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IFRS 9

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IFRS 9

Market report

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History of IFRS 9 and the three-stage approach

International Financial Reporting Standard 9 (IFRS 9) is a high-impact symbolic, operational, IT and organisational transformation event for finance and risk: an arranged marriage that is turning an uncomfortable courtship and good intentions into a powerful successful partnership that is greater than the sum of its parts. It is one of a few interlinked, unavoidable initiatives in finance, regulation, compliance and risk management that are catalysts to invest in sustainable best practice

IFRS 9 has foundations in common with a number of other key regulatory trends. Therefore, the foundations for an easier implementation of IFRS 9 can be achieved if an organisation has performed well, for example, in implementing:

- Basel Committee on Banking Supervision regulation 239 (BCBS 239) for data management
- Comprehensive Capital Analysis and Review, Dodd-Frank Act Stress Test and European Bank Authority stress testing
- Rigorous enterprise credit and counterparty risk management that is internal ratings-based (IRB)
- Close working practices, with risk management and finance sharing a common culture with regard to risk-adjusted performance management

Searching for solutions

Organisational support for implementing and running IFRS 9 will require change, and through greater involvement of different departments that so far have not been as directly active in finance activities, particularly risk and regulatory reporting.

The marketplace, including large Tier 1 financial institutions, is turning to software vendors for solutions. However, this new marriage of finance and risk is not reflected in most of the software vendors' previous experience. There are very few one-stop shops that encompass the whole process from transaction origination to audited profit and loss and balance sheet. Therefore, there are also many integrated, multi-vendor solutions.

There are few fully complete software packages that reflect the target state required by 2018, with deliverables still occurring during 2016, which makes some proofs of concepts reliant on vendor credibility and trust or successes for the early deliverers.

The complex structures of large financial institutions demand large in-house development, implementation and operations teams, as well as extra support from external professional advisers. All other financial institutions can rely on the packaged software marketplace, but they require close support from the large audit firms, as well as extra consultancy, development and integration resources. Throughout 2016 and 2017, there will be a shortfall in suitably qualified and experienced support services teams in this market sector, which, as mentioned earlier, faces new methodological and organisational challenges.

Data to support impairment modelling and calculations is a critical success factor. If not assembled comprehensively, aggregated and normalised rigorously within a formal data management and well-engineered IT architecture, companies' results will be negatively affected. Many companies, particularly those that have not been through the IRB experience, will have to upgrade their IT architecture or rely on a vendor's software-as-a-service infrastructure.

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History and status of the IFRS 9 standard

During the financial crisis, the Group of 20 tasked global accounting standard-setters with working towards creating a single set of high-quality global standards. In response to this request, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) began working together on the development of new financial instruments standards. The IASB decided to accelerate its project to replace International Accounting Standard 39 (IAS 39), and subdivided it into three main phases:

- Classification and measurement
- Impairment
- Hedge accounting

At the beginning of the project, the FASB and IASB worked jointly on both the classification and measurement and the impairment projects. However, due to lack of support for a three-stage approach for the recognition of impairment losses in the US, the FASB developed a single measurement model, while the IASB decided to continue with the three-stage model. In addition, the FASB decided it would not pursue a classification and measurement model similar to the IASB. As a consequence, IFRS 9 is not a converged standard, and therefore not applicable under US Generally Accepted Accounting Principles – US financial firms should refer to the guidelines from the FASB.

On 24 July, 2014 the IASB published the complete version of IFRS 9, *Financial instruments*, which replaced most of the guidance in IAS 39 and is applicable to all jurisdictions operating under IFRS. IFRS 9 is effective for annual periods beginning on or after 1 January, 2018, subject to endorsement in certain territories.

The IFRS 9 classification and measurement model

IFRS 9 provides a new model for the classification and measurement of debt financial assets driven by the business model in which the assets are held and their cash flow characteristics thus dictating the applicable accounting mechanism

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Any equity financial instruments are required to be carried on the balance sheet at fair value. The rules relating to the classification and measurement of financial liabilities contained in IAS 39 are carried almost unchanged into IFRS 9, with one exception relating to the recognition of 'own credit gain', whereby any fair value gains and losses on liability measurement are reported.

For the mixed-measurement model, the three main accounting mechanisms are:

- Amortised cost
- Fair value through profit and loss (P&L)
- Fair value through other comprehensive income

Organisational support for implementing and running IFRS 9 will require change, through greater involvement of different departments that, until now, have not been as directly active in finance activities. These particularly include risk and regulatory reporting.

The marketplace, including some large Tier 1 financial institutions, is turning towards the software vendors for solutions. However, this new marriage between risk and finance is not reflected in most software vendors' previous experience. There are very few one-stop shops that encompass the whole process from transaction origination to audited P&L and balance sheet. Therefore, there are also many integrated, multi-vendor solutions.

There are few fully complete software packages that reflect the target state required by 2018, with deliverables still occurring during 2016, which make some proofs of concepts reliant on vendor credibility and trust or successes for the early deliverers.

Large financial institutions' complex structures demand large in-house development, implementation and operations teams, as well as extra support from all of their external professional advisers. All other financial institutions can rely on the packaged software marketplace, but require close support from the large audit firms as well as extra consultancy, development and integration resources. Throughout 2016 and 2017, there will be a shortfall in suitably qualified experienced support services teams in this market sector, which – as mentioned earlier – has some new methodological and organisational challenges.

Data to support impairment modelling and calculations is a critical success factor. If this data is not assembled comprehensively, aggregated and normalised rigorously within a formal data management and well-engineered IT architecture, then firms' results will be negatively affected. Many firms – particularly those that have not been through the internal ratings-based experience will have to upgrade their IT architecture or rely on a vendor's software-as-a-service infrastructure.

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A complex nut to crack

Move to expected loss impairment regime brings major challenges, say banks and accountants. By Michael Hegarty

Need to know

- From January 2018, IFRS 9 will usher in a forward-looking 'expected loss' accounting regime for assets subject to impairment, such as loans.
- IFRS 9 will increase banks' loan-loss provisions, but it is also proving tough to implement due to the wide-ranging changes needed and a lack of detail on how this should be done.
- Broadly, banks' approaches fit into two categories: some are choosing to use complex models involving Monte Carlo simulations, while others are assigning weights to future scenarios using expert judgement.
- "The whole thing is crystal ball gazing at the end of the day," complains one IFRS 9 project manager at a large European bank. "The longer you go out, the more uncertain it becomes, and if everyone had perfect hindsight we'd all be on a beach drinking tequila."
- Some banks and policy experts speculate that a three-stage system for classifying assets under IFRS 9 could increase secondary market liquidity in loans.

With perfect hindsight, banks might have been spared the pain of the financial crisis. But in the absence of a crystal ball, magic mirror or time machine, such a level of clairvoyance is hard to achieve. In its absence, banks and regulators have searched for ways of making sure the possibility of future downturns is considered – for instance, by using counter-cyclical capital buffers, more pessimistic modelling assumptions and regular supervisory stress tests.

Accountants are also doing their bit. From January 2018, IFRS 9 will usher in a forward-looking 'expected loss' accounting regime for assets subject to impairment, such as loans. The idea is to force banks to consider the impact of potential adverse scenarios before they occur and ensure adequate reserves are set aside to cover them. That would be a contrast to banks' response to the 2008 financial crisis, when they were criticised for being too slow to recognise losses.

Once implemented, IFRS 9 is expected to significantly increase banks' loan-loss provisions (see box: *The capital crunch*). But even getting to that point is going to be tough, say banks. For one thing, there is confusion over what will pass muster under the rules, with the largest global accounting firms said to be offering varying interpretations. Putting the standard in place will mean revamping accounting systems and the way banks are organised, and it could also entail modifying credit risk models, hiring quants and improving governance.

"I don't see much of an industry convergence," says Wolfgang Reitgruber, head of credit risk modelling at UniCredit in Austria. "I would expect accountants will see pretty diverse environments after 2018 – so lots of different approaches, which will make it increasingly difficult to compare one bank to the other."

Sources close to the International Accounting Standards Board (IASB) say the principles-based nature of the standard means it is up to banks, regulators and auditors to agree on best practice. But for one IFRS 9 project manager at a large European bank, that approach brings little comfort. "It's frustrating in some sense that we're at this level of the project and suddenly these issues are still dangling like this with 18 months to go-live," he says.

The new expected loss regime is among a number of changes in IFRS 9 that are expected to have a big impact on banks. The new standard is the culmination of a decade-long project to reform accounting for financial instruments, which covers three areas: classification and measurement; impairment; and hedge accounting. Impairment is the last of these to be addressed.

Originally, IFRS 9 was a joint project between the two major accounting standard-setters – the IASB and the US Financial Accounting Standards Board (FASB) – and part of a wider attempt at convergence between US and global accounting rules. But following disagreements between the two groups, the FASB has since been working on its own version of the standard that includes its own rules on impairment, which are expected to be unveiled in the first half of this year.

Under the IASB's prior standard on accounting for financial instruments, known as IAS 39, losses on financial assets subject to impairment are not recognised until there is evidence that they have become impaired. IFRS 9 represents a radical departure from this philosophy, forcing banks to make greater and earlier provisions against losses. Under IFRS 9, banks will have to immediately set aside 12-month expected credit losses from the time any unimpaired asset is originated or purchased. They must then track the asset's changing credit risk at each financial reporting date using a three-stage process.

For stage one assets, banks would set aside 12-month expected credit losses and calculate interest revenue based on the gross carrying amount. If a stage one asset were to undergo a significant increase in credit risk, it would move to stage two and the bank would have to begin setting aside expected losses for the entire lifetime of the asset. If the asset were to become credit impaired – as reflected by a missed payment or a broken covenant, for example – it would move into stage three. In addition to setting aside lifetime expected losses, stage three requires that interest revenue is calculated on the net carrying amount, meaning expected losses must be taken into account (see table A).

Once IFRS 9 is in place, some banks and policy experts believe this three-stage approach could encourage banks to trade their loan portfolios, because stage two assets may revert back to stage one by being purchased by a rival bank, allowing the buyer to take lower loss provisions (see box: *IFRS 9: good news for loan liquidity?*).

Where things get complicated is when working out expected losses. IFRS 9 says banks should provide an "estimate of expected credit losses to reflect an unbiased and probability-weighted amount that is determined by evaluating a range of possible outcomes". Moreover, banks will need to back their estimates up by "considering all reasonable and supportable information, including that which is forward-looking".

It is not clear what this means in practice. Some had hoped a single best estimate of expected losses might fit the bill, but those expectations were dashed at a December 2015 meeting of the IFRS Transition Resource Group for Impairment of Financial Instruments – a discussion forum for banks, auditors and the IASB, which seeks to tackle implementation challenges. The group concluded that banks should incorporate multiple scenarios, rather than the most probable future one, because loan losses would be distributed asymmetrically around the most likely outcome. In other words, a slightly more negative economic outlook would imply a larger increase in defaults than the decline that would be experienced with an equally positive forecast.

"It's going to be unlikely in many cases that you can just have a single best estimate forecast," affirms Chris Spall, London-based global leader on IFRS financial instruments at accountancy firm KPMG and a member of the IFRS group. "You're going to have to think about what the other possibilities are and probabilities that attach to them, and to what extent those different outcomes could have an asymmetric impact on your estimate."

The group reiterated the principles-based nature of IFRS 9, and said banks should consider information from different sources and look at several different scenarios. However, it stopped short of specifying exactly how many scenarios they should use, saying instead that a "representative sample" would be needed.

It is the lack of detail in IFRS 9 that is confounding banks, says Scott Aguais, a London-based credit risk consultant who helped to build Basel II credit risk models at Barclays and Royal Bank of Scotland. Compared with the implementation of Basel II, for example, the level of guidance being offered to banks on IFRS 9 compares poorly, he says.

> "A year and a half before go-live there was a three-inch-thick Basel II bible that everybody had sitting on their desk, and they could go and check the specific requirements. IFRS 9 is not as far along and the key parts are written down on two pieces of paper" Scott Aguais, credit risk consultant

"A year and a half before go-live there was a three-inch-thick Basel II bible that everybody had sitting on their desk, and they could go and check the specific requirements," he says. "IFRS 9 is not as far along and the key parts are kind of written down on two pieces of paper."

It means banks are pursuing different ways of generating unbiased and probability-weighted estimates of expected losses. Broadly, the approaches fit into two categories: some are choosing to invest in complex models using Monte-Carlo simulations to estimate losses using forward-looking information, while others are assigning weights to various future scenarios, using expert judgement and techniques borrowed from scenario analysis and stress-testing.

Aguais and other credit risk modellers advocate using Monte Carlo simulations as the purist's solution to IFRS 9. They argue the technique's ability to simulate a huge number of potential future outcomes and come up with best estimates of credit risk metrics stands a better chance of meeting the standard's language.

Monte Carlo simulations involve random sampling being carried out many times over, based on historical data, allowing thousands of potential future scenarios to be mapped, with expected losses calculated for each one. The probability of these expected losses would be incorporated and all the losses aggregated to give a single, probability-weighted average.

Notwithstanding this, most banks that spoke to *Risk.net* had gone down the second, judgement-based route. Both types of approach entail challenges. "There are lots of ideas and lots of things being tried, but I don't think there is any industry consensus yet on the right way to do it," says Tom Millar, London-based accounting partner

A The three stages of IFRS 9

Stage 1	Stage 2	Stage 3
12-month expected losses	Lifetime expected losses	Lifetime expected losses
Interest calculated on gross carrying amount	Interest calculated on gross carrying amount	Interest calculated on net carrying amount

Source: IASB

and head of the global IFRS banking survey at Deloitte. "It's extremely difficult to practically do something that is as detailed, granular and data-based as they might like to do, partly because of the time, and partly because information and the methodologies simply don't exist yet."

While both approaches require changes to accounting systems, firms choosing to use Monte Carlo simulations must ensure they have the right IT in place to do the computational heavy lifting. The use of complex modelling techniques may appear to be a "black box" to senior management, says the IFRS 9 programme manager, who warns that a reliance on historical data could make the models vulnerable to future market crises.

On the other hand, banks going down the judgement-based route also have work to do. Vivien Brunel, head of risk and capital modelling at Societe Generale in Paris, says there is a debate going on about how to blend several different scenarios into the banks' models with the required probability weighting. "In theory [the forward-looking information] should account for all the possible outcomes in any type of scenario, but it's very difficult to implement like this, because you need to assign probabilities to the future economic scenarios, which is difficult in terms of model accuracy," he says.

"There are huge amounts of new risk and estimation processes and revised governance procedures that need to be added, because of the judgemental nature of forward-looking inputs" David Schraa, Institute of International Finance

At the moment, banks tend to base their loan-loss estimates on a single baseline scenario, so working with multiple visions of the future is a new frontier for bank economists – and one that makes some uncomfortable. "Our economists are saying they are unable to assign these probabilities," says Brunel.

Once banks have come up with probabilities for various scenarios, they must decide how to incorporate these as expected losses. One approach being taken is to attach probabilities to loan-loss metrics, such as probability of default (PD) and loss-given default (LGD). Another is the use of probabilities to weight macroeconomic variables.

To obtain unbiased estimates from a panel of economists, a strict challenge process is needed, say experts. "There are huge amounts of new risk and estimation processes and revised governance procedures that need to be added, because of the judgemental nature of forward-looking inputs, to have unbiased estimates," says David Schraa, regulatory counsel at the Institute of International Finance in London. "It's a very complex nut."

Potentially, one way to make IFRS 9 compliance easier is to reuse existing credit risk models. Banks following the internal ratings-based (IRB) approach to Basel II use several standard credit risk parameters, such as PD, LGD and exposure-at-default. The expected credit loss is the mathematical product of these measures.

One problem is that the numbers used for regulatory capital may not be entirely suited to IFRS 9. KPMG's Spall admits it is a "massive effort to re-engineer the systems" to get banks from existing Basel II IRB models to what is required by IFRS 9.

For instance, the IRB approach requires the use of through-the-cycle PD, which attempts to average out the peaks and troughs in default rates caused by the credit cycle. Under IFRS 9, banks will have to use point-in-time numbers, which can

CAPITAL IMPACT

The immediate impact of IFRS 9 will be to increase the provisions held by banks against future losses. In a speech to a London conference in September last year, Hans Hoogervorst, chairman of the International Accounting Standards Board, said the increase would be of "the order of around 35%", although this is expected to vary widely between banks.

Critically, the effect will also depend on how the regulators respond to the new standard.

Banks using the Basel II internal ratings-based (IRB) approach to credit risk can obtain limited relief against loan-loss provisions. Using a mechanism known as the 'provision miss', banks must compare their expected losses over a 12-month period with any accounting provisions that correspond to those losses. Banks with provisions larger than their expected losses can recognise the difference in Tier 2 capital for up to 0.6% of their credit risk-weighted assets, although this number may be constrained by their national regulator. Conversely, if banks' 12-month expected losses are larger than the relevant provisions, they must put aside additional Tier 1 capital to cover the difference.

Under IFRS 9, banks say the requirement to set aside lifetime expected losses for assets that are impaired could leave them out of pocket, because only provisions applying to 12-month expected losses are considered. Banks using the standardised approach to credit risk would fare even worse, because there is no provision-miss calculation in the simpler rules.

"What we will have is no recognition of these additional provisions that have been taken, other than the potential under the current rules for excess provisions," says Adrian Docherty, head of the financial institutions advisory team at BNP Paribas in London. "My current understanding is that IFRS 9 will deplete common equity Tier 1 capital dollar for dollar."

Banks say the Basel Committee on Banking Supervision should change its credit risk rules to account for the mismatch, but the committee is not expected to take any action until after the Financial Accounting Standards Board (FASB) has released its own impairment rules in the US – expected in the first half of this year.

On January 27, the European Banking Authority (EBA) launched its own impact assessment of IFRS 9. David Grünberger, head of IFRS 9 enforcement at the Austrian regulator, Finanzmarktaufsicht, who is closely involved with the EBA's work on IFRS 9, says the exercise will involve hundreds of Europe's largest banks and will be used by the Basel Committee to help inform its decision on future capital rules. The first results are expected in mid-2016, he says, with a second round of results "probably in early 2017".

Grünberger is adamant that any changes to credit risk capital rules must be finished by the time IFRS 9 is implemented, and says the European Union should be prepared to go it alone if necessary. "If the Basel Committee does not do it in time we will do it on a European scale," he says. "There is pressure on the Basel Committee to solve the issues during the next year or so, because IFRS 9 is going to be implemented in less than two years' time and we need a solution."

If the committee fails to act, a possible EU solution might involve narrow amendments to the Capital Requirements Regulation or guidance from the EBA on how regulators should interpret existing rules, says Grünberger.

The Basel Committee declined to comment.

IFRS 9: GOOD NEWS FOR LOAN LIQUIDITY?

Some banks and policy experts speculate that the three-stage system used under IFRS 9 could increase secondary market liquidity in loans.

Under IFRS 9, banks must set aside 12-month expected credit losses from the moment an unimpaired asset is originated or purchased. If it undergoes a significant increase in credit risk, the asset moves from stage one to stage two, and the bank will have to begin setting aside expected losses for the entire lifetime of the asset.

If the asset were to become credit impaired – as reflected by a missed payment or a broken covenant, for example – it would move into stage three.

Moving from stage two to stage three has no impact on expected losses, but means interest revenue must be calculated on the net, rather than gross, carrying amount.

Theoretically, if a bank held a loan in stage two and it was purchased by another bank, it would be reset to stage one. This would allow the purchasing bank to set aside 12-month expected losses and not the full lifetime provisions that would have been held by the selling institution.

"The innovation here is that if someone steps in… the new owner of the asset potentially has a dramatically different expected loss calculation than the originator," says a US-based policy expert and former government official.

Some say the resultant increase in loan liquidity could be a positive development for European banks, which have struggled to shed their non-performing loans (NPLs) in recent years.

"If you're looking to incentivise banks to unload non-performing assets there has to be a mechanism to ensure the acquisition of NPLs and related provisioning has some benefit. That 12-month reset on acquisition could be very useful in incentivising asset acquisition at a discounted rate," adds the policy expert.

Adrian Docherty, head of the financial institutions advisory team at BNP Paribas in London, says some more sophisticated European banks are already preparing loan portfolios to be traded as a result of IFRS 9. However, he refuses to be drawn on which particular firms are involved. He says the rules on lifetime provisions will incentivise banks to hold loans in the trading book rather than the banking book, and he expects some trades involving these assets to emerge as early as next year.

Greater liquidity in NPLs is something that would be welcomed by European regulators, says David Grünberger, head of IFRS 9 enforcement at Finanzmarktaufsicht, the Austrian regulator. But he does not believe the impact will be as significant as others hope. High transaction costs are likely to impede liquidity, he says, while there is also a problem of information asymmetry between buyers and sellers.

"For us, as banking supervisors, this would be a nice result, because we like higher liquidity on loan markets, but I am not sure whether this is going to happen," Grünberger says. "It might, in some areas or niches, produce a market, but I don't expect this to be a really striking effect of IFRS 9."

make a huge difference.

"If those commercial and corporate [through-the-cycle] PD models that everybody is using for Basel II don't reflect the credit cycle, they aren't fit for purpose for IFRS 9," says Aguais. "Your credit losses can vary across the credit cycle by a large factor of up to 10 times relative to using [through-the-cycle] models."

Obtaining point-in-time numbers from through-the-cycle models means building the credit cycle into them by altering the core econometrics or overlaying cyclical variations on to the model by adjusting its outputs. Both will require more work for banks, but Aguais says adjusting the core econometrics is a tougher job than adding an overlay.

In a similar way, some banks taking the judgement-based route are looking to make use of work they have already completed for supervisory stress tests, such as those required annually by the US Federal Reserve Board and the European Banking Authority. Such firms are centralising their pool of future scenarios so they can dip into them whenever they need to – whether for stress testing or IFRS 9, says Burcu Guner, a London-based director in the stress-testing team at Moody's Analytics.

But here, as elsewhere, many of the figures used by banks are through-the-cycle, as opposed to point-in-time. "I spent most of my career trying to document what I think is a point-in-time versus a through-the-cycle probability of default, but not all banks have the same definition," says the IFRS 9 project manager. "And, for a lot of banks, the whole concept of point-in-time risk measures is quite alien to them."

Whichever path banks choose, it is clear there is a lot of work to do, and it's important to find the right people to do it. But this is a struggle, say firms. "Most banks are investing tens of millions of pounds over this four-year effort, and most of that is going on talent and skills," says the IFRS 9 project manager. "Resourcing is one of the biggest challenges at the moment, because everyone's competing at the same time for what is a very niche pool of quantitative skills."

Once IFRS 9 is implemented, will all of the effort be worthwhile? Banks and industry observers seem sceptical. Although the aim of the IFRS 9 impairment rules is to encourage faster recognition of possible future losses, UniCredit's Reitgruber warns not to expect too much from the resulting predictions.

"My personal opinion is that accountants are overly optimistic with respect to achievable model quality," he says. "They strongly focus on forward-looking [scenarios], as if anybody would know if the next year is going to be a crisis or not."

The large European bank's IFRS 9 project manager puts it more bluntly: "The whole thing is crystal ball gazing at the end of the day. The trouble with forecasting is the longer you go out, the more uncertain it becomes, and if everyone had perfect hindsight we'd all be on a beach drinking tequila."

Now the IASB has spoken, banks say they urgently need more clarification from regulators on which approaches to modelling would be acceptable. With the January 2018 deadline looming, firms say they do not want to invest time and money developing new systems and processes only to find they don't meet the supervisors' interpretation of IFRS 9.

"Clearly, the timelines are very short," says the IFRS 9 project manager. "That's the big concern of banks at the moment: there isn't much room for manoeuvre if the goalposts were to change significantly over the course of the next six months."

Deloitte's Millar agrees there is more that regulators and accountants can do. "What I hope we are going to see is more guidance from the accounting firms, [and] hopefully a slightly more practical approach from the regulator on what needs to be done in order to comply."

Previously published on Risk.net

Impairment and the three-stage approach

A summary of the expected credit loss model under IFRS 9

The revision of hedge accounting rules, the restructuring of credit risk models and a new approach to impairment measurement – market participants must prepare for the transformational effects of IFRS 9

The expected credit loss (ECL) model constitutes a significant change, which seeks to address the criticisms of the incurred loss model. Entities will be required to record impairment almost immediately equal to the 12-month expected loss after the initial recognition of financial assets that are not credit-impaired.

ECL forecasts a probability-weighted estimate of credit losses. A credit loss is the difference between the cashflows that are due to an entity in accordance with the contract and the cashflows that the entity expects to receive discounted at the original effective interest rate. Firms should discount the cashflows that they expect to receive at the effective interest rate determined at initial recognition, or an approximate figure, in order to calculate ECL.

An ECL estimate of loan commitments should be consistent with expectations of drawdowns on that loan commitment. Management should consider the expected portion of the loan commitment that will be drawn down within 12 months of the reporting date when estimating 12-month ECL. It should also consider the expected portion of the loan commitment that will be drawn down over the expected life of the loan commitment.

IFRS 9 contains a three-stage approach based on the change in credit quality of financial assets since initial recognition. Assets move through the three stages as credit quality changes, and the stages dictate how an entity measures impairment losses and applies the effective interest rate method.

Where there has been a significant increase in credit risk, impairment is measured using lifetime ECL rather than 12-month ECL with operational simplifications for lease and trade receivables (figure 1).

The standard requires qualitative management when determining whether the credit risk on a financial instrument has increased significantly by considering all reasonable and supportable information available. Financial institutions are required to gather significant historical data about their credit exposures to enable application of the relative credit quality assessment.

It is important to note that the credit risk of the instrument needs to be evaluated without consideration of collateral. This means that financial instruments are not considered to have low credit risk simply because that risk is mitigated by collateral.

The standard requires the use of both forward-looking and historical information to determine if a significant increase in credit risk has occurred. Lifetime ECL is expected to be recognised before a financial asset becomes delinquent.

The model can be applied granularly at an individual or portfolio level. However, some factors or indicators may not be identifiable at an instrument level. In such cases, the factors or indicators should be assessed at a portfolio level.

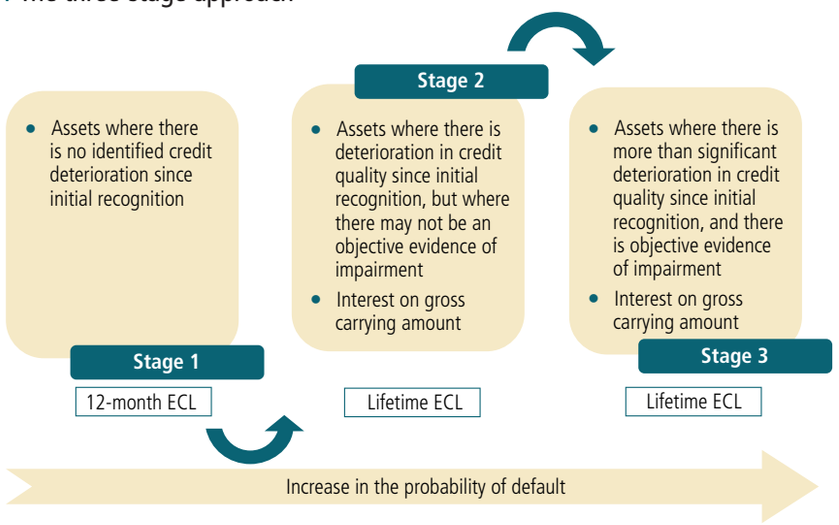
Firms can group financial instruments on the basis of shared credit risk characteristics such as instrument type, credit risk ratings, remaining term to maturity, industry, and so on. Determining appropriate segmentation of credit exposures based on shared risk characteristics is a very important element of the application of IFRS requirements.

Extensive disclosures are required to conform to IFRS 9 ECL, including:

- Reconciliations from opening to closing amounts of the ECL provision, assumptions and inputs.
- A reconciliation on transition of the original classification categories IAS 39 to the new classification categories in IFRS 9.

Auditors and main boards are emphasising that the required data and systems for all these needs will be critical to ensure the completeness of IFRS 9 project planning, implementation and production.

1 The three-stage approach



Source: Chartis, *IFRS 9 Technology Solutions, 2016*

Moody's ANALYTICS

A strategic approach to IFRS 9 impairment

Success in impairment calculation depends on flexible modelling techniques, a scenario-driven approach to forecasting and the transition towards a traceable and controlled technology architecture, writes Burcu Guner, senior director at Moody's Analytics

What is IFRS 9 and why is it important?

IFRS 9, and particularly the new impairment standards, are a response to the last financial crisis and reflect the intention of the International Accounting Standards Board (IASB) to overcome the 'too little, too late' recognition of credit losses inherent in IAS 39.

IFRS 9 impairment introduces new forward-looking expected credit loss (ECL) models that will require more timely recognition of changes in ECLs, and require institutions to account for them from the point at which a significant deterioration of the credit quality occurs.

From our experience on IFRS 9 engagements, the importance of IFRS 9 is twofold:

- While provisions are expected to increase significantly, we anticipate the impact on earnings level and volatility to be non-trivial, leading to implications on loan pricing and availability of credit. Firms will need to think about stakeholder management ahead of the January 2018 deadline, as well as in an ongoing capacity.
- Significant multi-year implementation efforts will require a rethink of and changes to the data, systems, models and validation as well as to future monitoring, reporting and business decision-making.

Burcu Guner

What are the biggest operational challenges in IFRS 9?

Based on our observations, there are two key operational challenges:

- The tactical challenges in achieving compliance by the January 2018 deadline. Banks are addressing this by leveraging and ensuring scalability of existing internal or external capabilities, such as using existing off-the-shelf modelling, data and calculation capabilities to meet the tight deadlines.
- The strategic challenges to meet the ongoing monitoring, reporting and validation requirements of the new standard, as well as to manage the anticipated impact on business and earnings volatility through advanced analytics and infrastructure.

In an age of increasing regulatory demands and new accounting standards, coupled with declining margins and low profitability, many banks of all sizes are seeing the benefits of the Moody's Analytics suite of IFRS 9 solutions as an opportunity to minimise manual intervention and improve cost savings while enhancing analytics.

What broad approaches are firms taking to incorporate forward-looking information about expected losses and, in particular, the required use of multiple economic scenarios?

The success in IFRS 9 forward-looking impairment calculation depends on flexible modelling techniques, forward-looking models and data available for model development and benchmarking, all of which need to be compliant with the regulatory and audit requirements. To ensure consistency across all scenario-based aspects of IFRS 9 and other risk management concerns, we propose that firms put in place a flexible modelling approach where models and scenarios can be leveraged for both IFRS 9, the internal capital adequacy process (ICAAP), stress testing and other strategic, capital and business forecasting and planning purposes.

There is increasing scrutiny of the ongoing validation and independency requirements as to the multiple scenarios used for IFRS 9, and this is making firms seek external help in the construction of such scenarios as well as their validation.

To ensure forward-looking estimations, firms should initially start by estimating point-in-time (PIT) credit measures. Typically, firms tend to have the through-the-cycle (TTC) measures that they wish to convert to PIT measures by credit cycle-driven conversion/adjustment factors.

Moody's Analytics has worked on wholesale portfolios where it was able to convert TTC measures into PIT by using country- and industry-specific credit cycles. In the case of retail portfolios, vintage elements can be further analysed to apply conversions. The vintage approach can be used at both granular and portfolio segment level, depending on data availability.

When firms do not have TTC measures due to data scarcity, we overcome the issue by using industry standard off-the-shelf models. In most cases, we added expert-driven elements to the off-the-shelf scorecards, as well as specific factors affecting the credit quality through the client's internal data, when available.

For forward-looking lifetime measures, we observe banks using a scenario-based model to convert 12-month probability of default/loss-given default (PD/LGD) to conditional PD and LGD term structure for a single and/or multiple set of macroeconomic scenarios. These conditional PD/LGD values can be applied for IFRS 9 stage allocation and ECL calculations. Most clients capture portfolio-level default and migration dynamics across different macroeconomic conditions when projecting the lifetime ECL estimations.

IFRS 9 requires firms to use multiple scenarios to produce probability-weighted lifetime ECLs. To help firms comply with this requirement, firms should produce multiple, fully fledged, upside and downside economic scenarios that align with the scenarios' probability distribution and our deep understanding of the global economy and potential key threats. These scenarios need to extend through long future horizons to satisfy the IFRS 9 lifetime requirements.

Another approach being taken is the scenario-driven approach to forecasting – this begins with our baseline forecast. We define this as the 'most likely outcome' based on current conditions and our view of where the economy is headed. From this, we develop the basic outlines of our alternative scenarios by running multiple simulations to develop a probability distribution of economic outcomes. As a result, this allows for the identification of scenarios that are associated to customer-defined percentiles.

What questions surround the three-stage impairment approach?

One of the most important dimensions of the new accounting standard is the definition of the transferring criteria or bucketing allocation.

The general principle is to incorporate both quantitative and qualitative assessments within the determination of 'significant deterioration of credit risk' and to use lifetime PD as the primary quantitative measure for such transferring criteria. The questions vary across firms from the weighting between the quantitative and qualitative parameters to the consistency with the rating systems, credit policies, monitoring and forbearance processes, and credit strategies. This, in itself, presents certain governance challenges, especially in a context of all changes needing to be traceable and justifiable.

Firms are exploring various approaches – at a tactical level, clients have recently considered embedding the criteria within other relevant processes at the organisation. Moody's Analytics has been involved in formulating a strategic approach, where clients transition towards a more traceable, controlled and automated workflow and technology architecture.

How will IFRS 9 affect banks' incentives to do certain types of business?

Stakeholders pay close attention to earnings as they have significant impacts on stock prices. Typically, they prefer higher earnings with lower earnings volatility.

With IFRS 9, the earnings volatility is expected to increase significantly across the portfolio and firms will be looking to do one of the following:

- Minimise the portfolio's earnings volatility given a certain level of expected earnings – equivalent to maximising expected earnings to earnings volatility ratio.
- Minimise the loss in portfolio earnings under extreme conditions given a certain level of expected earnings under normal conditions – equivalent to maximising expected earnings to earnings tail risk.

As a result, firms need to explore ways to enable business in the new era of earnings of volatility by advancing their analytic capabilities as well as their infrastructure.

Does the three-stage impairment model create the opportunity for regulatory arbitrage?

Given the principle-based nature of IFRS 9, there is much room for interpretation, especially in the adoption of staging criteria. This is expected to narrow down as supervisors and auditors review firms' IFRS 9 practices, including the determination of staging criteria.

According to the Basel Committee on Banking Supervision's guidance on accounting for expected credit losses (GAECL), when assessing capital adequacy, supervisors consider how a bank's accounting and credit risk assessment policies and practices affect the quality of the bank's reported earnings and, therefore, its capital position.

When credit risk assessments and parameterisations are widely varied or deficient and not remedied on a timely basis, the supervisors can consider whether such deficiencies and variations should be reflected in supervisory ratings or through a higher capital requirement under ICAAP Pillar 2 of the Basel capital framework.

This in itself encourages the firms to go through ongoing independent validation process of the IFRS 9 models and frameworks and ensures the staging criteria is appropriate, considering the existing supervisory guidelines, accounting firm interpretations and evolving industry practices.

Can Basel II credit risk models be redeployed for use with IFRS 9?

According to the Basel Committee's GAECL, firms should use information consistently across the bank, and common models and data should be used for both capital and provisioning purposes. This will ensure consistency in the interpretation and application of the new IFRS 9 standard and reduce the extent of bias. Therefore, banks typically take Basel credit risk models and make adjustments to these – PIT calibrations, scaling up to lifetime measures that take into account multiple scenarios, and so on. This approach is compliant and consistent with that applied across the industry and is in line with guidelines from the supervisory authorities.

Beyond credit risk models, the guidelines encourage firms to ensure consistency in macroeconomic forecasts used across the organisation, from ICAAP scenario analysis, stress testing business forecasting, strategic planning to IFRS 9 models and leveraging existing governance processes in place for macroeconomic scenarios in ICAAP. This will ensure that economic forecasts are disclosed transparently and consistently among ICAAP reports and IFRS 9 disclosures.

If the firms choose not to extend existing credit risk models, systems and information for the purposes of IFRS 9 ECL calculations, then the underlying rationale for differences should be documented and approved by senior management. In our opinion, this will create additional unnecessary burden for clients and should be avoided.

Can IFRS 9 be viewed as an opportunity to revamp your modelling, model governance and data?

IFRS 9 can be viewed as a catalyst to optimise and seek synergies across the firm's modelling landscape and data frameworks.

Leveraging the multi-year IFRS 9 programmes, many firms have started to review and extend their modelling capabilities, revise their governance structure and enhance data and technical infrastructure capabilities in this regard.

For example, in developing multiple scenario-based credit loss estimates for financial reporting, many of our clients are starting to initially consider the experience and lessons learnt from similar exercises they have conducted for regulatory purposes and then extend the forward-looking information and related credit risk factors for IFRS 9 ECL purposes.

We anticipate further advancements in the analytics space as firms move away from the tactical mind-set towards a strategic one – and begin to focus on the management of earnings volatility and capital implications.

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Challenges in IFRS 9

Building on current infrastructure

Upgrading to the latest IFRS 9 is a significant transformational event for all financial institutions, regardless of their size and complexity

Miss Kanithar Aiumla-Or/Shutterstock

Market commentators have compared the changes required as being similar in scale to the re-engineering required for Basel, but in practice financial institutions will be affected unevenly. For example, a bank that has an advanced BCBS 239 project is likely to have less trouble mining for historic data and linking it back to the general ledger than a bank that has invested less in its data infrastructure and governance processes.

Similarly, financial institutions with a mature portfolio of internal ratings-based (IRB) credit risk models will be better able to evaluate IFRS 9 exposures and re-engineer these models than financial institutions following the Basel standardised approach with its simpler rules and governance.

Due to the significance of the changes expected, the International Accounting Standards Board (IASB) provided a multi-year period to facilitate the necessary changes and parallel test the new provisions and monitoring systems ahead of formal adoption in January 2018.

Point-in-time probability of default

All financial institutions need to repurpose or build their main credit models to incorporate probability of default (PD), loss-given default (LGD) and exposure at default (EAD). Currently, credit loss provisions are posted on an incurred loss basis. Now models will need to predict credit exposure at point-in-time (PIT) rather than through-the-cycle (TTC), which is the basis for Basel IRB.

Twelve-month expected credit losses used for regulatory purposes are normally based on TTC probabilities of a default in cycle-neutral economic conditions. PD used for IFRS 9 should be PIT PD in current economic conditions, and will therefore change as an entity moves through the economic cycle.

Historic data will be required – especially origination data – to build 12-month and lifetime estimates of PD, LGD and EAD.

IFRS 9 model validation

Model validation will follow many existing IRB processes, but will diverge from them in these key areas:

- There is likely to be more diversity in the models that require testing – for example, the complexities in validating low default portfolios and expert judgement models, especially LGD calculations.
- IRB models are tested as TTC and IFRS 9 models are PIT, so validation for IFRS 9 will be a parallel and separate process to IRB.
- IRB does not require full coverage of the balance sheet; however, IFRS 9 coverage is much higher, so more models will require validation.

Model validation will be required at a minimum to cover the following:

- Review of model documentation – methodology, delivery of models and testing.
- Governance process – status, compliance and appropriateness.
- Methodology review – challenges to the techniques used and focus on weaknesses and limitations. IRB models often cater for weaknesses by being conservative; however, IFRS 9 models are not meant to be conservative, but best estimates.
- Review of model performance – through backtesting, historic model testing for each period under review, reperforming models, comparison of model performance using other models, etc.

IRB calibration tests will need to be enhanced for IFRS 9 calibration, including:

- Calibration for a maximum of 90 days past due (DPD) for IFRS 9 (with some exceptions) versus possible 180 DPD for IRB.
- Conservatism in IRB models to adjust for model error or uncertainty versus IFRS 9 measures that are meant to be the current best estimates.
- Expected life can be greater than contractual life – for example, revolving credit facilities – which can affect the quantum in the EAD calculation.

Overview of the hedge accounting rules under IFRS 9

IFRS 9 has revised the existing rules relating to hedge accounting contained in IAS 39, viewed by some as disconnected from the practice of risk management.

The rules on hedge accounting in IAS 39 have frustrated many, as the requirements have often not been linked to common risk management practices, and have made the process impossible or very costly.

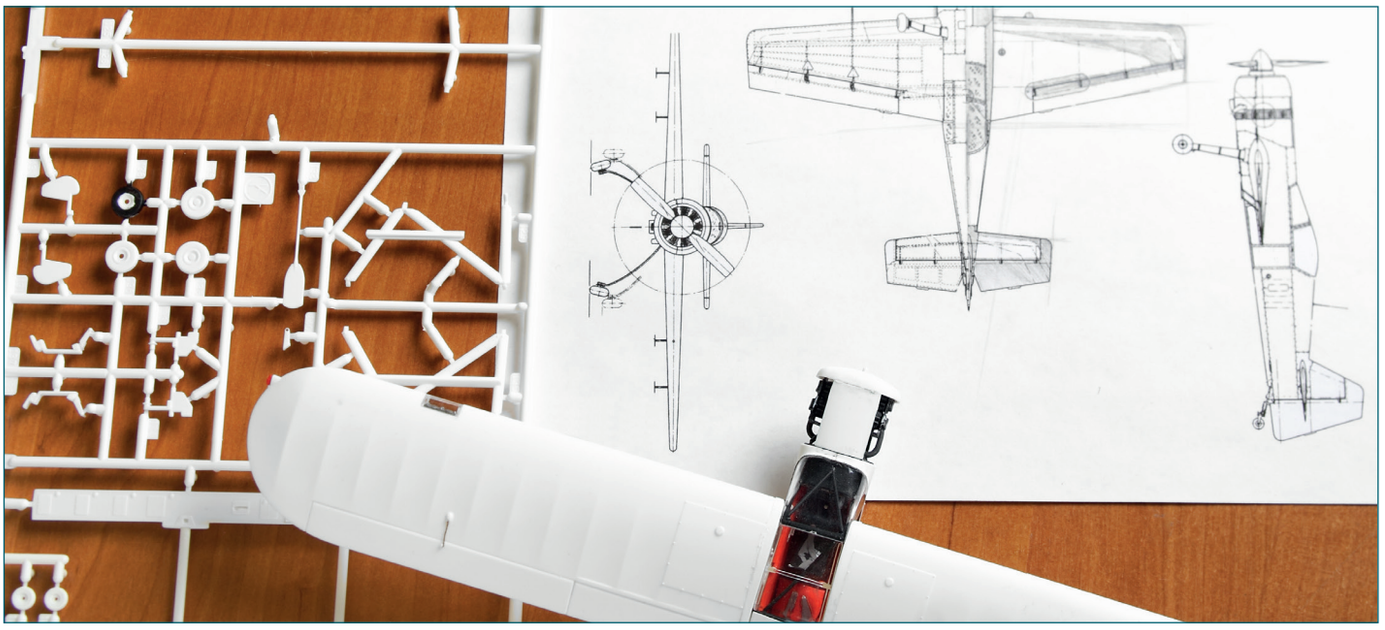
IFRS 9 improves this by better aligning hedge accounting with the risk management activities of an entity. IFRS 9 addresses many of the issues in IAS 39 that have frustrated treasury and asset-liability management departments. In doing so, it makes fundamental changes to the current requirements by removing or amending some of the key prohibitions and rules under IAS 39. The main changes in IFRS 9 in relation to hedge accounting are presented in figure 1.

It is important to note that the IFRS 9 hedge accounting rules do not apply to fair-value hedges of the interest rate exposure of a portfolio of financial assets or financial liabilities – that is, fair-value macro hedges. This is because the IASB carved out the macro hedge accounting part of the overall hedge accounting project, which will be issued separately outside of IFRS 9. At the moment there is no clarity over when the rules relating to macro hedge accounting will be finalised. In the meantime, until the macro hedge accounting rules are finalised, companies applying the IFRS 9 hedge accounting framework can continue to apply IAS 39 requirements for fair-value macro hedges. This is an important issue for the banking sector as banks generally take a portfolio view of interest rate risk – that is, when hedging the interest rate risk on mortgages.

1 Hedge accounting changes

Hedging instruments	• Non-derivatives can be hedging instruments when hedging fair-value risk • Simplifications in hedge accounting, using options and forwards as hedging instruments
Hedge items	• More components of risks can be hedged • Group/net and aggregate exposures can also be hedged
Hedge effectiveness testing	• No bright lines when assessing hedge effectiveness • Testing more qualitative then quantitative in nature • Only performed prospectively
Voluntary de-designation not allowed	• De-designation of hedging relationships is only allowed in the case of a change in risk management objectives
Link with risk management	• Direct link established between the practice of risk management and hedge accounting thereof
Disclosures	• Enhanced disclosures to provide more meaningful information about the hedging strategies applied and their financial impact

Source: Chartis, *IFRS 9 Technology Solutions*, 2016



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Model building for IFRS 9

Incorporating the right techniques

An illustration of the process for building an IFRS 9 model, outlining approaches for both wholesale/corporate and retail

Wholesale/corporate IFRS 9 model build

The main activities are typically:

- Determine the client segmentation.
- Define the targeted model structure: group/local/multiple models.
- Define the input data and identify candidate variables for the analysis between quantitative factors – for example, return on assets, return on equity, debt equity ratio – and qualitative factors – for example, quality of the management board, market share, market structure (monopoly versus competitive), hurdles to entry.
- Definition of default: 30, 60 or 90 days past due (DPD).
- Perform data quality verification.
- Define the historic data population for development and validation.
- Development of subsequent modules: univariate or multivariate analyses.
- Development of the joint model from separately developed modules.
- Analyses of the prepared models and final model selection.
- Pre-implementation tests.

Retail IFRS 9 model build

From a risk perspective, retail models are driven more by scorecards and homogenous groups. Such segmentation has a significant effect on the analytics; therefore, vital areas for consideration are statistical methods, governance and model validation/calibration. A summary of variables is offered below.

Credit application models

- Socio-demo variables: income, profession, region, age, marital status, education, and so on.
- Relations with the bank: length of the co-operation, average amount of loans, product mix, and so on.
- Interactions between complex variables: age and income, region and income, and so on.
- Variables based on credit bureau data, describing repayment history: debt level and number of DPD.
- History of loan origination: frequency, level of debt, loan types.
- History of queries to credit bureau.

Behavioural models:

- Behaviour on current accounts.
- History of delinquency.
- Level of exposure, exposure amount divided by exposure as at origination data.
- Frequency of loan origination – how frequently the client takes new loans.
- Delinquency value to exposure value.
- Usage of the available off-balance limit – in case of revolving products.
- Number, value, frequency or share of cash transactions and cashless transactions.
- Repayment patterns for subsequent instalments.
- History of co-operation with the bank.

Best practice for choosing a model for retail probability of default, loss-given default and exposure at default is to use several techniques or a combination of these. Final selection of the model is then based on its statistics and not on the assumptions of modelling techniques.

Moody's ANALYTICS

Managing earnings volatility and uncertainty in the supply and demand for regulatory capital

The impact of IFRS 9

This novel approach to modelling from Moody's Analytics allows better management of the interplay of supply and demand dynamics for regulatory capital, combining an economic framework with regulatory capital and new loss recognition rules

Introduction

The framework is particularly relevant in understanding the extent to which IFRS 9 can lead to more aggressive provisioning, which feeds into earnings volatility. The approach provides guidance on how organisations can better manage their capital buffer, considering investment concentration, its impact on earnings volatility and relationship to regulatory capital requirements. Imperative to portfolio management, the framework recognises the likelihood of a capital shortfall being significantly impacted by portfolio name, industry, geography and asset class concentration, as extreme fluctuations in capital supply and demand occur more often for institutions holding more concentrated portfolios. Finally, we discuss integrated investment and strategic decision-making measures that account for the full spectrum of economic risks and interactions with regulatory and accounting rules, as well as the instruments' contribution to earnings volatility and capital surplus dynamics.

With stringent regulatory and accounting requirements, risk managers can struggle with incorporating regulatory capital requirements and loss accounting rules into investment decisions. An economically appealing approach considers stakeholders who maximise return while recognising the risks and who face regulatory capital constraints; investment decision rules recognise both regulatory capital and economic risks[1]. Intuitively, an investment with less concentration risk, all else being equal, is better diversifying and more appealing. Similarly, an investment that attracts less regulatory capital, all else being equal, is less constraining and more appealing. Accordingly, institutions can use integrated metrics that account for both regulatory capital and economic risks such as regulatory-adjusted return on risk-adjusted capital (Rorac), concentration-adjusted return on regulatory capital, or composite capital measures that reflect regulatory capital constraints, as well as economic risks.

In addition to considering regulatory requirements and economic risks related to concentration effects, the question of being able to fulfil future regulatory requirements is material. In reality, credit deterioration flows into earnings along with increases in regulatory capital, resulting in a potential capital breach. The likelihood of such a breach depends very much on a portfolio's composition, the degree to which it is diversified and the supply of equity. Ideally, investment decision rules should account for the likelihood and cost of breaching future regulatory capital requirements.

The key to managing the dynamics in regulatory capital requirements is to quantify the likelihood that the supply of capital is sufficient to address future regulatory capital requirements. This probability is determined by the dynamics of regulatory capital supply and demand, with the supply affected by earnings and loss recognition rules. Compared to its predecessor, IAS 39, the new IFRS 9 accounting standard for financial instruments requires institutions to set aside provisions at origination. In addition, the staging rule for IFRS 9 requires institutions to update loss allowance to reflect changes in credit quality at each reporting date, which can increase earnings volatility that flows into the supply of capital.

This article examines how IFRS 9 affects regulatory capital supply and demand. We provide an overview of how an institution can utilise integrated measures that account for economic risks and regulatory capital for better capital management. Our approach leverages an economic capital framework similar to the one proposed by Levy, Kaplin, Meng and Zhang (LKMZ) in 2012[1], in which stakeholders maximise return per unit of risk while facing regulatory capital constraints. In addition to recognising current regulatory capital requirements, this article incorporates uncertainty in the supply of and demand for regulatory capital coming from changes in the credit environment.

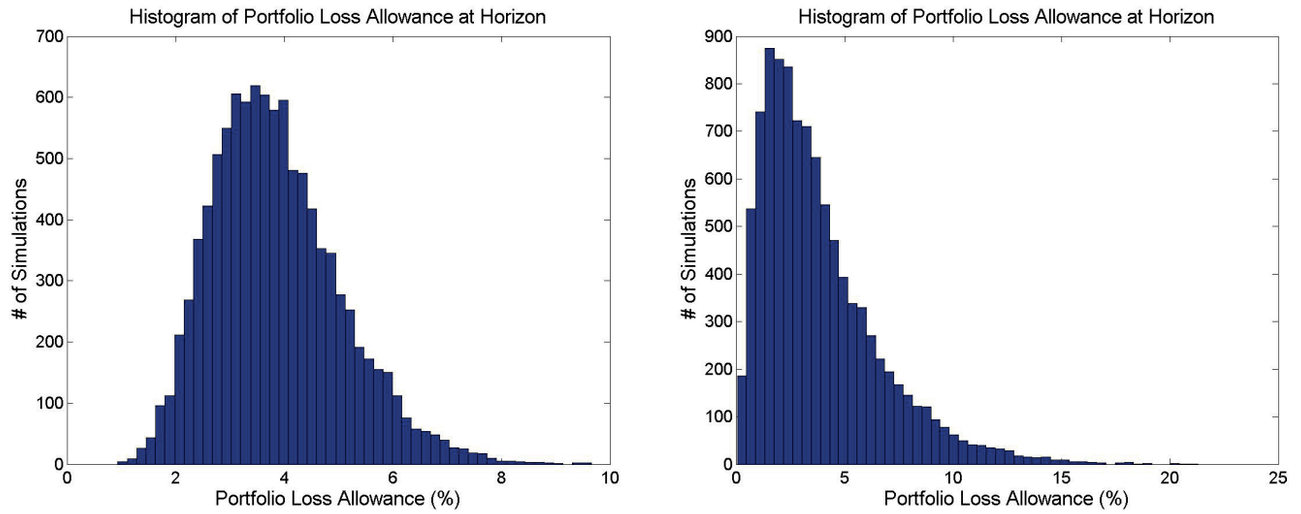
Impact of IFRS 9 on regulatory capital management

1. How IFRS 9 affects the dynamics of regulatory capital at horizon

IFRS 9 affects the supply and demand for regulatory capital in at least two ways. First, IFRS 9 generally requires an institution to recognise 12-month expected credit loss of a financial instrument as soon as the instrument is originated or purchased. Meanwhile, IFRS 9's predecessor, IAS 39, generally requires material credit events to trigger loss provision. Thus, IFRS 9 can cause an initial reduction in the Tier 1 capital supply, driving required regulatory capital to be more constraining for banks using a standardised approach to compute regulatory capital[2]. In addition, IFRS 9 staging rules can result in further reduction in the capital supply when lifetime losses must be considered.

Second, IFRS 9 can increase the volatility in

1 Loss allowance at horizon of diversified portfolio versus concentrated portfolio



capital supply. IAS 39 requires provisioning under significantly negative credit triggers, which generally dampens the impact of credit migration on capital supply volatility. In contrast, under IFRS 9, institutions update loss allowance to reflect changes in credit risk on every reporting date, resulting in credit migration being accounted for in capital supply. An important corollary to this observation is that more concentrated portfolios will, in general, be more impacted by the IFRS 9 volatility increase. Intuitively, a perfectly diversified and granular portfolio exhibits no volatility. Figure 1 compares the IFRS 9 loss allowance at horizon of a well-diversified portfolio and a portfolio with high concentration in the oil industry. It can be seen that, for the simulated trials, loss allowance for the well-diversified portfolio never exceeds 10%. In contrast, the diversified portfolio loss allowance at horizon exceeds 10% in 3.7% of trials. All else being equal, organisations' loss provisions will be more extreme for concentrated credit portfolios, driving a higher volatility in earnings and likelihood of facing a regulatory capital shortfall.

2. Quantifying change in capital surplus

As discussed above, IFRS 9 loss provision affects the supply of capital, potentially impinging on an institution's ability to meet regulatory capital requirements. The dynamics of loss allowance, with each reporting date, can further constrain the organisation, as it should consider buffering for a deteriorated credit environment. Capital surplus measures the gap between capital supply and demand. In the context of Basel III and IFRS 9, the change in capital surplus is driven by the change in regulatory capital required by Basel III, and earnings that are driven by interest income, default losses and provisions – either 12-month or lifetime, depending on the assets' stage.

Since the change in capital surplus captures the dynamics of both required regulatory capital and earnings, it provides a foundation for measuring how much capital must be set aside. With that said, the expected change in capital surplus associated with each individual instrument does not account for concentration and diversification risks. Consequently, an institution should not use it as the only measure when making investment decisions. For example, all else being equal, an instrument with a 4% expected increase in capital surplus may be more attractive than one with a 6% expected increase, if its credit risk is less correlated with other instruments in the portfolio.

3. Leveraging an economic framework to manage earnings dynamics and the demand and supply of regulatory capital

As discussed in the introduction, the LKMZ framework accounts for regulatory capital constraints at the time of investment; in reality, future credit deterioration results in changes to regulatory capital requirements and its potential violation. The likelihood of such a breach depends greatly on the portfolio composition, the degree to which it is diversified and its capital surplus. Investment decision rules should account for the likelihood and the cost of breaching future regulatory capital requirements. Institutions have addressed this issue by adopting buffers beyond their stated required regulatory capital requirements. The challenge is in quantifying the buffer, how portfolio composition can improve managing that buffer, and how all this should feed into investment decision rules. Intuitively, institutions should set aside capital buffers, so the likelihood of a capital breach does not exceed a target probability. In addition, institutions should assign an additional capital buffer to each instrument according to the expected change in capital surplus associated with the instrument, and how that change contributes to the overall likelihood of a breach. The distribution of changes in capital surplus is depicted in figure 2.

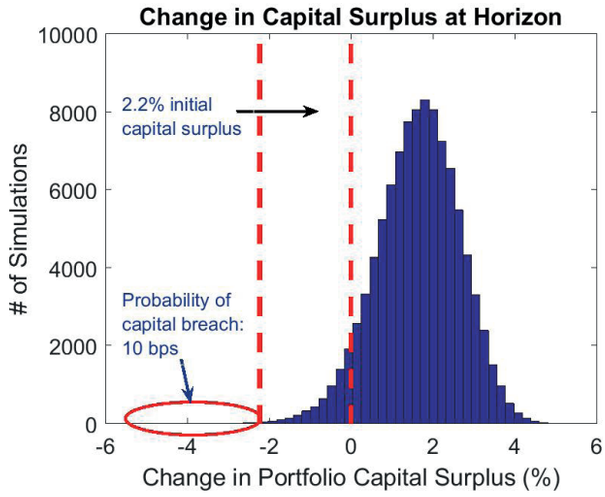
The left-hand side of figure 2 shows the distribution of changes in capital surplus over a one-year horizon for a sample loan portfolio; the right-hand side depicts the capital surplus distribution for a more concentrated portfolio that does not benefit from country and industry diversification. In this case, the probability of a capital breach more than doubles, to 26 basis points, if the same 2.2% additional capital buffer is set aside[3]. Limiting the probability of a capital breach to 10bp requires a 2.2% additional capital buffer to be set aside beyond what is needed to address current regulatory capital requirements.

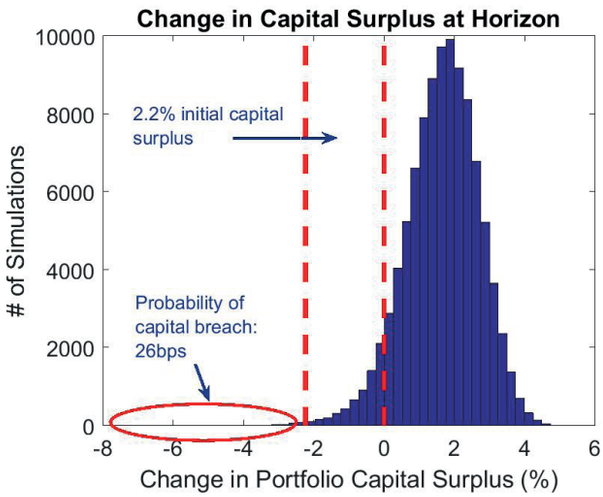
[1] *For example, Levy, Kaplin, Meng and Zhang (LKMZ) (2012) introduce a regulatory capital-adjusted Rorac measure by integrating economic capital with regulatory capital under a capital asset pricing model framework. Xu and Levy (2015) extend LKMZ's model and create a composite capital measure that serves as a capital allocation measure accounting for both regulatory capital requirements and economic risk.*

[2] *Under the Basel III rule for advance IRB banks.*

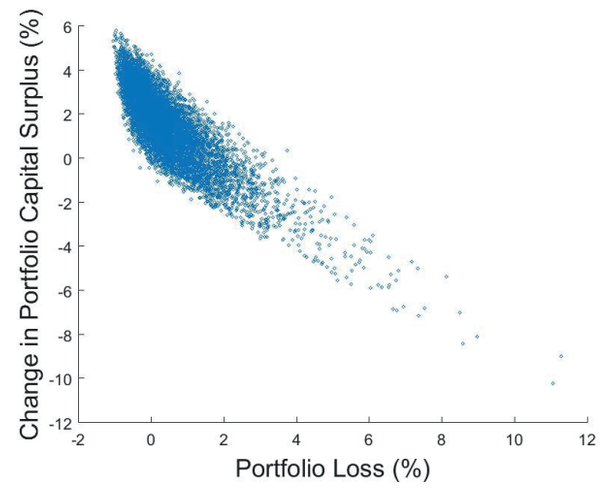
[3] *The required regulatory capital for each instrument is computed based on the Basel III advanced IRB approach in all examples in this article.*

2 Probability of capital breach: diversified portfolio versus concentrated portfolio





3 Change in capital surplus versus change in capital risk



It is important to note that, even though the two portfolios shown in figure 2 have different capital breach probabilities, both have the same expected change to their capital surplus: 1.95%. Therefore, it is clear that the expected change to the capital surplus by itself is not sufficient to describe an instrument's risk, as it does not account for portfolio concentration and diversification effects. This trait is similar to expected loss measures not being impacted by diversification and concentration.

Figure 3 provides an additional perspective to the dynamics of capital surplus by comparing it with portfolio fair value loss. While the change in portfolio capital surplus has a general inverse relationship with portfolio loss, there is a reasonable amount of dispersion. One primary reason behind this observation is that fair value portfolio loss, which includes both default loss and credit migration loss, is entirely driven by the migration of point-in-time probability of default, while the change in capital surplus is partly determined by the migration in through-the-cycle probability of default, which feeds into regulatory capital calculations.

To account for the full spectrum of economic risks and interactions with regulatory and accounting rules, one can leverage the LKMZ framework and associate an additional capital buffer charge to each instrument as the organisation ensures capital solvency In the future. The resulting investment decision rules account for capital surplus dynamics as well as the concentration and diversification risks associated with each instrument.

Conclusion

The introduction of IFRS 9 changes the dynamics of capital supply and demand and affects institutions' investment decisions. In particular, the new loss recognition rule under IFRS 9 can make regulatory capital requirements more stringent and can increase the uncertainty of capital adequacy in the future. IFRS 9 can also introduce significant concentration risk into capital planning. These implicit costs should be accounted for in investment decisions and capital allocation. An extended LKMZ model leverages an economic framework and derives investment decision rules based on the full spectrum of risk, and it accounts for regulatory capital as well as future dynamics in capital supply and demand.

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Loan classification under IFRS 9

IFRS 9 requires classifying non-defaulted loans in two stages depending on their credit quality evolution since initial recognition by the bank. In this paper, Vivien Brunel proposes an optimal way to perform this classification. Target values of some key performance indicators of the provisioning model emerge from the implementation of this process. In particular he computes the target value of the stage 2 'hit rate' and the size of the stage 2 portfolio

Scoring and rating models have been used in the field of the granting of credit and in credit risk management for some time. In 2001, the Basel Committee required the use of internal models to be extended to capital charge measurement (Basel Committee on Banking Supervision 2001). Since then, banks and regulators have both developed statistical tools to evaluate the quality of internal rating models because bad performance can lead to inefficient allocation of capital.

In 2014, the International Accounting Standards Board (2014) published the final version of the IFRS 9 accounting standards, which aim to overcome the problems that arose during the financial crisis because of the previous IAS 39 incurred loss model. The new requirement is to recognise loss allowances or provisions on all loans, including performing loans. This is done in a two-stage process for non-defaulted loans.

- Stage 1: if the credit risk of a financial instrument has not increased significantly since initial recognition, the loss allowance is equal to the 12-month 'expected credit loss' (ECL).
- Stage 2: if the credit risk of a financial instrument has increased significantly since initial recognition, the loss allowance is equal to the lifetime ECL.

In general, stage 1 loans are of better credit quality than stage 2 loans. Paragraphs 5.5.10 and 5.5.11 of the norm (International Accounting Standards Board 2014) provide some requirements about the transfer criteria. However, the norm is 'principle based' and does not detail how to determine which instruments should be in stage 1 or in stage 2. Implementing the standards is subject to interpretation and to some subjective choices in terms of credit risk quantification.

In this paper, we propose how assets should be assigned to the two stages. Our proposal involves the following three assumptions.

- We assume that the transfer criteria from stage 1 to stage 2 are based on scoring and rating systems of the bank and that an instrument is transferred to stage 2 when its absolute level of risk has gone beyond a given threshold; this is a good approximation when the bank does not originate any loan with a score under a given cutoff value.
- Loan classification aims to accurately predict defaults over a given time horizon, and its performance will be assessed accordingly. Even if the ECL is measured over the lifetime of an instrument, we assume that the performance of rating and scoring models is measured over a one-year horizon as this is usually the case in practice.
- In the specific case of retail exposures, we assume that the scores and ratings under consideration incorporate some specific issues such as multiple defaults, restructured loans or default contagion.

As we will emphasise, efficient provisioning in the IFRS 9 framework is based on measuring credit risk and model performance accurately. The main statistical tools used to assess the performance of a rating or scoring tool are based on the cumulative accuracy profile (CAP) or the receiver operating characteristic (ROC), and on their summary statistics, namely the accuracy ratio (AR) and the area under the ROC curve (AUC), respectively (see Sobehart, Keenan & Stein 2000). We mention that the AR and AUC are criticised for being flawed, particularly when expressed in terms of misclassification costs, and that a more objective measure exists (Hand 2009).

By considering that the two-stage classification process of performing loans is based on a scoring model, we link the two-stage accuracy ratio of a portfolio of loans to the underlying score accuracy ratio. We show that optimality in the two-stage classification can be reached by appropriately choosing the 'hit rate' (called the 'stage 2 hit rate' hereafter) that we target, ie, the proportion of defaulted loans that come from stage 2 loans. In many realistic cases the optimal target stage 2 hit rate is in the range 70–90%. Additionally, we derive a formula for the size of the stage 2 portfolio. We show that, for a given portfolio of loans, the main driver of the provision is the stage 2 hit rate and not the size of the stage 2 portfolio.

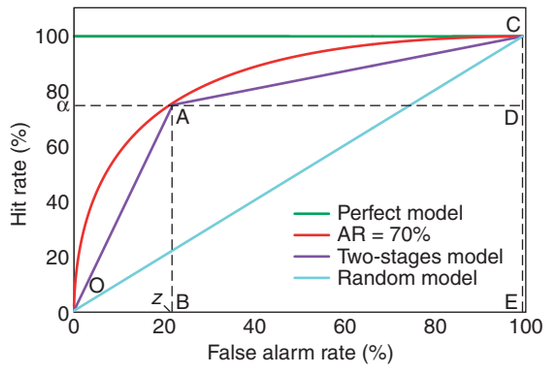
To make our paper self-contained, we describe the main statistical tools used to assess the performance of a rating or scoring system in the next section. Later we show how these performance indicators are shifted when loans are classified into only two buckets, and we compute the optimal target stage 2 hit rate. We go on to derive the formula that links the size of the stage 2 portfolio to the other parameters, and in the final section we provide a simple proxy formula for the total provision.

The measures of discriminatory power

A scoring model aims to rank the clients of a bank according to their creditworthiness, ie, their ability to pay back the loan they have been granted. Whatever it is based on – either a mathematical model or an expert-based judgment, or both – the performance of a scoring model is measured by the concordance of low scores with the occurrences of defaults. When a scoring model is random, ie, contains no information about the likelihood of a default, the conditional default probabilities of the clients are uncorrelated with their scores. Conversely, for a perfect scoring model, the scores perfectly rank the risk of the clients: the clients that go to default are assigned the worst scores prior to default. We mention that the IFRS 9 norm focuses on the notion of credit risk deterioration and does not provide any definition of the default event. Banks usually have only one definition of default, which coincides with the Basel definition.

We consider a homogeneous portfolio of loans, meaning that the loans have the same risk drivers. These loans are granted to the same types of client in the same geographic area and belong to the same asset class (for instance, prime residential mortgages in the UK originated

1 The ROC curve (the hit rate as a function of the false alarm rate)



by entity X of the bank). We call p the one-year average unconditional probability of default within the loan portfolio. We consider a rating model that produces a continuous score over the set of debtors in the portfolio. The higher the score assigned to a loan, the lower its probability of default. We rank the debtors according to their creditworthiness, starting with those that have the lowest scores and going to those with the highest scores. Let us consider the fraction x of the debtors having the lowest scores. Among all the defaulters in the portfolio, we call $\mathrm{HR}(x)$ the 'hit rate' function, which is the proportion of defaulters that have been classified correctly regarding the score value corresponding to x. Similarly, we call $\mathrm{FAR}(x)$ the 'false alarm rate' function, which is the proportion of non-defaulters that have been classified incorrectly regarding the score value corresponding to x.

The cumulative accuracy profile (the CAP curve) is obtained by plotting $\mathrm{HR}(x)$ when x ranges from 0% to 100%. The receiver operating characteristic (the ROC curve; see figure 1) is obtained by plotting $\mathrm{HR}(x)$ as a function of $\mathrm{FAR}(x)$ when x ranges from 0% to 100%. In what follows, we call the ROC function $R(u)$, where $u = \mathrm{FAR}(x)$ is the false alarm rate. For a random scoring model, the hit rate is equal to the false alarm rate for all x, and the ROC curve is the diagonal of the unit square; the area under the ROC curve, called AUC, is equal to $\frac{1}{2}$. For a perfect model, the hit rate is always equal to 100% and AUC is equal to 1. The CAP and ROC curves are closely related to each other, as well as to their associated summary statistics (see Engelmann *et al* 2003):

$$\mathrm{AR} = 2\mathrm{AUC} - 1 = 2\int_0^1 R(u)\,\mathrm{d}u - 1 \tag{1}$$

When considering real data, both the CAP and ROC curves are noisy. The most popular fit of the ROC curve used in statistics is the binormal approach, which is based on a two-parameter family of ROC functions (Hanley 1996):

$$R^{\mathrm{B}}_{a,b}(u) = N(a + bN^{-1}(u)) \tag{2}$$

where the function $N(\cdot)$ is the cumulative normal distribution function. This type of ROC function corresponds to a normal distribution of the scores of both the defaulters and the survivors, which is a reasonable assumption in practice. The case $b = 1$, for which the score volatility is the same for defaulters and survivors, is often used in the statistical literature because it often leads to very good fits (Hanley 1996). We will set $b = 1$ hereafter; as emphasised by Tasche (2012) and Cramer (2003), this special case motivates the choice of modelling the probability of default curves with the inverse logit function. Additionally, $b = 1$ is the only value of the parameter b for which the binormal ROC curve is concave over the whole interval $[0, 1]$.

Another fit uses an exponential shape for the CAP curve. It was proposed by Van der Burgt (2008) in the context of low-default portfolios (sovereign credit risk in his paper). In this paper, we introduce the exponential fit of the ROC curve, which is similar to Van der Burgt's fit:

$$R^{\mathrm{E}}_k(u) = \frac{1 - \mathrm{e}^{-ku}}{1 - \mathrm{e}^{-k}} \tag{3}$$

In what follows we will assume that the ROC function $R(u)$ is concave and has either a binormal or an exponential shape. Other shapes are of course possible and our results can be extended straightforwardly. From (1), we derive the value of AR as a function of the parameters of the ROC function in the particular cases of the binormal (see equation (3.14) in Tasche (2010)) and exponential approaches:

$$\left.\begin{array}{ll} \text{Binormal fit } (b = 1) & \mathrm{AR} = 2N\left(\dfrac{a}{\sqrt{2}}\right) - 1 \\ \text{Exponential fit} & \mathrm{AR} = 2\left(\dfrac{1}{1 - \mathrm{e}^{-k}} - \dfrac{1}{k} - \dfrac{1}{2}\right) \end{array}\right\} \tag{4}$$

The stage 2 hit rate target value

In contrast to the Basel framework, in which rating systems are required to have at least seven grades for non-defaulted loans, the IFRS 9 norms introduce an unusual classification for non-defaulted loans with only two grades: stage 1 and stage 2. The resulting classification of loans performs less well than the original score because of the loss of information in the bucketing process. Indeed, to assess the two-stage classification rule, we assume that the ranking of the loans within each stage is random, but loans in stage 1 all have a better ranking than loans in stage 2. The resulting ROC curve, named $R_2(u)$, where u is the false alarm rate obtained with the new rankings, is an affine function per interval (the purple line in figure 1).

Let us call AR_2 the two-stage accuracy ratio and α the stage 2 hit rate, ie, the proportion of defaults captured by the stage 2 portfolio. We show in the appendix that AR_2 is linked to the stage 2 hit rate α:

$$\mathrm{AR}_2 = \alpha - R^{-1}(\alpha) \tag{5}$$

We obtain a direct relationship between the proportion of defaults that stage 2 catches and the performance of the two-stage model. We see geometrically that $\mathrm{AR}_2 \leqslant \mathrm{AR}$ due to the loss of information in the bucketing process; we propose to undertake the bucketing in such a way as to minimise this loss of information. From (5), we show that AR_2 reaches a maximum for $\alpha = \alpha^*$, which is the solution of:

$$\left.\frac{\partial R^{-1}(\alpha)}{\partial \alpha}\right|_{\alpha=\alpha^*} = 1 \tag{6}$$

The selected value of α depends on the calibration of the transfer criterion from stage 1 to stage 2. Transfer criteria for which $\alpha > \alpha^*$ are not relevant because the two-stage accuracy ratio decreases for

this range of parameters. After some algebra, we obtain a one-to-one relationship between the underlying scoring model accuracy ratio and the maximum target hit rate from (6) and (3):

$$\left.\begin{array}{ll}\text{Binormal fit } (b=1) & \alpha^* = N\left[\dfrac{\sqrt{2}}{2}N^{-1}\left(\dfrac{1+\text{AR}}{2}\right)\right] \\ \text{Exponential fit} & \alpha^* = \dfrac{1}{1-\text{e}^{-k}} - \dfrac{1}{k} = \dfrac{1+\text{AR}}{2}\end{array}\right\} \quad (7)$$

We note that in the binormal case we obtain the same result as that obtained by Tasche (2012) using a criterion based on misclassification cost. We plot the values of the maximum target stage 2 hit rate α^* and of the associated two-stage accuracy ratio AR_2^* as functions of AR in figure 2.

For realistic values of the accuracy ratio AR – between 60% and 80%, say – the maximum value of AR_2 is reached when the stage 2 hit rate is in the range 70–80% in the binormal case and in the range 80–90% in the exponential case. For the exponential ROC function, the link between AR_2^* and AR is implicit, with intermediate variable k. This link is explicit in the case of the binormal approach, and we obtain from (5) and (7):

$$\text{AR}_2^{\text{B}*} = 2N\left[\frac{\sqrt{2}}{2}N^{-1}\left(\frac{1+\text{AR}}{2}\right)\right] - 1 \quad (8)$$

The maximum attainable values of AR_2 are in the range 45–65% when the underlying score accuracy ratio is in the range 60–80%, and they are very similar for both approaches. We also observe the maximum attainable values of AR_2 depend only on AR and not on the portfolio default probability.

From a practical point of view, we propose using the stage 2 hit rate and the two-stage accuracy ratio to assess the calibration and performance of the transfer criterion. People in conferences and working groups sometimes refer to the value of 70% as a target for the stage 2 hit rate, which looks sound at first sight. However, the above equations show that the relevant targets for the stage 2 hit rate depend on the two-stage accuracy ratio or on the underlying score accuracy ratio, ie, on the quality of the scoring model. In most cases, a stage 2 hit rate of 70% is suboptimal.

Stage 2 portfolio size formula

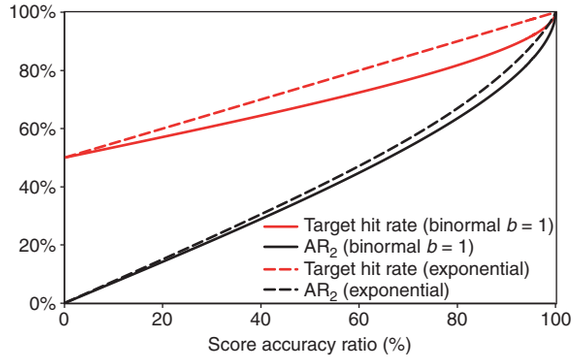
Let us call B_2 the size of the stage 2 portfolio expressed as a percentage of the total portfolio exposure. The default probability within bucket 2 is then equal to $\alpha p/B_2$. The stage 2 hit rate is equal to the probability that a loan is in stage 2 prior to default; from the definition introduced earlier, we have $\text{HR} = \alpha$. The stage 2 false alarm rate is equal to the amount of surviving loans in stage 2 divided by the total amount of surviving loans of the portfolio:

$$\text{FAR} = \frac{B_2 - \alpha p}{1-p} \quad (9)$$

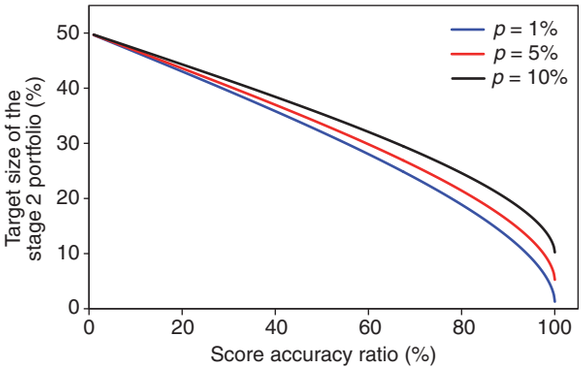
These values of the stage 2 hit rate and stage 2 false alarm rate correspond to the co-ordinates of point A in figure 1. By computing the area under the two-stage ROC curve (the area under the $R_2(u)$ function), we obtain the following relationship (see the appendix):

$$\text{AR}_2(1-p) = \alpha - B_2 \quad (10)$$

2 Optimal hit rate and two-stage accuracy ratio as functions of the score accuracy ratio (AR)



3 Target size of the stage 2 portfolio as a function of the score accuracy ratio



We notice that this formula remains true whatever the transfer criterion, even if it is not based on a score or a rating system. Let us focus on the binormal ROC function from now on in order to get some orders of magnitude. When the score accuracy ratio is equal to $\text{AR} = 80\%$ and the stage 2 hit rate is equal to $\alpha = 70\%$, we get $\text{AR}_2^B = 60.1\%$; when $p < 15\%$, the size of the stage 2 portfolio is then in the range 10–20%. We plot the size of the stage 2 portfolio corresponding to the optimal target stage 2 hit rate as a function of the score accuracy ratio AR for several values of p in figure 3:

$$B_2(\text{AR}) = (2p-1)N\left(\frac{\sqrt{2}}{2}N^{-1}\left(\frac{1+\text{AR}}{2}\right)\right) + 1 - p \quad (11)$$

We observe B_2 is quite stable when the portfolio default probability changes and remains considerably above the default probability for realistic values of p.

IFRS 9 provision proxy formula

The amount of provision is equal to the ECL over one year for all loans in stage 1 and to the ECL at maturity for all loans in stage 2 (International Accounting Standards Board 2014). We assume that the losses given default are the same within stage 1 and stage 2 (this assumption can easily be relaxed). As the stage 1 portfolio has a size

equal to $B_1 = 1 - B_2$, a proxy of the IFRS 9 provision is given by the following formula:

$$P = \text{LGD}\left[\frac{(1-\alpha)p}{B_1} B_1 D_1 + \frac{\alpha p}{B_2} B_2 D_2\right]$$
$$= p\,\text{LGD}[(1-\alpha)D_1 + \alpha D_2] \quad (12)$$

where D_1 (respectively, D_2) is the IFRS 9 risky duration within the stage 1 (respectively, stage 2) portfolio, defined as the probability weighted value of €1 invested in the stage 1 (respectively, stage 2) portfolio over a one-year horizon (respectively, lifetime). Because of the small probability of default in stage 1, we have $D_1 \sim \text{DF}(1)$, where $\text{DF}(T)$ is the discount factor associated with horizon T. Conversely, defaults and maturity effects are no longer negligible in stage 2; we take into account the survival rate of the loans thanks to the one-year default probability within the stage 2 portfolio, which is equal to $\alpha p / B_2$, and we get approximately:

$$D_2 \sim \text{WAL}\left(1 - \alpha\frac{p}{B_2}\right)^{\text{WAL}} \text{DF}(\text{WAL}) \quad (13)$$

To obtain this formula we have computed the duration of a bullet portfolio with maturity WAL (equal to the weighted average life of the stage 2 portfolio). In general, banking book loans have a maturity higher than one year on average and we have $D_2 > D_1$. In such a case, we see that the provision is not necessarily a decreasing function of the stage 2 hit rate α. A more careful study should then be made to establish when an accurate model (with a high value of AR) generates lower provisions (this situation would correspond to negative misclassification costs).

Conclusion

We obtain two important results in this paper. First, we derived a quantitative criterion to determine loans that should go into either stage 1 or stage 2. We obtain the optimal target stage 2 hit rate of the two-stage classification at a one-year horizon, which is around 70–80% for realistic scoring models, corresponding to the binormal case. Second, we obtained a formula that links the size of the stage 2 portfolio with risk and performance indicators. We showed that the IFRS 9 provision is driven by the stage 2 hit rate and not by the size of the stage 2 portfolio, whatever the transfer criterion between stage 1 and stage 2.

The proposed approach sets some targets for the stage 2 hit rate and the two-stage accuracy ratio that can be helpful for calibrating and backtesting the transfer criteria that banks are using. The proxy formula may also be used as a simplified approach to computing IFRS 9 provisions when too little data are available for calibration. This formula can, at least, be used as a benchmark for IFRS 9 provisions.

Appendix: proof of equations (5) and (10)

The area under the ROC curve of the two-stage model, called AUC_2, is equal to the sum of the areas of the triangle OAB, the rectangle ADEB and the triangle ADC in figure 1. The co-ordinates of point A are (z, α), where, from (1), we have $\alpha = R(z)$. The geometry of figure 1 leads to:

$$\text{AUC}_2 = \frac{\alpha z}{2} + (1-z)\alpha + \frac{(1-\alpha)(1-z)}{2} = \frac{1+\alpha-z}{2}$$

We obtain $\text{AR}_2 = 2\text{AUC}_2 - 1 = \alpha - z = \alpha - R^{-1}(\alpha)$. From (9), the stage 2 false alarm rate links the size of the stage 2 portfolio and the value of z:

$$z = \text{FAR} = \frac{B_2 - \alpha p}{1-p} = R^{-1}(\alpha) = \alpha - \text{AR}_2$$

This last equation leads to (10). ■

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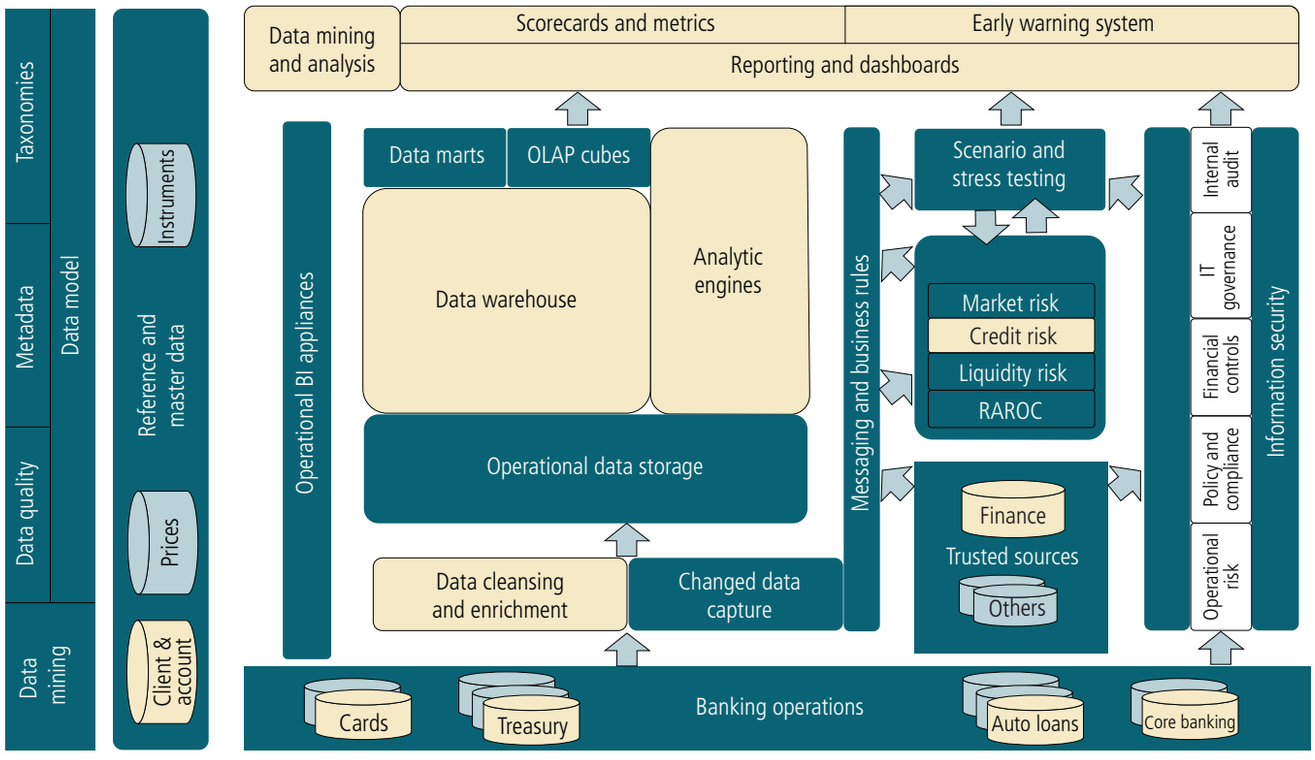
Implications for IT systems

Joined-up approaches are needed to couple risk and finance spaces in an effort at continuous default risk monitoring

1 Affected IT infrastructure for IFRS 9 projects



Source: Chartis, *IFRS 9 Technology Solutions*, 2016

IFRS 9 applies further pressure to financial institutions already faced with increasing regulatory reporting requirements. These cause particular stress to legacy IT systems.

Impact analysis if IT design and architecture for IFRS 9 is required covers:

- Historic data analysis and retention
- Analytics
- Calibration
- Monitoring

Figure 1 summarises the affected IT infrastructure for a typical IFRS 9 project – those parts most affected are coloured yellow.

Apart from the obvious changes to internal ratings-based (IRB) models required for IFRS 9, workflow across the enterprise is a key area for analysis. The extensive reworking of models is shadowed by the requirements for continuous monitoring of relative changes, since origination of loans and exposures in probability of default, loss-given default and exposure at default. Early warning systems and limits and exposure measurement systems will all require review to ensure they are IFRS 9-enabled.

The technologies required for IFRS 9 will need to bridge the gap between risk and finance. As an accounting initiative, the controls and reconciliations that exist for other accounting processes will be a priority. Any repurposing of IRB and risk technology will therefore have to address these emerging functional requirements.

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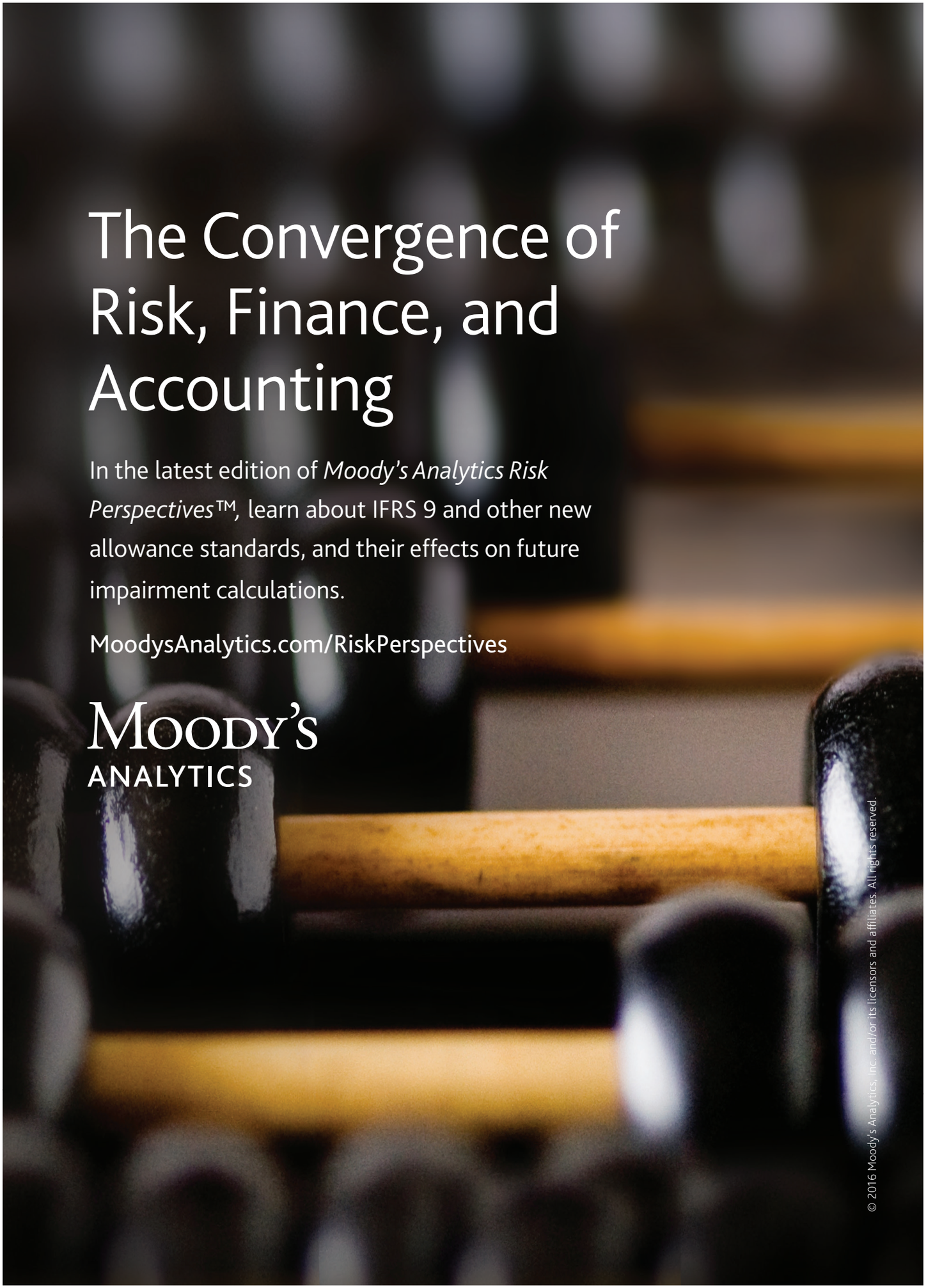
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