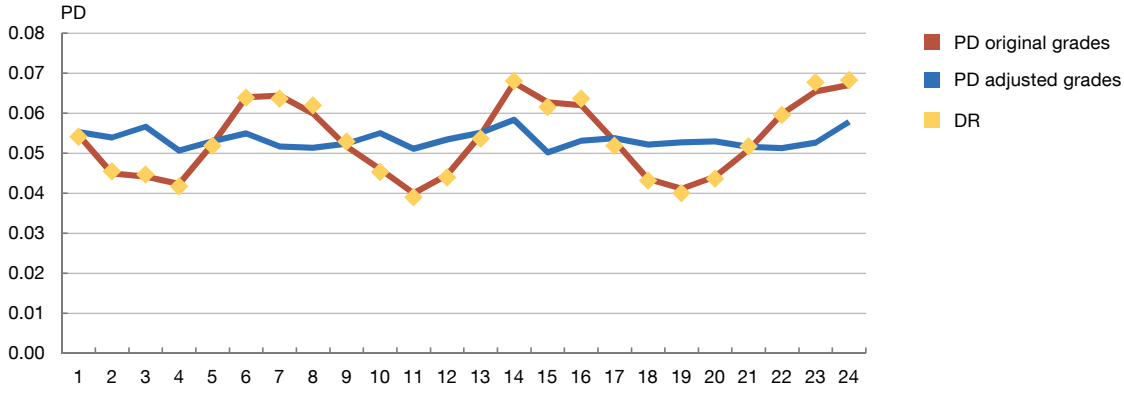
10 By performing a calibration at grade level, in accordance with paragraph 92(a) of EBA/GL/2017/16, the grades' PDs are calibrated to the observed average default rate (OAvDR) within the period representative of the likely range of variability of the one-year default rates (LRVDR). It is assumed that the observed historical period is representative of the LRVDR and also that there are not any representativeness issues within the dataset. For each grade, the OAvDR is the simple average of the one-year default rate by grade and date.

Chart 6
PDs by grade (synthetic data)



SOURCE: Banco de España.

Chart 7
Average PD (synthetic data)

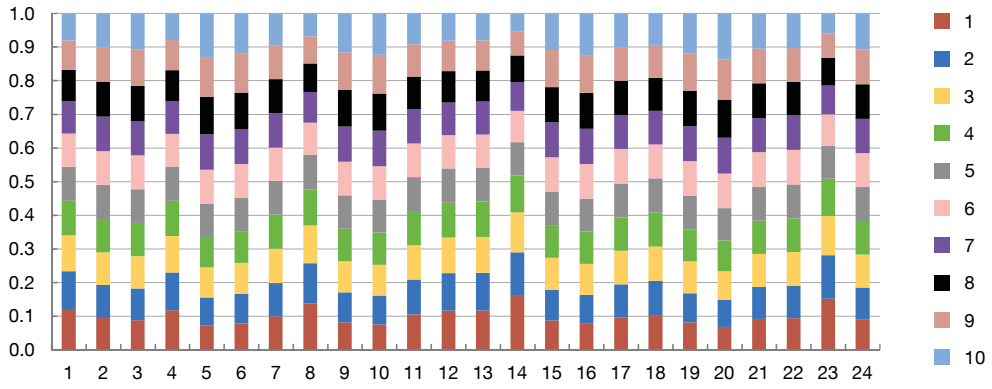


SOURCE: Banco de España.

3.4 IRB PD dynamics

Despite the similarities in the PDs by grade, when these estimates are applied to the available years (see Chart 7), the proposed calibrations show different patterns. First, the (number-weighted) average PD at aggregate (portfolio) level based on the adjusted score calibration is less volatile over time and its correlation with GDP is lower (indeed, the volatility in the series is driven by the idiosyncratic and noise terms used to generate the synthetic data). Second, the average PD based on the original score calibration shows a much higher volatility. In particular, the average PD at portfolio level closely follows the average one-year default rate of the portfolio, indicating a clear excessive sensitivity to macroeconomic conditions in the assignment of exposures to grades.

Chart 8
Proportion of observations by adjusted decile and year (synthetic data)



SOURCE: Banco de España.

This is the result of the adjusted scores' more stable grade distribution, as shown in Chart 8 below, when compared with the grade distribution based on the original scores (shown in Chart 4).

It can therefore be concluded that the proposed adjustment to the scores worked as expected with the synthetic dataset specifically designed to test it, given that PD cyclicality was indeed reduced.

In the next section, this method is applied to actual data.

4 Application to actual data

4.1 Data preparation: calibration dataset

In this section, actual data is used to test the proposed methodology. In particular, historical credit information on small and medium-sized enterprises (SMEs) is obtained from the Banco de España Central Credit Register (CCR).[11] This information is further enhanced with the in-house credit assessment system of the Banco de España (ICAS BE), an internal credit assessment system of public and private Spanish non-financial corporations that allows the loans extended to these corporations to be used as collateral in monetary policy operations. It has two different rating systems: the Full-ICAS BE for large companies, which is based on a quantitative approach plus a human expert assessment, and the Statistical-ICAS BE for SMEs, based purely on statistical models without the intervention of an analyst.[12] By combining the CCR and ICAS BE, a database with the following information is obtained:

11 For more details about the CCR database, see Banco de España (2022).

12 A full description of the Banco de España in-house credit assessment system can be found in Gavilá et al. (2020).

— Obligor identifier.

— Date, spanning from August[13] 2011 to August 2021 (yearly frequency).

— A default flag that indicates if the obligor had a 90 days past due default event in the 12 months following the ICAS assessment.

— Score assigned by the ICAS BE. For the purposes of this exercise, only the scores from the automated statistical model are used, based on the most recent financial statements at the time of the assessment. It should be noted that not considering other elements such as the expert judgement of the Full-ICAS BE and the sectoral risk assessment of the Statistical-ICAS BE likely increases the sensitivity to macroeconomic conditions compared with the complete version of the model, in which a higher degree of stability is expected.

— Economic indicators. The database is enriched with several Spanish macroeconomic indicators.[14] ICAS BE assessments made in August are combined with macroeconomic indicators from the previous December. By using this approach, the macroeconomic information is always available at the time of the grade assignment, thus avoiding the practical difficulty mentioned in Section 2.

4.2 Adjusted score

In addition to the ICAS score, the adjusted score is defined as follows:

$$s^{*}_{i,t} = s_{i,t} - \left(\beta_0 + \beta_1 \times GDP_{t-1} + \beta_2 \times UR_t\right)$$

where β_0, β_1 and β_2 are the coefficients of a linear regression of the series of the original score centrality measure[15] c_t against the year-on-year change in GDP (with one lag) and the year-on-year change in the unemployment rate (UR).

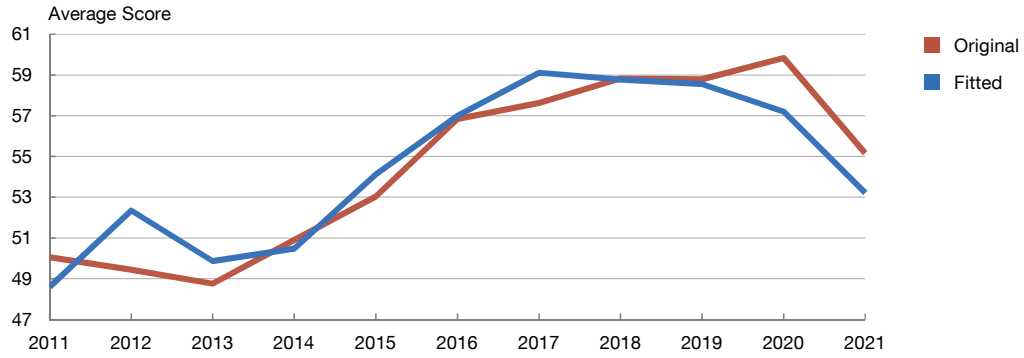
Chart 9 provides more details about the results of the linear regression. It can be observed that the average score series follows a decreasing trend over the period 2011-2013, followed by a steady increasing trend over the period 2013-2020, which is only interrupted by the sharp decrease observed between August 2020 and August 2021. Since higher scores represent better credit quality, at first glance this trend seems to be in line with economic developments in the Spanish economy, where 2014 marked the end of the distressed conditions observed

13 ICAS assessments at August are used for the periodical monitoring of the rating systems.

14 Macroeconomic indicators sourced from the Banco de España time series search engine.

15 In this case, the mean is used as a centrality measure.

Chart 9
Comparison between original and fitted average scores



SOURCE: Banco de España.

since 2008 and the start of a period of economic growth which was interrupted in 2020 with the outbreak of the COVID-19 pandemic.

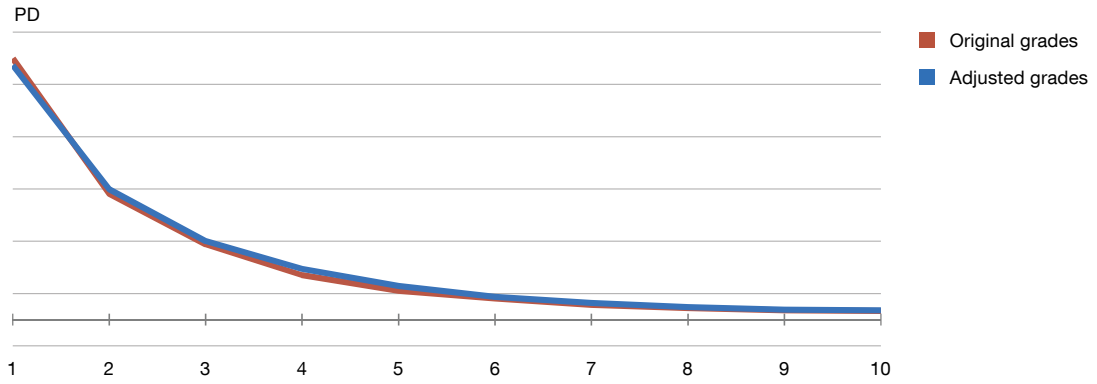
However, it should be stressed that economic developments are not necessarily the only driver of changes in average scores. The composition of the portfolio and other non-cyclical systemic effects might also be a source of changes in the series. Since the aim of this methodology is for these other effects that affect credit quality in a non-cyclical manner to be reflected in changes in capital requirements, they are left untreated in the derivation of s^*.

This also has implications for the regression to be performed. As this methodology does not seek to obtain an explanatory model of the series considering all the relevant drivers, a pragmatic approach is adopted, by using a simple ordinary least squares regression rather than more complex time series analysis tools. For instance, it is highly likely that the residuals will show autocorrelation as a result of these missing drivers. But since the aim is just to identify the part of the changes in the series that may be attributed to the economic indicators, this should not be considered an impediment to use the regression results for the purposes of this methodology. Thus, only a minimal assessment of the model fit was performed, to ensure that the sign of the coefficients is meaningful. Overall, the obtained model is considered to properly achieve its aim.

4.3 IRB PD estimation

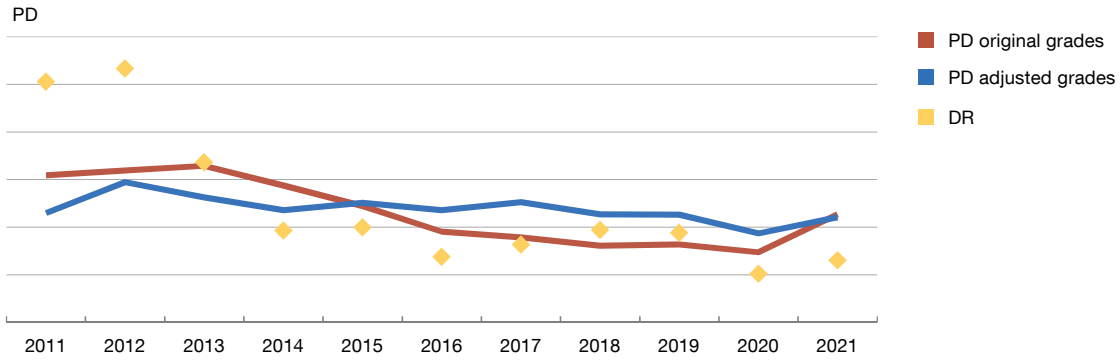
The same process used with the synthetic dataset to obtain two different PD calibrations (with the original and adjusted scores, respectively) (see Section 3) is also followed here. It is important to note that these PD calibrations are solely performed for the purpose of this theoretical analysis and have no relation to the actual PD calibrations applied by the ICAS BE. The obtained default probabilities, and Charts 10 and 11 in particular, provide no information about the ICAS BE's actual calibration.

Chart 10
PDs by grade



SOURCE: Banco de España.

Chart 11
Average PD



SOURCE: Banco de España.

Chart 10 shows the PDs by grade for both calibrations. It can be observed that the resulting PDs are quite similar in both approaches. For confidentiality reasons, the PD scale is omitted.

4.4 IRB PD dynamics

As in the case of the synthetic data, different patterns emerge when the estimates are applied over the available years (see Chart 11). In particular, the (number-weighted) average PD at aggregate level based on the adjusted score calibration is less volatile over time than the (number-weighted) average PD at aggregate level based on the original score calibration.

Table 1
Quantitative assessment of the results. Series of average PD

Statistic (average PD series)	Original	Adjusted
Range	1.8%	1.1%
1st central moment	0.6%	0.2%
Standard deviation	0.7%	0.3%

SOURCE: Banco de España.

Table 2
Quantitative assessment of the results. Series of average RW

Statistic (average RW series)	Original	Adjusted
Range	22.2%	12.1%
1st central moment	7.3%	2.4%
Standard deviation	8.4%	3.2%

SOURCE: Banco de España.

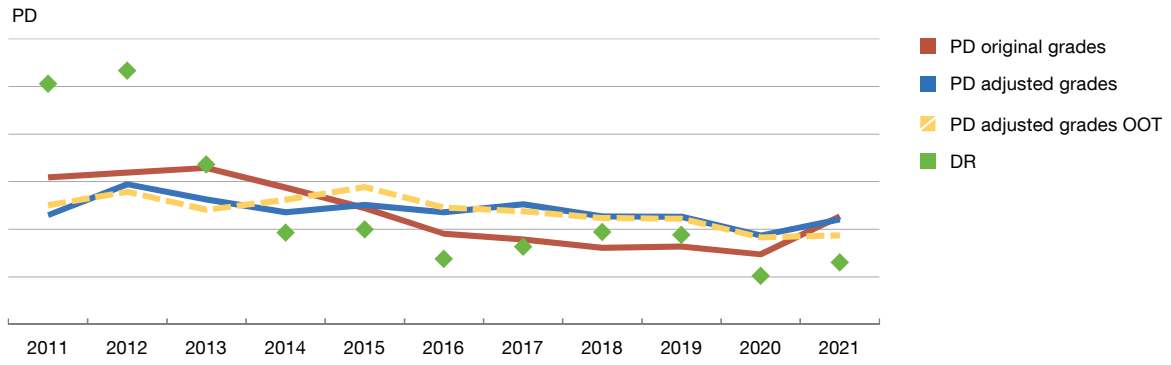
Quantitatively assessing the degree of sensitivity of a grade assignment method to economic conditions is a complex issue, for which there is no generally agreed technique. This article does not attempt to select one of the available metrics to assess the extent to which the adjustment has reduced the sensitivity. Instead, the quantitative assessment is based on the fact that the adjusted scores are the original scores from which a quantity is subtracted. This quantity represents only the effect of the economic indicators on the score average for each year identified through the regression. It can therefore be assumed that any differences between PDs of the two calibrations are solely attributable to their different sensitivity to the economic indicators. Hence, comparing the variability of both PD series provides an indication of how less volatile the adjusted score is. Such reduction can be attributed to the different sensitivities to economic conditions.

Table 1 provides several statistics related to the dispersion of both series. In particular, it shows the PD range (difference between the maximum and minimum PDs of the series), the first central moment (average distance from the PDs in the series to the mean) and the standard deviation. It shows that there is a significant reduction in variability.

The same effect can be obtained by using the series of average RWs[16] instead of the series of average PDs. As expected, the reduction in variability is also significant (see Table 2).

16 For each obligor in the sample, the RW by date is calculated in accordance with Article 153 of Regulation (EU) No 575/2013 by assuming loss given default (LGD)=45%, maturity (M)=2.5 years and sales< €5 million. Once the RW is obtained for each obligor and date, a simple average is calculated to obtain the series of average RWs by date.

Chart 12
Average PD (including OOT exercise)



SOURCE: Banco de España.

It is important to reiterate that the objective is not to remove the variability of the PDs (and RWs) entirely, but to ensure that this variability is driven only by idiosyncratic and/or structural changes and not by changes in economic conditions. These results should therefore be interpreted as the result of applying the method to attempt to remove the score variability due to changes in economic conditions.

4.4.1 Out-of-time (OOT) analysis

The results shown above indicate a relevant reduction in PD variability due to a decrease in its sensitivity to macroeconomic conditions. However, it can be argued that this reduction is observed in the same sample that has been used to develop the regression. Below it is assessed whether the methodology also yields successful results when applied to data not used for the regression.

To this end, the whole process is simply repeated, but this time the regression of the score centrality measure against macroeconomic indicators is performed without the last two available dates (August 2021 and August 2020).[17]

Chart 12 shows the PD series for each calibration process, i.e. (i) the one based on the original grades, (ii) the one based on the adjusted grades where the regression is conducted with the whole sample, and (iii) the one based on the adjusted grades where the regression is conducted without the last two dates. A similar reduction in PD variability is obtained both over the whole period and, more importantly, over the two years excluded from the sample.

17 Again, several linear regressions were tested by using different macroeconomic indicators. In this case the model only includes the year-on-year change in the unemployment rate.

5 Conclusions

The cyclicality of capital requirements has been a matter of concern for banking regulators, banking supervisors and the industry for years. Motivated by this concern, this article describes a methodology that intends to take into account plausible changes in economic conditions when assigning exposures to grades or pools. The strategy is to start with an existing grade assignment method and to attempt to remove its sensitivity to economic conditions. To do so, a GAD-control module is added to it. This GAD-control module simply subtracts from the original score an amount which reflects the estimated effect of the economic conditions on the original score. This amount is modelled through a linear regression of a centrality measure of the score against some economic indicators.

This method has several advantages: the order of the original scores is maintained; it enables both the original score and the adjusted score to be kept, allowing the one most suited for its intended purpose to be used; it only affects the scores in a deterministic way depending on the values of the economic indicators, thus respecting any other trend in the scores which cannot be explained in terms of economic developments; it can be combined with additional drivers used for the PD quantification; and finally, its implementation is believed to be quite straightforward.

Once confirmed that the methodology worked with a synthetic dataset designed specifically for this purpose, the methodology was also applied to a real dataset from one of the modules of Banco de España's ICAS for SMEs. The results indicate a significant reduction in the variability of PDs and RWs between the original and the adjusted scores.

Apart from continuing to test this methodology on other datasets, future research may attempt to define methods to obtain centrality measures which neutralise the effect of changes in the portfolio composition on the average score by date. This would make the effect of the economic environment on the centrality measure series more visible, and thus easier to model.

Finally, it should be noted that there may be countless methods to attain the goal of assigning grades in a way that is not overly sensitive to economic conditions. This article will hopefully draw further attention to this matter which, in turn, could contribute to the emergence of new methods.

REFERENCES

Banco de España. (2022). *Memoria de la Central de Información de Riesgos.* https://www.bde.es/f/webbe/Secciones/Publicaciones/PublicacionesAnuales/MemoriaCentralInformacionRiesgos/22/CIR_M2022_Completa.pdf

Basel Committee on Banking Supervision (BCBS). (2004). *International Convergence of Capital Measurement and Capital Standards - A Revised Framework.* https://www.bis.org/publ/bcbs107.pdf

Carlehed, Magnus, and Alexander Petrov. (2012). "A methodology for point-in-time–through-the-cycle probability of default decomposition in risk classification systems". *Journal of Risk Model Validation,* 6(3), pp. 3–25. https://doi.org/10.21314/JRMV.2012.091

ECB. (2024). *ECB Guide to internal models.* https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.supervisory_guides202402_internalmodels.en.pdf

European Banking Authority. (2017). Guidelines on PD estimation, LGD estimation and treatment of defaulted exposures (EBA/GL/2017/16). https://www.eba.europa.eu/sites/default/documents/files/documents/10180/2192133/f5a2e068-dc4b-4a0e-a10f-378b517ac19c/Guidelines%20on%20PD%20and%20LGD%20estimation%20%28EBA-GL-2017-16%29_EN.pdf?retry=1

European Union. (2013). Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R0575&from=EN

Gavilá, Sergio, Alfredo Maldonado and Antonio Marcelo. (2020). "The Banco de España in-house credit assessment system". *Financial Stability Review - Banco de España,* 38, pp. 95-122. https://repositorio.bde.es/handle/123456789/13555

Rubstov, Mark. (2021). "Calibration of rating grades to point-in-time and through-the-cycle levels of probability of default". *Journal of Risk Model Validation,* 15(4), pp. 51–74. https://doi.org/10.21314/JRMV.2021.010

Rubstov, Mark, and Alexander Petrov. (2016). "A point-in-time–through-the-cycle approach to rating assignment and probability of default calibration". *Journal of Risk Model Validation,* 10(2), pp. 83–112. https://doi.org/10.21314/JRMV.2016.154

How to cite this document

Fidalgo, Óscar, Víctor Martínez, Esther Moral and María Oroz. (2024). "A method for reducing credit scores' sensitivity to economic conditions". *Financial Stability Review - Banco de España,* 46, Spring. https://doi.org/10.53479/37652

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ISSN: 2605-0897 (electronic edition)