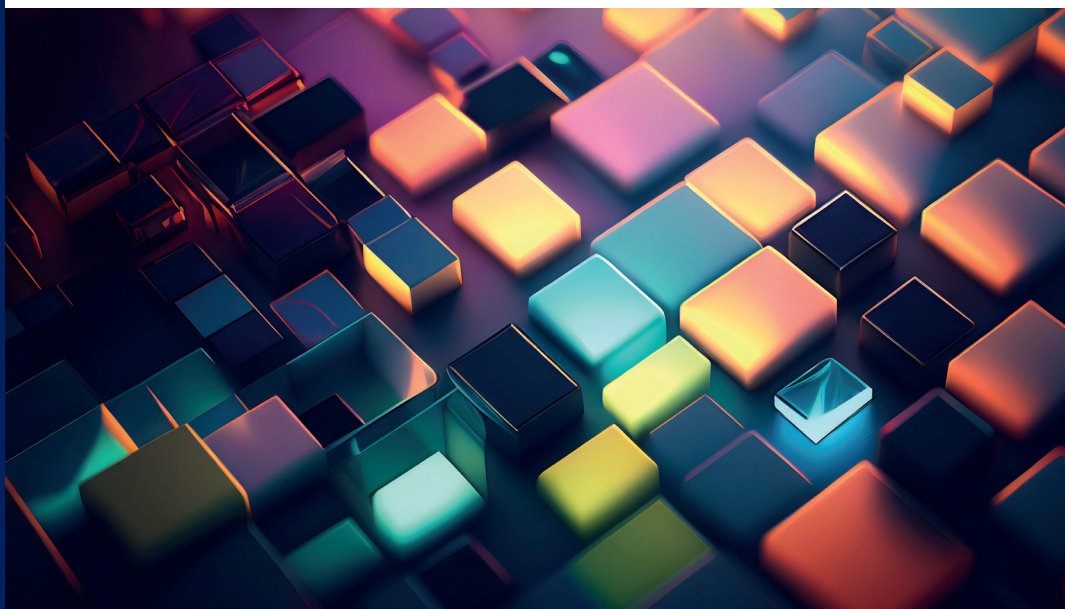


Elena Bruno

# The variability in RWA density

New perspectives on the approach  
to risk measuring



Giappichelli

The bank's Solvency Ratio (SR) represents the “fulcrum” around which banking regulation revolves; introduced by the Basel Committee in 1988 as a tool to ensure the solidity of banks, it represents the indicator of banks' capital adequacy, the main prudential requirement.

Over the years it has undergone an evolution; the framework of the Capital agreement – Basel II (2004) – was a first step of development aimed at improving its sensitivity to risk through changes in the calculation of the denominator. Subsequently, in Basel III (2010), the attention of the Regulator shifted to the calculation of the numerator of the prudential requirement.

This research focuses on the denominator of the SR – RWA Density Ratio – expressed by the ratio between risk-weighted assets and total balance sheet assets. Analysis of the average weightings of banks has highlighted the excessive variability of the RWA ratios over time and space profile, leading to the conclusion that banks tend to “manipulate” the measurement of risk, in order to obtain capital savings. This has called into question the ability of RWAs to adequately reflect the levels of banking and financial risks, thus undermining the pursuit of financial stability and a level international playing field. With the aim of reducing the variability of weighted assets and consequently improving the comparability of the capital requirements of different banks, in 2017 the Basel Committee published the reforms to be made to the current regulatory framework, known as Basel IV.

The book is divided into five chapters and provides a description of the main features of the reforms in the regulation of banks, by underlining its content, development and prospects under pressure from the international regulation. It focuses on the factors affecting the evolution of banks' regulation during the crisis years, by distinguishing between demand and supply factors driving loan

growth, credit risk being the most relevant element in the RWA determination.

In the first chapter, the regulatory excursus on banking supervision will be presented critically, highlighting the point of view of the Regulator and outlining the main aspects of the legislation from the perspective of its evolution. The provision of the “three pillars”, the use of external ratings and the possibility of adopting internal models for risk measurement, represent the most important innovations in the regulation of capital agreements developed by the Basel Committee. Thus, if Basel II focused exclusively on the calculation of RWAs, to affirm the existence of the principle of capital adequacy, the international financial crisis of 2007-2008 brought out its weaknesses. Basel III also focuses therefore on the qualitative aspects of banks’ capital, reinforcing its contents. Examples are the countercyclical buffers, the leverage ratio, better risk coverage, additional requirements for systemic banks and liquidity requirements, as well as the current regulatory framework which also sees the introduction of crisis prevention requirements, the MREL and TLAC.

The in-depth analysis of the critical issues arising from the definition of the items that make up the denominator of the solvency ratio and its variability will be the subject of the second chapter (chapter 2). The intent is to highlight how the solvency ratio is extremely variable from bank to bank and from jurisdiction to jurisdiction.

This derives from the actual diversity of the risk profiles of the banks, but the excessive variability of the indicator, both in terms of time and in a transversal dimension, has led scholars and operators to doubt its reliability. The first part will therefore present some empirical evidence and the possible factors of divergence of weighted assets, divided into expected or “desired” factors, such as the risk profile and the business model, and “undesired” factors, such as accounting rules and prudential practices, and finally in risk management practices with both positive and negative connotations. The second part will describe the limits of density, i.e. the lack of coherence, completeness and decomposability, which have

paved the way for alternative indices. Analyzing two of these, it will be concluded that the main causes of the variability of weighted assets are the roll-out effect and the business mix. Despite the intrinsic flaws noted, the Density Ratio assumes considerable importance in the context of bank mergers, to which a brief paragraph will be dedicated.

In the third chapter (Chapter 3) highlights the limits of this report, raising questions about its usefulness as an analytical tool: in particular, its inconsistency, in attempting to cover all of the bank's business, and its value, affected by a multitude of different factors, whose effect is difficult to assess (balance sheet structure, investment policies, type of assets, operations and also RWA calculation methodologies).

The more difficult topics relating to “risk manipulation” policies, by virtue of the recourse to internal rating models by banks and the interventions carried out to restore confidence in RWAs, will be the issue of the fourth chapter (chapter 4). The possibility offered by Basel II to adopt internal models introduces the opportunity to manipulate the calculation of capital requirements in advantageously, and the Basel III “squeeze” on the capital resources that banks must hold has increased the fear of a downward bias of risk estimates. Therefore, some measures have become necessary to improve the consistency of these estimates: the provision of a non-risk-based financial leverage ratio, the strengthening of information transparency, the launch of the Single Supervisory Mechanism.

The Basel IV capital agreement, which came into force on 1 January 2023, but which in its entirety will become fully operational in 2028, introducing a mechanism to limit the discretionality of the results of the estimates of internal models, to the introduction of the standardized output floor and of additional requirements for systemic banks, will inevitably lead to an expansion of RWAs and therefore of capital requirements. The content of this document will be discussed in chapter five. We will have to wait for the complete implementation of Basel IV in 2028 to verify the actual capacity of the new regulatory standarders to mitigate the excessive variability of RWAs. The book is divided into five chapters and provides a de-

scription of the main features of the reforms in the regulation of banks, by underlining its content, development and prospects under pressure from the international regulation. It focuses on the factors affecting the evolution of banks' regulation during the crisis years, by distinguishing between demand and supply factors driving loan growth. Among the latter, Basel III requirements are a key factor.

Banks' internal models and their use in financial regulation have been among the most controversial topics in the post-crisis age. Among the non quantitative advantages of the IRB models, there are the better understand the risks of their portfolios. The RWA variability can be based on structural factors; more intuitive metrics might help in better interpreting the underlying economic meaning the adopted measures. Finally, our conclusions are relevant from a policy perspective. Limiting RWA variability and focusing on a comprehensive metric for banks' risk levels might help supervisory authority to better use the tools of risk's measures.

## Chapter I

# **Basel III and completion of reforms: an overview and analysis on RWA variability**



**Summary:** 1. Basel III and the regulatory capital adequacy: an overview.  
– 2. Focus on RWA variability and the internal ratings based approach.

## **1. Basel III and the regulatory capital adequacy: an overview**

The first international agreement on the assessment of capital and capital ratios dates back to 1988 when the Basel Committee on Banking Supervision set the levels of minimum capitalization (usually to Basel I). Although explicitly referring to credit risk, these criteria were also considered appropriate to offer coverage against other types of risk (BCBS 1988).<sup>1</sup> The 1988 agreement on capital contributed to increasing the capital resource of the banks and make uniform the rules applied across different european countries. However, the Basel I Capital Accord presented some critical elements such as the exclusive treatment of credit risk, the insufficient recognition for supervisory purposes of risk mitigation instruments and the lack of alignment of capital ratios with the overall banking risk. As a result of the significant changes in the credit sector due to the emergence of new forms of business, such as securitization and credit derivatives, it was necessary to prepare more advanced models of credit risk management, which have encouraged the spread of regulatory arbitrage practices, especially in large banks, making it extremely difficult to define the correspondence between the degree of risk and the required level of capital.

Improving the correlation between prudential requirements and regulatory capital came with a new international framework on

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<sup>1</sup> Basel Committee on Banking Supervision (BCBS) (1988), *International convergence of capital measurement and capital standards*, July, p.5.



capital accord in 2006 (BCBS 2006),<sup>2</sup> which encourages banks to adopt better risk management approaches, with the intent of reduce the gap between prudential rules and market rules, promoting an interaction between them and seeking a closer fit between regulatory and economic capital. Economic capital expresses the amount of capital needed to carry out activities against the assumption of a certain level of risk regardless of regulation.

The Basel II framework was based on three pillars: (1) minimum capital requirements, (2) supervisors' assessment of risk control systems and capital adequacy policy, and (3) market discipline aimed at implementing transparency and promoting sound banking management policies.

The financial crisis of 2010 required EU regulators to revise prudential rules to ensure greater stability, soundness and transparency in the banking system's activities; this led to the development of the Basel III framework,<sup>3</sup> which was adopted in Europe by the Capital Requirements Regulation (CRR-Regulation no. 575/2013 of the European Parliament and of the Council of June 26, 2013 on prudential requirements for credit institutions and investment firms) and the Capital Requirements Directive IV (CRD IV-Directive 2013/36 of the European Parliament and of the Council of June 26, 2013 on the access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms). Many of the requirements were phased in gradually, reaching full implementation in 2019, when all prudential measures become operational.

The main reasons for the introduction of Basel III are linked to the financial crisis of 2010-2011 that will evidence the high on- and

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<sup>2</sup>Basel Committee on Banking Supervision (BCBS) (2006a), *Basel II framework. International Convergence of Capital Measurement and Capital Standards*, 30 June.

<sup>3</sup>Basel Committee on Banking Supervision (BCBS) (2006b). *A global regulatory framework for more resilient banks and banking systems*, 16 december 2010; and Basel Committee on Banking and Supervision (2011), *Basel III: A global regulatory framework for more resilient banks and banking systems*, revised version, June.

off-balance sheet leverage; the reduction of quantitative and qualitative amount of capital resources; insufficient liquidity buffers; a procyclical deleveraging process that is a tendency to increase in recessions and decrease in period of expansion; the strengthen interconnection of systemic institutions.

That is, when the natural fluctuations of the economy becomes procyclical banks are induced to change the supply of credit, reducing it in recessions and increasing it in expansions. This deleveraging process, despite being good for the solvency of individual banks, has intensified the spiral between losses, erosion of bank capital and credit crunch, thus the instability of financial markets.

Similarly to the previous capital agreement, Basel III is comprised of three pillars: minimum capital requirements, a supervisory review process, and market discipline. While the basic approach remains unchanged, the new framework is built and strengthened through the enhanced quantity and quality of own funds held by intermediaries, the introduction of counter-cyclical buffers and the discipline of rules for managing liquidity risk and the containment of leverage, while also improving the definition and quality of regulatory capital (i.e. the numerator of the existing capital ratios).

New macroprudential key indicator for the systemical financial banks (SIBs); were included as part of the new capital accord framework, to restore the credibility of banks' capital ratios, as the financial crisis had threatened their effectiveness in ensuring the soundness of banks, especially the larger ones.

The observed variation in the RWAs of European banks did not reflect actual differences in risk taking;<sup>4</sup> instead, by improving comparability between the capital ratios of even dimensionally different banks it was possible to contain better-controlled manifesta-

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<sup>4</sup> Basel Committee on Banking Supervision (BCBS) (2013a), *The regulatory framework: balancing risk sensitivity, simplicity and comparability*, Discussion Paper, July; and (2013b), *Regulatory Consistency Assessment Programme. Analysis of risk-weighted assets for credit risk in the banking book*, July.

tions of capital inadequacy.<sup>5</sup> In so doing, significant increases in overall capital requirements could be avoided.<sup>6</sup>

The completion of the Basel III post-crisis reforms involved several areas of the Basel standards and a wide range of regulatory measures, including restrictions on the use of internal models and improvements in the robustness and risk sensitivity of existing standardized approaches. In particular, the two approaches available for credit risk, the standardized approach (SA) and the internal models approach.

## **2. Focus on RWA variability and the internal ratings based approach**

Credit risk constitutes the largest part of banks' capital requirements and is a primary source of variations in risk-weighted assets (RWAs) – the denominator of the capital ratio. In line with the overall objectives of the reforms, the Basel Committee introduced revisions to the two available approaches for the treatment of credit risk in the Basel standards: the Standardised Approach for credit risk (or SA) and the approach based on banks' internal models (Internal Ratings Based Approach or IRB).

The regulatory capital requirements for credit risk are calculated on IRB, as an alternative to the Standardized Approach. Basel II established (within Pillar 1) the IRB Approach (Foundation or Advanced- FIRB or AIRB), which has remained unchanged under Ba-

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<sup>5</sup> Basel Committee on Banking Supervision (BCBS) (2014a), *Capital floors: the design of a framework based on standardised approaches*, December; and (2014b). *Operational risk – Revisions to the simpler approaches*, Consultative Document.

<sup>6</sup> Basel Committee on Banking Supervision (BCBS) (2016a), *Reducing variation in credit risk-weighted assets – constraints on the use of internal model approaches*, Consultative Document; and (2016b), *Regulatory Consistency Assessment Programme: Analysis of risk-weighted assets for credit risk in the banking book*; and (2016c), *Revisions to the Standardised Approach for credit risk*, Second Consultative Document.

sel III and the CRR 575/2013. Under the IRB approach, banks with advanced risk-management systems are allowed to determine capital requirements on the basis of internally produced risk parameters subject to specific minimum requirements. The IRB Approach therefore relies upon the bank's internal assessment of its counterparties and exposures and is consistent with the advanced credit risk measurement and management practices of the most sophisticated banks (best practices). It is risk sensitive and complex and is aimed at accurately aligning capital requirements with credit risk. Banks adopting the IRB approach are subject to stringent minimum standards to ensure the comprehensiveness and integrity of their internal credit risk-assessment capabilities.

Banks may apply the IRB Approach only if allowed by the regulators; who verify the soundness of a bank's rating and risk management systems. Its internal ratings and default loss estimates and associated systems and processes must be essential in the risk-management and decision-making process (Allen and Overy 2014).<sup>7</sup> The expected loss, which represents the forecast of the average level of credit loss, is defined as the ratio of the amount expected to be lost on an exposure from the potential default of a counterparty over a one-year period and the amount outstanding at default. The unexpected loss, which represents the true exposure risk component, is refers to a loss above the average level of reasonably foreseeable credit losses. Banks must ensure adequate resources for solvency to deal with both the scenarios; however the provenance of resources is differs according to the type of loss. Expected losses, which represent a cost to the banking business, recall resources through provisioning and write-offs; in the event of a gap between a bank's provisions and expected loss, the bank's own funds must be increased or decreased depending on the sign of the deviation. Conversely, unexpected losses must be covered with capital requirements. When referring to an entire loan portfolio, the corresponding expected loss is the sum of the expected losses relat-

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<sup>7</sup> Allen & Overy (2014), *Capital Requirements Directive IV Framework, Internal Ratings Based Approach to Credit Risk in the Banking Book*, January.

ed to all exposures within the portfolio. Consequently, it cannot be mitigated through diversification measures but must be stabilized through portfolio expansion. In contrast, the unexpected loss of the entire portfolio can be reduced by appropriate diversification policies, such as implementation by geographical areas, industries and size of enterprise classes financed.

In March 2015 the EBA revisited the regulation (EBA 2015a)<sup>8</sup> and in september 2015 launched a consultation on the matter, with the goal of enhancing harmonization of such approaches across the European prudential framework, and therefore consistency in the way the European banks applied regulatory capital requirements (EBA 2015b).<sup>9</sup> The need to intervene with such guidelines arises from the fact that different approaches may constitute a driver for the variability of risk estimates and capital requirements, which undermine comparability across intermediaries. In other words, it must be remembered that the definition of default affects a bank's own fund requirements under the IRB (also the Standardized Approach), by representing the basis for risk parameter estimation and therefore influencing risk weights and expected loss calculations for both default and non-default exposures. For these reasons, it is important to ensure a level playing field across European banks. To this end, the EBA provided detailed guidance on the application of several aspects of the definition of default, including past due criteria as an indication of default, indications of unlikeliness to pay, specific aspects of the application of the definition of default for retail exposures, application of the default definition in a banking group and criteria for the return to a non- defaulted status (see EBA 2015b). Under the IRB Approach a further step is represented by the determination of the risk-weighted exposure amounts.

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<sup>8</sup> European Banking Authority (EBA) (2015a), *Future of the IRB approach*, EBA Discussion Paper, March 2015.

<sup>9</sup> European Banking Authority (EBA-2015b), *Guidelines on the application of the definition of default under Article 178 of Regulation (UE) 575/2013*, Consultation Paper, 22 September.

Finally, consider that in the course of 2015 the EBA initiated a review process of the IRB Approach in order to identify the main regulatory actions necessary to address the key drivers of variability in the implementation of IRB models.<sup>10</sup> The proposed changes to the regulatory framework aim at addressing the current concern about the lack of comparability of capital requirements under the IRB Approach across institutions. In particular, the EBA reiterates its stance in favour of the continued use of the IRB Approach and introduces changes aimed at harmonizing definitions and supervisory practices in the definition of default (EBA 2016),<sup>11</sup> the estimation of risk parameters and treatment of default assets, credit risk mitigation techniques and disclosure. In order to ensure an efficient use of resources in institutions and supervisory authorities, the EBA calls for a flexible approach in the implementation of the regulatory review. To this end, all regulatory changes are expected to be finalized by the end of 2020 (EBA 2015a; EBA 2016).

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<sup>10</sup> European Banking Authority (EBA 2015a), *Future of the IRB Approach*, Discussion Paper, March.

<sup>11</sup> European Banking Authority (EBA 2016), *Opinion of the European Banking Authority on the implementation of the regulatory review of the IRB Approach*, February.



## Chapter II

### **RWA density assessment. Evidence of literature review**





**Summary:** 1. Introduction. – 2. An overview on an international scale: some empirical evidence. – 3. An overview of RWA measures divergence. – 4. Summary remarks.

## 1. Introduction

That risk-taking is an integral part of banking is a circumstance that has now been established in the light of the discussion so far. For this reason, the primary purpose of prudential regulation, namely the strengthening of global financial stability, must be achieved through sound and prudent risk management.

The backbone of banking supervision is represented by the solvency ratio which measures the amount of regulatory capital, indicated as the main defense against losses, with respect to risk-weighted assets (RWA). The latter, therefore, “represent the reference quantity for assessing the adequacy of the capital that each bank must hold in relation to the risks assumed. [...] The intuition behind the concept of RWA is to convert the nominal value of an exposure into a weighted equivalent capable of reflecting the implicit riskiness of that asset.”<sup>1</sup>

The link between capital and risk was introduced with the 1988 Capital Accord (Basel I) and was then strengthened in the following years to overcome the shortcomings revealed over time. One of the first steps in this evolution was the amendment to the 1996 Capital Agreement, which introduced market risk into the range of risks to be covered by capital, overcoming one of the great limitations of the first agreement. Furthermore, the low risk sensitivity of

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<sup>1</sup>F. Cannata, S. Casellina, M. Libertucci (2015), *(In)coerenza degli attivi ponderati per il rischio delle banche: un’analisi empirica sui grandi players europei*, Rivista Bancaria-Minerva Bancaria, n. 2, marzo-aprile, p. 11.

RWAs calculated according to the Basel I rules had created the problem of regulatory arbitrage, which is why Basel II (2004) concentrated on improving the calculation of banking risks, precisely therefore on the denominator of the solvency ratio, assuming that the capital of the system was adequate. Indeed, experience following the implementation of Basel I seemed to support the idea that the volume of capital was sufficient to withstand potential crises. The objective of Basel II was therefore to increase the risk-sensitivity of capital requirements, above all through the possibility for banks to use their own internal estimates for prudential purposes. Just as Basel II was coming into force, however, the global financial crisis of 2007-2008 erupted, highlighting, among other things, the lack of high-quality capital. These developments thus led to the formulation of Basel III (2010), which confirmed the previous approach regarding the methods for calculating RWAs but, unlike the 2004 agreement, turned its attention to Regulatory Capital, not only improving its quality but also raising its level through new prudential requirements and buffers. However, a few years after its implementation, a heated debate arose about the actual ability of RWAs to adequately reflect banking risks. The literature, in fact, has highlighted divergences in the RWAs of various banks, some of which appear unjustified and, therefore, could compromise both financial stability and a real level playing field (the international level playing field). In particular, having Basel III strengthened from a quantitative and qualitative point of view the capital resources that banks must hold against risks, there is “the fear that this tightening action could be offset by a relaxation in risk measurement practices”<sup>2</sup>, which is therefore reflected in an unreliable determination of RWAs. In other words, “the greater the pressure to increase the numerator, the greater the pressure will be to reduce the denominator through various means.”<sup>2</sup>

The “renewed attention to the topic by Regulators and market operators is confirmed by a large number of articles, mostly by

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<sup>2</sup>J.M. Arroyo, I. Colomer, R. García-Baena, L. González-Mosquera (2012), *Comparing Risk-Weighted Assets: the importance of supervisory validation processes*, *Rivista de Estabilidad Financiera*, n. 22, Banco de España, p. 12.

market analysts, which compare RWAs across banks and jurisdictions. Despite methodological differences, most argue that there is an excessive degree of subjectivity in bank RWA measurements and that they are therefore not easily comparable across banks; moreover, some of them argue that risk-weighted assets do not even correctly reflect the actual risk on banks' balance sheets. All call for decisive action by the Authorities to improve the convergence of supervisory rules and practices."<sup>3</sup>

The purpose of this chapter is to investigate in more depth the denominator of the Solvency Ratio. The various contributions of the literature to the topic in question will be reviewed, starting first of all from the empirical evidence based on the RWA Density Ratio, then analyzing the possible factors underlying the discrepancies between the RWAs of different banks. Due to inherent flaws, the use of such an indicator could lead to erroneous conclusions and therefore doubts about its usefulness as an analytical tool have paved the way for alternative indices. Analyzing two of these, it will be concluded that the main causes of RWA variability are changes in the business mix of banks and the roll-out effect. Furthermore, to complete the picture relating to the RWA Density Ratio, a paragraph will be dedicated to the importance of this indicator, albeit with all its limitations, for the subject of bank mergers.

The unwarranted excessive variability of RWAs, however, has raised questions about the possibility of risk manipulation by banks adopting IRB models. In this regard, the evidence in support of this thesis provided by analysts, bankers and academics through econometric analyzes will be illustrated. All of this has led to a loss of confidence in RWAs and the need for a series of actions to improve their consistency.

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<sup>3</sup> F. Cannata, S. Casellina, G. Guidi (2012), *Inside the labyrinth of RWAs: how not to get lost*, Banca d'Italia Occasional Papers, n. 132, settembre, p. 11.

## 2. An overview on an international scale: some empirical evidence

A useful starting point for analyzing the elements that contribute to explaining the differences in the RWAs of different banks and jurisdictions is constituted by the empirical evidence.

Such evidence is based on the observation of the RWA Density Ratio, a risk indicator widely used by financial analysts to make comparisons between different banks. It is given by the ratio between RWAs and total assets, in the period of one year (y):

$$\text{RWA}_{\text{density}}(y) = \frac{\text{Risk Weighted Assets}_{\text{totals}}(y)}{\text{Total Assets}(y)}$$

The result is, therefore, a concise indicator of the amount of risk assumed by a bank with respect to its assets:<sup>4</sup> a high value at the intermediary level reflects a greater capital absorption against the assets.

Ledo (2011)<sup>5</sup> analyzes the RWA Density in two dimensions: one temporal and one transversal. From a time perspective, the ratio of RWAs to total assets has trended downwards over the years: as Figure 2.1 shows, the weighted average RWAs for a sample of US and European banks<sup>6</sup> from the beginning of 2000 to 2010 decreased from 44% to 39%, and this trend was widespread in all jurisdictions. Even considering a broader sample of banks, which also includes banks in Canada, Australia and Japan, the trend remains quite similar in all the geographical areas examined (graph 2.2).

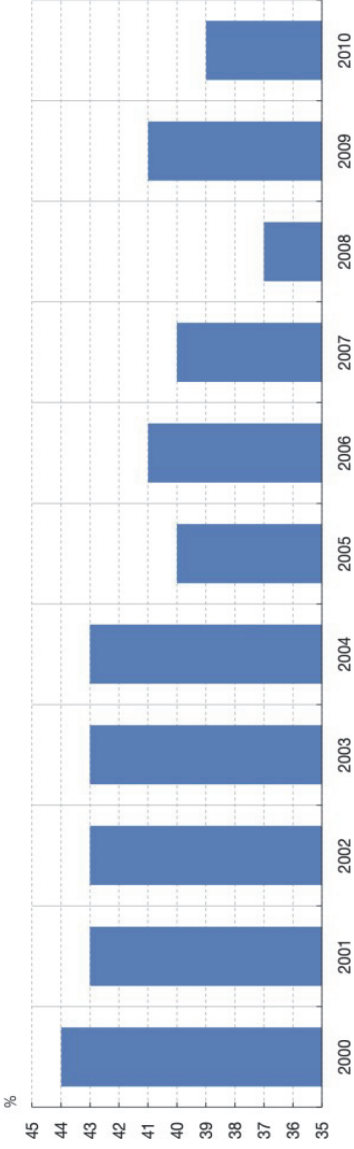
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<sup>4</sup>L. Brie, H. Fréon (2016), *Rwa density. What lies behind this underrated financial ratio*, Chappuis Halder & Co., Hong Kong, p. 8.

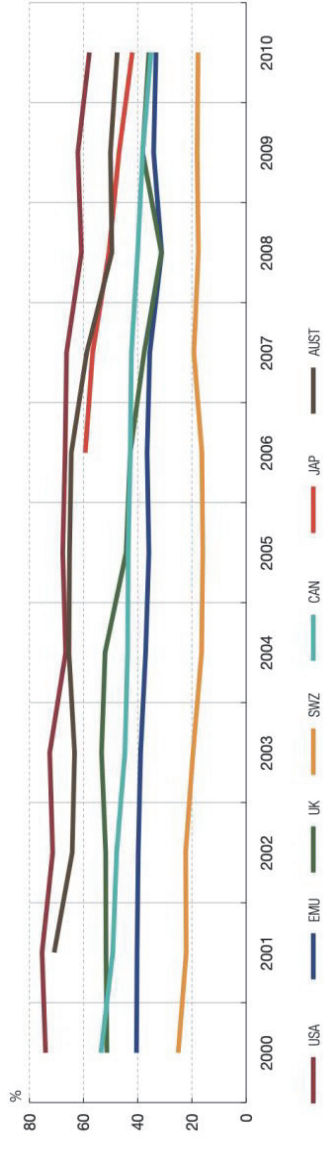
<sup>5</sup>M. Ledo (2011), *Towards more consistent, albeit diverse, risk-weighted assets across banks*, *Rivista de Estabilidad Financiera*, n. 21, Banco de España.

<sup>6</sup>It should be kept in mind that for some countries, such as the United States, Basel I was used for the entire period, while European banks switched from Basel I to Basel II in 2008.

**Graph 2.1. RWA/TA USA and EU banks**



**Graph 2.2. RWA/TA for banks in different geographical areas**



Source: M. Ledo (2011), p. 46.

It is highly likely that this downward trend is due to changes in business models. In fact, in a context of greater competition and the search for yield, the various banks have begun to diversify the activities of their balance sheets, primarily reducing the lending activity with respect to total assets. Since credit risk contributes to the composition of capital requirements to a greater extent than market risk and operational risk, the reduction in the Density Ratio could be partly explained by this reduction in the share of lending activity.

The years of the global financial crisis deserve a separate reflection. First of all, it is significant that the introduction of Basel II in Europe in 2008 did not lead to a change in the trend of RWAs, indeed a reduction of the ratio of 3 percentage points is observed, quite similar in terms of magnitude to that which occurred in 2005. It would therefore appear (for now) that there is no relationship between the introduction of IRB models and the downward trend of RWA density. However, what is rather striking is the lack of procyclicality of RWAs during the crisis. As is known, one of the limitations of Basel II is its tendency to amplify fluctuations in the economic cycle by modifying the supply of credit to the economy. This is because IRB models, while considered a major advance in institutional risk measurement, are supposed to enhance the procyclicality of RWAs, which are calculated as an increasing function of the probability of default (PD), the loss given default (LGD) and exposure in the event of default (EAD). So, these variables are expected to increase during recessions thus tightening capital requirements and automatically making it more difficult for banks to grant loans.<sup>7</sup> In this way, however, the negative phase of the economic cycle would be accentuated.

Contrary to expectations, the empirical evidence during one of the worst financial crises shows an enigmatic behaviour of RWAs: instead of the expected upward movement, there is a decrease. However, it is possible to identify at least three possible explanations for this behaviour.

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<sup>7</sup>M. Behn, R. Haselmann, V. Vig (2022), *The limits of model-based regulation*, *The Journal of Finance* 77, pp. 1635-1684.

First, most banks may have embarked on a deleveraging process by getting rid of riskier assets and thus reducing the RWA Density, and this is what above all Swiss banks did. However, for banks that increased their assets during the crisis, the corresponding increases in RWAs were very limited. The fact that some institutions have achieved a reduction in their risk profile in the face of the increase in total assets could be explained in two ways: first, it is possible that an optimization of RWAs was carried out through different corporate strategies and, second, the massive use of cyclical mitigation techniques may also have played a role. With regard to this last aspect, in fact, it is possible that in the midst of the crisis the IRB models of some banks are switched from point-in-time (PIT) to through-the-cycle (TTC) rating systems, in order to avoid a certain degree of upward pressure on RWAs.<sup>8</sup>

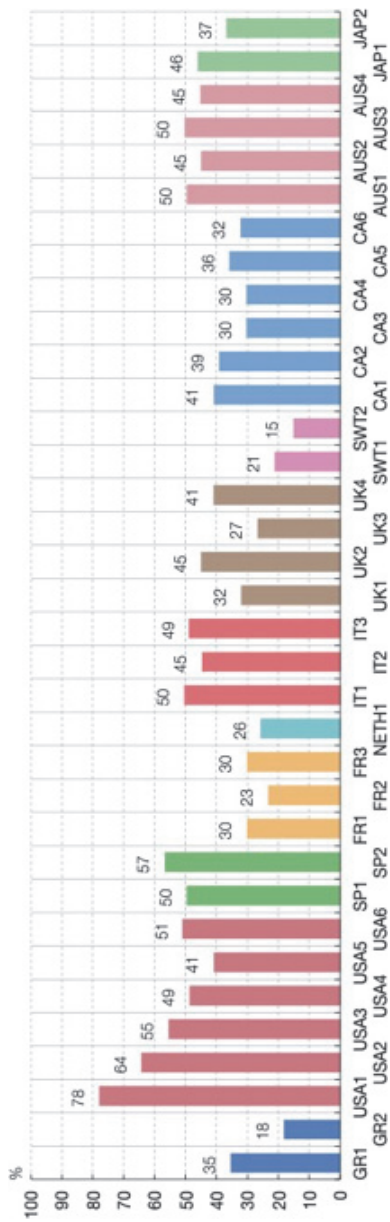
So far we have shown what the trend of the indicator is over time. On the other hand, the cross-sectional dimension of RWA examines the differences between jurisdictions in different geographic areas. From graph 2.3, significant differences can be seen both across the countries of continental Europe and by comparing continental Europe with the countries of the rest of the world, especially the United States. As far as Europe is concerned, in fact, we see that German and Swiss banks are those that record a lower RWA Density, followed by the French and the Dutch, while Spanish and Italian banks are those characterized by a higher ratio. Outside of Europe, Australian and, to a lesser extent, Japanese banks have above-average RWAs. Finally, as far as the transatlantic debate is concerned, it is significant that US banks have a higher RWA Density than European ones.

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<sup>8</sup>“PIT rating systems tend to provide a counterparty rating conditioned by the current economic situation and are therefore unable to capture the future evolution of creditworthiness. Conversely, in TTC systems, the judgment relating to the creditworthiness of the counterparty is made considering a longer time horizon, which sometimes includes a recession scenario. PIT systems therefore tend to be affected, to a greater extent than TTC ones, by fluctuations in the economy, resulting in more frequent transitions between rating classes.”. See F. Cannata (2010), *Il metodo dei rating interni. Basilea 2 e il rischio di credito: le regole, la loro attuazione in Italia, le proposte di revisione dopo la crisi finanziaria*, Bancaria Editrice, Roma, p. 86.



**Graph 2.3. RWA Density Ratio by country (2010)**



There may be several factors underlying these differences, such as the risk profiles, risk management and supervisory practices of different geographical areas. In particular, if we focus on the comparison between the United States and Europe, most of the existing divergences could be explained through two main reasons: the first refers to the accounting rules since in the United States the financial statements are drawn up according to the Generally Accepted Accounting Principles – GAAP – while in Europe the International Financial Reporting Standards – IFRS – are used, the second, however, refers to a different business model. In reality, there are at least two other alternative hypotheses, namely the scale of bank losses in the United States during the crisis that were higher than those of the European banking sector, and the implementation of Basel II in Europe which, thanks to the IRB models, allowed more leeway in the assessment of RWA.

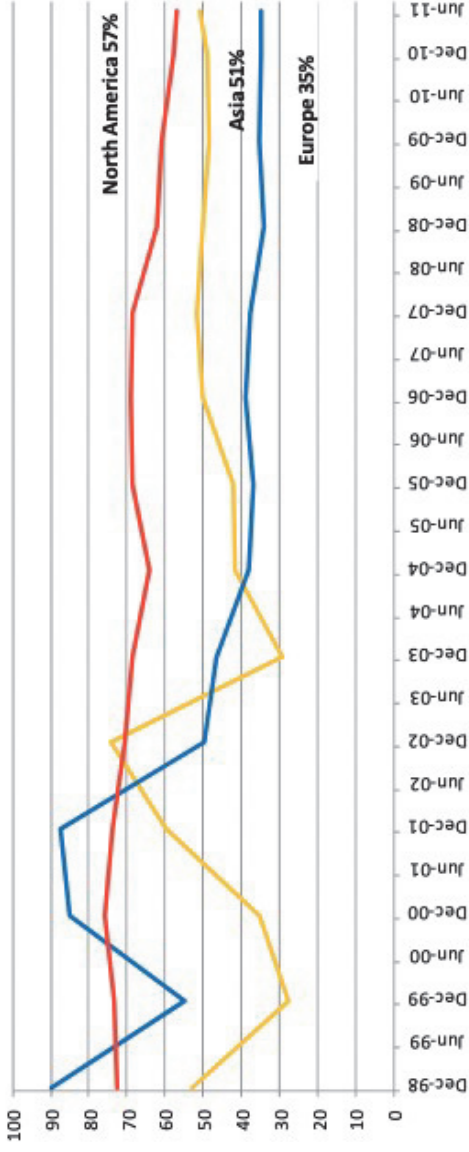
Le Leslé and Avramova (2012)<sup>9</sup> also analyzed the trend of the RWA Density and tried to find possible explanations for the differences found. They too reveal a variation in the ratio both over time and between jurisdictions. In particular, as can be seen in graph 2.4, it is slowly decreasing over time especially in Europe, where banks switched to Basel II between 2007 and 2008, while in the United States, where banks continued to adopt Basel I, it remain fairly stable.<sup>10</sup>

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<sup>9</sup>V. Le Leslé, S. Avramova (2012), *Revisiting Risk-Weighted Assets*, IMF Working Paper, n. 90, p. 15.

<sup>10</sup>The sample consists of 50 systemically important banks (SIBs) located in three regions: Asia-Pacific, Europe and North America.

**Graph 2.4. Evolution of RWAs on total assets in the various regions in the period 1998-2011 (in percentages)**



Source: Le Leslé V., Avramova S. (2012).

The key factors influencing the calculation of RWAs are primarily the regulatory environment, accounting regime and the business models.<sup>11</sup>

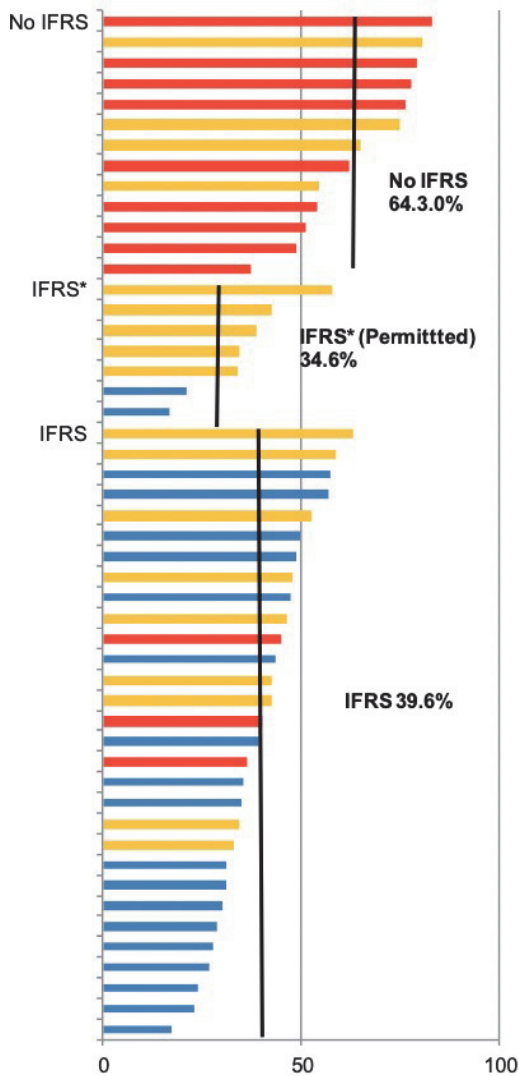
First, risk-weighted assets are driven by the regulatory framework in place: some banks were still following Basel I, others Basel II, during the period considered. The two agreements differ significantly, indeed Basel II imposes capital requirements also for operational risk, in addition it provides for three approaches for calculating credit risk: the standard method (SA), the foundation internal rating method (FIRB) and the advanced method (AIRB). Obviously, banks have a strong incentive to select those activities that are more “advantageous” in the light of their regulatory; therefore, European banks lean more towards assets that involve a low risk weighting in order to record high capital ratios, whereas US banks tend to choose assets that offer attractive, and therefore more risky, returns.<sup>12</sup> Consequently, the RWA density is higher in the countries enter into an agreement to the first Accord and decreases as jurisdictions adapt to the more sophisticated approaches of Basel II, i.e. they move from the standardized method to the FIRB method and finally to the AIRB, as graph 2.5 shows:

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<sup>11</sup> Additional factors include: supervisory practices (e.g. initial validation and ongoing supervision of models), legal framework (e.g. risk management and recovery procedures, use of collateral), structure of the economy, assumptions about the business cycle and probability of default (e.g. use of PIT or TTC rating systems, differences in historical data used for PD estimation, different time periods considered for estimation).

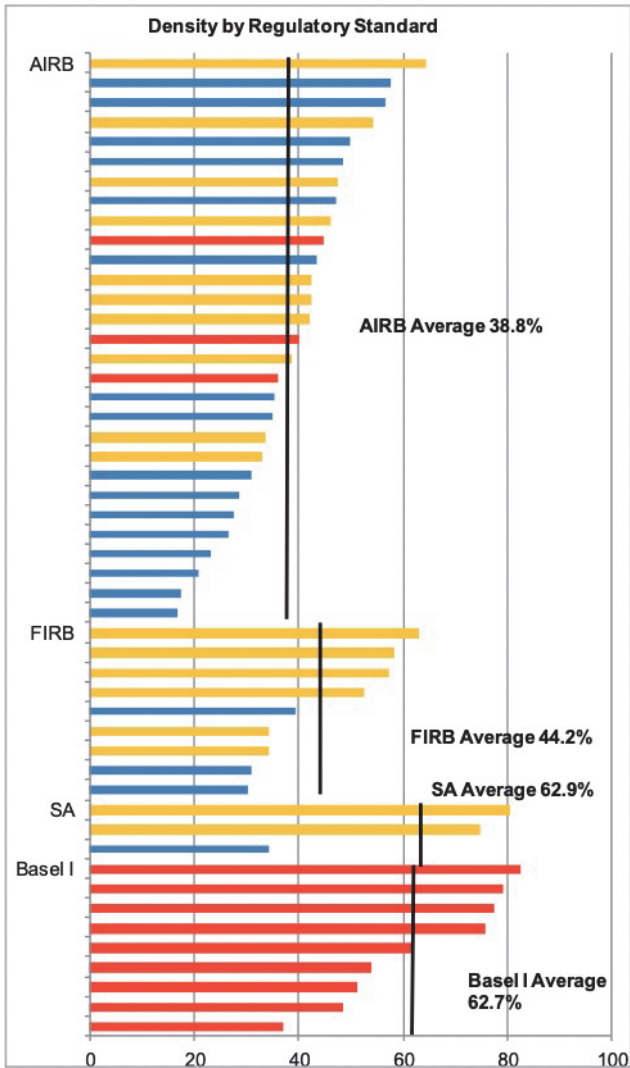
<sup>12</sup> Recall that, due to the rigidity of risk weightings under Basel I, there is an incentive to prefer riskier and more rewarding loans for the same capital requirement (see Chapter 1).

**Graph 2.5. RWA Density based on regulatory standards**



Second, the RWA/TA ratio for non-IFRS banks is higher than for IFRS banks (Graph 2.6); so, suggests that the accounting regime is also an important variable that helps explain the differences in the RWAs of different jurisdictions.

**Graph 2.6. RWA Density based on accounting principles**



According to the regulatory and accounting framework, it can be deduced that the RWA density of European banks tends to be lower than that of Asian and North American banks. However, significant differences can also be found within each region based on the type of business model:

- in Europe, some banks in Spain, Italy and the UK, which are more oriented towards retail activities, are characterized by a higher ratio than some banks based in France, Germany and Switzerland, which are oriented towards universal banking or investment;
- in North America, US regional banks outnumber international banks, as well as regional banks in Europe and Asia-Pacific, due to their focus on mortgages and retail;
- in Asia-Pacific, some Australian banks, whose corporate profile is closer to that of European universal banks, rank below the regional average.

It can therefore be concluded that retail banks tend to have a higher ratio than universal banks and investment banks (graph 2.7).