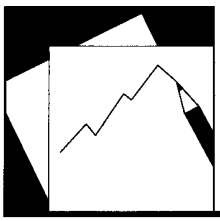
WP/12/90



# IMF Working Paper

# Revisiting Risk-Weighted Assets

## "Why Do RWAs Differ Across Countries and What Can Be Done About It?"

*Vanessa Le Leslé and Sofiya Avramova*

INTERNATIONAL MONETARY FUND

 WP/12/90

**IMF Working Paper**

Monetary and Capital Markets Department

# Revisiting Risk-Weighted Assets

**Prepared by Vanessa Le Leslé and Sofiya Avramova**[1]

Authorized for distribution by Aditya Narain

March 2012



## Abstract

In this paper, we provide an overview of the concerns surrounding the variations in the calculation of risk-weighted assets (RWAs) across banks and jurisdictions and how this might undermine the Basel III capital adequacy framework. We discuss the key drivers behind the differences in these calculations, drawing upon a sample of systemically important banks from Europe, North America, and Asia Pacific. We then discuss a range of policy options that could be explored to fix the actual and perceived problems with RWAs, and improve the use of risk-sensitive capital ratios.

JEL Classification Numbers: G21, G28, G32, G38

Keywords: Banks, Regulation, Risk-weighted Assets, Basel I, II, III, Capital

Author's E-Mail Address: vlelesle@imf.org; savramova@imf.org

[1] We are grateful for contributions and comments from J. Fiechter, C. Pazarbasioglu, F. Melo, K. Seal, A. Sy, A. Ilyina, I. Guerra, and J. Kiff. The paper also benefited from discussions with market participants and public sector officials. Any remaining errors in the paper are our own.

**Contents** **Page**

# I. INTRODUCTION

Strengthening capital ratios is a key priority in the aftermath of the global financial crisis. Increasing the quantity, quality, and transparency of capital is of paramount importance to restore the banking sector to health. Recent regulatory reforms have primarily focused on improving the numerator of capital ratios, while changes to the denominator, i.e., risk-weighted assets (RWAs), have been more limited.

Why look at RWAs now? Confidence in reported RWAs is ebbing. Market participants question the reliability and comparability of capital ratios, and contend that banks may not be as strong as they are portrayed by risk-based capital ratios. The Basel Committee recently announced it will review the measurement of RWAs and formulate policy responses to foster greater consistency across banks and jurisdictions.

The academic literature on capital is vast, but the focus on RWAs is more limited. Current studies mostly emanate from market participants, who highlight the wide variations existing in RWAs across banks. There is no convergence in views about the materiality and relative importance of these differences, and thus no consensus on policy implications.

This paper aims to shed light on the scale of the RWA variation issue and identify possible policy responses. The paper (i) discusses the importance of RWAs in the regulatory capital framework; (ii) highlights the main concerns and the controversy surrounding RWA calculations; (iii) identifies key drivers behind the differences in RWA calculations across jurisdictions and business models; and (iv) concludes with a discussion on the range of options that could be considered to restore confidence in banks' RWA numbers.

A comprehensive analysis of broader questions, such as what is the best way to measure risk or predict losses, and what is the optimal amount of capital that banks should hold per unit of risk, is beyond the scope of this study. A comparison of the respective merits of the leverage and risk-based capital ratios is also outside our discussion.

# II. RISK-WEIGHTED ASSETS, CAPITAL, AND THE REGULATORY FRAMEWORK

## A. RWAs are an Important Component of Capital Ratios

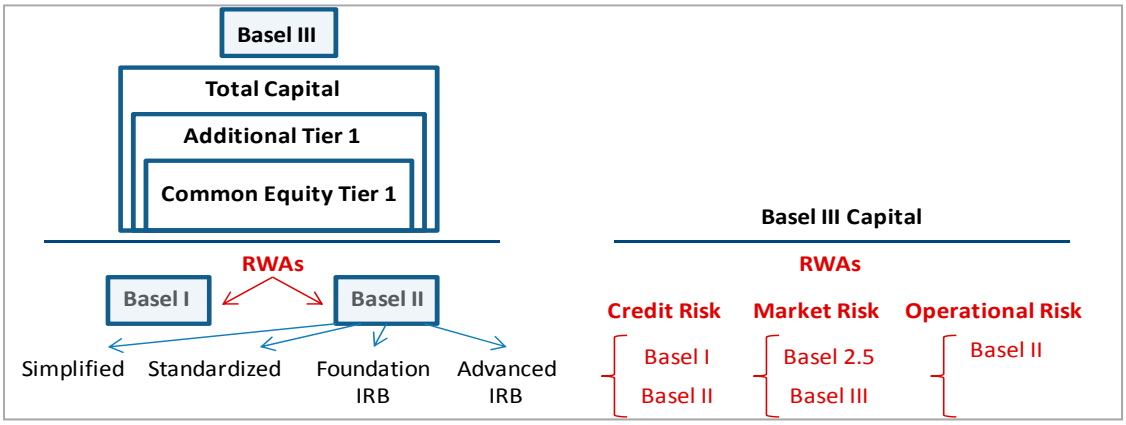
**Risk-based versus unweighted capital ratios.** Capital ratios are a key indicator of a bank's solvency and resilience. Over time, the regulatory capital framework has changed significatly (see appendix I for a full discussion), but remains heavily dependent on RWAs. The Basel Committee's regulatory solvency measures[2] are currently all defined in terms of risk-

[2] Tier 1 (T1), Tier 2 (T2) and Total Capital (TC), and Common Equity Tier 1 (CET1), Additional Tier 1 (AT1) and TC under Basel III , as well as other key solvency measures, such as Core Tier 1 (CT1) or Tier 1 Common.

weighted assets (RWAs). However, Basel III will gradually introduce a new solvency measure, the leverage ratio, initially defined as Tier 1 capital over total unweighted on-and off-balance sheet assets.

**The denominator is still subject to the coexistence of various approaches under the Basel regimes.** While Basel III will foster greater convergence in the definition and composition of the numerator of capital, the denominator is the product of a mix of Basel approaches (figure 1).

**Figure 1. Capital Ratios Under Basel III Use Several Versions of the Basel Regime**




Source: BCBS, IMF Staff.

## B. Why Do We Need to Look at RWAs?

**Risk-weighted assets have at least three important functions**. RWAs are an important part of both the micro- and macro-prudential toolkit, and can (i) provide a common measure for a bank's risks; (ii) ensure that capital allocated to assets is commensurate with the risks; and (iii) potentially highlight where destabilizing asset class bubbles are arising.

**The perceived differences in the detailed application of the Basel standards for RWAs have brought into question the credibility and effectiveness of the capital framework.** Policy makers, banks, and investors all rely heavily on capital ratios to assess the strength of banks, and to provide solutions to the financial crisis that started in 2007 and is still plaguing some banking systems. The most recent illustration is the European Banking Authority stress tests, where risk-based capital requirements were temporarily raised to solidify European banks. Similarly, the new capital buffer for global systemically important banks (G-SIBs) is based on a percentage of RWAs. However, increased reliance on capital ratios comes at a time when their robustness is being questioned, as various capital measures provide different and often conflicting messages about banks' solvency (see III A). As doubts arise concerning the robustness of the risk assessment, questions are also being asked as to the accuracy of reported levels of capital.

**Capital ratios have been scrutinized for as long as they have been in existence.** As early as 1999, the Basel Committee noted that "with increasing sophistication of the banks and the development of new innovative techniques in the market, the largest banks have started to find ways of avoiding the limitation which fixed capital requirements place on their risk-taking relative to their capital. For certain banks, this is undoubtedly starting to undermine the comparability and even the meaningfulness of the capital ratios maintained."

**The focus has shifted from the numerator to the denominator.** While in the run-up to the financial crisis, doubts were centered around the numerator, now they are squarely focused on the denominator. In fact, in recent months, senior regulators from several leading agencies and international organizations have publicly expressed their concerns about RWAs.

**Investors' concerns are also highlighting the need to focus attention on RWAs.** Investors' growing concerns about the reliability of the denominator of capital ratios bear similarities to their previous loss of confidence in the numerator in the run-up to the 2007 financial crisis. At that time, market participants moved away from regulatory measures and chose to focus instead on capital measures, which better reflected true loss-absorbing capital (e.g., Core Tier 1 in Europe and Tangible Common Equity or Tier 1 Common in the United States). Basel III then sought to correct the main deficiencies of the numerator, by adopting a much stricter definition of capital. Recent market intelligence points to an increased mistrust in the way certain banks calculate their RWAs (particularly the ones using the Basel II advanced IRB approach). Some investors may prefer to rely on un-weighted capital measures (leverage ratio) to assess solvency, or to require a higher capital ratio to compensate for the possible understatement of RWAs. Either way, this underlines the urgency to revisit RWAs.

**This paper aims to further the debate on RWAs.** Starting with the premise that retaining risk-based capital ratios is our preferred outcome, our discussion centers around mapping out concerns and differences, and suggesting possible policy options to strengthen the current RWA framework and solidify market confidence.

## III. What Are The Key Concerns About RWAs?

Some regulators, banks, and market participants have expressed doubts about the adequacy, consistency, transparency, and comparability of capital (summarized in table 1). Market distrust about the reliability of RWAs reported by banks could have a number of consequences, including: (i) market participants may re-calculate banks' capital ratios (most likely downwards) and disregard regulatory reported ratios; (ii) further, they could stop using risk-based capital ratios altogether and turn to the leverage ratio; (iii) investors may require higher capital ratios to compensate for the low perceived reliability of the denominator; and (iv) they could restrict lending to banks for which they have doubts about reported capital adequacy.

**Table 1. Overview of Key Concerns Resulting from Current RWA Calculation Practices**

| Key Concerns | Possible impact |
|---|---|
| ***Regulators' main concerns*** | |
| ***Reliability and Accuracy of capital ratios*** | |
| • Inaccurate measurement of risk, both on- and off-balance sheet<br>• Understatement of risk<br>• Tail risk not captured properly, thus low probability/high impact events mispriced | • Reported capital adequacy ratios can substantially overstate banks' capital adequacy and send wrong signals about the true solvency and resilience of banks<br>• Capital ratio is not a reliable indicator of stress, possibly delaying necessary restructuring/ recovery/resolution |
| ***Adequacy of capital*** | |
| • RWAs as a percentage of total assets have trended down in recent reportings despite a heightened risk environment, leading to concerns that low RWA calculations reflect insufficient capital<br>• RWAs decrease due to "optimization", "model changes", "data cleaning", "parameter updates", etc…<br>• Banks with similar business models may have very different capital levels | • Imperfect match between risk and capital<br>• Some banks are under-estimating risk<br>• The lower the RWA density, the higher the scope for error in the calculation of capital requirements |
| ***Pro-cyclicality*** | |
| • RWAs, which rely on ratings and are mostly based on historical parameters, may be too low in good times & rise too late in bad times<br>• Probability of default: "point in time" versus "through the cycle" affects cyclicality of capital | • Calculation of RWA may amplify pro-cyclicality of capital requirements, as banks de-leverage in a downturn to reduce their RWAs, or increase them in good times, thereby amplifying the crisis or building up an asset bubble |
| ***Risk-taking incentives and risk management*** | |
| • Banks may "game" the system by under-estimating risks to optimize their capital beyond what prudence requires<br>• RoE type targets may incentivize banks to aggressively manage their RWAs down | • Lack of prudence and excessive management discretion in pushing capital down may result in aggressive risk-taking and could potentially lead to bank failure, with significant related social and economic costs |
| ***Banks' main concerns*** | |
| ***Competitive advantage*** | |
| • Some banks worry that the banks with the lowest RWAs could benefit from an undue competitive advantage (due to lower capital requirements), and capture market shares thanks to more aggressive pricing power<br>• G-SIFI capital surcharge will be calculated as a percentage of risk-weighted assets, not of total assets, which could favor some banks over others in terms of additional capital | • Least conservative banks could gain ground, which could threaten global financial stability<br>• Based on RWAs, the G-SIFI surcharge does not necessarily penalize the largest banks (in terms of total assets) |
| • Uneven regulations and supervision of banks' RWA practices across jurisdictions<br>• Model approvals are neither uniformly robust nor uniformly reviewed | • Application of Pillar II and capital buffers is variable<br>• Supervisory practices vary excessively, and some banks get a more lenient treatment |

| *Investors' & Markets' main concerns* | |
|---|---|
| ***Comparability of capital ratios*** | |
| • RWAs are subjective and vary from one bank to the next, and it is challenging to compare capital ratios across banks, both cross-border & within countries | • Markets may prefer a simpler, more objective and easier to compare measure such as the leverage ratio |
| ***Credibility of capital ratios*** | |
| • Different methodologies may lead banks, regulators, and markets to distrust each others on reported RWAs | • Could lead to a confidence crisis, where markets become reluctant to lend to banks, ultimately resulting in a liquidity crisis |
| ***Opacity and complexity of internal models*** | |
| • The formula for calculating RWAs is very complex in itself and leaves large potential for different interpretations<br>• Difficult for markets to gauge the quality of internal models and the robustness of methodologies used by IRB banks (a difficulty also faced to a certain extent by supervisors)<br>• Large cross-border banks often rely on a myriad of models, each measuring a small portion of the assets under specific rules of various jurisdictions, and it is not unusual for G-SIFIs to employ several dozens of models simultaneously | • Markets may doubt RW based capital measure & adopt leverage ratio instead<br>• Regulators may be tempted to over-ride internal models and impose minimum risk-weights floors<br>• Temptation to move backwards and discard Basel II for Basel I |

## A. Comparing Capital Ratios Globally is Difficult

Most bank comparisons rely on capital ratios, but this paper argues that (i) capitalization varies greatly depending on the capital measure used (risk-based or un-weighted); (ii) similar headline capital ratios may mask very different risk levels, or at least different measurement approaches; and (iii) banks converge toward the regulatory capital ratio that is the most favorable to them. Throughout the paper, we base our discussion on a sample of 50 systemically important banks (SIB)[3] based in three regions: Asia Pacific ("Asia," color-coded in yellow), Europe ("EU" color-coded in blue) and North America ("NA" in red). The sample is also broken down into three main (simplified) business models: retail (commercial) banks, investment banks, and universal banks.

**The ranking of banks' capital adequacy varies significantly, depending on whether capital ratios are risk-weighted or not**. Figure 2 compares the dispersion in capitalization levels by regions (Europe, North America, and Asia Pacific), based on three indicators: (i) Core Tier 1[4] (CT1) over RWAs; (ii) Tangible Common Equity (TCE) over tangible Total

[3] A complete presentation of the sample and methodology is available in Appendix II. Analysis solely relies on publicly available data, which frequently lack full disclosure and consistency.

[4] Tier 1 is a more widely reported indicator, but the numerator varies significantly across jurisdictions and it is not the strongest measure to assess capital adequacy.

Assets (TA); and (iii) TCE over RWAs. All three indicators point to higher capital levels in Asia Pacific and North America, with wider dispersion among the European banks. The latter are scattered when ranked in terms of risk-based CT1 or TCE/RWAs, but migrate downwards when assessed on an un-weighted basis (leverage ratio), while U.S. and Asia Pacific banks stack up at the top.

**Figure 2. Comparison of Core Tier 1 over RWAs, Leverage Ratios, and Core Tier 1 Equivalent (in percent)**


Source: Bloomberg Data as of June, 2011. Legend: Asia—yellow, Europe—blue, North America—red.

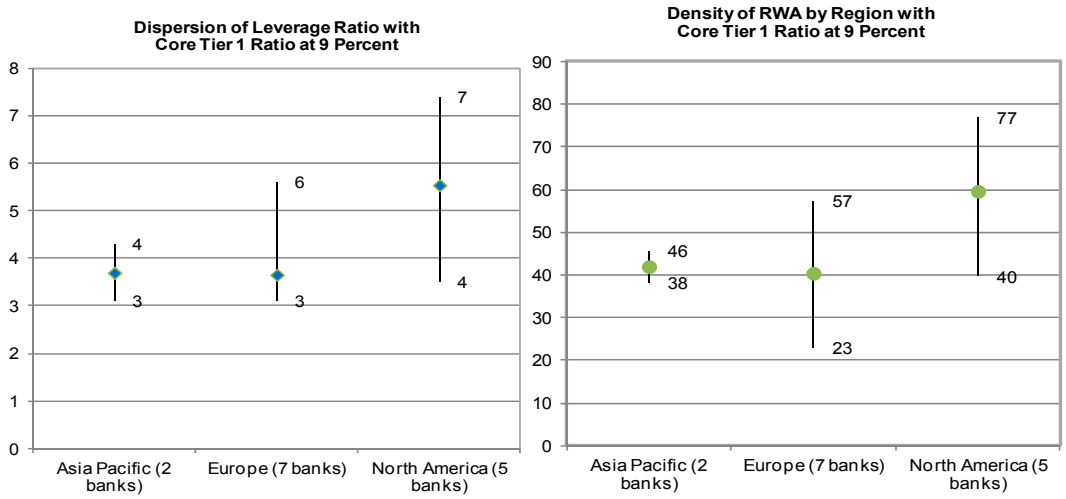
The better performance of banks in certain geographical locations under certain capital ratios is driven by a combination of factors discussed in section IV, and particularly:

- Regulatory environment
- Accounting framework
- Economic cycle and probability of default
- Banks' business models, composition of RWAs and methodology

**Similar capital ratios may reflect a very different risk measurement.** Can we even compare capital ratios? Taking a sub-sample of 14 banks from Europe, North America, and

Asia Pacific who all reported a 9 percent Core Tier 1 (or equivalent),[5] figure 3 illustrates that the corresponding leverage ratio and "RWA density" (measured as a percentage of RWAs over TAs) for these 14 banks varied significantly, both across and within regions. The Leverage Ratio varied between 3 percent in Europe and Asia Pacific and 7 percent in North America. Similarly, for RWA density, the level goes from 23 percent (Europe) to 77 percent (North America). Both charts show large gaps between the lowest and highest leverage ratio and RWA density reported within each region. This suggests that a nominal reported ratio of 9 percent Core Tier 1 may mask differences in the level of risks it supports across banks. It may equally show a combination of different types of assets and different risk weights.

**Figure 3. Leverage Ratio and RWA Density for a Sample of 14 Global Banks with a 9 percent Core Tier 1 Ratio (or equivalent) (in percent)**

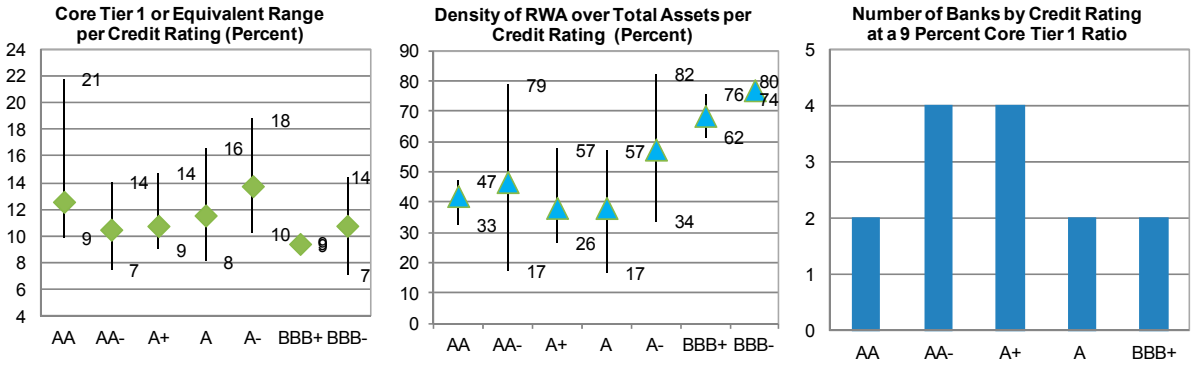



Source: Bloomberg, SNL, Staff estimates (June 2011).

**Linking ratings and capital measures also highlights the difficulty in relying on any single measure of capitalization to assess a bank's solvency**. For the broader sample of 50 banks, figure 4 shows a very wide dispersion of reported Core Tier 1 (or equivalent) for banks rated in the same category. For instance, AA rated banks (based on an average of Standard and Poor's and Moody's ratings) report a CT1 ratio of between 9 percent and 21 percent. Similarly, the level of RWA density for each rating bucket displays wide ranges. This would tend to suggest that even if capital is an important component of the rating decision, ratings are not a strong indicator per se of bank solvency, as they incorporate other quantitative and qualitative parameters. For the narrower 14 banks sample, ratings also point to a variation in the overall quality assessment of banks.

[5] 9 percent was the most frequently observed ratio, and appears as a good transitional level to look at until Basel III comes into force, as evidenced by European Banking Authority's use of a 9 percent threshold in the 2011 stress tests of European banks.

**Figure 4. Ranges of CT1 and of RWA Density by Ratings and Distribution of Ratings for the 14 Banks with a 9 percent Core Tier 1 Ratio**



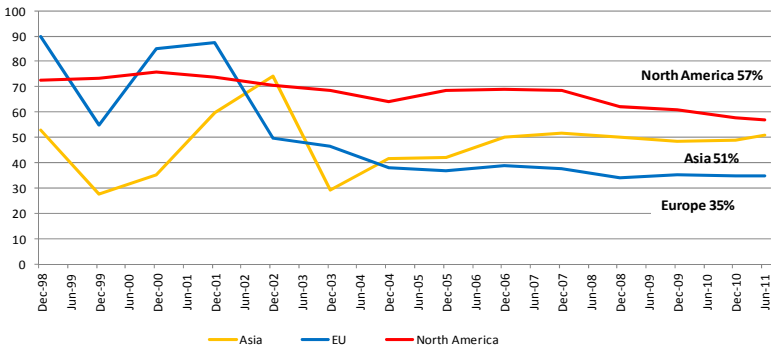

Source: Bloomberg, SNL, Standard &Poor's, Moody's, Staff estimates (June 2011).

## B. RWAs and Total Asset Variations across Regions and over Time

**Recently, there has been a shift in perception about how to interpret RWA density.** The level of RWAs as a percentage of TAs (RWA density) should be viewed as good indicator of a bank's riskiness. Typically, a high proportion of RWAs would tend to indicate a higher share of riskier assets, and regulators and market participants should prefer banks with a low RWA density. However, recently the perception has changed dramatically, with many viewing higher RWAs as "better" and more reliable. Higher RWA density is now considered as an indication of more prudent risk measurement, where banks are less likely to "optimize" the computation of their risk-based capital ratios.

**Figure 5. Evolution of RWA over Total Assets (1998–2011) across Regions[6] (in percent)**

**Total assets, risk-weighted assets and RWA density vary across jurisdictions and through time.** The differences between the average RWA/TA ratios ("RWA density") across regions are significant (Figure 5), prompting questions about consistency across the RWA methodologies used by




Source: Bloomberg, SNL, individual bank reports

[6] The sample is not constant over the period (due to consolidation and changes to the perimeter of banks under review), and encompasses 8 banks at its narrowest point (1998) and 50 from 2008 onwards. In addition, the sample masks differences between individual banks, with some seeing an increase in RWAs and others experiencing a decrease.

banks in different jurisdictions, and casting doubts on the reliability of banks' capital ratios. RWA density is slightly trending down over time, in Europe (where banks gradually transitioned to Basel II by 2007), but remains stable in the United States, where banks continue to report under Basel I.

**After a decade marked by an increase in total assets, RWA density decreased (or stopped increasing)**. In the run-up to the financial crisis, many banks experienced balance sheet inflation, due to a mix of consolidation, organic growth and expansion, as European SIBs (which mostly follow a "universal banking model") diversified their business lines and geographies. There are some indications of a recent decline in RWA density in some jurisdictions, but data seems inconclusive and is often inconsistent across banks. Limited information makes it difficult to explain why RWA density is trending down, which could be the result either of a reduction in RWA or of an increase in total assets (or a combination of both). The question is whether TA and RWA are moving in step or diverging?

**RWAs have been declining proportionally more than total assets** for some banks and jurisdictions in recent years. Several factors may explain this decrease in RWA density. As intended by design, the gradual shift from Basel I to Basel II (particularly IRB approaches) has enabled banks to benefit to some extent from lower RWAs, as they move their portfolios to the advanced IRB. The average RWAs could also have been driven down by changes in the business mix, with banks increasing at a relatively faster rate those assets that carry lower risk-weights (as banks have a regulatory incentive to gravitate towards assets attracting less capital) and reducing assets attracting higher capital requirements. The point in the cycle (growth or downturn period) at which PDs and RWAs are calculated is also important. A deterioration in economic conditions should push the probability of default (PD) of assets up and lead to an *increase* in RWAs, which prove true for some, but not all the banks. The increased use of collateral (which decreases the loss given default) may have contributed to the RWA density reduction.

**The transition from Basel I to Basel II and the business mix changes are legitimate reasons to support an RWA decline in recent years.** However, some contend that some banks (particularly advanced IRB banks) may have amplified this decline by changing their RWA methodology further to obtain lower RWAs, but this is hard to prove based on publicly available data.

## IV. KEY DRIVERS OF DIFFERENCES IN RWA CALCULATIONS

**A host of factors influence banks' risk modeling choices.** Some reflect true risk-taking and are bank-specific parameters (such as the business model or asset quality), while others are unrelated to the risks that banks incur (such as institutional, accounting, regulatory parameters). First, ***we would expect there to be differences***, as operating environments and business models vary widely among banks. However, this study sets out to (i) to identify the factors to which these variations can be attributed and map out the extent of those

differences, and (ii) differentiate between external parameters and bank-related ones. Our analysis looks into differences in RWAs across regions and types of banks.

## A. Overview of Factors Influencing RWAs

Table 2 provides a simplified overview of the main factors behind RWA differences, which are detailed in following paragraphs.

**Table 2. Main Factors of Differences in RWA Densities across Jurisdictions and Banks**

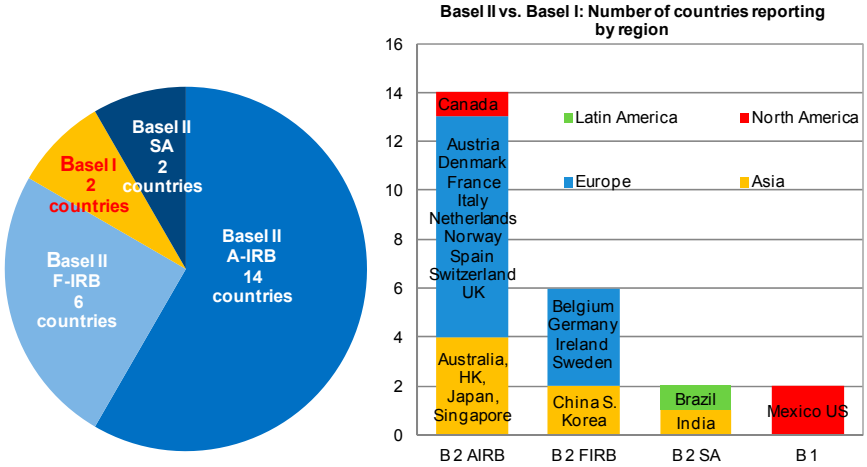
| External Parameters | Banks' Internal Parameters |
|---|---|
| ***Regulatory framework*** | |
| • Reporting under Basel I or Basel II regime, and for Basel II, under Standardized Approach (including the Simplified one), versus Foundation Internal Rating Based (IRB) or Advanced IRB approach<br>• Regulatory emphasis on risk-weighted based capital ratios or on leverage measures (un-weighted) | • Bank choice of approach under Basel II: standardized or IRB; combination of approaches for different portfolios and/or geographies |
| ***Supervisory framework*** | |
| • Initial validation of models<br>• On-going supervision of models and RWA classification methodology<br>• Imposition (or not) of minimum floors on some asset classes<br>• Cross-bank surveys on methodology<br>• Intensity of use of Pillar 2<br>• Understanding of broader risk management | • Modeling risk<br>• Risk management and strategy<br>• Risk appetite |
| ***Accounting framework*** | |
| • IFRS versus US GAAP or other local accounting standards | • Some banks report under both IFRS & US GAAP<br>• Full or partial implementation of IFRS standards |
| ***Legal framework*** | |
| • Recovery process, through judiciary courts or through direct bank repossession<br>• Access to collateral<br>• Contract enforcement | • Internal risk management and recovery procedures<br>• Use of collateral |
| ***Economic cycle*** | |
| • Economic growth versus downturn (mild or severe?)<br>• Rates of defaults by regions and countries<br>• Rates of default by asset classes<br>• Rates of recovery | • Asset mix (by geography and business lines)<br>• Lending and recovery practices<br>• Internal probabilities of default / loss given default and expected recovery<br>• Probability of default: use of "point in time" or "through the cycle" |
| ***Business model*** | |
| • Constraint on bank structure (legal separation of activities, ring-fencing) | • Business model choice: universal bank / retail bank / investment bank (or combination)<br>• Asset composition and business mix |
| ***Lending, valuation and provisioning practices*** | |
| • Directed lending (from the government or related public bodies) or free market<br>• Mortgages: originate and distribute / on- or off-balance sheet (e.g. passed over to GSEs)<br>• Structure of the economy (e.g. SMEs versus large corporates; level of indebtedness of corporate and households) | • Lending practices (loans versus bonds; maturity of assets; quality of borrowers)<br>• Geographic footprint may impose local practices in addition to group ones<br>• Valuation and collateralization of assets<br>• Classification of assets into performing/non performing loans<br>• Provisioning practices |

## B. External Parameters

***Regulatory frameworks are a key factor influencing the calculation of RWAs***

**Banks' RWAs are primarily driven by the regulatory framework prevalent in their home jurisdiction**. Banks follow either the Basel I or Basel II framework, which differ significantly (see Appendix I). Even within Basel II, there are three possible approaches to choose from: Standardized Approach (SA), Foundation Internal Ratings Based Approach (F-IRB) and Advanced Internal Ratings Based Approach (A-IRB). Basel II imposes capital charges for operational risk, whereas Basel I does not.

**Figure 6. Regulatory Frameworks in 24 Systemically Important Jurisdictions**




Source: Banks' Pillar III Reports, Annual Reports.

**The majority of systemically important jurisdictions report under Basel II**[7] (figure 6), with the Advanced IRB approach the most commonly used (14 countries). In Europe, all banks were required by European legislation (Capital Requirements Directive, "CRD") to implement Basel II in 2007. In Asia, countries with large financial sectors follow one of the Basel II approaches as well. In contrast, the US banks continue to report under Basel I, with the largest internationally active US banks (with total assets of over $250 billion) in a parallel-run phase, with a view to migrating to Basel II (and III).

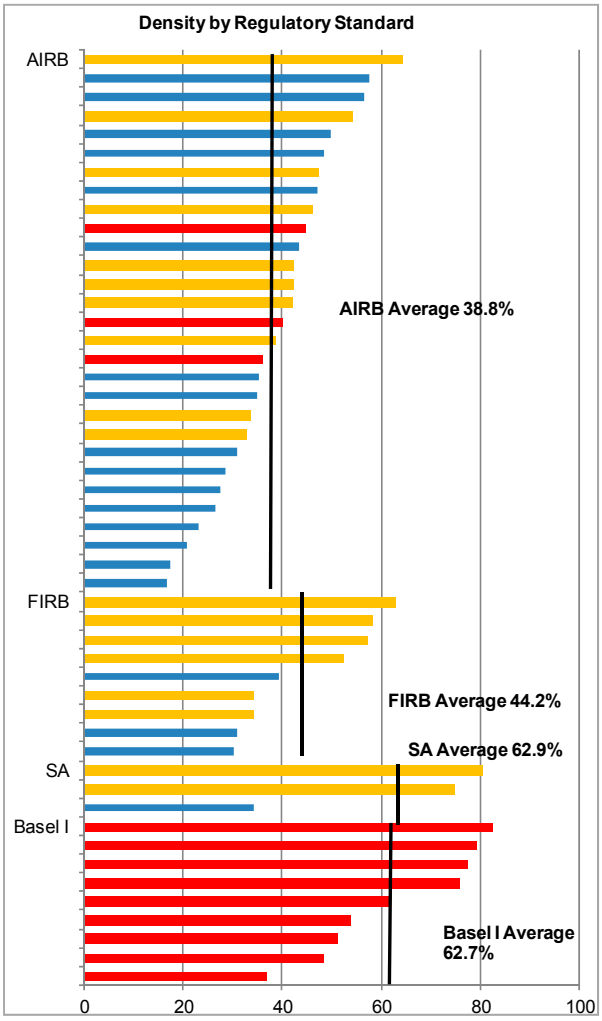
**Reporting under Basel I or II carries important implications for the way assets attract risk-weights.** Banks have a strong regulatory incentive to select assets that look attractive under their regulatory regime. European banks tend to gravitate towards assets that carry a low risk weight, allowing them to report strong capital ratios under the Basel II risk-weighted framework. Conversely, in the United States, where the emphasis beyond Basel I has long

[7] This classification is simplified, as some banks may have opted from a different approach than the one which is the most common in their country of incorporation, and many banks use a combination of approaches.

been on the leverage ratio, banks tend to focus more on assets that carry attractive returns, since they have a more binding leverage constraint and cannot over-accumulate assets. As a result and as expected, RWA density is higher in Basel I countries, and trends down as jurisdictions report under the more sophisticated Basel II approaches (figure 7).

**Banks under Basel I have much higher RWA densities than banks under Basel II FIRB and A-IRB.** In fact, the A-IRB average RWA density is around 1.6 times lower than the Basel I average RWA density. This is consistent with the objective of Basel II, which was to incentivize banks to develop more advanced risk management (and be "rewarded" with lower RWAs and capital requirements). Typically, risk weights are expected to be the lowest under A-IRB, and highest under Basel I. This tiering means that, as banks migrate to a more sophisticated approach, their RWAs decrease and Core Tier 1 ratio increases. F-IRB is in limited use, as it is mostly a stepping stone towards A-IRB. Most European banks adopted A-IRB, but to varying degrees (some almost exclusively, others still relying on a combination of approaches on different segments of their portfolios).

**Figure 7. RWA Density by Regulatory Standards**




**Regulatory and institutional differences have fuelled a debate about the way European versus US banks measure risks and capital.** Beyond their distinct regulatory regime, the United States and Europe also have a different institutional set-up. For instance, the existence in the United States of government-sponsored entities (GSEs) enables US banks to offload most of their mortgage books (which is not possible in Europe) and to reduce their total assets and RWAs. Neither regime is better or worse per se, but are the product of deeply entrenched political and social choices, and thus are different. Comparisons tend to raise more meaningful issues when done on a regional basis, among banks with similar regulatory set-ups as well as relatively similar business models.

**Floors have been introduced to backstop capital requirements, and should partially offset regulatory effects.** To ensure banks do not hold insufficient regulatory capital, Basel II set a floor on the amount of capital required, as a percentage of what would be demanded

under Basel I. The floor gradually decreased from 95 percent to 80 percent in 2009, when it was supposed to be removed. However, the continuing effects of the financial crisis led the Basel Committee to extend the Basel I floor. Assuming the floor is applied, it would limit the extent to which observed differences can be explained by differences in regulatory regimes. A floor has also been implemented as part of the EBA 2011 recapitalization exercise to mitigate against excessive 'model optimization' among IRB banks.

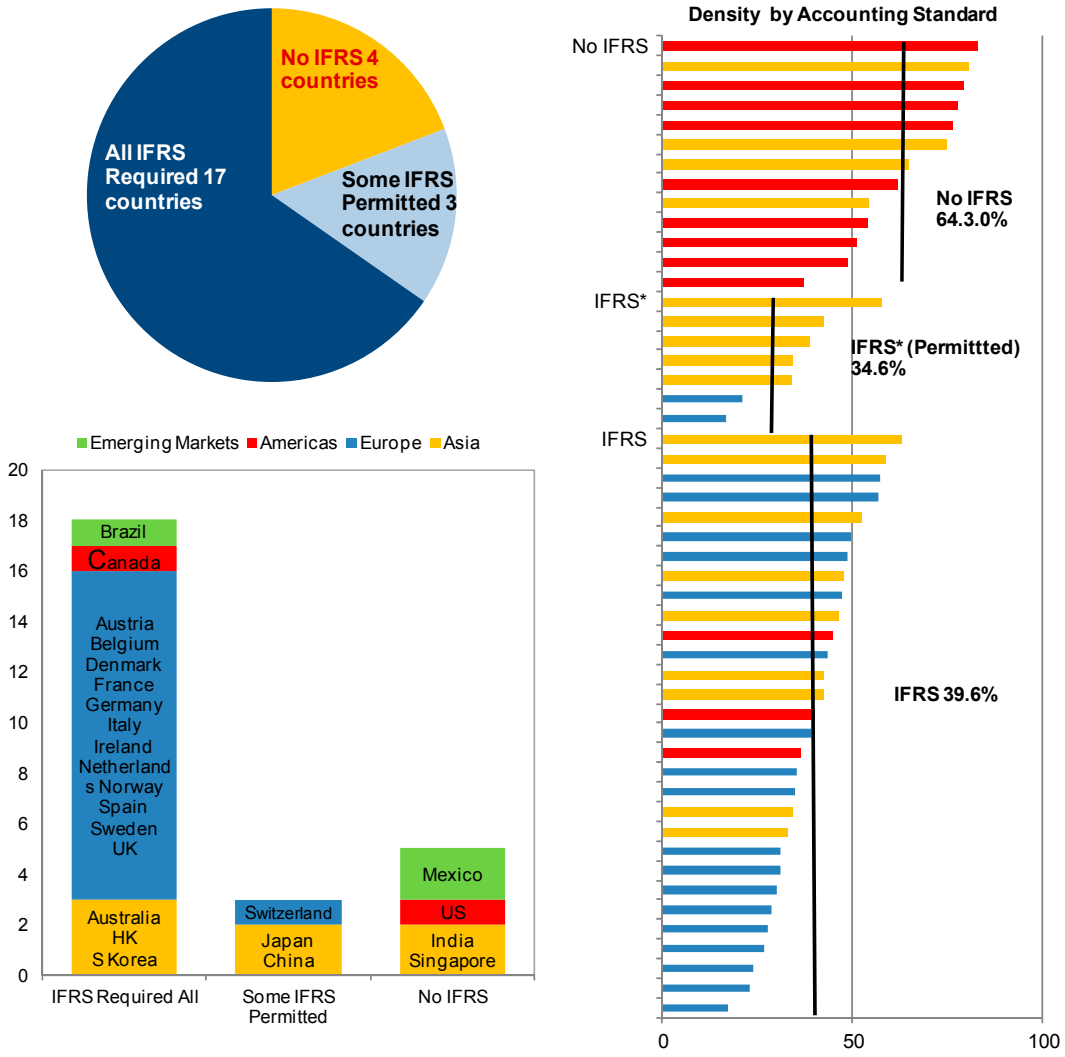
**However, floors cannot prevent some divergences in implementation across jurisdictions**. In Europe, the floor required by the original CRD also expired at the end of 2009, but CRD3 reinstated it until end-2011. The CRD4 draft proposes prolonging the Basel I floor until 2015, but national authorities would be able to waive the requirement under strict conditions. In the United States, Dodd-Frank Act implementation measures created a permanent Basel I floor on minimum risk-based capital requirements, which limits the effects of the migration to Basel II for large international US banks.

***The accounting framework matters***

**The accounting regime influences RWA density**. Most systemically important jurisdictions permit or require the use of International Financial Reporting Standards (IFRS) for domestic companies (figure 8a).The European Union has adopted virtually all IFRS standards (with some carve-outs for IAS 39 and IFRS 9), and many Asian, and North and South American countries have IFRS or equivalent standards in place. In the United States, US GAAP remains the prevalent accounting framework, but work is under way to allow greater convergence towards IFRS. Among the key differences between accounting standards is the netting of derivatives positions (authorized under US GAAP, but disallowed under IFRS). Hence, the off-balance sheet positions would appear more "inflated" on an IFRS basis.

**The biggest impact of accounting is likely to be on the denominator of the RWA density ratio (total assets), rather than on the numerator (RWAs).** The observation that average risk weights for non-IFRS banks are, on average, higher than those for IFRS banks (Figure 8b) suggests that the accounting framework matters when comparing average RWA density.

**Figure 8 a and b. Acounting Standards in 24 Systemically Important Jurisdictions**




Source: Deloitte & Touche, 2011, Banks' Pollar III Reports and Annual Statements, 2010.

### *Economic cycle and PD assumptions are important in determining RWAs*

A key input in the IRB complex formula is the probability of default (PD). Different interpretations and calculations of the PD may result in drastically different outputs in the formula. Risk weights increase as the PD rises, but the relationship is not proportional, and a high increase in the PD will typically translate into a more moderate increase in RW. Barclays analysts[8] show how risk weights can be derived from different levels of PDs for given Loss Given Default (LGD) levels. For example, assuming a 50 percent LGD, a PD of 6 basis points (bps) generates a risk weighting of 44 percent, whilst a PD of 18 bps generates a risk weighting of 75 percent.

[8] Barclays, April 2011.

**Several factors may explain variations in PD estimates**, including:

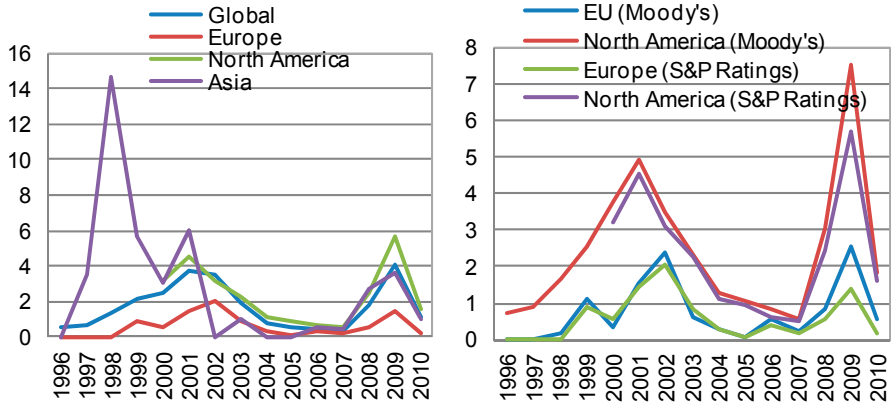
- Whether PDs are based on a "point-in-time" basis or use "through-the-cycle" default rates. That, in part, explains why some banks experienced significant RWA inflation as the recession deepened, yet others didn't.

- PDs may also vary because of the differences in historical data used in their estimation. Figure 9 shows that historical rates of default in Europe over the last 15 years have been consistently below those in Asia and the United States. Defaults in the United States have been more elevated than in Europe for both bonds and loans. So, the differences in default history may have justified the use of lower risk weights by European banks in the past. However, Europe is likely to see an increase in defaults in coming quarters.

- Rating agencies differ on default rates, as Moody's and S&P for instance report different default rates for the same regions (figure 9).

- Finally, differences in PD estimates can also arise because of different time periods used in the estimation. For instance, according to S&P, the estimated default rate for U.S. mortgage loans increased from 20 basis points prior to 2008 to 200 basis points after the crisis had been observed.

**Figure 9. Default Rate by Region (1996–2010) and by Rating Agency (in percent)**




Source: Standard & Poor's (S&P) and Moody's.

## C. Bank-related Parameters

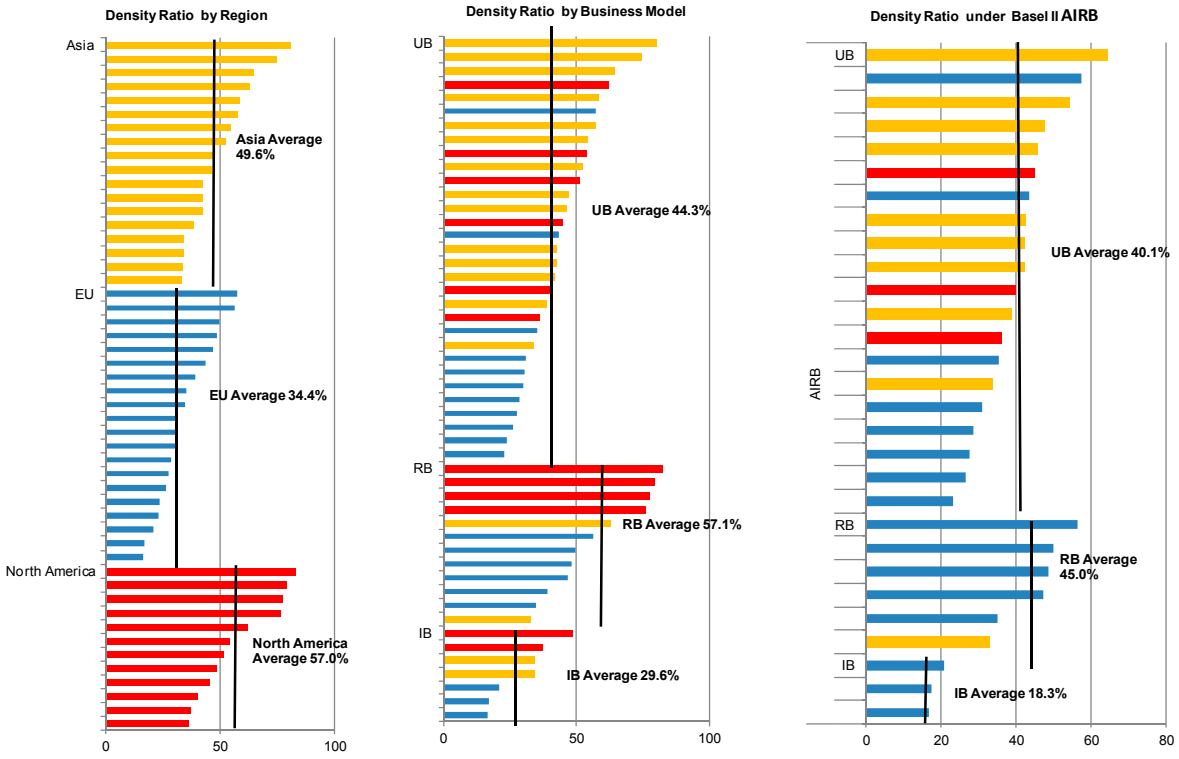
***Business models are a key driver in the composition and level of RWAs***

**Each bank has a unique business model and geographic footprint**. Depending on their business mix, banks can be broadly categorized into three groups: (i) retail/commercial banks, (ii) universal banks, and (iii) investment banks. Investment banks are mostly exposed to market risk, retail banks are mostly exposed to credit risk, while universal banks span

across all activities and are exposed to both credit and market risks. Operational risk is only accounted for under Basel II.

**Regional distributions show that the RWA densities of European banks tend to be lower than those of Asian and North American banks**. Based on our sample of SIBs, within each of these regions, there are some notable (but simplified) cross-country differences. In Europe, some banks from Spain, Italy, and the UK, which are more geared towards retail activities, have a higher RWA density than some banks based in France, Germany, and Switzerland, whose bank profiles are more towards universal or investment banking. In North America, US regional banks' RWA density is higher than that of international banks and of regional banks in Europe and Asia Pacific, mainly because of their mortgage and retail focus. Large US global money center banks are below their regional average, while Canadian banks exhibit low RWA density, primarily because parts of the mortgage book are also government guaranteed. In Asia Pacific, some Australian banks, whose business profile is closer to that of European universal banks than to developing Asian banks, rank generally below their regional average.

**Figure 10. RWA Densities for all Banks in our Sample Grouped by Region and by Business Model**




Source: Bloomberg, individual bank reports, Staff estimates June 2011.

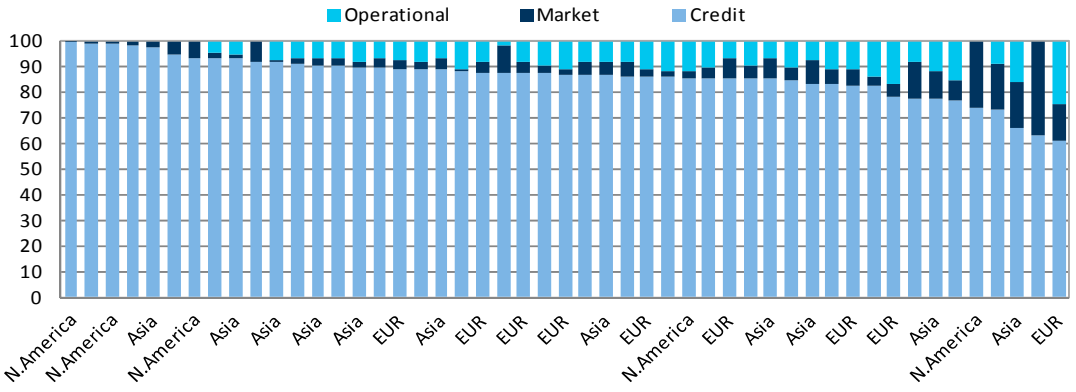
**Retail banks tend to have higher RWA densities than universal banks and investment banks.** The relatively lower RWA densities of investment banks are to be expected as these

banks have large trading books, which attracted lower risk weights than banking book assets. This is about to change with the implementation of Basel 2.5. Going forward, migration of market risk towards a higher level (e.g., securitization, proprietary trading, credit valuation adjustment─ "CVA") means that the RWAs of investment banks will increase. Quantitative impact studies from the Basel Committee have indicated that market risk should triple on average (with some banks experiencing over 10 times higher risk weights post Basel 2.5).

**The characteristics of banks' portfolios heavily influence the calculation of RWAs.** Collateral quality and quantity is an important driver of loss given default (LGD), especially as risk weights (RWs) move in line with LGD (the formula shows a linear relationship). Since LGDs tend to have a greater impact on RWs than PDs do, banks have an important incentive to extend secured (versus unsecured) loans. This may influence their business mix, as banks opt for mortgages and Commercial Real Estate (CRE) rather than for unsecured retail or corporate loans (which attract higher LGDs). Portfolio maturity also influences the ultimate RWs. Longer dated assets attract higher RWs than assets with a short maturity, to account for the greater uncertainty in loss prospects. Banks whose portfolios have a longer average maturity (e.g., large mortgage books) will see an uptick in their RWs.

**Credit risk is by far the largest component of RWAs**, representing 86 percent on average for our sample (figure 11). Market and operational risks are broadly equal at 6.5 percent and 7.5 percent respectively, but they are spread differently. US banks, who do not yet report under Basel II, do not disclose any operational risk. Market risk is limited for most banks, but is concentrated in large global investment banks (and a few universal banks), mostly American and European, whose average is 17 percent. The range between maximum and minimum for credit risk is 38.4 percent across all business models and regions, whereas the range for market risk is 36.7 percent.

**Figure 11. Breakdown of RWAs by Credit, Market and Operational Risks[9] (in percent)**




Source: SNL, individual bank reports, and Staff estimates for June 2011.

[9] Inconsistencies in definition and delimitation of risks may arise, as we use the breakdown of risks provided by banks (Pillar 3, annual reports, 2010).

- **Credit risk still exhibits large variations across banks and portfolios**

**By design, the A-IRB formula is complex and leaves ample room for interpretation.** Under IRB, the scope for getting very different results is real, since the formula for calculating RWAs under Basel II is highly complex, which increases the potential for different interpretations, and offers limited transparency. The formula relies on many parameters, with key inputs such as Probability of Default (PD), Loss Given Default (LGD), Exposure at Default (EAD) and Maturity (M). Indeed, as the Bank of England's Haldane recently observed:"(the) number of risk buckets has increased from around seven under Basel I to, on a conservative estimate, over 200,000 under Basel II. To determine the regulatory capital ratio of this bank, the number of calculations has risen from single figures to over 200 million. The quant and the computer have displaced the clerk and the envelope."

**Variations in RWAs across banks due to credit risk are quite large**. The way credit risk weights are computed is essentially unchanged under Basel III, and will be driven by either Basel I or Basel II. Most of the criticisms are centered around Basel II IRB, in particular the Advanced version, where banks enjoy the most flexibility. For instance, in Europe, where most banks rely on A-IRB/F-IRB, investment bank analysts point out that credit risk measurement varies greatly. Their research (Table 3) shows that within each category of credit risk (mortgages, corporates, institutions, and other unsecured retail), the variations between risk weights are very significant, mainly due to divergences in the implementation of Basel II by domestic supervisors in a number of important aspects. This is the case for risk parameter floors, treatment of non-performing loans, parameters for cycle adjustment, and migration matrices.

**Table 3. Minimum, Median, and Maximum Risk Weights Attributed to Categories of Credit Risk**

| | Mortgages | Corporates | Institutions | Other retail |
|---|---|---|---|---|
| **Autonomous** | 5% - 20% - 53% | 32% - 59% - 76% | n/a | n/a |
| **Barclays** | 7% - 15% - 49% | 33% - 55% -89% | n/a | n/a |
| **BBVA** | 8% - 15% - 23% | 37% - 52% - 78% | 4% - 16% - 27% | 14% - 33% - 48% |
| **BNP** | 6% - 13% - 25% | 27% - 54% - 75% | n/a | 10% - 38% - 156% |
| **KBW** | 6% - 18% - 53% | 26% - 55% - 158% | 6% - 19% - 34% | 7% - 36% - 64% |
| *Average* | *6.4% - 16.2% - 40.6%* | *31% - 55% - 95.2%* | *5% - 17.5% - 30.5%* | *10.3% - 35.7% - 89.3%* |

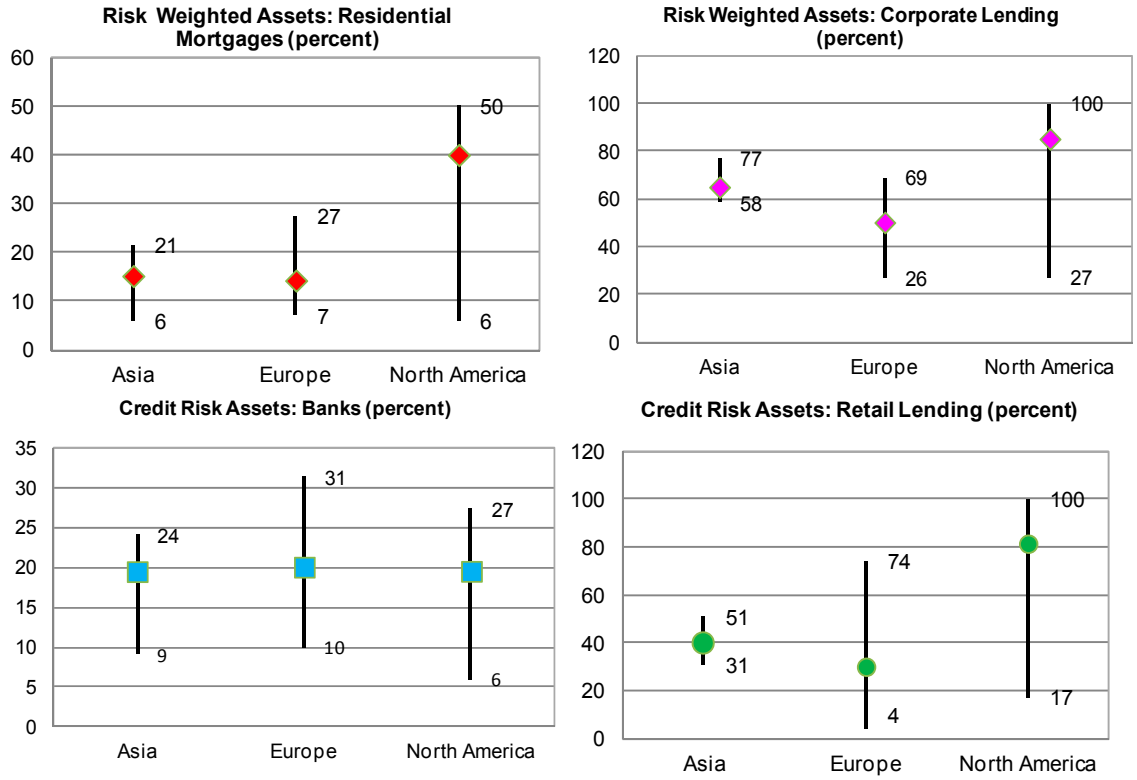
Source: analyst reports, based on Pillar 3 disclosure, company data and analysts' estimates Autonomous – 22 European banks, 2 Canadian and 2 Australian banks – corporate loans and mortgages only Barclays – 21 European banks – corporate loans and mortgages only – full set of data for 2009 (used), as 2010 is partial. BNP Exane – 22 European banks covered – 2010 data – Median –KBW – 27 European banks – BBVA – 12 European banks.

Similar conclusions emerge from the analysis of our global sample (figure 12), which shows large variations in risk weights across regions, and within each region. Breaking down credit risks into Residential Mortgages, Corporate Lending, Banks and Retail Lending categories, we find the following:

**North American banks have, on average, higher risk weights in most credit risk categories**, with the exception of banks. This is largely due to US banks still operating under Basel I, where risk-weights are 0 percent for OECD Sovereigns, 20 percent for OECD banks, 50 percent for mortgages, and 100 percent for corporates.

**Mortgages in Asia and Europe attract similar risk weights** (15 percent and 14 percent average, respectively), with moderate variations, and are much lower than in North America (40 percent average). If differences across regions are justified, variations within the same region may appear excessive. For instance, in Europe, RWA in mortgage portfolios range from 7 percent to 27 percent, even though divergent features and risk profiles are lower than might be suggested by reported risk weights. Within North America, Canada and the United States diverge significantly. US banks push the maximum towards 50 percent, while Canadian banks, which have some government guaranteed portfolios, drive the minimum below 10 percent. Global banks with a wide geographic footprint tend to use a combination of approaches (Basel II SA, F-IRB and A-IRB, and sometimes Basel I) for the relevant portions of their books, depending of the location of the loans (or assets).

**Figure 12. Minimum, Maximum, and Average Risk-Weights by Region for Different Categories of Credit Risk**




Source: Individual bank reports (Pillar 3 disclosure) and staff estimates; December 2010.

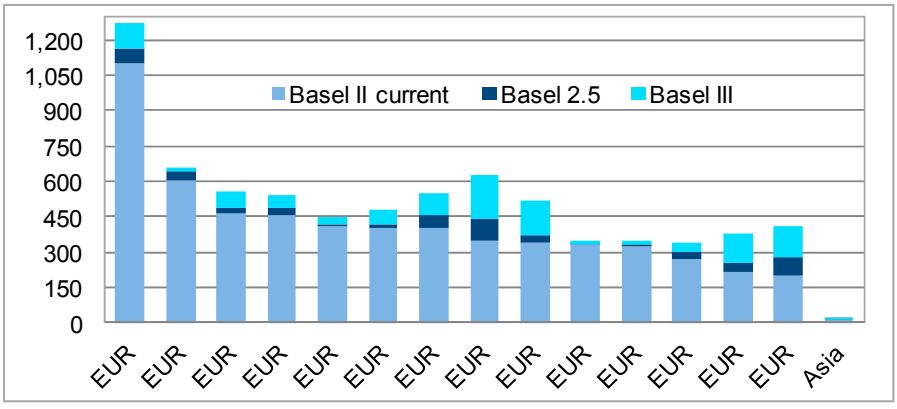
**With the exception of loans to banks, other loans show wide variations.** Corporate loans display some degree of variation in the averages for the three regions, Europe and Asia

(50 percent and 65 percent, respectively) are considerably below North America (85 percent), as would be expected for Basel I banks. Given the higher administrative costs of lending to corporates (especially SMEs), there is a significant implicit incentive to increase high-volume standardized lending (consumer retail lending and home mortgages) and CRE lending. Unsecured loans have the highest risk weights in North America (up to 100 percent) and the smallest range in Asia. Exposures to credit cards vary greatly from bank to bank. Loans to banks show relatively similar average risk weights across the world, with moderate dispersion in all three regions.

- **Market risk: convergence is still limited**

**Basel 2.5 and III will strengthen the risk capital framework in the trading book, incremental risk and securitization products.** According to BCBS's quantitative impact study (QIS), trading-book market risk capital requirements will triple on average under Basel 2.5, with some banks even experiencing a double-digit increase. However, it is unclear to what extent they will reduce the gap between the existing market risk RWAs of European and US banks with sizeable market-related activities. Based on available public data, figure 13[10] indicates that the average increase in RWAs for Basel 2.5 and III before any mitigation actions are taken (with the exception of one bank, net of mitigation) is 36 percent for a sample of 14 European banks and one Asian bank. The dispersion ranged from 104 percent maximum to 4 percent minimum. The ultimate RWA impact is expected to be lower as banks implement mitigating actions.

**Figure 13. Basel 2.5 and Basel III Impact on RWAs of Select Banks (in billion USD)[11]**



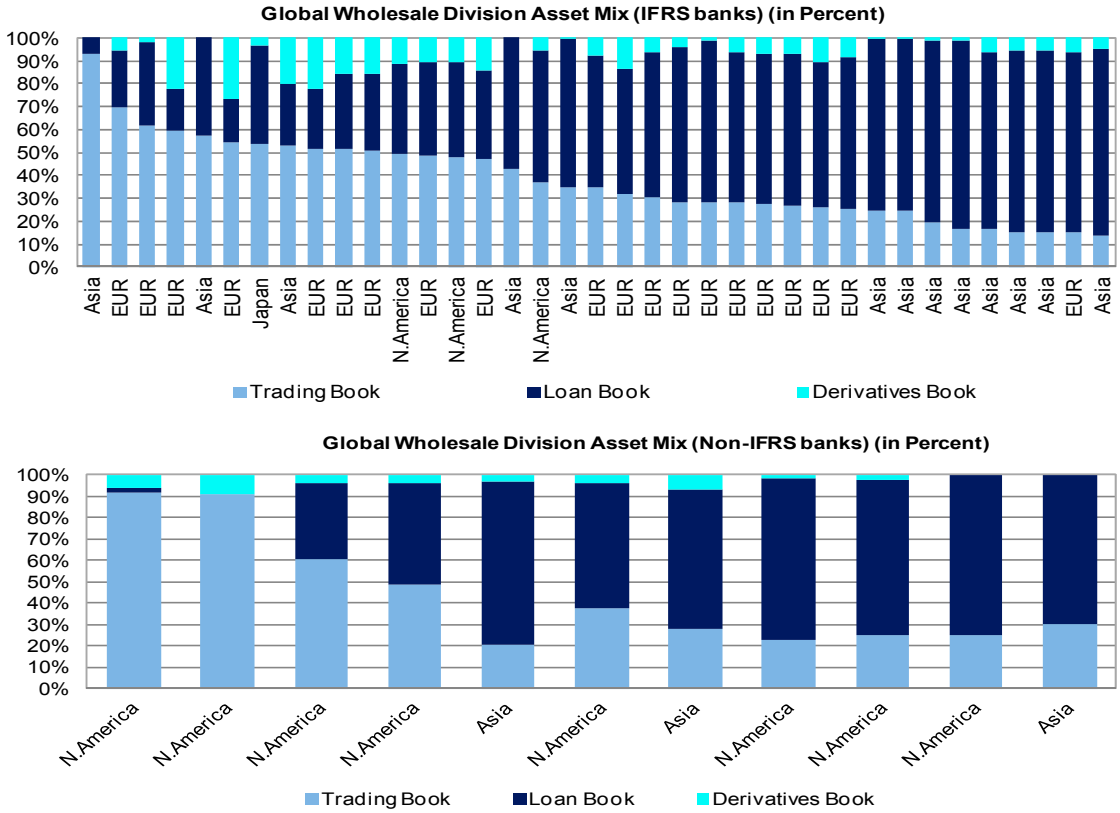

Source: Individual banks' reports, staff estimates; December 2010

[10] See forthcoming IMF Staff Discussion Note on "Estimating the Costs of Financial Regulations."

[11] Final legislation is not in place yet in the United States, and thus US banks are excluded from this chart.

**The inconsistency in implementation of Basel 2.5 across Europe and the United States may result in uneven risk-weighting for market risk capital calculations**. Basel 2.5 (CRD3) has been implemented in Europe as of end-December 2011, but is still under consultation in the United States, with implementation expected later in 2012. There are common elements to Basel 2.5 in the two regions (e.g., the introduction of Stressed VaR, Incremental Risk Charge, and the comprehensive risk measure (CRM) as the new modeling components). However, some factors could result in significant RWA differences. Among them are (i) differences in the regulatory intensity of the supervisory model approval process; (ii) definitional differences (e.g., scope of securitizations); and (iii) the imposition of surcharges (e.g, correlation trading portfolio is applied a 15 percent of standard charges surcharge to CRM in the US proposal, versus a 8 percent of standard charges floor in Europe). In addition, the use of external ratings varies, with Europe allowing the standard specific risk charge to be a function of the external rating for covered debt and securitization positions, whereas the United States is proposing certain alternatives to external ratings (Dodd Frank Act, section 939A).

**Figure 14 a. (IFRS banks) and 14b. (non IFRS banks). Breakdown of Wholesale Assets**



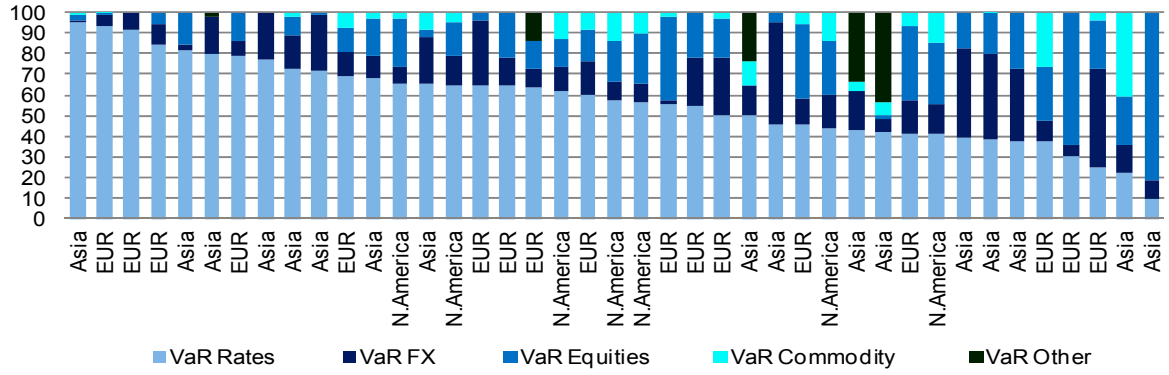

Source: Bankscope, SNL, Staff estimates (as of June 2011)

**Business models explain remaining differences in RWAs**. Banks biased towards credit trading products will attract higher risk weights (due to the IRC) than banks geared towards flow forex, rates, equities or advisory operations (fig. 14 and 15). Similarly, banks with a higher proportion of secured financing will carry lower risk weights than banks heavily

exposed to securitizations or to principal/proprietary trading. OTC derivatives will see a steep rise in overall risk weights, so banks will have an incentive to move standardized derivatives to CCP or to conduct secured OTC transactions.

**Figure 15. Value at Risk for Market Risk under Basel II**

**Market Risk VaR Distribution in Percent (December 2010)**




Source: Banks' Pillar III Reports, IMF Staff estimates.

## D. Certain RWA Differences May Warrant Particular Attention

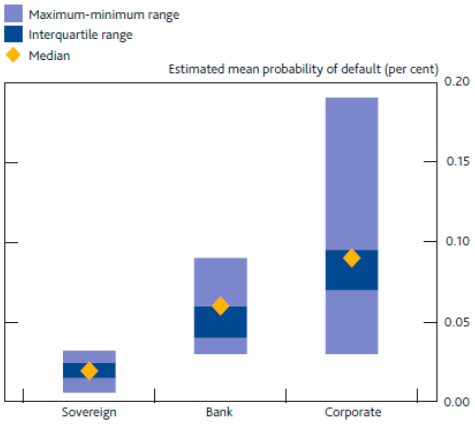
**A host of institutional, accounting, regulatory and bank-specific factors can influence the risk modeling choices of banks.** Some differences are largely explained by observable and rational factors, but the importance of unexplained factors is still quite material. The Bank of England's latest FSR argues that "evidence from the recent crisis suggests that the observed variations in RWAs might not entirely reflect genuine difference in risk-taking." The UK FSA conducted a useful review of the RWA practices of UK banks (Box 1).

**Box 1. U.K. Financial Services Authority (FSA) Survey of RWA Practices**

To evaluate the objectivity of FIRB or AIRB methodology in estimating RWA, the U.K. FSA conducted in 2007 and 2009 a benchmarking exercise, "the Hypothetical Portfolio Exercise" (HPE). The HPE was submitted to 13 UK banks, and covered 50 sovereign issuers, 100 banks, and 200 large companies. It compared participants' internal models for estimating the PDs against historical annual default rates utilized by S&P (1981-2008). Banks reported their PDs only for counterparties to which they had exposure. The overlap in exposures among participants was limited, but the FSA identified a group (the "jointly-rated sample") of sovereigns, banks, and corporates which all participating firms had to rate, to facilitate comparisons.

**Figure 1. Variations in estimated probabilities of default on common hypothetical portfolios**

The FSA survey revealed a large dispersion in estimated PDs, suggesting that banks had very different views on the same underlying risk. The highest mean PD was 3 to 6 times larger than the lowest mean PD. Small differences could be attributed to point-in-time versus through-the-cycle features. The biggest ranges were observed on corporate, and banks to a lesser extent. Variations of PDs on sovereign exposures were much smaller.




Source: FSA, 2009 HPE; Bank of England calculations

**The current set-up for RWA calculation leaves considerable scope for subjectivity and interpretation.** Most banks rely on a combination of approaches to calculate RWAs, which inevitably brings complexity and opacity. Pillar 3 individual reports often refer to "model changes," "data cleansing," "RWA optimization," "parameter update" or other techniques that could suggest that banks may be "tampering" with their RWAs in order to lower capital requirements. However, it is prudent to guard against any simplistic conclusion, and against inferring that any bank with a low RWA density is necessarily "gaming the system."

**Understanding why there are material differences, and whether they are legitimate is a difficult exercise.** First, cross-border comparisons may be of limited value, especially if banks have very different business profiles. Comparisons are more meaningful when targeted at banks within a relatively homogeneous region or with a similar business mix. Second, disclosure is very limited. Based on publicly available data, whose granularity and quality is variable, it is nearly impossible to assess the extent to which variations stem from genuine changes in banks' asset mix and risk appetite or from a less palatable shift in risk measurement. However, some banks have publicly disclosed changes in their RWA methodology in 2011 that led to a reduction in their RWAs, without reflecting an improvement in their risk management or overall strength.

**RWA practices have recently been particularly criticised in two areas, namely the measurement of sovereign risk and covered bonds.** Some of the key concerns regarding the latter are discussed in Box 2. A comprehensive discussion of sovereign risk will be available in the forthcoming Global Financial Stability Report[12]. The Basel Committee is also in the process of reviewing its RWA methodology, and senior BIS officials have called for a review of sovereign risk (Hannoun, 2011).

**Box 2. Are There Some Anomalies in the Treatment of Covered Bonds?**

**Basel II/III treat covered bonds the same as bank unsecured debt for risk-weighting purposes** (see first line of table 1). However, for European banks using the revised standardized approach (RSA), certain "Capital Requirement Directive (CRD)-compliant" covered bonds issued by European Union (EU) banks can be assigned a risk-weight as low as 10 percent. The bonds must meet the requirements of Article 52(4) of Directive 85/611/EEC (UCITS 52(4)), and be secured by eligible assets prescribed under the European CRD. For instance, a LGD comprised between 11.25 percent and 12.5 percent can be applied to eligible covered bonds (meeting certain criteria), whereas under Basel II, the LGD is 45 percent, similar to senior unsecured bank debt.

**There are important implications in using the standardized versus IRB approach**. The table below presents the standardized approach, where weights depend on the credit rating of the issuing institution, so that a CRD-compliant covered bond issued by a bank rated single-A is assigned a 20 percent weight, versus 50 percent on its unsecured debt. The table assumes that the relevant jurisdiction has mandated the use of the *credit assessment-based method* ("Option 2") where the risk weight of an issuer's senior unsecured debt depends on the issuer's external credit rating. The *central government risk weight-based method* ("Option 1") bases the risk

[12] IMF, April 2012 GFSR, Chapter II, "Safe Assets: Financial System Cornerstone?"

weight of an issuer's senior unsecured debt on the external credit rating of the central government of the jurisdiction in which the issuer is incorporated. Under the IRB approach, RWs for covered bonds are derived from the probability of default of the issuer or sponsor bank (which is itself linked to its senior unsecured rating).

**Table 1. Risk-weights for senior unsecured debt and covered bonds**

| Basel II RSA Risk Weights for Senior Unsecured Debt and Covered Bonds | | | | | |
|---|---|---|---|---|---|
| | Originating institution's credit rating | | | | |
| | AAA/AA | A | BBB | BB | B |
| Senior unsecured debt and non-CRD compliant covered bond | 20% | 50% | 50% | 100% | 150% |
| CRD compliant covered bond | 10% | 20% | 20% | 50% | 100% |

**The favorable treatment of covered bonds is a European specificity**. The preferential treatment of covered bonds, which is to be extended until 2013 or 2014, is an area of contention. Concerns have emerged on the lack of differentiation in LGD and risk-weighting between covered bonds backed by assets deemed risky (such as shipping, commercial property, etc) and those backed by more stable and higher quality assets (such as prime residential mortgages and public sector collateral). Another weakness stems from the uneven treatment of covered bonds and securitizations, with the former benefiting from a much more favorable treatment, thus encouraging banks to package ABS assets into covered bonds. An additional concern is the link between covered bond risk weights and sovereign ratings, allowing covered bonds backed by bank bonds to continue to receive a preferential risk-weight even in the event of a downgrade of the banks, if the sovereign rating of the country of issue remains above a certain threshold.

Within Europe, not all countries follow CRD rules, and some have adopted a stricter framework, increasing the differences in RW approaches across jurisdictions. At minimum, and until a full review of covered bonds RW practices is conducted, banks should be required to disclose their covered bond exposures and to indicate whether they have benefited from any preferential treatment under CRD provisions.

**A few "red flags" relative to risk measurement and the calculation of RWAs may be worth looking into.** Regulators are fully aware of certain practices that may need to be investigated further, particularly when banks:

- Experience large swings of RWAs over time, even when there has been no material change in their business mix.
- Report a strong Basel III risk-weighted capital ratio, but have a weak leverage ratio (based on what banks may disclose during the observation period).
- Move from a more sophisticated approach (e.g., A-IRB) to a less sophisticated one to benefit from some "loopholes" (e.g., a uniform 2.5 year maturity under F-IRB or a zero risk-weight on sovereign risk under the Standardized approach).
- "Cherry pick" the most favorable methodology for each type of exposure and combine several methodologies with a clear view to optimize capital, and not as a result of the coexistence of various operating environments in different jurisdictions.

- Report decreasing RWAs as the recession deepens (if they report under Basel II IRB).

- Report much lower RWAs than peers (i) in the same jurisdiction or (ii) peers with the same business model, suggesting that banks support comparable/identical risks with very different levels of capital.

- Cannot provide a verifiable and justifiable explanation for reporting significantly lower risk weights and refer to them as "methodology changes."

## V. What Can be Done to Restore Confidence in RWA?

### A. Objectives of RWA Reforms

**Our paper aims to retain the risk-based capital framework, while diminishing the scope for criticism and improving confidence.** We have offered an explanation for why RWAs differ across banks and have concluded that while many variations are legitimate, there are areas where the variations seem less justified, at least based on publicly available data.

**We would expect some degree of RWA differences to remain.** This would reflect banks' different business models and risk profiles, but also account for different views on risks among regulators. Some variations among estimates of RWAs for similar risks may be acceptable and contribute to financial stability, through the co-existence of different business choices, models and risk appetites. A uniform risk measurement might lead to herd behavior and be detrimental to some asset classes (reduction in exposures), while others could become over-crowded. The objective of reforming RWAs is not to seek a full harmonization, but to ensure a greater level of consistency in methodologies and higher transparency in the outputs, for banks and their supervisors.

**Abandoning risk-based capital ratios would not be a desirable outcome**. There are grounds for concerns about the reliability of the RWA framework. However, it is also widely acknowledged that not all assets carry the same risks. Retaining risk-sensitive ratios, but with some adjustments to reform the existing RWA framework, is largely preferable to suppressing the IRB approach or discarding risk-based ratios for the leverage ratio. The question then is whether policymakers need to intervene to fix RWAs. We assume the answer is "yes," and discuss a few key considerations in undertaking reforms.

**Full use of Pillar II and Pillar III measures should be made while a more comprehensive review of policy actions is considered.** Supervisors already have the capacity to impose Pillar II adjustments. Banks could also disclose more detailed and frequent information. These two measures are essential to complement any Pillar I reforms, both in the transition and steady state phases.

**A primary objective is that the reforms should ensure a robust alignment of capital allocation and asset pricing with underlying risks.** Reforms need to encourage banks to develop an RWA methodology that captures the genuine risks in their books, rather than to "optimize" their RWA and capital in a way where banks comply with "the letter, rather than the spirit" of regulations. Overall, the resulting framework should be one that cannot be easily manipulated and restores regulators' and investors' confidence in RWAs.

**The timing of the reforms needs to be carefully considered**. A gradual review may be necessary to conduct an impact study, avoid cliff effects, and allow time for coordination with other regulations. In particular, a phased-in implementation of a stricter framework for risk-weighting sovereigns may be necessary to avoid precipitating further the withdrawal of banks from sovereign bonds. In addition, the existing floor should be prolonged for a longer period to allow banks and supervisors time to build in sufficient capacity to implement and validate internal models. Besides, as the Basel III leverage ratio will be implemented in 2018, there could be an effective role for Basel I floors to help transition to the new regime.

**In addition to the above considerations, the reforms should:**

- **balance objectives** between (i) creating a more level playing field based on improved harmonization, transparency, comparability across banks and jurisdictions (but possibly ignoring special situations on certain asset classes or in certain countries which would require a different set-up); and (ii) allowing more flexibility at bank or country level in better calibrating RWAs.

- **be decided and implemented at the right level**. For global systemically important banks (G-SIBs) spanning across multiple jurisdictions, a high degree of international cooperation would be desirable, and the Basel framework has always been designed with "internationally active banks" in mind. For purely domestic players, whose activity tends to center around traditional lending activities, beyond common basic rules for more consistent implementation, reforms could be more nationally or regionally focused and international guidance could be aimed at fostering greater convergence in methodologies. National supervisors do have the power to closely scrutinize a bank's rating system, and to act where warranted.

- **focus first on the most visible deficiencies.** The Basel Committee will review the measurement of RWAs in both the banking book and the trading book. Credit risk is a likely area for reform, and sovereign risk in particular deserves attention to help restore the credibility of the Basel II standardized and IRB approaches. On market risk, Basel 2.5 and Basel III prompted some changes, but the variability in implementation across regions still allows large inconsistencies. In any case, the underlying model for computing market risk capital is being reviewed by the standard setters.

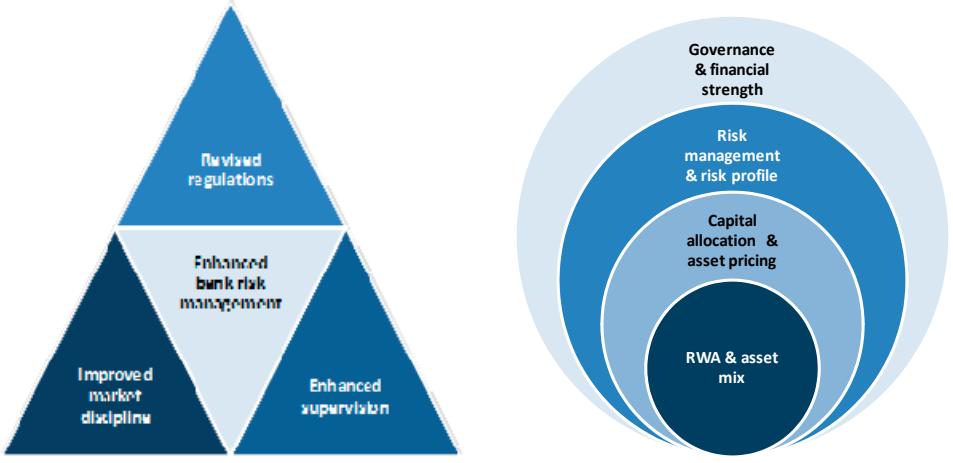
- **be assessed against capital ratios at large.** The reform of RWAs aims to improve risk measurement and recognition, rather than to address an intrinsic increase in asset riskiness (which would be addressed primarily through higher provisions and other policy tools). Until now, many regulators have compensated for what they regarded as insufficient risk recognition through an increase in overall capital ratios. Going forward, if risk is better measured (and capital more commensurate), capital requirements may need to be reviewed, so that a tightening of the denominator does not add to a capital ratio that already factors in a "risk premium."

- **be coordinated with the broader regulatory agenda.** Policymakers may want to avoid a piecemeal approach and ensure that any reform of RWAs does not conflict with other regulatory changes, with particular attention to two areas: (i) liquidity rules (especially for sovereign risks) and (ii) macro-prudential rules.[13] Risk weights should be more dynamic to dampen asset bubbles and foster weak credit growth. Close interaction with the new counter-cyclical buffer is needed (e.g., through imposing floors to prevent erosion through IRB models in good times and/or raising specific risk weights in the face of mounting risks or uncertainty).

### B. Policy Options to Reform RWAs Should Rely on a Multipronged Approach

**Broadly, solutions should rely on a mix of** (i) regulatory changes to the existing capital framework; (ii) more intrusive supervisory intervention; (iii) additional disclosure by banks to foster greater market discipline; and (iv) more robust risk management and strategy within banks. The first step to identify material shortcomings and inform policy choices could be an international survey to compare G-SIBs' RWA practices.

**Figure 16 a and b. Reforming RWAs Has to Rely on a Combination of Measures**




[13] See Bank of England 2011 Discussion Paper.

**Running a global survey[14] on a sample of cross-border SIBs could shed light on supervisory implementation practices and banks' RWA methodologies.** The Basel Committee could lead a peer review, based on submitting a "hypothetical portfolio," at a minimum to FSB's list of G-SIBs, to assess how they risk-weigh certain assets. As a starting point, the survey could include the asset classes easiest to compare, such as trading books and syndicated loans. This benchmarking exercise could enable cross-border comparisons. Modalities to do an international assessment of retail exposures (mortgages, unsecured loans etc.) could be discussed at a later stage, but at a minimum, a supervisory peer review should shed light on how exposures tightly linked to domestic factors are handled. The survey's results, at individual bank level, should be disclosed in great detail among Basel Committee's supervisors, while a more limited, but still granular, version could be shared with the markets.

**Enhanced supervision is essential.** Pillar II offers supervisors extended powers to scrutinize risk weights, and they should use them. However, efficient oversight can only be achieved through an increase in supervisory resources at the country level. In the absence of skilled and sufficient staff, as well as a clear mandate and structure, a logical safeguard would be to require IRB banks to apply more conservative haircuts on assets, or possibly to abandon their internal models and move back to the Standardized Approach, until supervision is appropriate.

**Strengthening disclosure is a critical complement to regulatory and supervisory measures.** Limited and inconsistent disclosure of RWA assumptions and methodologies makes it hard to compare banks and to distinguish between compelling business or institutional justifications and unexplained differences in risk assessments. Providing more granular information on a frequent basis (Table 4) would foster market discipline, and in the short term, could help banks to ease investor uncertainty while a fuller study is undertaken and policy responses are formulated.

**Views differ on whose judgment is the most reliable to measure risk-weighted assets**. The two extreme (figure 17) views are that (i) banks and CRAs are best placed to measure risks or that (ii) regulators should determine the floors for each asset, regardless of banks' internal risk assessments. This drives policy options, which range from (i) a full, unfettered modeling within banks or (ii) a prescriptive regulatory approach relying on floors.

[14] FSA, Pandit (CEO of Citigroup).

**Figure 17. Possible Options to Reform the Existing RWA Framework**


**Neither moving back to Basel I or the Basel II Standardized Approach, nor allowing banks to use their models unchecked for RWAs carries much appeal**. Workable solutions are likely to fall in-between. While a more standardized approach may carry the benefit of simplicity, it may not necessarily capture properly the cost of risk (e.g., on sovereign risk) and a "one-size-fits-all" may not lead to greater financial stability. Regulators already have tools (including Pillar II), which can influence the attractiveness of approaches (e.g., additional floors on IRB could reduce its desirability versus a revamped standardized approach). A better compromise could be to continue to let banks use their internal models to calculate RWAs, but regulators and supervisors would address possible deficiencies and contain excessive bank discretion, where necessary and under clear guidelines.

**Banks need to rely more on an economic rather than regulatory approach for measuring and managing risk**. The Boston Consulting Group (BCG) indicates that banks' focus is "squarely on ensuring compliance [with capital requirements] rather than managing risk costs and creating economic value. Banks report risk metrics, for example, but have not integrated them into key business processes or used them to influence critical business decisions". The BCG calls for banks to "move beyond a backward-looking measurement of risk and understand how their risk profiles might change under different circumstances. To this end, most banks will need to enhance their stress-testing, scenario-analysis, and simulation capabilities. These tools can help them develop a clear action plan for mitigating certain risks and optimizing the allocation of capital." More broadly, the interaction between economic and regulatory capital and their prioritization in the allocation of capital could be enhanced.

**Capital adequacy assessment should rely on a combination of capital metrics.** Risk-weighted based measures should be used in tandem with capital measures relative to total assets to capture the riskiness of exposures, while limiting excessive leverage. The new Basel III leverage ratio serves as an important backstop to risk-based ratios that rely extensively on banks' models, and allows insight to be gained into the credibility of banks' average risk-weighted assets. Linking capital ratios to the macro-prudential framework would be useful in addressing exuberant or constrained asset classes.

**In the ultimate analysis, it should be recognized that capital adequacy is but one, albeit key, part of a holistic approach to assessing banks' financial strength.** Capital requirements should not be viewed as a "one-size-fits-all" benchmark, but should rather be

tailored to match the level of credit, market and operational risk each bank is taking. Other risks should also be considered, such as underwriting policies, asset classification and hedging, provisioning measures, and concentration risks. Beyond that, supervisors and markets need to gauge banks' risk appetite, risk underwriting policy, risk controls and more generally risk management to assess whether banks are not exposed to greater losses than what their business profiles would suggest and capital levels would support. A full understanding of the balance sheet composition, its riskiness and contribution to revenues (or losses) is also important to understand the linkage between total and risk-weighted assets. Finally, supervisors need to step up their oversight of risk management, governance, strategy, and capital allocation.

**Overall, any meaningful progress will only be achieved through a combination of measures based on Pillar I, II and III, as well as on enhanced internal risk management within banks (table 4).**

**Table 4. Some Policy Options to Revisit the RWA Framework**

| Policy Options | Comments |
|---|---|
| **Reforming regulations** | |
| Introduce or increase minimum floors | Floors can be introduced at different levels, within the IRB formula, on RWAs or on capital ratios, and their effectiveness will depend on the objectives. Increasing floors on the IRB approach could reduce its attractiveness (in terms of lower RW and lower capital requirements) versus the Standardized Approach, and encourage banks to be more prudent and conservative.<br>• On **PD,** encourage banks to use "through the cycle" measures, versus "point in time" PDs, and ensure that crisis periods and fat tail risks are properly accounted for.<br>• On **LGD**, some countries may consider topping-up the 10 percent LGD floor enshrined in Basel II based on their experience<br>• On **M**, avoid the catch-all 2.5 year average maturity under F-IRB, as it may not reflect the long duration of the mortgage books of most retail banks<br>• On **RW**, introduce minimum floors (including temporary ones) on asset classes experiencing excessive growth, or on assets deemed riskier (re-securitization, market risk, "high volatility CRE", etc…).<br>• On **Capital Ratios**, provide a safeguard against an excessive decline in minimum capital requirements. The Basel II floor on the amount of capital required (80% of the capital that would be required under Basel I) could be prolonged for a longer period.<br>Conversely, regulators may also continue to give preferential treatment to encourage certain types of lending (lower risk-weights for loans to SMEs). |
| Allow for time-varying or variable risk weights | In conjunction with macro-prudential policies, risk weights should go up and down to limit or foster excessive or insufficient growth on certain assets at certain points in the cycle. Further, risk-weights could be used to target emerging risks in specific exposure classes, and could be different for the flow relative to the stock to directly influence lending. For IRB banks, a multiplicative scalar for the sector under consideration could be applied to internal model outputs. |

| | |
|---|---|
| Allow for a variable scaling factor | Risk-weights would stay constant, but Basel II's 1.06 scaling factor could be adjusted upwards or downwards to divert or attract capital to certain asset classes |
| Return to Basel II Standardized and abandon the IRB approach | Advantages<br>• Simple approach, more transparent, easy to monitor<br>• Still allows for some risk-sensitivity (more than Basel I)<br>Disadvantages<br>• Goes against the efforts to promote IRB systems and to allow sophisticated banks to move away from cruder methodologies<br>• Increases reliance on CRA when those are under intense scrutiny<br>• Differentiation is too limited in some asset classes (e.g. all mortgages are equally weighted)<br>• Removes the incentive for banks to develop good risk management and to get exposures to assets carrying a penalizing RW, even though they are properly priced and entail social benefits<br>• Is more expensive (increases capital requirements), in particular on corporate and mortgage exposures |
| Suppress completely the risk-based approach and rely only on the un-weighted leverage ratio | • A leverage ratio is viewed as (i) being simple to compute and more objective; (ii) offering a safeguard against model risk and measurement errors; (iii) reducing risks of banks attempting to "game" the system, and (iv) putting a cap on the over-accumulation of "low or zero risk" assets.<br>• The argument for adjusting for asset risk is that the pool of assets of each individual bank may differ greatly. Risk-based capital allows to (i) differentiate between risky and safer assets; (ii) optimize the level of capital. |
| Allow banks to rely purely on A-IRB and remove floor constraints | In theory, this extreme outcome would allow all banks to rely on their own internal models, unfettered by floors or caps, to encourage them to develop the most efficient models.<br>In practice, many contend that shareholders and bank managers do not have adequate incentives to ensure the sufficiency of risk weights, so unlimited discretion may prove unwarranted |
| **Enhancing supervision** | |
| Greater use of Pillar II at individual banks or at system-wide level | Supervisors can always rely on the broad powers conferred by Pillar II to correct RW at any particular institution (based on its business model, or on an excessive deviation from peers' best practices , or as an add-on buffer to mitigate modeling risk |
| Discretional power to raise floors on specific exposures | Supervisors should be able to build-in additional buffers, by requiring higher risk-weights (and more capital) on assets they deem riskier |
| Increased monitoring and remedial powers | Supervisors need to assess on an ongoing basis (not just in the pre-validation phase) the robustness of banks' models and suggest remedial actions if necessary. |
| Harmonize implementation of existing rules | Supervisors need to ensure the existence of a rigorous risk-weighting process, based on appropriate, and transparent standards.<br>Need for more international harmonization of supervisory practices |
| Conduct an international survey of G-SIBs' RWA practices | The Basel Committee could conduct a survey based on test portfolios to compare standards of implementation and banks' methodologies across jurisdictions. |
| Supervisory peer review and cross-country monitoring | Use validation teams working to verify the methodologies used at individual (international) banks and ensure their compliance with international standards. Work could be conducted<br>• At the international level, possibly under the auspices of the Basel Committee. Horizontal reviews of individual institutions would help assess the level of variation across supervisory practices and help |

| | |
|---|---|
| | develop a more consistent implementation of Basel rules across jurisdictions<br>• Alternatively, national supervisors could participate in joint examinations of individual banks |
| **Fostering greater market discipline** | |
| Greater market disclosure to improve confidence | Banks should disclose more granular and frequent (quarterly) information on the composition of their RWAs, ideally broken down by geography. They should also explain the methodology applied to RWA and to capital in general, and detail any material changes.<br>Basel I floors should be disclosed in addition to Basel II requirements. |
| Publication of a benchmark porftolio | Based on an international benchmark and theoretical portfolio, G-SIBs could publish on a regular basis their methodology to measure risks. |
| Improved communication | Better dialogue could take place between banks and investors, and the analyst community at large, particularly on changes in models, exemptions, or material reduction in RWA levels. |
| Enhanced role for bank auditors | Auditors are both independent third parties and have access to confidential bank information. Their reports could expand on risk-taking, risk appetite and risk management, in a qualitative and quantitative way. |
| **Improving banks' internal risk management** | |
| Adopt a more "economic" approach for measuring capital and managing risk | • Would help integrate more closely business decisions with cost of risk and of capital;<br>• More dynamic measurement of risks than provided by ratios;<br>• Would be more efficient than a purely regulatory approach for RWA calculation, capital allocation and asset pricing. |
| Develop more forward-looking risk measurement metrics | Banks would benefit from building up more dynamic models that reflect changes in their risk profile and portfolios and allow them to adapt to new conditions. |
| Develop models that better capture tail risk | Banks need to factor in extreme stress scenarios and have contingency plans to deal with them. |
| Abandon IRB and move back to Standardized | Sophisticated banks already reporting under IRB may voluntarily revert back to the more basic Standardized approach to show investors their commitment to transparency, simplicity and objectivity. The likely increase in capital requirements could be offset by improved investor confidence. |

## VI. CONCLUSION

Perceived differences in RWAs within and across countries have led to a diminishing of trust in the reliability of RWAs and capital ratios, and if not addressed, could affect the credibility of the regulatory framework in general. This paper is a first step towards shedding light on the extent and causes of RWA variability and to foster policy debate.

The paper seeks to disentangle key factors behind observed differences in RWAs, but does not quantify how much of the RWA variance can be explained by each factor. It concludes that a host of factors drive differences in RWA outputs between firms within a region and indeed across regions; many of these factors can be justified, but some less so. Differences in RWAs are not only the result of banks' business model, risk profile, and RWA methodology (good or bad), but also the result of different supervisory practices. Aiming for full harmonization and convergence of RWA practices may not be achievable, and we would expect some differences to remain. It may be more constructive to focus on improving the

transparency and understanding of outputs, and on providing common guidance on methodologies, for banks and supervisors alike.

The paper identifies a range of policy options to address the RWA issue, and contends that a multipronged approach seems the most effective path of reform. A combination of regulatory changes to the RWA regime, enhanced supervision, increased market disclosure, and more robust internal risk management may help restore confidence in RWAs and safeguard the integrity of the capital framework. Finally, the paper contends that even if RWAs are not perfect, retaining risk-sensitive capital ratios is still very important, and the latter can be backstopped by using them in tandem with unweighted capital measures.

This paper aims to encourage discussion and policy suggestions, while the Basel Committee undertakes a more extensive review of the RWA framework.

## APPENDIX I. EVOLUTION OF THE REGULATORY CAPITAL FRAMEWORK

**From Basel I to Basel II, a new way to calculate RWAs**. Basel I introduced in 1988 the capital framework, which only dealt originally with credit risk, while market risk was added later. For credit risk, assets were assigned a level of capital ("risk weights") based on the *nature* of the assets, ranging from zero for the assets deemed "safest" to 100 percent for the riskiest assets. Between 2004 and 2009, Basel II revised the way RWAs are computed and broadened the risks under coverage. Regulatory capital requirements are now calculated for three major components of risk that a bank faces: credit risk, market risk, and a new risk, operational risk. Basel II assigns risk weights based on the *quality* of assets, as measured either by external ratings provided by external credit rating agencies (CRAs) or by internal ratings calculated by banks, based on their own internal models.

**Basel 2.5 and Basel III introduce key changes on market risk in trading books**. The three most important changes are the introduction of (i) the incremental risk charge (IRC), a charge designed to capture migration and default risk for securities within the trading book (e.g., bonds, credit derivatives, leveraged loans, etc.); (ii) the stressed VaR capital charge (which comes in addition to the current VaR requirements), designed to account for volatile market conditions, and (iii) the credit valuation adjustment (CVA) charge, aimed at capturing counterparty credit risk. Basel 2.5 is also expected to reduce capital arbitrage opportunities between the trading and banking books, in particular on securitization positions. Increased regulatory capital requirements related to the trading book were scheduled to come into force at year-end 2011.

**Basel III mostly strengthens the numerator, but changes to RWAs are more limited.** Basel III significantly improves and harmonizes the numerator of risk-based capital ratios, through a stricter definition and composition of the capital base, including more stringent deductions. Overall, Basel III upgrades the quality of regulatory capital, increases the minimum capital requirements (to 7 percent, including the capital conservation buffer), creates a capital countercyclical buffer (variable, of up to 250 basis points), and introduces an international leverage ratio requirement. In addition, systemically important banks (SIBs) will be subject to an additional capital requirement of 1 percent to 2.5 percent of RWAs. While Basel 2.5 and Basel III pave the way to greater consistency in RWA related to market risk, a full-fledged review of risk-weighted assets has not started yet.

**A comprehensive overhaul of the denominator seems to be the next step on the regulatory agenda.** In July 2011 and January 2012, the Basel Committee on Banking Supervision (BCBS) announced it will start working on RWAs.

**Credit Risk is still calculated under Basel I or Basel II.** Banks have five choices, depending on their jurisdiction's regulatory set-up. Under Basel I, there are only five buckets for risk weights: 0, 10, 20, 50 and 100 percent, and four categories of assets: claims on

sovereigns, banks, residential mortgage loans, and on corporates. The 100 percent risk bucket is considered the "normal risk" bucket, but preferential weights are given to claims originating in OECD governments or banks.

**Basel II hoped to move from the one-size-fits-all approach to a tailor-made approach to bank capital.** The concept was to offer, similar to the 1996 Market risk amendment, an "evolutionary approach" to calculate regulatory capital. Therefore, banks which were capable of meeting a series of quantitative and qualitative criteria would be allowed to use more risk-sensitive methodologies. Simpler standardized methodologies would also be offered in a menu of options, with built-in incentives for banks to improve their risk management practices and risk measurement and therefore qualify for the more advanced approaches. Under Basel II, credit risk is calculated based on three different approaches of varying degrees of sophistication: (i) Standardized (and simplified standardized) approach; (ii) Foundation "Internal Rating-Based" (F-IRB); and (iii) "Advanced IRB" (A-IRB) approach.

- ***The Standardized Approach (SA)***

Table 1 provides an overview of different risk weights under Basel I and II Standardized approaches. Basel II SA risk weights can be significantly higher than Basel I's highest of 100 percent, but they can also be much lower. Low CRA ratings can drive risk weights as high as 150 percent for sovereign counterparties (from 0 percent under Basel I), banks and securities firms (from 20 percent), and non-financial corporate counterparties (from 100 percent). However, risk weights are reduced for fully secured residential mortgages from 50 to 35 percent, and for consumer retail lending from 100 to 75 percent. Moreover, good ratings can reduce risk weights for exposures to non-financial corporates and commercial real estate (CRE) to as low as 20 percent (from 100 percent under Basel I).

The Standardized approach is also defined in a "simplified" version, mainly for countries where CRA penetration is small and the number of unrated counterparties is likely to be large. In this approach, CRA ratings are replaced by those of Export Credit Agencies, with a general 100 percent risk weight for unrated corporates and a 75 percent risk weight for retail exposures.

**Table 1. Illustration of Risk Weights from Basel I to Basel II**

| | Basel I | Basel II Standardized Approach |
|---|---|---|
| Claims on **Sovereigns** (and Central banks) | ▪ OECD: 0%<br>▪ Non-OECD: 100%<br><br>National discretion: exposures to own sovereign in domestic currency: 0% | ▪ AAA to AA-: 0%<br>▪ A+ to A-: 20%<br>▪ BBB+ to BBB-: 50%<br>▪ BB+ to B-: 100%<br>▪ Below B-:150%<br>▪ Unrated: 100%<br>**National discretion for exposures to own sovereign in domestic currency: 0%**<br>IMF, BIS, ECB and EC: 0% |
| Claims on **Multilateral Development Banks** (MDBs or IFIs) | ▪ 20% | ▪ WB, ADB, AfDB, EBRD, IADB, EIF, EIB, NIB, CDB, IDB, CEDB: 0%<br>▪ Otherwise based on option 2 for claims on banks |
| Claims on **Banks** | Short-term (<1 year)<br>▪ OECD: 20%<br>▪ Non-OECD: 20%<br>Long-term (>1 year)<br>▪ OECD: 20%<br>▪ Non-OECD: 100% | Option 1 – Use sovereign rating minus one RW category<br>▪ AAA to AA-: 20%<br>▪ A+ to A-: 50%<br>▪ BBB+ to B-: 100%<br>▪ Below B-:150%<br>▪ Unrated: 100%<br>Option 2 – Use rating of the bank<br>✓ Short-term (<3 months)<br>▪ AAA to BBB-: 20%<br>▪ BB+ to B-: 50%<br>▪ Below B-:150%<br>▪ Unrated: 20%<br>✓ Long-term (>3 months)<br>▪ AAA to AA-: 20%<br>▪ A+ to BBB-: 50%<br>▪ BB+ to B-: 100%<br>▪ Below B-:150%<br>▪ Unrated: 50% |
| **Mortgages** | **50%** for residential properties occupied (or rented) by borrower and secured by first charge on property | **35 %** for residential properties occupied (or rented) by borrower and secured by first charge on property<br>75% if the loan-to-value ratio exceeds 80% |
| Claims on **Corporates** (including insurance) | 100% | National discretion to weigh all corporate claims at 100%, or to use ratings based on:<br>▪ AAA to AA-: 20%<br>▪ A+ to A-: 50%<br>▪ BBB+ to BB-: 100%<br>▪ Below BB-:150%<br>▪ Unrated: 100%<br>For qualifying unsecured retail portfolios: 75% (up to 100%) |

Source: BIS

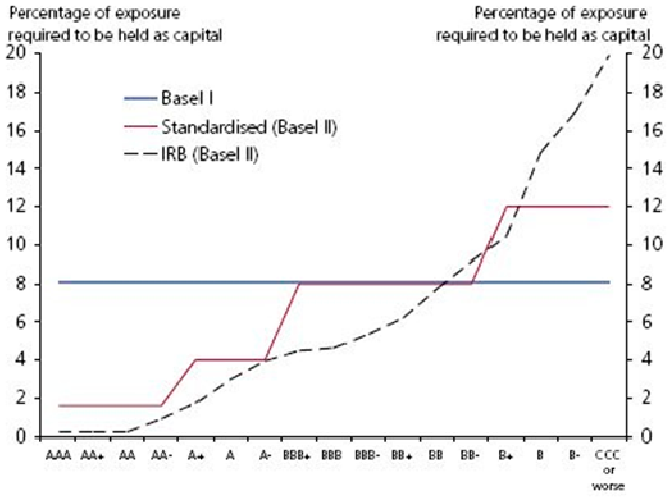
- ***The Internal Rating Based Approach (IRB)*** [15]

The real innovation of the Basel II risk framework was the IRB approach. The IRB approach is based on the concept that banks with better risk management capacity (meeting a range of conditions and under explicit supervisory approval) would be allowed to use their own classifications and measurements for "key drivers" of credit. The IRB is offered in two versions: (i) the IRB foundation approach, under which banks are allowed to calculate borrowers' probabilities of default (PD), and (ii) the advanced IRB approach, under which banks are also allowed to use their own calculations of loss given default (LGD) and

[15] "An Explanatory Note on the Basel II IRB Risk Weight Functions – BCBS, October 2004."

exposure at default (EAD). The Basel committee stopped short of allowing banks to use their own models to calculate the actual capital requirements. Instead, the measures of the key drivers are converted into risk weights and capital requirements by using regulatory formulas. Different risk weight functions are provided for each category of assets (corporates, banks, sovereign, retail and equity), with adjustments for asset correlations and maturity.

**Figure 1. Illustration of Regulatory Capital from Basel I to Basel II—Corporate Risk Credit**




**IRB was meant to provide a strong capital incentive for banks with good risk management.** The risk-sensitivity imbedded in the framework would require much less capital for less-risky assets than the standardized approach and Basel I, while exponentially more capital for lower quality assets. Hence, a transition to Basel II F-IRB, and especially, to Basel II A-IRB would be expected to substantially lower the risk weights (figure 1). However, the Basel Committee also built in a few safeguards to prevent capital from dropping excessively. Besides the corrections built into the framework, the supervisory approval of IRB use would imply a higher understanding of the internal methodologies used by the banks and the power to require additional capital if the supervisor determines that, the calculated numbers are not sufficient. More importantly, Basel II provided two additional safety features against banks unduly reducing capital levels based on IRB: (i) a scaling factor of 1.06 to be applied to RWA calculated under IRB, and (ii) the use of capital floors based on Basel I.

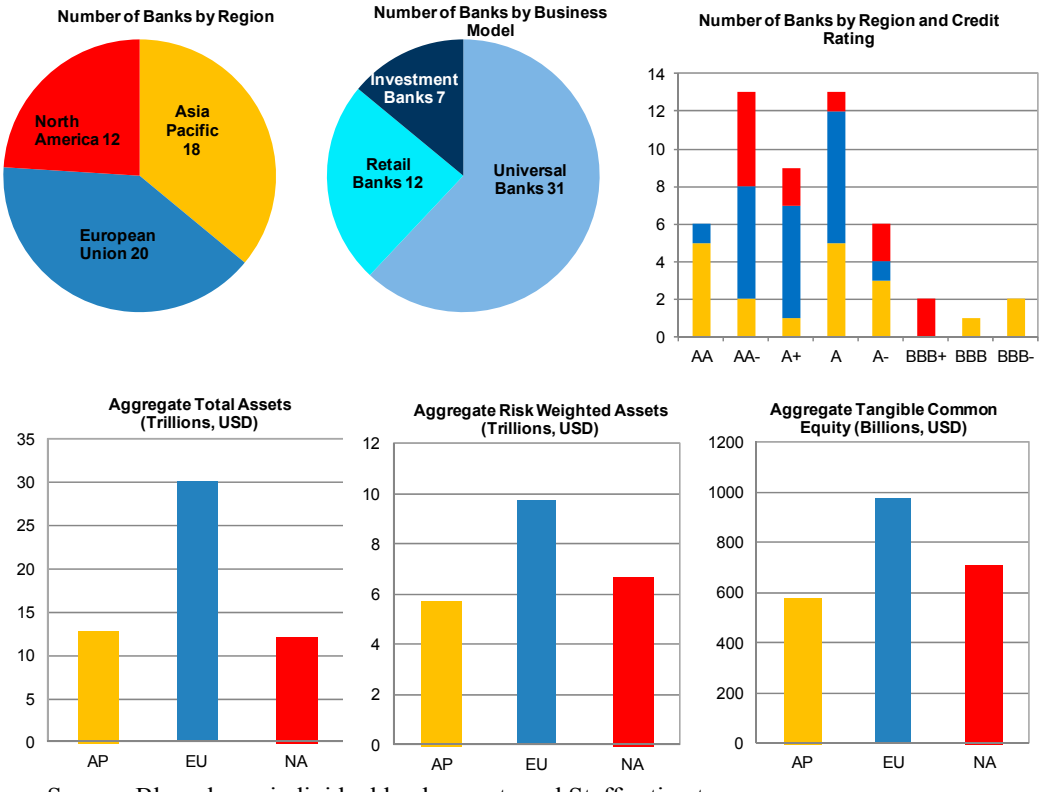
**Market and operational risks were enhanced further.** For market risk, 2009 amendments (Basel 2.5) and Basel III have provided significant enhancements to the previous framework, and should foster greater convergence in the calculation of market risk across banks and jurisdictions. For operational risk, there are also three different approaches: (i) Basic Indicator Approach (BIA), (ii) Standardized Approach or TSA, and (iii) the internal measurement approach (an advanced form of which is the advanced measurement approach or AMA). A comprehensive review of operational risk is beyond the scope of this paper and will not be discussed.

## APPENDIX II. METHODOLOGY AND SAMPLE DESCRIPTION

Our analysis relies on a sample that consists of 50 systemically important banks (SIBs) in 19 countries, spanning Europe, North America and Asia-Pacific. **All information comes from publicly available sources, and is based on a mix of individual banks' reports as they stand (no adjustments to financial statements)**, Bloomberg, Bankscope and SNL, as well as from the three main credit rating agencies. These SIBs are grouped by region (North America 12, Europe 20, and Asia-Pacific 18) and by business models (investment banks 7, retail banks 12, and universal banks 31), as well as by regulatory reporting and accounting standards prevalent in their home jurisdictions.

The dominant business model is "universal banking". As expected for leading SIBs, ratings tend to be concentrated in the single A and higher categories. Aggregate total assets for the European banks exceed those of Asia Pacific by 136 percent and those of North America by 149 percent. European banks' aggregate RWAs are higher than for Asian Pacific banks (71 percent) and North American ones (46 percent). Tangible common equity for the European banks is 69 percent higher than for their Asian counterparts and 38 percent up from their North American peers. The deviation in European total assets appears much wider than in risk-weighted assets or tangible common equity.

**Figure 1. Presentation of the Global Sample of Banks**




Source: Bloomberg; individual bank reports and Staff estimates.

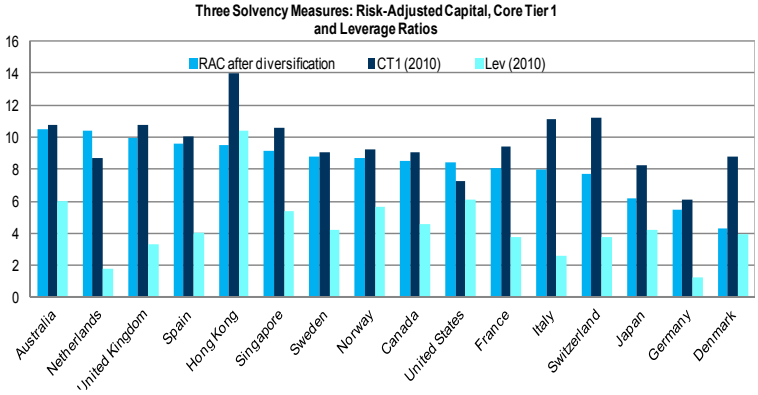
**Table 1. Sample of Banks by Region and Country**

| Region | Country | Bank Name |
|---|---|---|
| Asia Pacific | AUSTRALIA | ANZ Banking Group |
| Asia Pacific | AUSTRALIA | Commonwealth Bank of Australia |
| Asia Pacific | AUSTRALIA | Macquarie Group |
| Asia Pacific | AUSTRALIA | National Australia Bank |
| Asia Pacific | AUSTRALIA | Westpac Banking Corp |
| Asia Pacific | CHINA | Bank of China |
| Asia Pacific | HONG KONG | Bank of East Asia |
| Asia Pacific | HONG KONG | Hang Seng Bank (part of HSBC) |
| Asia Pacific | INDIA | ICICI Bank |
| Asia Pacific | INDIA | State Bank of India |
| Asia Pacific | JAPAN | Mitsubishi UFJ FG |
| Asia Pacific | JAPAN | Mizuho FG |
| Asia Pacific | JAPAN | Nomura Holdings Inc |
| Asia Pacific | JAPAN | Sumitomo Mitsui FG |
| Asia Pacific | SINGAPORE | DBS Group Holdings |
| Asia Pacific | SINGAPORE | United Overseas Bank |
| Asia Pacific | SOUTH KOREA | Kookmin Bank |
| Asia Pacific | SOUTH KOREA | Woori Bank |
| Europe | UNITED KINGDOM | Barclays |
| Europe | UNITED KINGDOM | HSBC Holdings |
| Europe | UNITED KINGDOM | Lloyds Banking Group |
| Europe | UNITED KINGDOM | Royal Bank of Scotland |
| Europe | FRANCE | BNP Paribas |
| Europe | FRANCE | Crédit Agricole |
| Europe | FRANCE | Groupe BPCE |
| Europe | FRANCE | Société Générale |
| Europe | GERMANY | Commerzbank |
| Europe | GERMANY | Deutsche Bank |
| Europe | ITALY | Intesa Sanpaolo |
| Europe | ITALY | UniCredit |
| Europe | SPAIN | Banco Bilbao Vizcaya Argentaria |
| Europe | SPAIN | Banco Santander |
| Europe | DENMARK | Danske Bank |
| Europe | NETHERLANDS | ING Bank |
| Europe | NORWAY | DnB NOR |
| Europe | SWEDEN | Nordea |
| Europe | SWEDEN | Skandinaviska Enskilda Banken |
| Europe | SWITZERLAND | Credit Suisse Group |
| Europe | SWITZERLAND | UBS |
| North America | CANADA | Bank of Montreal |
| North America | CANADA | Bank of Nova Scotia |
| North America | CANADA | Royal Bank of Canada |
| North America | UNITED STATES | Bank of America |
| North America | UNITED STATES | Citigroup |
| North America | UNITED STATES | Goldman Sachs |
| North America | UNITED STATES | JPMorgan Chase |
| North America | UNITED STATES | Morgan Stanley |
| North America | UNITED STATES | PNC Financial Services |
| North America | UNITED STATES | SunTrust Banks |
| North America | UNITED STATES | US Bancorp |
| North America | UNITED STATES | Wells Fargo |

## APPENDIX III. S&P'S RISK-ADJUSTED CAPITAL (RAC) FRAMEWORK

**Figure 1. Comparison of 3 Solvency Measures: RAC, Basel II Core Tier 1, and Leverage Ratio**

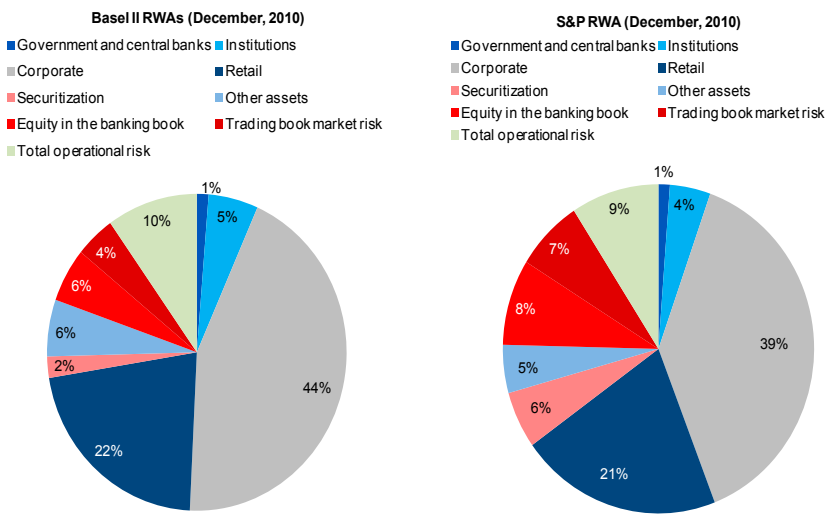
In 2009, S&P developed its own solvency measure—the "RAC" ratio, to facilitate the comparability and transparency of banks' capital adequacy globally. After diversification, the RAC ratio is broadly comparable to Core Tier 1 (and to the upcoming Common Equity Tier 1 under Basel III), with some country variations (figure 1). The RAC ratio adjusts the numerator, by excluding hybrid instruments and applying stricter deductions from capital for pension deficits, and is broadly in line with the upcoming Basel III definition of capital.




Source: S&P Portal; Bloomberg (December, 2010).

**Figure 2. Comparison of Basel II RWA and Standard & Poor's RWA**

The methodology for calculating the denominator differs more significantly from Basel, even if on market risk, Basel 2.5 and S&P RWAs should exhibit greater convergence (RAC is only 3 percent higher on average). The RAC ratio differs from regulatory capital measures by adjusting for concentration and diversification of credit, market, operational and insurance risks, whereas the Basel formula assumes infinite granularity of exposures. Adjustments relate to single name concentration, industry-sector diversification in the corporate portfolio and concentration by geographies, business lines and risk types.




Source: S&P's Portal and Bloomberg (December 2010)

This methodology may be a useful step to foster greater comparability across banks operating under different jurisdictions and business models, and it is already in place. However, it is constrained by the fact that (i) only banks with an S&P rating would be covered; (ii) the methodology is proprietary and not shared with market participants; and (iii) some regulators and market participants may be uncomfortable with increasing reliance on CRAs.

## References

Abouhossein, Kian et al, 2012, "Global Investment Banks—US Basel 2.5 NPR2 Capital at Risk Analysis: Yet Another US IB Disadvantage," J.P.Morgan Cazenove, January 25.

Bank for International Settlements, 1999, "*Capital Requirements and Bank Behaviour: The Impact of the Basle Accord,"* Working Paper 1.

Bank of England, "*Financial Stability Report,*" Issue 30, December 2011.

———, 2011, "Instruments of Macroprudential Policy," Discussion Paper, December.

Basel Committee on Banking Supervision (BCBS), Basel II: Revised International Capital Framework, available online at: http://www.bis.org/publ/bcbsca.htm

———, 2011, "*Final Elements of the Reforms to Raise the Quality of Regulatory Capital Issued by the Basel Committee,*" January 13. http://www.bis.org/press/p110113.htm

———, 2011, "Basel III Definition of Capital Frequently Asked Questions," October 20, available online at: http://www.bis.org/publ/bcbs204.htm

———, Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework, available online at: http://www.bis.org/publ/bcbs107.htm

———, Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework, November 2005 Revision, available online at: http://www.bis.org/publ/bcbs118.htm

———, Basel II: International Convergence of Capital Measurement and Capital Standards: a Revised Framework, Comprehensive Version, available online at: http://www.bis.org/publ/bcbs128.pdf

———, 2010, "Basel III: *A Global Regulatory Framework for More Resilient Banks and Banking Systems*," http://www.bis.org/publ/bcbs189.htm, December 16 (revised June 2011).

———, "Basel I Accord," *"International convergence of capital measurement and capital standards,"* July 1988 and updated several times until 1998, including the *1996 "Amendment to the Capital Accord to Incorporate Market Risks."*

———, "Basel II Accord," "*International Convergence of Capital Measurement and Capital Standards, a Revised Framework*," June 2004, revised in 2005 http://www.bis.org/publ/bcbs118.htm, "*Application of Basel II to Trading Activities and the Treatment of Double Default Effects*," 2006 http://www.bis.org/publ/bcbs119.htm, and "*Overview - Enhancements to the Basel II Framework, including the capital regime for trading book positions*," January 2009, available online at: http://www.bis.org/publ/bcbs/basel2enh0901.htm.

———, "Outcome of the September 2011 Basel Committee Meeting", September 28 2011.

Boston Consulting Group, "Risk Report 2011: Facing New Realities in Global Banking," 2011.

de Longevialle, Bernard and Thierry Grunspan, 2011, "*Despite Significant Progress, Capital is Still a Rating Weakness for Large Global Banks,*" Standard & Poor's, January 18.

Demirgüç-Kunt, Asli, Enrica Detragiache and Ouarda Merrouche, 2010, "*Bank Capital: Lessons from the Financial Crisis*," Policy Research, Working Paper Series 5473, The World Bank.

Dodd-Frank Wall Street Reform and Consumer Protection Act, July 21, 2010 (www.gpo.gov/fdsys/pkg/PLAW-111publ203/pdf/PLAW-111publ203.pdf)

Duffie, Darrell and Kenneth J. Singleton, 2003, "*Credit Risk: Pricing, Measurement, and Management,*" Princeton University Press.

European Banking Authority (EBA), "Capital Buffers for Addressing Market Concerns over Sovereign Exposures – Methodological Note," December 8 2011.

European Commission (EC), "*Capital Requirements Directive"* (CRD), 2006/48/EC and 2006/49/EC, revised in October 2008 and July 2009 (Directives 2009/111/EC for "CRD 2" and 2009/83/EC for "CRD 3").

———, "CRD4" draft proposal for a Directive and for a Regulation, July 20 2011 (http://ec.europa.eu/internal_market/bank/regcapital/index_en.htm)

Oliveira Santos, André and Elliott, Douglas 2012 forthcoming, "Estimating the Costs of Financial Regulation", Staff Discussion Note, International Monetary Fund.

Financial Services Authority (FSA), 2010, "Results of 2009 Hypothetical Portfolio Exercise for Sovereigns, Banks and Large Corporations" and "Banks, Sovereigns and Large Corporates HPE: Technical Appendix," March 1.

Fitch, 2010, "*Core Capital in Financial Institutions: The Fitch Perspective.*" March.

FT, 2011, Masters, Brooke and Ed Hammond, "FSA Crackdown on Understated Property Risks," December 11.

———, 2012, Pandit Vikram, "Apples vs. Apples—A New Way To Measure Risk," January 10.

Global Financial Stability Report, chapter II, "Safe Assets: Financial System Cornerstone?" International Monetary Fund, forthcoming (April 2012).

Gordy, Michael B. and Marrone James, "Granularity Adjustment for Mark-to-Market Credit Risk Models," FEDS 2010-37, Federal Reserve Board, Washington DC, June 3 2010.

Haldane, Andrew, 2011, "*Capital Discipline,*" Remarks given at the American Economic Association in Denver, January 9.

Hannoun, Hervé, 2011, "Sovereign Risk in Bank Regulation and Supervision: Where do we stand?" Financial Stability Institute High-Level Meeting, October 26.

Kruse, Jacob, 2011, "European Banks—RWAs—Finding Order Within Chaos," Autonomous, September 21.

Lakhani, Kinner R. et al, 2011, "The Weighting Game," Citi, June 20.

———, 2012, "Weighing Down – European Banks' RWAs and Pro-cyclicality", Citi, January 19.

Morgan, Don and Adam B. Ashcraft, 2003, "*Using Loan Rates to Measure and Regulate Bank Risk: Findings and an Immodest Proposal,"* Journal of Financial Services Research, June 10.

Notice of Proposed Rulemaking (NPR), Federal Register, 2011, Vol.76, No.7, "Risk-Based Capital Guidelines: Market Risk," January 11, United States.

———, "Risk-Based Capital Guidelines: Market Risk; Alternative to Credit Ratings for Debt and Securitization Positions," amends January 2011 NPR above-mentioned.

Risk Magazine, 2011, "FSA's Turner: RWA Divergence Would Undermine Basel III," June 24, available online at: www.risk.net/risk-magazine/news/2081533/fsas-turner-rwa-divergence-undermine-basel-iii

———, 2011, "Europe lax on RWA Calculations, Says Bair," June 24, available online at: www.risk.net/risk-magazine/news/2081139/europe-lax-rwa-calculations-bair

Samuels, Simon and Mike Harrison, 2011, "Two Hundred Million Inputs—Can You Trust Risk Weightings at European Banks?" Barclays Capital, April 6.

———, 2011, "The Shrinking European Bank Sector—The RWA Debate Rumbles On," Barclays Capital, May 23.

———, 2011, "Saving risk weightings – How can European banks regain trust in risk weighting", Barclays Capital, July 12.

Stimpson, Andrew, 2011, "European Banks—Pillar Talk: Risk Weights at Risk?," Keefe, Bruyette & Woods, April 13.

Stuart, Graham and Jacob Kruse, 2011, "European Banks—Risk Weighting Sovereigns," Autonomous, November 7.

Turner, Adair, 2011, "Financial Stability Report," FSA, Q&A session on June 24.

Tarullo, Daniel, 2011, "Testimony Before the Committee on Financial Services, US House of Representatives", June 16, available online at: http://www.federalreserve.gov/newsevents/testimony/tarullo20110616a.htm

Wellink, Nout, 2011, Wall Street Journal, May 6.

Yogarajah, Jag, 2011, "Risk Weights on the Skinny Side?" Exane BNP Paribas, June 8.