

Moody's Analytics

RISK PERSPECTIVES

THE CONVERGENCE OF RISK, FINANCE, AND ACCOUNTING

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FEATURED ARTICLES:

IMPLEMENTING AN IFRS 9 SOLUTION

Challenges faced by financial institutions

8

IFRS 9 SURVEY RESULTS

Preparedness for and opinions on IFRS 9 guidelines

28

SOLVING THE COUNTERPARTY DEFAULT SCENARIO PROBLEM

A 2016 CCAR case study

74

FROM THE EDITOR

Welcome to the seventh edition of *Risk Perspectives*[™], a Moody's Analytics publication created by risk professionals for risk professionals.

One of the Seven Sages of Ancient Greece, Periander, has said, "Be moderate in prosperity, prudent in adversity." This is the mantra that underlies the actions of global accounting standard setters as they implement some of the biggest changes to bank accounting in recent history. The changes to the impairment standards are a direct response to the global financial crisis, when many financial institutions built insufficient loan loss reserves based only on historical loss experience. The new accounting standards are aiming to make loan loss provisions counter-cyclical by incorporating forecasts of economic conditions into provision calculations.

Almost two years into IFRS 9 implementation, with a looming deadline in 2018, full impacts of the transition are still difficult to measure. Of the three elements of the new standard, Hedge Accounting, Classification and Measurement, and Impairment, the last appears to be most challenging. Our survey of regional banks, on page 28, found that 80% of respondents were still in early stages of planning for IFRS 9 compliance. Another recent industry survey conducted by Deloitte found that while some banks expect increases in provisions of up to 25%, over half of respondents could not quantify impact yet. One thing is clear: complexity of calculations required by the new accounting standard is forcing institutions to rethink their processes and systems and often reorganize their resources. A process that was historically managed by an Accounting team alone with input from Risk functions, will now be a joint effort between Risk, Finance, and Accounting. Hence the theme of this edition. We know this is top of mind for industry participants and, as a result, we dedicate this issue



to IFRS 9 Impairment and the next issue to its US counterpart, Current Expected Credit Loss standard, finalization of which is expected in the summer of 2016. Convergence of risk and finance functions is also driven by regulatory-mandated improvements to capital and liquidity planning, as well as resolution and recovery planning. This is why this theme is also shared by our annual Risk Practitioner Conference, which will take place in October this year.

The structure of this edition is a bit different from prior ones. You will see that the first section, Spotlight, is focused squarely on implementation of the new accounting standards, IFRS 9 and CECL. The rest of the magazine is split in three sections. *Principles and Practices* is a section dedicated to case studies and implementation approaches. Here, Nancy Michael details the changing landscape of small business lending and how banks can better compete with alternative lenders. In *Innovation Zone*, our "looking ahead" section, Sam Malone describes an innovative methodology using compound scenarios to assess counterparty risk. And finally, in *Regulatory Review*, we look at guidance and standards, already issued and on the docket, that will affect risk management practices in the coming year.

We hope you enjoy the articles and the new format.

As always, I encourage you to take part in this conversation and help us shape future issues of *Risk Perspectives* by sharing your feedback and comments.

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CONTENTS

FROM THE EDITOR

1

Anna Krayn, Editor-in-Chief, introduces this *Risk Perspectives* edition and its focus on the convergence of Risk, Finance, and Accounting.



SPOTLIGHT: IFRS 9

- | | |
|--|----|
| Implementing an IFRS 9 Solution: Challenges Faced by Financial Institutions
<i>Cayetano Gea-Carrasco and Nihil Patel</i> | 8 |
| Preparing for the New Impairment Requirements: Practitioner's View
<i>Christian Henkel and Emil Lopez</i> | 11 |
| IFRS 9 Survey Results
<i>María Cañamero, Michael McDonald, and Yagmur Uenal</i> | 28 |
| IFRS 9 Impairment Regulations: Implementation Challenges and Potential Solutions
<i>Christopher Crossen and Dr. Yashan Wang</i> | 34 |
| Probability-Weighted Outcomes Under IFRS 9: A Macroeconomic Approach
<i>Barnaby Black, Glenn Levine, and Dr. Juan M. Licari</i> | 42 |
| Complying with IFRS 9 Impairment Calculations for Retail Portfolios
<i>Barnaby Black, Dr. Shirish Chinchalkar, and Dr. Juan M. Licari</i> | 48 |



PRINCIPLES AND PRACTICES

- | | |
|--|----|
| How Banks Can Raise Their Game in Small Business Lending
<i>Nancy Michael</i> | 58 |
|--|----|



INNOVATION ZONE

Are Deposits Safe Under Negative Interest Rates? <i>Dr. Anthony Hughes</i>	66
Solving the Counterparty Default Scenario Problem: A 2016 CCAR Case Study <i>Dr. Samuel W. Malone</i>	74



REGULATORY REVIEW

Reading the Tea Leaves of Recent Regulatory Guidance <i>Anna Krayn, Ed Young, and David Little</i>	84
AnaCredit: A New Approach to Banking Regulatory Compliance <i>Michael van Steen</i>	92

BY THE NUMBERS	4
SUBJECT MATTER EXPERTS	98
CONNECT WITH US	102
GLOSSARY	103

BY THE NUMBERS

2018

Financial entities must adopt IFRS 9 by January 1, 2018.

[Implementing an IFRS 9 Solution: Challenges Faced by Financial Institutions.](#)

Page 8

60%

Despite rapid provisioning, coverage (measured as the ratio of reserves to noncurrent loans) fell below 60% in the fourth quarter of 2009, down from a typical 100%.

[Preparing for the New Impairment Requirements: Practitioner's View.](#)

Page 11

96%

By late 2015, 96% of surveyed regional banks expected challenges in the IFRS 9 Impairment phase.

[IFRS 9 Survey Results.](#)

Page 28

3

Factors influencing vintage-segment performance can be conceptually divided into three classifications.

[Complying with IFRS 9 Impairment Calculations for Retail Portfolios.](#)

Page 48

24

Small business borrowers spend an average of 24 hours on paperwork for bank loans.

[How Banks Can Raise Their Game in Small Business Lending.](#)

Page 58

0%

Crossing the threshold from positive to negative interest rates may stimulate the economy, as Central Banks are hoping, but it can also cause economic challenges.

[Are Deposits Safe Under Negative Interest Rates?](#)

Page 66

80%

By late 2015, 80% of regional banks surveyed had not initiated work or were still focusing on gap analysis to comply with IFRS 9 guidelines.

[IFRS 9 Survey Results.](#)

Page 28

12

In some cases, firms can use changes in 12-month probability of default as an approximation of the lifetime default risk change.

[IFRS 9 Impairment Regulations: Implementation Challenges and Potential Solutions.](#)

Page 34

2

For most firms, IFRS 9 guidelines suggest using at least two economic scenarios for impairment calculations.

[Probability-Weighted Outcomes Under IFRS 9: A Macroeconomic Approach.](#)

Page 42

8

For eight bank holding companies, the Fed now requires layering a counterparty default scenario onto standard CCAR exercises, and next-generation stress tests could feature shocks to bank interconnectedness.

[Solving the Counterparty Default Scenario](#)

[Problem: A 2016 CCAR Case Study.](#)

Page 74

3

When implementing recent regulatory guidance, there are three common themes to consider.

[Reading the Tea Leaves of Recent Regulatory Guidance.](#)

Page 84

95

The new AnaCredit regulation proposes that banks report at least 95 data elements regarding exposures' credit risk.

[AnaCredit: A New Approach to Banking Regulatory Compliance.](#)

Page 92





SPOTLIGHT: IFRS 9

IMPLEMENTING AN IFRS 9 SOLUTION: CHALLENGES FACED BY FINANCIAL INSTITUTIONS

By Cayetano Gea-Carrasco and Nihil Patel



Cayetano Gea-Carrasco
Managing Director – Advisory Services

Cayetano Gea-Carrasco works with financial institutions to address their technology and enterprise risk management needs. Previously, he held leadership positions at various institutions and global banks. He is a regular speaker at international conferences and has published several articles in the areas of risk management, financial technology, and derivatives pricing. Cayetano holds a BSc. and MSc. in Telecommunication Engineering, a master's in Economics and Finance, and an MSc. in Financial Mathematics, with distinction, from King's College London.



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Nihil Patel is a Senior Director within the Enterprise Risk Services division at Moody's Analytics. He serves as the business lead driving our product strategy related to credit portfolio analytics. Nihil has broad experience in research, modeling, service delivery, and customer engagement. Prior to his current role, Nihil spent nine years in the Research organization leading the Portfolio Modeling Services team as well as the Correlation Research team. Nihil holds a MSE in Operations Research and Financial Engineering from Princeton University and a BS in Industrial Engineering and Operations Research from UC Berkeley.

IFRS 9 is a new international standard set forth to address the weaknesses of IAS 39. This article provides an overview of the new standard and analyzes the major challenges financial institutions will face in ensuring compliance. While there is still uncertainty in terms of implementation approaches, we believe IFRS 9 adoption will lead to a more efficient and lower-risk financial system.

As part of the response to the last financial crisis, the International Accounting Standards Board (IASB) recently issued IFRS 9 to resolve the weakness of IAS 39. Under IAS 39, incurred loss resulted in credit loss recognition that was "too little, too late." Improvements under IFRS 9 include a logical model for the classification and measurement of financial instruments, a forward-looking expected credit loss impairment model, and a substantially reformed approach to hedge accounting.

The new standard has a wide reach; it is required in more than 100 countries across Europe, the Middle East, Asia, Africa, the Americas, and Oceania. While all financial entities must adopt IFRS 9 by January 1, 2018, many organizations are targeting parallel runs and impact analyses of the end-to-end process (including staging and classification, impairment calculation, and reporting) by mid-2017. Quantitative Impact Studies (QIS), such as European Banking Authority's QIS in Europe, are also accelerating timelines of infrastructure and tactical short-term solutions for an early assessment of the impacts on provision levels.

IFRS 9 covers three areas with profound implications for financial institutions:

» **Classification and Measurement:** IFRS 9 introduces a logical approach for the classification of financial assets driven by cash flow characteristics and the organization's business model in which an asset is held. This

principle-based approach replaces existing rule-based requirements which are complex and often difficult to apply.

- » **Impairment:** Under IFRS 9, the expected credit loss (ECL) model will require more timely recognition of credit losses compared with the incurred loss model of IAS 39. The new standard requires entities to account for expected credit losses using forward-looking information and lowers the threshold for recognition of full lifetime expected losses.
- » **Hedge Accounting:** IFRS 9 represents a substantial overhaul of hedge accounting that aligns the accounting treatment with risk management activities, enabling entities to better reflect these activities in their financial statements.

IFRS 9 will drive profit and loss, which will affect earnings. In addition, the standard will materially influence financial institutions' financial statements, with impairment calculations most affected. IFRS 9 will lead to changes including the following:

- » It will no longer be necessary for a credit event to occur before credit losses are recognized.
- » The measurement of allowance of credit loss will depend on the instrument's impairment stages.
- » An entity will be required to base its assessment and measurement of expected

credit losses on historical, current, and forecast information that is available without undue cost or effort.

- » Measurement of financial assets will be aligned with a bank's business model, contractual cash flow of instruments, and future economic scenarios.
- » The forward-looking provision framework will make financial institutions evaluate how economic and credit changes alter their capital and provision levels at each subsequent reporting date.

An expected credit loss impairment model will also bring significant challenges for auditors given the move from a factual credit event as

required by IFRS 9 in a cost-effective, scalable way.

- » **ECL calculation engine:** The calculation engine will need to be robust and flexible. It will need to incorporate facility level and be adjusted by credit events. The ECL engine will need to support granular calculations and expected modeling challenges. It must have built-in data quality checks and reports, and must be able to define or choose ad hoc economic forecast and scenarios. It must be capable of modeling or importing PD, LGD, and EAD term structures and behavioral metrics affecting cash flows. It must be able to allocate, optimize, and value collateral and credit risk mitigants.

IFRS 9 provision calculation will require integration of multiple processes across different areas, including risk, finance, and accounting.

a driver of provision and toward quantitative credit forecasting approaches and staging classification. In turn, this will create significant risks due to the effect on profitability, capital ratios, fair value measures, and tax rates. Primarily for these reasons, auditors are actively monitoring the development of ECL models and the implementation of IFRS 9 solutions at financial institutions.

From a solution design perspective, ability to track data and manage overrides (for example, due to effect on earnings) will be critical. In addition, multiple processes including those in risk, finance, and accounting groups will need to be integrated for the IFRS 9 provision calculation. In terms of architecture design, an IFRS 9 solution requires multiple layers, including: risk and finance data aggregation layer, model risk management and workflow layer, ECL calculation engine, general ledger (GL) reconciliation layer, and reporting and variance analysis layer.

For financial institutions transitioning to IFRS 9, the main architecture design questions involve the business, systems, and processes. Main challenges include the following:

- » **Systems, processes, and automation:** Systems will need to change significantly in order to calculate and record changes
- » **Risk, finance, and accounting integration:** Previously separate processes will need to integrate, especially from a data and process perspective.
- » **General ledgers reconciliation:** Ledgers will need to reflect IFRS 9 calculations and new impairment metrics. Financial institutions usually have several general ledgers within a single legal entity.
- » **Computational and performance requirements:** The IFRS 9 forward-looking impairment calculation will require higher volumes of data than the current IAS incurred loss model, Basel guidelines, or stress testing. Institutions will want to do facility-level analyses, and calculations leveraging scalable architecture, such as grid computing processes, will be imperative.
- » **Tax treatment:** IFRS 9 may affect effective tax rates, as some institutions may leverage IFRS 9 as a tax optimization tool.
- » **Underwriting, risk-adjusted pricing, and limits systems:** Financial institutions will have to estimate and book an upfront, forward-looking expected loss (either 12-month or lifetime) and monitor for ongoing deterioration of credit quality.
- » **Risk-adjusted pricing metrics:** Pricing

and performance metrics will need to be redesigned and/or expanded (e.g., IFRS 9 based risk-return metrics) in order to be aligned to IFRS 9 dimensions and capital impacts.

- » **Impairment calculation:** Institutions must have the ability to calculate a probability-weighted impairment that incorporates past events, current conditions, and forecasts of future economic conditions. In addition, valuation analysis needs to consider scenario-specific cash flows.
- » **Collateral allocation and valuation:** Institutions will need to determine how to incorporate collateral effects on the valuation and computation of cash flows for impairment calculation purposes.
- » **Hedge accounting:** IFRS 9 will affect existing documentation, hedging models, and software systems.
- » **Reporting and financial statements:** It will be necessary to reconcile with other regulatory rules, including Basel 3, the Dodd-Frank Act, and the Foreign Accounting Tax Compliance Act (FATCA). Institutions will need to reconcile risk and finance data where risk data will be used down to the legal reporting entity level. Additionally, impairment values and variance changes over reporting horizons will need to be included in FINREP reporting by European institutions.
- » **Operational risk:** This type of risk will increase as a result of changes in systems, models, processes, and data.

Financial institutions will also face additional data requirements to meet IFRS 9-related calculations and ongoing monitoring. These requirements will lead to related challenges, including:

- » **Retrieval of old portfolio data:** It will be necessary to save old data, which will be especially difficult for transactions originated many years ago.
- » **Classification of transactions at origination:** There is the need to map products if they can be categorized prior to the calculation. An additional effort would be required to identify products that can be considered out of scope,

such as short-term cash facilities and/or covenant-like facilities.

- » **Flexibility of implementation:** Exact implementation procedures must be able to change depending on data according to the asset classes and model availability. For example, if a granular approach should be applied to a certain part of the portfolio (e.g., corporate) or if it should be aggregated (e.g., retail).
- » **Gather and store data:** Very granular data must be gathered and stored for any new transactions.

Given the IFRS 9 requirements in terms of classification, measurement, impairment calculation, and reporting, financial institutions should expect a need for significant changes to the way they do business, allocate capital, and manage the quality of loans and provisions at origination.

Financial Institutions will face modeling, data, reporting, and infrastructure challenges in terms of reassessing the granularity (e.g., facility level provisioning analysis) and/or credit loss impairment modeling approach, and maintaining consistency in the definition of risk metrics between Basel and IFRS 9 models. Institutions will also face challenges in enhancing their coordination across finance, risk, and business units. Furthermore, considerable uncertainty remains regarding the interpretation of the IFRS 9 standard and modeling approaches. These will likely be fine-tuned after QIS and parallel runs are performed by institutions and regulatory bodies.

Effectively addressing these challenges will enable boards and senior management to make better-informed decisions, proactively manage provisions and effects on capital plans, make forward-looking strategic decisions for risk mitigation in the event of actual stressed conditions, and help in understanding the evolving nature of risk. In the end, a thoughtful, repeatable, and consistent capital planning and impairment analysis should lead to a more sound, lower-risk financial system with more efficient institutions and better allocation of capital, thus enhancing returns for shareholders.

PREPARING FOR THE NEW IMPAIRMENT REQUIREMENTS: PRACTITIONER'S VIEW

By Christian Henkel and Emil Lopez

This article describes the new standards set forth by the FASB. It covers the history of the ALLL and explains how the recent financial crisis highlighted the need for new standards. It also suggests how banks should align with the new CECL impairment standards, including early preparation and core capabilities.



Christian Henkel
Senior Director – Risk
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Christian Henkel is a Senior Director in the Moody's Analytics Risk Measurement Services group. He leads a national team of risk consultants who work closely with banks, insurers, and other financial institutions. Having spent most of his career in commercial banking, Christian has a unique blend of business and academic experience across the financial services industry – including expertise in areas such as commercial credit and financial analysis, portfolio management, and asset quality. He has a BA and an MBA from the University of Texas at Dallas in Finance and Accounting, and he graduated valedictorian from the Southwestern Graduate School of Banking at SMU.

Overview

An appropriate allowance for loan and lease losses ("ALLL") covers estimated credit losses inherent in an institution's loan and lease portfolio. The ALLL represents management's best estimate of likely net charge-offs that are to be realized for a loan or group of loans, given facts and circumstances as of the evaluation date.¹

On April 27, 2016, the Financial Accounting Standards Board (FASB) voted to move forward with a new credit impairment model, known as

Understanding the Existing Guidance

Setting aside reserves for future bad debts is a concept with a long history, as shown in Figure 1. The reserve for bad debts became a legitimate tax accounting method with the Revenue Act of 1921. Nearly a century later, regulators continue to fine-tune processes for estimating losses and adequate provisions.

Most recently, in 2006, the banking supervisory agencies issued a policy statement on the ALLL which remains in place today. Its primary objectives were to incorporate allowance-related

In many cases, the ALLL does little to show the true extent of the credit risk inherent in a bank's loan portfolio. That is among the most commonly cited criticisms of the existing rules.

the Current Expected Credit Loss model (CECL), for the recognition and measurement of credit losses for loans and debt securities. The final standard is expected to be released in June 2016 with implementation beginning in 2018. This new standard is far more than an exercise in financial accounting and bank regulation. It will replace the current incurred loss model with an expected loss model, one of the most significant changes in the history of bank accounting.

developments since earlier policy statements and to ensure consistency with Generally Accepted Accounting Principles (GAAP). It also expanded the scope of coverage to credit unions.

While the 2006 policy statement is the most comprehensive guidance to date – helping to establish rules and governance and to bring together supervisory entities – it was left with significant deficiencies that the Great Recession would soon reveal.



Emil Lopez
Director – Risk Measurement

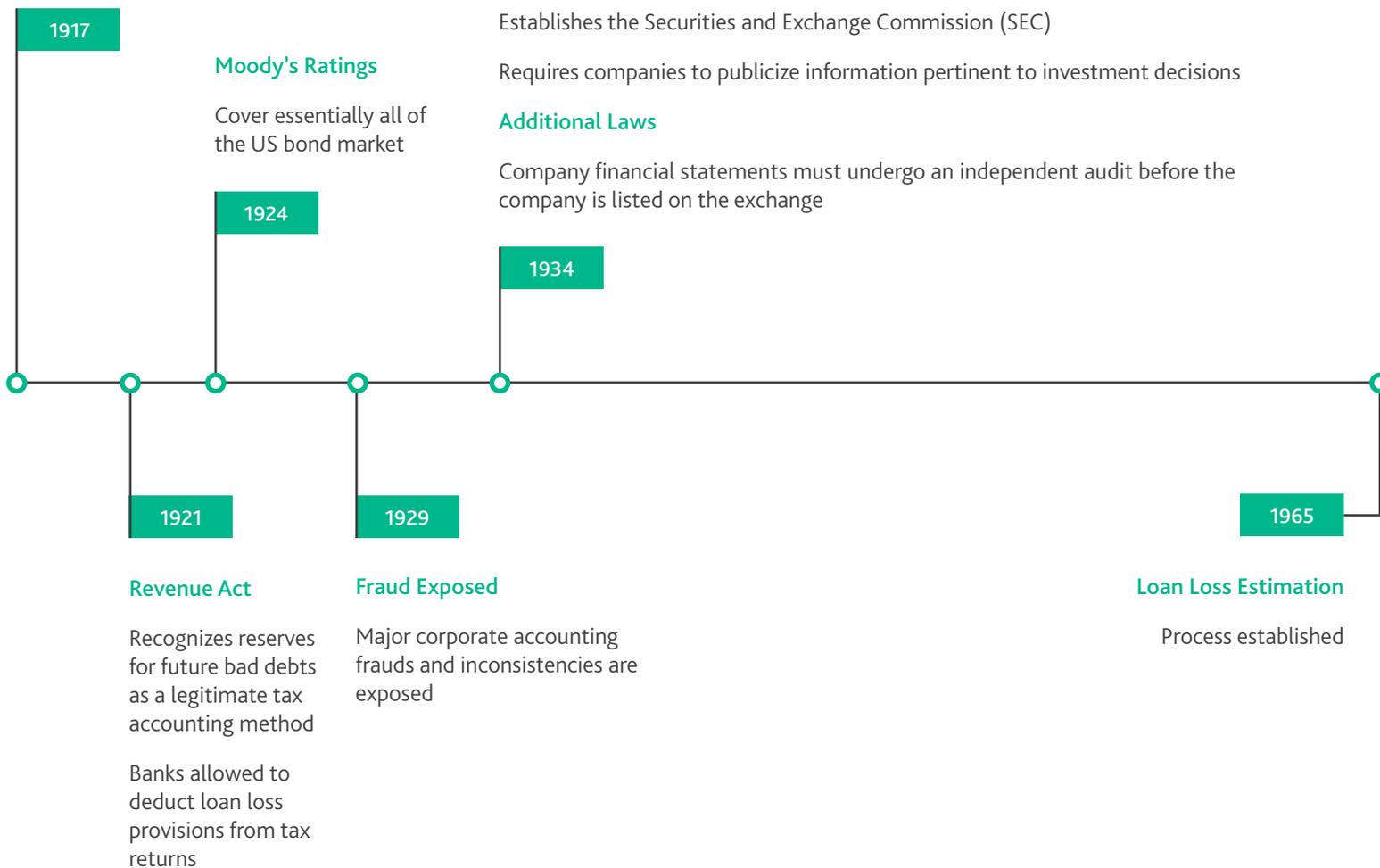
Emil Lopez is a Director in the Moody's Analytics Risk Measurement Group, where he leads risk modeling advisory engagements and manages the team's data quality, risk reporting, and IFRS 9 research. Prior to joining the group, he oversaw operations for Moody's Analytics Credit Research Database, one of the world's largest private firm credit risk data repositories. Emil has extensive experience in credit risk modeling and reporting, data sourcing, and quality control. Emil has an MBA from New York University and a BS in Finance and Business Administration from the University of Vermont.

¹ Interagency Policy Statement on the Allowance for Loan and Lease Losses, Federal Reserve, December 2006.

Figure 1 History of the loan loss reserves in the US

Federal Reserve Standards

Aim to improve financial statements but are ineffective

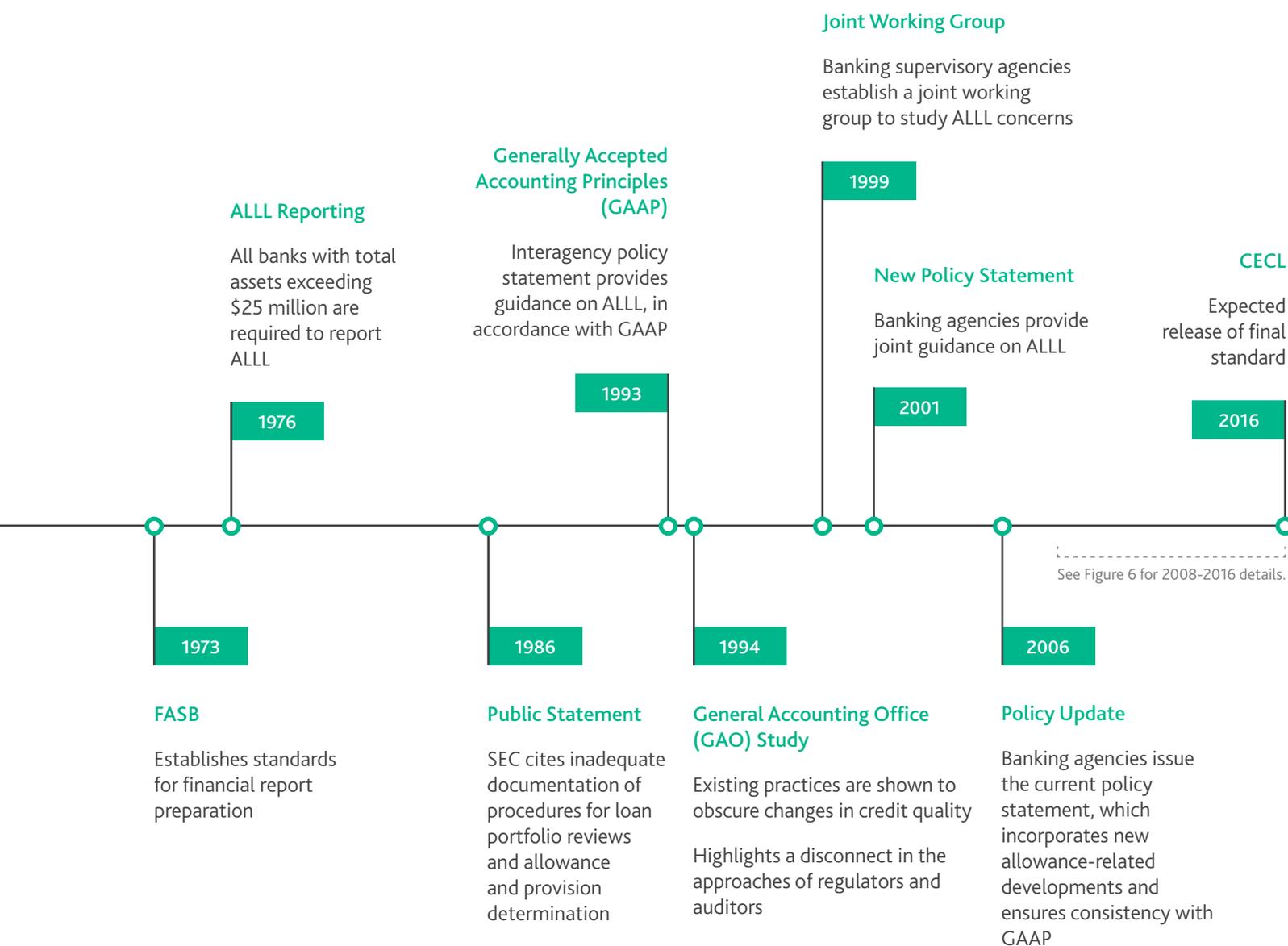


Source: Moody's Analytics

It is important to first understand how the existing guidance is applied in practice. There are approximately 6,000 banks in the US (far fewer if you consider that more than three-fourths are part of a bank holding company, or BHC), and they are all required to report their allowance in the same way and under the same rules. As we'll discuss later, how they derive at the allowance estimate will differ considerably.

To help illustrate the point, Figures 2, 3, and 4 show excerpts from an annual report of a \$25 billion commercial bank.

For commercial banks, loans and leases comprise the majority of their assets, and the ALLL is the most significant estimate on their balance sheets. Commercial banks make loans to businesses and individuals with the money



they raise through issuing deposits and other borrowings, with the objective of getting fully repaid on both the principal and interest on the loan. However, some borrowers inevitably default on their loans, which often results in the bank having to charge off all or a portion of the debt. On average, the net charge-off (NCO, which is gross charge-offs less recoveries) rate is about 1%.²

In this example, the bank set aside \$175 million in reserves to account for management's best estimate of the NCOs that are likely to be realized from its \$15 billion in loans outstanding, given the facts and circumstances as of the evaluation date (December 31, 2015). At the end of the prior reporting period, the bank held \$159 million in reserves in anticipation of future charge-offs. The amount of the allowance is

² Average annualized quarterly NCO rate for all loans and leases 1984–2015 is 0.91%; FDIC.

Figure 2 Balance sheet (assets only)

Assets	December 31,	
	2015	2014
Cash and due from banks	\$ 251,258	\$ 261,544
Interest-bearing deposits	155,907	132,695
Securities available-for-sale, at fair value	2,984,631	2,793,873
Securities held-to-maturity (fair value of \$3,961,534 and \$3,948,706)	3,923,052	3,872,955
Federal Home Loan Bank and Federal Reserve Bank stock	188,347	193,290
Loans held for sale	37,091	67,952
Loans and leases	15,671,735	13,900,025
Allowance for loan and lease losses	(174,990)	(159,264)
Loans and leases, net	15,496,745	13,740,761
Deferred tax asset, net	101,578	73,873
Premises and equipment, net	129,426	121,933
Goodwill	538,373	529,887
Other intangible assets, net	39,326	2,666
Cash surrender value of life insurance policies	503,093	440,073
Accrued interest receivable and other assets	328,993	301,670
Total assets	\$ 24,677,820	\$ 22,533,172

Source: Webster Financial Corporation

Figure 3 Changes in the ALLL during fiscal year 2015

(In thousands)

Allowance for loan and lease losses:	Total
Balance at January 1, 2015	\$ 159,264
Provision (benefit) charged to expense	49,300
Losses charged off	43,560
Recoveries	9,986
Balance at December 31, 2015	\$ 174,990

Source: Webster Financial Corporation

Figure 4 Income statement

<i>(In thousands, except per share data)</i>	Years ended December 31,	
	2015	2014
Interest Income:		
Interest and fees on loans and leases	\$ 552,441	\$ 511,612
Taxable interest and dividends on securities	190,061	189,408
Non-taxable interest on securities	15,948	17,064
Loans held for sale	1,590	857
Total interest income	760,040	718,941
Interest Expense:		
Deposits	46,031	44,162
Securities sold under agreements to repurchase and other borrowings	16,861	19,388
Federal Home Loan Bank advances	22,858	16,909
Long-term debt	9,665	10,041
Total interest expense	95,415	90,500
Net interest income	664,625	628,441
Provision for loan and lease losses	49,300	37,250
Net interest income after provision for loan and lease losses	615,325	591,191
Non-interest Income:		
Deposit service fees	136,578	103,431
Loan and lease related fees	25,594	23,212
Wealth and investment services	32,486	34,946
Mortgage banking activities	7,795	4,070
Increase in cash surrender value of life insurance policies	13,020	13,178
Gain on sale of investment securities, net	609	5,499
Impairment loss on securities recognized in earnings	(110)	(1,145)
Other income	23,573	18,917
Total non-interest income	239,545	202,108
Non-interest Expense:		
Compensation and benefits	297,517	270,151
Occupancy	48,836	47,325
Technology and equipment	80,026	61,993
Intangible assets amortization	6,340	2,685
Marketing	16,053	15,379
Professional and outside services	11,156	8,296
Deposit insurance	24,042	22,670
Other expense	70,584	73,101
Total non-interest expense	554,554	501,600
Income before income tax expense	300,316	291,699
Income tax expense	93,976	91,973
Net income	206,340	199,726

Source: Webster Financial Corporation

increased or decreased through the combination of NCOs and the provision expense through the operating income.

In this case, the bank reported NCOs during fiscal year 2015 of \$33.6 million (\$43.6 million gross charge-offs and \$10.0 million in recoveries) and a provision expense of \$49.3 million to arrive at the \$175 million allowance. Said another way, the NCOs during 2015 reduced the bank's ALLL by \$33.6 million, but the bank had to expense through the income statement another \$49.3 million in order to ensure the amount of the allowance remained adequate (i.e., \$175 million) for future charge-offs based upon the facts and circumstances at the end of 2015 (Figure 3).

In simple terms, ASC 450-20 (FAS 5) is the reserve that institutions calculate for performing loans. Since these borrowers have not defaulted, the amount of potential loss is unknown, so it is usually estimated on a "pool" basis rather than an individual basis. That is, the assets are grouped into relatively homogenous groups of risk characteristics. This segmentation approach is similar to the approach bank management might take when determining the appropriate risk rating methodology or model for a specific portfolio. To perform this grouping, the portfolio of borrowers is stratified by characteristics such as sector, size, geography, and loan type before determining the best metrics for estimating future credit risk. Under the existing guidance,

A critical component of the existing guidance is the distinction between accrual versus disclosure. As subtle as it may seem, this is perhaps the most significant justification for a new impairment model.

As depicted in the income statement in Figure 4, the bank reported net interest income during 2015 of \$665 million but the \$49 million provision to increase the ALLL reduced operating income and, in turn, capital.

The concept of the ALLL and its presentation on an institution's balance sheet is straightforward, but in many cases it does little to inform investors and other interested parties about the true extent of the credit risk inherent in a bank's loan portfolio. This is among the most commonly cited criticisms of the existing rules.

Let's take a closer look.

The principal sources of guidance on accounting for impairment in a loan portfolio under US GAAP are as follows:

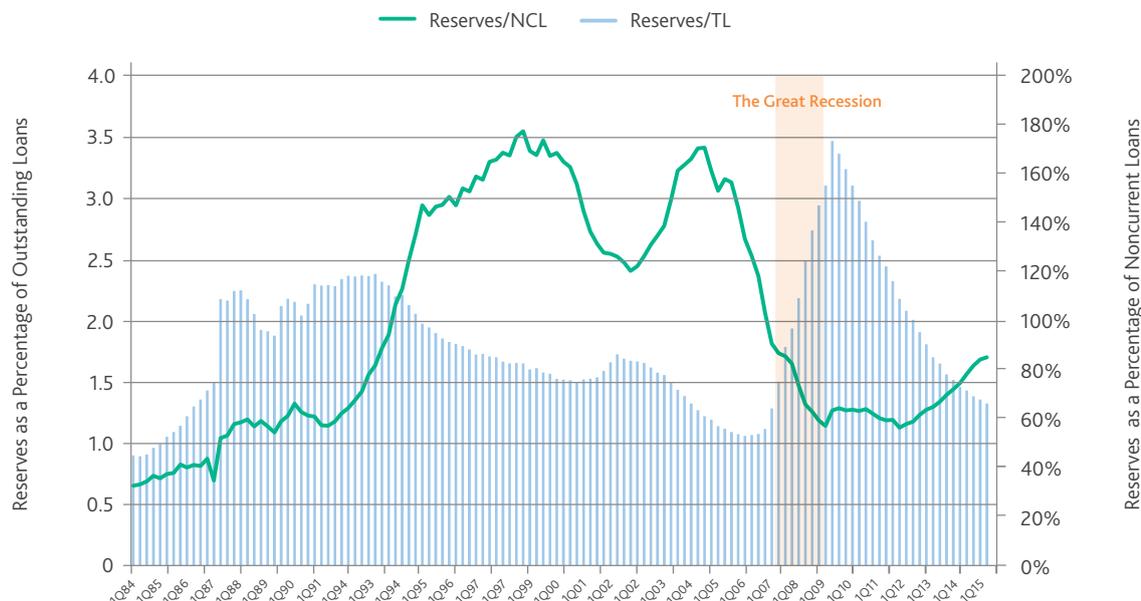
- » ASC 450-20, Loss Contingencies (formerly known as FAS 5)
- » ASC 310-10, Receivables (formerly known as FAS 114)

a widely used method is applying a historical NCO rate to each group, adjusted for the effects of qualitative or environmental factors.

ASC 310-10 (FAS 114) is the reserve that institutions calculate for non-performing or "impaired" loans. Although the impairment designation is institution-specific, a general rule is that a loan is impaired when the institution believes repayment of the loan will not be realized. According to the current guidance, the allowance is estimated using one of the following three impairment measurement methods:

1. The present value of expected future cash flows
2. The loan's observable market price
3. The fair value of the collateral if the loan is collateral-dependent (repayment solely based on collateral)

Figure 5 Ratio of reserves to total loans and reserves to noncurrent loans (1985–2015)



Source: FDIC

An institution may choose the appropriate impairment measurement method on a pool or loan-by-loan basis for an individually impaired loan, except for a collateral-dependent loan.³

Aside from the fact that these rules are inherently complex, with several impairment models, another critical component of the existing guidance is the distinction between accrual versus disclosure. As subtle as it may seem, this is perhaps the most significant justification for a new impairment model. According to the rule, an allowance should be recorded in the financial statements if it is “probable” that a loss will incur and the amount can be reasonably estimated. Otherwise it should be disclosed in the notes, or omitted altogether. In practice, this incurred loss model delays recognition of loss by only considering past events and current conditions.

In the words of Comptroller of the Currency John Dugan in 2009:

“When the [down]turn finally did come, and the tidal wave of losses began hitting shore, banks have had to recognize losses through a sudden series of increased provisions to the loan loss reserve, which in turn has more than offset earnings and eaten into precious capital. Stated differently, rather than being counter-cyclical, loan loss provisioning has become decidedly pro-cyclical, magnifying the impact of the downturn.”⁴

Post-Crisis Era and Why the Requirements Are Changing

While many institutions had been interpreting the existing guidance more broadly and increasing reserves proactively as problems arose, it is hard to argue that the incurred loss model was working as intended.

Figure 5 shows a 30-year time series of two important financial ratios used when analyzing asset quality. The bars in the chart, whose values are associated with the left vertical axis, show the trend in the amount of reserves held by the

³ *Interagency Policy Statement on the Allowance for Loan and Lease Losses*, Federal Reserve, December 2006.

⁴ *Comptroller Dugan Urges Less Pro-Cyclical Approach to Reserves*, Office of the Comptroller of the Currency, March 2009.

industry relative to the amount of outstanding loans. The quarterly average is 1.84%, which means that for every \$100 in loans, the industry was setting aside just under \$2 in reserves. During the financial crisis and in its wake, the industry began rapidly setting aside reserves in anticipation of greater future loan losses.

Now look at the line in the chart, whose values are associated with the right vertical axis.

On average, the average ratio of reserves to noncurrent loans (defined as loans that are 90 days or more past due or placed on nonaccrual status by the bank) has been 100.16%, indicating that for every \$100 of problem loans the industry has set aside \$100 in reserves.

While it is debatable whether banks should be reserving for the full amount of defaulted loans (loss given default is generally less than 100%), the trend in the two ratios leading into and through the Great Recession highlights a major problem.

In the fourth quarter of 2009, the ratio of reserves to total loans rose to more than 3%, nearly tripling in just two years. In order for the industry to maintain an allowance that was believed to be adequate for future loan losses, banks had to record \$583 billion in provision expenses from 2008 to 2010.⁵ As a direct impact on earnings and capital, this put many institutions in capital preservation mode, which made financing less available for businesses and individuals at a time when they needed it most, exacerbating the downturn.

Although the industry was increasing the allowance at record pace, it could not keep up with the pace of rising problem loans. The coverage ratio fell to a level not seen since the savings and loan crisis in the late 1980s and early 1990s. Despite the costly rapid provisioning to boost the ALLL, the ratio of reserves to noncurrent loans fell below 60%, underlining one of the primary limitations of the incurred loss model.

A New Impairment Model Is Born

In October 2008, in the midst of the financial

crisis, the FASB and International Accounting Standards Board (IASB) began a joint effort to address reporting issues arising from the global financial crisis. As part of that commitment, the Financial Crisis Advisory Group (FCAG) was formed to advise the accounting boards of the accounting issues emerging from the crisis, along with recommendations for potential changes to the global regulatory environment.

The July 2009 report issued by the FCAG contained several recommendations, including the need to explore alternatives to the incurred loss model for loan loss provisioning that use more forward-looking information. These alternatives include an expected loss model and a fair value model.

While an objective of the joint advisory group was convergence in accounting standards, the FASB and IASB decided to go in different directions. In December 2012, FASB introduced its proposed accounting standards update,⁶ known as the Current Expected Credit Loss model (CECL). In July 2014, the IASB released its final impairment rules, known as IFRS 9. The FASB is expected to release its final standard in June 2016. Figure 6 shows the timeline of key events.

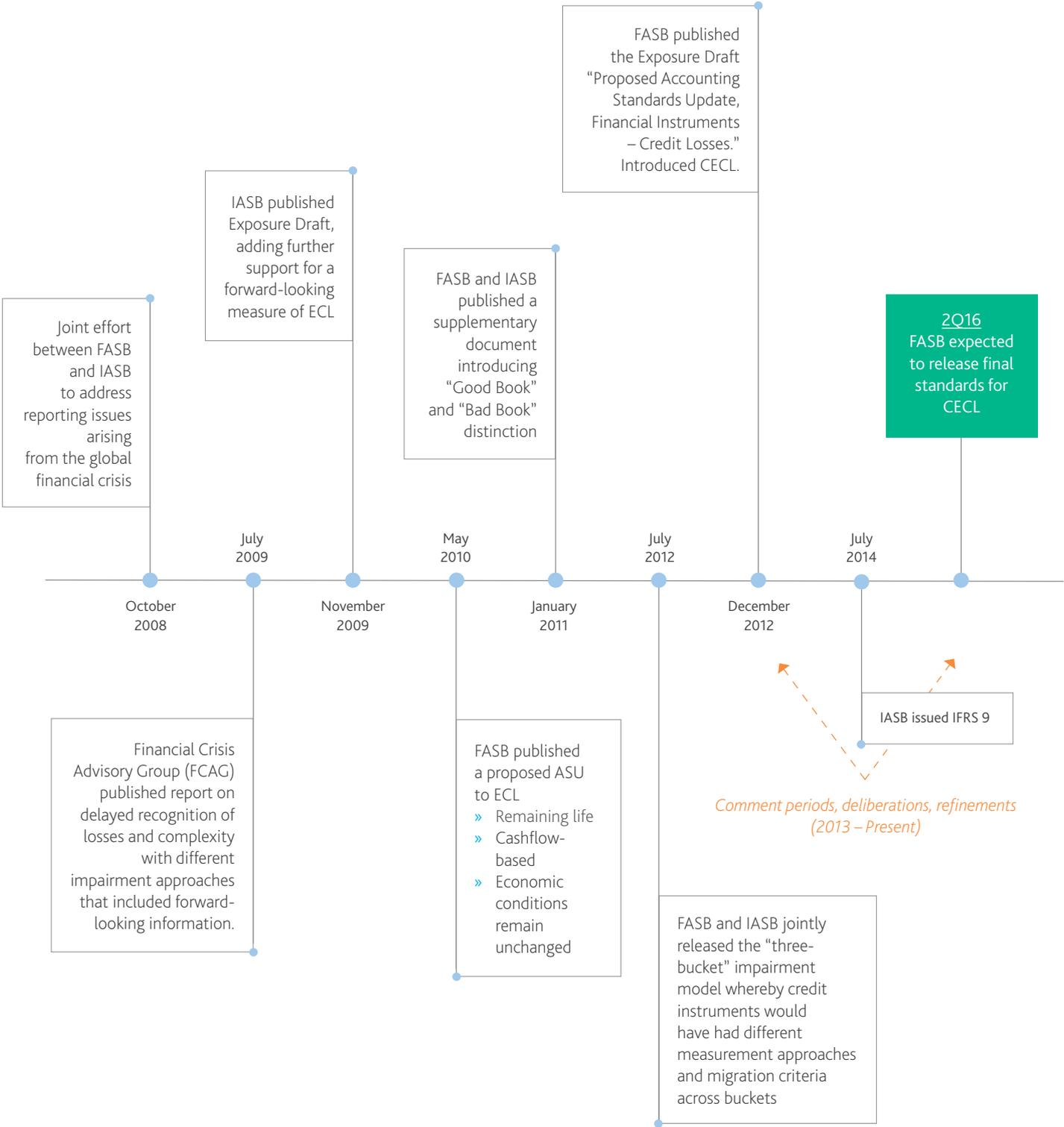
While the two boards did achieve convergence on a number of issues raised by the FCAG, there are two significant distinctions worth noting:

- » Impairment under IFRS 9 begins with a classification stage to determine how financial assets and liabilities are measured. The classification is driven by the cash flow characteristics and business model in which an asset is held, but measurement ultimately ends up in a single impairment model being applied to all financial instruments. While FASB's proposal includes a single impairment model, it does not include a classification stage.
- » Under IFRS 9, full lifetime expected losses are to be measured only if credit risk has increased significantly since initial recognition. Otherwise, the impairment

5 FDIC Quarterly Banking Profile (all insured institutions).

6 *Financial Instruments – Credit Losses (Subtopic 825-15)*, Accounting Standards Update, FASB, December 2015.

Figure 6 Timeline of key events leading to a new impairment model



Source: FASB

measurement period is limited to twelve months from initial recognition. FASB's proposed model requires a life-of-loan forecast of credit losses to be recorded at origination, regardless of credit quality.

Since the release of the FASB's accounting standards update more than three years ago, there have been comment periods, deliberations and re-deliberations, and strong industry feedback. The FASB has met with countless stakeholders – bankers, regulators, auditors, solution providers, the SEC, the Public Company Accounting Oversight Board (PCAOB), and members of the investing community. As we

flow, loss rates, probability of default (PD), or a provision matrix using loss factors.

- » FASB is expected to issue CECL in June 2016, which will be effective for SEC registrants' 2020 financial statements and in 2021 for banks that are not SEC registrants. Early adoption will be permitted for all organizations for fiscal years beginning after December 15, 2018.

Under CECL, an institution will be required to impair (reflected as an allowance for expected credit losses) its existing financial assets based on an estimate of the present value of the contractual cash flows not expected to be

The goal of CECL is to improve the process by which institutions measure credit risk, to the benefit of third parties and the institutions themselves.

draw closer to the soon-to-be-final standard, the FASB has released several key decisions to date, including the following:⁷

- » An entity should apply the CECL model for financial assets measured at amortized cost, such as loans, debt securities, trade receivables, lease receivables, and any other receivables that represent the contractual right to receive cash.
- » An entity should consider available information relevant to assessing the collectability of contractual cash flows, including information about past events, current conditions, and reasonable and supportable forecasts.
- » An entity should consider all contractual cash flows over the life of the related financial assets (life of loan).
- » An entity's estimate of expected credit losses should always reflect the risk of loss, even when that risk is remote.
- » Methods to estimate expected credit losses may include the following: discounted cash

collected at the reporting date. Not only will this remove the "probable" threshold in the current approach, but it will also broaden the range of information to be considered when estimating the allowance.

The following paragraphs illustrate some of the key changes CECL may bring. There will not be a "one size fits all" approach when it comes to implementation, a common misconception. The rules to comply and the presentation of an entity's financial statements will largely be the same from one institution to the next, but how they arrive at an estimate of expected credit losses will depend on factors unique to the size and complexity of the institution's portfolio.

Measuring Expected Credit Loss

It is clear that the goal of CECL is to improve the process by which institutions measure credit risk, to the benefit of third parties and the institutions themselves.

The measurement of expected credit loss often starts with a look to the past as a predictor of future performance. By grouping financial assets into pools of similar risk characteristics, an

⁷ FASB (as of March 23, 2016).

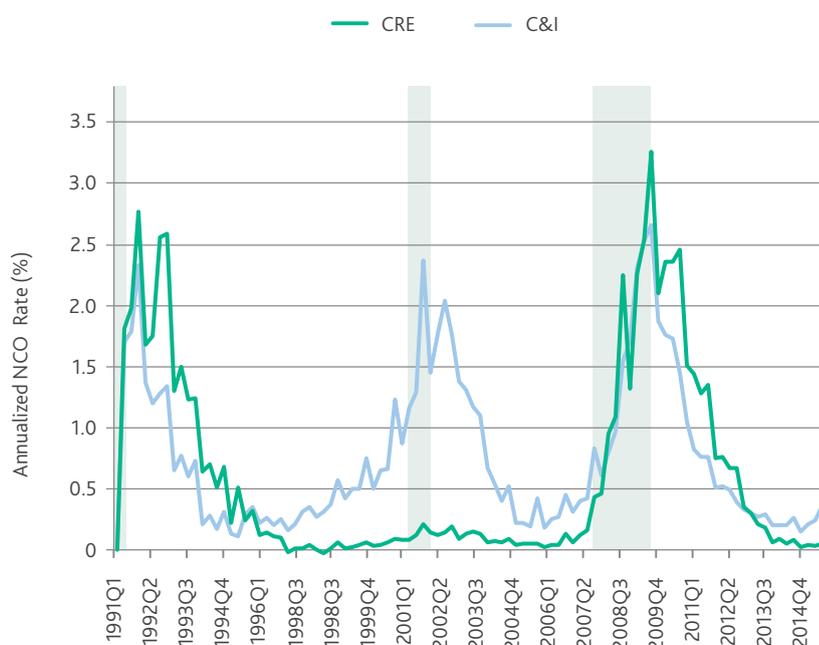
institution can look to its historical experience or the experience of a suitable benchmark for those assets. Although no two credit cycles are the same, reasonable inferences about the future can be made from information from the past. In fact, that's the fundamental assumption in the current allowance process and in most credit risk rating models.

CECL will not prescribe a specific methodology to be used for measuring expected credit losses, but a logical approach toward compliance would be one that starts with an institution's current risk rating practices, to the extent they are effective at both differentiating the credit risk

its risk measurement process and capabilities. The same recommendation would apply if the output of the ratings is not calibrated to a specific risk measure such as a PD or expected loss (EL).

Over the last decade, many regional banks and larger community banks have sought to improve their risk rating practices by making their internal ratings much less subjective. A common approach has been a bifurcation of credit risk whereby borrowers are rated on their likelihood of default (i.e., PD), and credit facilities are rated on the severity of loss should default occur (i.e., LGD). Through accurate risk measures, an

Figure 7 Quarterly (annualized) charge-off rates: C&I and CRE loans (1985–2015)



Source: Federal Reserve

of borrowers within a portfolio and producing a reliable financial measure of credit risk. That is a limitation with which many institutions struggle. For example, if 80% of the loans in a relatively diverse commercial loan portfolio share a similar rating, then it may be necessary for management to revisit the effectiveness of

institution can derive an estimate of EL that could be used not only for managing risk, but also as a foundation for CECL compliance.

Incorporating Current Conditions

Using historical averages as a basis for deriving forecasts of credit quality is an approach widely accepted in the banking industry. While such a

through-the-cycle view has its merits, it loses effectiveness when historical experience differs from prevailing and near-term conditions.

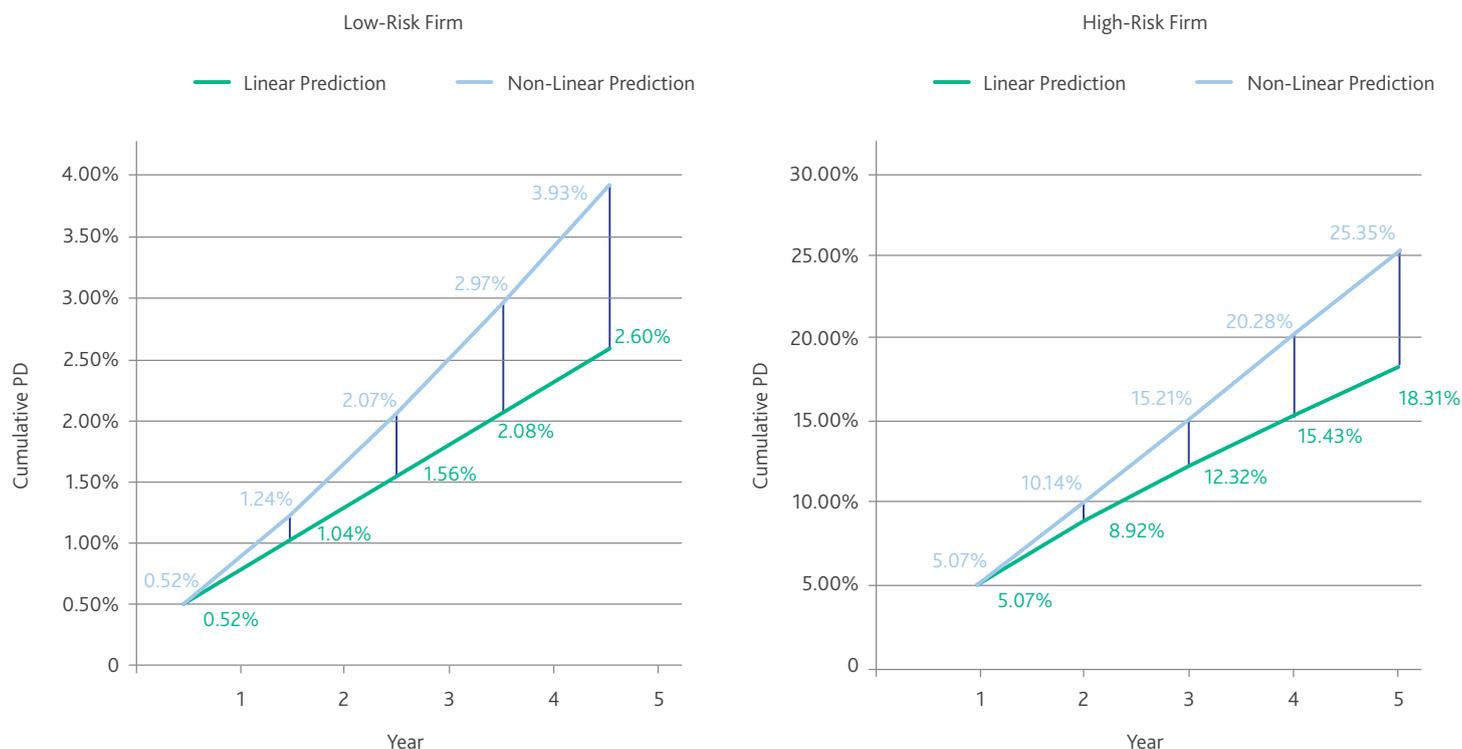
Take the energy sector as a very recent and relevant example. With oil prices continuing to hover around \$40 per barrel as of March 2016 (compared to roughly \$100 per barrel only two years ago),⁸ many energy companies are defaulting or nearing default on their loans. At the same time, to hedge future credit losses, lenders are curtailing lending and seeking to reduce exposure as they ramp up reserves. If oil prices continue to remain at a level not seen since the height of the financial crisis, the \$3 trillion sector could soon face a funding crisis with rippling effects cascading throughout the broader economy.

Taking a longer view, we can see how current conditions in a given cycle can have a profound

impact on an institution's credit losses. As depicted in Figure 7, the average annualized quarterly NCO rate for Commercial and Industrial (C&I) loans over the last 25 years is 0.77%, but it climbed to approximately 2.50% during the recession of 2001 and during the recent financial crisis. The impact of the credit environment is even more pronounced with Commercial Real Estate (CRE) loans. While the average NCO rate for the same period is 0.62%, the median is only 0.14%, indicating that loans secured by CRE are usually a safe and low-risk investment. That is, until the cycle shifts.

During the nine-quarter period between Q3 2007 and Q4 2009, the industry's NCO rate for CRE loans rose exponentially, from 0.16% to 3.26%. At the end of 2015, the rate of NCOs on CRE loans had returned to near zero – below pre-crisis levels.

Figure 8 Term structure of default risk for a low-risk firm and a high-risk firm



Source: Moody's Analytics

8 Crude Oil WTI (NYMEX); NASDAQ.

Figure 9 Suggested action items for bank management



Source: Moody's Analytics

It is quite a different story when compared to the energy sector.

By incorporating information about current conditions, perhaps as a factor within a model or as a qualitative adjustment to a cycle-neutral rating, an institution will be better positioned to understand the impact of the prevailing credit cycle on its loan portfolio in order to improve its estimate of expected credit losses.

Predicting the Future

In parallel with the actions of the accounting boards to rectify problems that arose during the financial crisis, the Federal Reserve and other banking agencies were making waves of their own. The accounting boards and banking agencies sought to incorporate a more forward-looking view of credit risk, but they focused on different measures. Whereas bank supervisors focused on low-probability, high-impact events that could strain a firm's capital adequacy, the FASB and IASB dedicated their efforts on accounting for "reasonable and supportable" forecasts under more probable scenarios. One way to look at it would be that the allowance serves as a cushion for "expected" credit losses, and capital serves to absorb tail events, or "unexpected" credit losses.

Without a forward-looking component in the estimation of loss forecasting, reserves are inherently pro-cyclical. Banks add to the allowance during periods of stress, usually when access to financing is needed most, and they release reserves during periods of expansion, when many businesses and individuals can meet their financing needs with operating cash flow or discretionary income. If implemented

properly, CECL should enable institutions to add to reserves when times are good, in anticipation of a shift in the cycle, and to begin to release reserves when it appears the worst is behind them, to help facilitate growth.

A forward-looking view requires an ability to predict the future. The proposed update will require an entity to consider available information relevant to assessing the collectability of contractual cash flows, including information about past events, current conditions, and reasonable and supportable forecasts. Once the forecast and its impact on the portfolio can no longer be reliably estimated, CECL will allow an entity to revert to historical credit loss experience for future periods.

It is worth reiterating that the practical interpretation will be different across institutions. What will be expected of a community bank is not the same as what will be expected of an institution that is subject to the Dodd-Frank Act Stress Tests (DFST). Institutions that are already translating macroeconomic scenarios into a granular forecast of credit losses are well-positioned to incorporate reasonable and supportable forecasts into the allowance. Community banks will likely apply a broader and more judgmental approach to deriving forecasts.

Extending Measurement Across the Life of the Loan

Most loans issued by banks do not mature within a year of origination. However, many institutions set aside an allowance for a year's worth of charge-offs. Under CECL, a life-of-the-

Figure 10 Core capabilities required for new impairment calculations



Source: Moody's Analytics

loan forecast of credit losses will be recorded at origination, thereby mandating reserves be set aside when a loan is made and maintained throughout its contractual life. What's more, the new standard suggests that it is inappropriate to simply "gross-up" annual measures. Figure 8 illustrates the difference between a term structure of default risk calculated on a purely linear basis and one calculated on an empirically-derived non-linear basis.

The low-risk firm has a one-year PD of 0.52%. Assuming a five-year maturity, the cumulative default risk is nearly 4% when modeled empirically.⁹ That equates to nearly an eightfold increase over a five-year period. When the term structure of default risk is calculated by simply multiplying the one-year measure by the number of years (i.e., linear rather than

exponential ($0.52\% \times 5$)), the cumulative default risk is 2.60%, which is considerably less than 3.93%. The opposite is the case with the high-risk firm, which has a 5.07% one-year PD. On a linear basis, the five-year cumulative default risk is more than 25%; however, on an empirical basis, the probability of default over five years is only about 18%. These two examples highlight the reality that the term structure for low-risk firms is increasing (mathematically, the intercept coefficient is positive), whereas for high-risk firms, the term structure of PD is decreasing. This behavior follows a somewhat mean-reverting pattern.

To summarize, with many institutions establishing an allowance equal to an estimate of NCOs over a one-year horizon, the life-of-loan requirement introduces complexity beyond

⁹ Moody's Analytics RiskCalc v4.0 Corporate Model.

the capabilities most institutions currently possess. In our meetings with FASB officials, we were able to confirm that CECL has no mandate for modeling and leaves questions of methodology to individual banks. Nonetheless, many of the objections to date are focused on implementation. Bankers fear that regulators and auditors will expect them to use the same tools and methodologies used by larger banks, which is something they cannot afford to do.

Early Preparation

For jurisdictions under IFRS 9, the implementation deadline is set firmly for January 2018. FASB's CECL standard is slated for release by June 2016, with implementation required by January 2020 for SEC filers and January 2021 for all others. Given the significance of the changes, financial institutions would benefit from a proactive approach to develop the organizational capabilities necessary to satisfy the new impairment requirements. Figure 9 highlights the key actions management should consider to get started.

- » **Manage Expectations:** Organizations will face questions from a variety of stakeholders, including employees, auditors, regulators, and investors. It is critical for management to understand the new guidance and be able to clearly communicate to stakeholders how the organization may be affected financially and non-financially. Communicating early and often regarding the potential impact, the firm's implementation plan, and progress in the firm's preparations will be essential to managing expectations.
- » **Establish Program Governance:** Implementation of the new impairment accounting rules will require resources and coordination from across the organization, including lending, risk, finance, and IT. A steering committee should be developed with ultimate responsibility for implementation of the new framework. The committee can form task groups to focus on specific workstreams such as modeling, data infrastructure, and reporting.

- » **Perform Financial Impact Analysis:** Management will not know the exact impact of the new standards on the organization's financial statements until the new framework has been implemented at an enterprise level. However, pilot tests on segments of the portfolio using simplifying assumptions (i.e., flat LGD term structure) can help management identify a range of possible outcomes. These results can be socialized with peer institutions and compared to public impact studies.
- » **Perform Gap Analysis:** Management must identify what in its "toolbox" will help the organization meet the requirements. What approaches meet basic requirements? What data, models, and technology can the bank repurpose, and who owns these within the organization?
- » **Develop an Initial Roadmap:** The gap analysis will identify relevant existing tools, as well as areas where the organization must develop new capabilities. These findings will inform the organization's roadmap for implementation. The roadmap should identify the key objectives, major milestones, and broad timelines spanning preparation through implementation. The roadmap sets the development priorities for the program and serves as the foundation for a more detailed project plan. Major milestones typically include methodology design, software implementation, and impact analysis (i.e., parallel run). As part of the roadmap, the organization should determine whether to seek an accelerated path to achieve early adoption. Even the most advanced institutions may need at least 18 months to go live with a new impairment framework.

Core Capabilities Required

Figure 10 summarizes the core set of capabilities institutions will need to estimate credit impairment under the new standard. The analytical rigor demanded in each category may

vary widely across institutions and portfolio segments.

Expected credit losses must represent an unbiased estimate using reasonable and supportable information about past events and current conditions, as well as forecasts of future economic conditions. To account for forecasts of future economic conditions, institutions will need to source economic scenarios internally or by third parties. They must determine which variables to forecast, the number of possible outcomes to consider, the likelihood of the possible outcomes, and the source(s) of the economic forecast. Large financial institutions have developed economic forecasting capabilities for stress testing purposes,¹⁰ but economic forecasting is likely to represent a capability gap for most financial institutions.

Credit data encompasses the current information required to estimate credit losses for each of the exposures in the portfolio (balances, commitment, PD/LGD profile, cash flow profile, etc.). In addition, it includes the credit research data required to develop loss estimation models that are trained using historical data. Some institutions will need to develop the capability to integrate all the loan accounting and risk profile data into a single system for impairment calculations. In addition, firms will need to aggregate historical credit risk data from internal and external sources to facilitate credit risk model development.

Credit modeling represents the analytical tools required to estimate probability of default, loss severity, exposure at default, and/or expected losses for the various segments of the portfolio. Some institutions have developed sophisticated model development and validation functions to support internal model development. Others have outsourced some of these capabilities, leveraging the data or expertise of third parties for specific asset classes. Regardless of the source of these tools, the models must be powerful, forward-looking estimates of credit risk throughout the life of the exposure. Some institutions have developed credit risk models for Basel and internal risk management purposes. In most cases these will need to be modified to extend the forecasting horizon (most current models estimate credit risk over a one-year horizon) and to reflect current and forward-looking information.

Institutions must also develop the capability to perform sensitivity analysis. In the context of impairment calculation, this refers to the ability to test the sensitivity of the impairment estimates to model assumptions. Sensitivity analysis could take place in various forms, including changing the scenarios or the probability assigned to each scenario, or using alternative credit risk models to estimate credit losses. This could be a very manual process, or it could be carried out in a controlled environment with auditability, reporting, and archiving

¹⁰ For example, CCAR banks in the US are required to generate firm-specific stressed loss forecasts in addition to the regulatory scenarios.

features. Ultimately, the idea is to better inform management of the uncertainty around the impairment estimates.

Workflow and overlay management and analysis and reporting focus on the operating environment used for impairment calculations. Because impairment values are used directly in an organization's financial statements, they require strong governance and controls. Unlike risk parameter estimates used for regulatory reporting, risk estimates used for impairment calculation will fall directly under the purview of auditors. The calculation environment will ideally support workflow and overlay management to define user roles and track overrides to model estimates. The system will need to integrate the scenarios, data, models, and provision calculations in a way that facilitates user interactivity and auditability.

In many jurisdictions, reporting requirements for regulated financial institutions are being adapted to reflect changes in the impairment framework. Institutions would be required to explain the drivers of the changes in provisions between reporting periods. For example, banks may need to separate changes due to new originations, asset disposal, change in the risk of existing loans, and changes due to updates in the estimation methodology. Furthermore, management may have its own preferences regarding the analysis and reports that will be

disseminated throughout the organization. Accordingly, institutions may need to enhance reporting capabilities to address new and evolving reporting requirements.

Large institutions have developed robust data repositories and reporting infrastructures to address Basel and stress testing requirements, but enhanced reporting will pose a particular challenge to small and mid-size institutions. Technical footprint, performance, flexibility, and compatibility with existing systems should be carefully considered when investing in a new infrastructure solution.

Conclusion

While we await the release of the final standard, we interpret CECL to be consistent across institutions. However, implementation of the rules will be unique to the size, complexity, and geographical footprint of the institution. One size certainly will not fit all. The capabilities required to be compliant will differ throughout the industry, but the mandate to provide stakeholders with actionable information about an institution's credit risk will not.

For all its shortcomings, CECL should bring about a more comprehensive view and a disciplined approach for quantifying the expected credit losses inherent in an institution's financial instruments.

IFRS 9 SURVEY RESULTS

By María Cañamero, Michael McDonald, and Yagmur Uenal

This article is a summary of the views expressed by regional banking institutions in a recent survey about IFRS 9 regulation. The survey was conducted to assess progress, potential challenges, and plans of banks with regards to IFRS 9 compliance. The article describes the survey methodology and reviews current preparedness levels of banks. It shows expected impact on loan provisions, origination policies, and anticipated increases in personnel. It also reports on banks' main challenges in the areas of data, models, and infrastructure, and summarizes institutions' overall opinions of IFRS 9.

Introduction

Moody's Analytics conducted a survey in Q3 and Q4 2015 to gauge the state of IFRS 9 implementation and related challenges. The survey was conducted via one-on-one interviews with 25 regional banking institutions in North America and Europe to understand their views regarding the IFRS 9 guidelines. The group was defined as banks with under \$30 billion in assets.

The purpose of this survey was to assess progress, central areas of concern, and future investment plans of regional banks with regards to IFRS 9 compliance.

The survey revealed these key points:

- » 80% of interviewed institutions were still at early stages of IFRS 9 preparedness and would be considering external help for their IFRS 9 projects.
- » In Canada, the Netherlands, and the UK, most banks anticipated investment decisions in 2016, and the largest institutions were furthest along. Spanish and Italian banks generally had not begun their IFRS 9 preparations.
- » The main challenges cited were IFRS 9

impairment and the expected impact on provisioning. Data and modeling demands were perceived as the most challenging aspects of the impairment calculations. Almost all participants expected their banks' provisions to increase.

- » Nearly 75% of all interviewed parties had defined IFRS 9 budgets. Two in five respondents planned to invest more than \$1 million in Austria, Canada, the Netherlands, and the UK, with credit modeling as the primary focus.

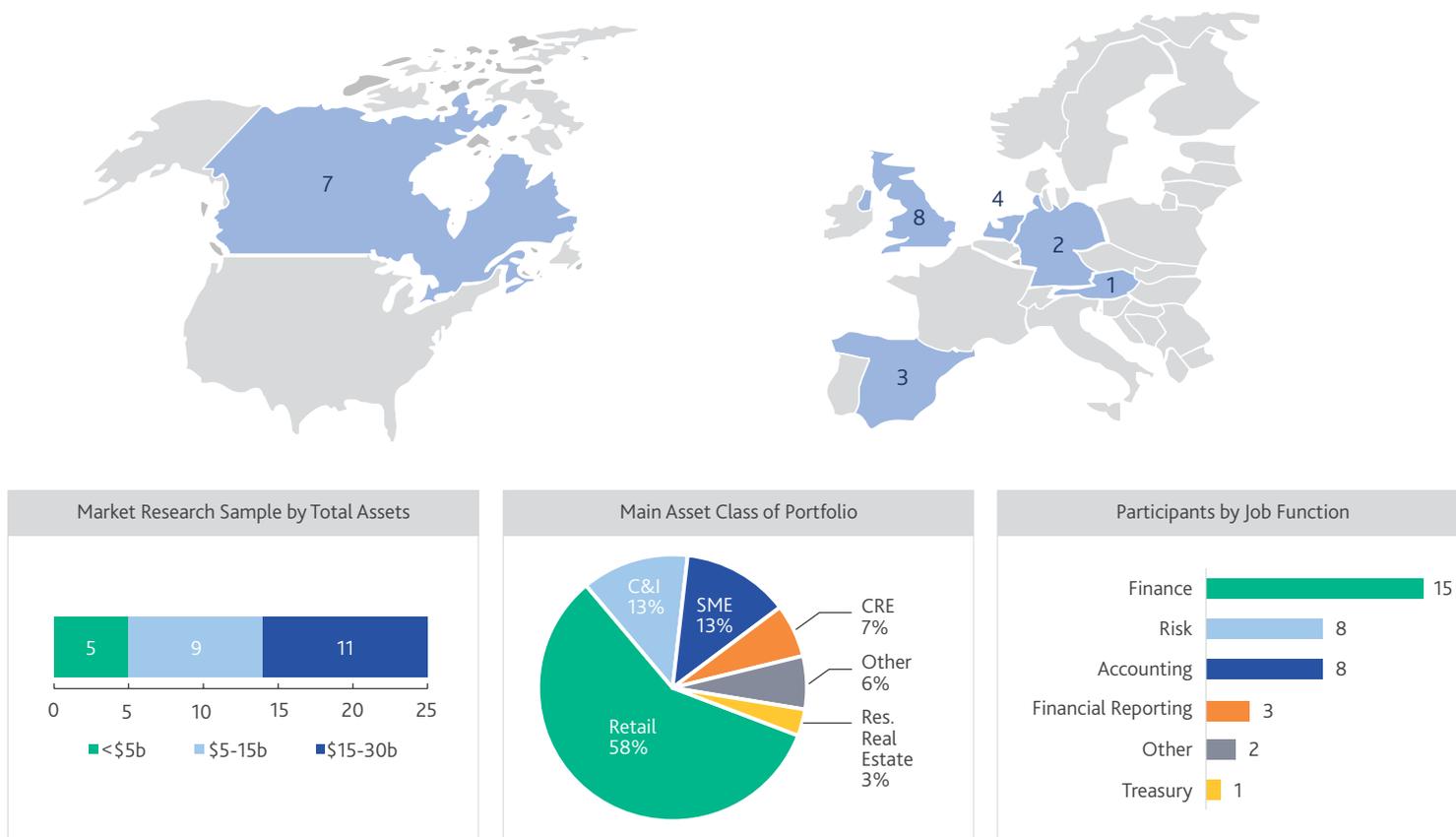
Methodology

Moody's Analytics conducted 25 one-on-one market research discussions with regional banks between September and December 2015. All participating banks had under \$30 billion in total assets, with retail being the main asset class of most banks' portfolios. Figure 1 summarizes the complete breakdown of participants by country, total assets, main asset class, and job function.

Low Preparedness Levels

The survey found that banks were largely unprepared for IFRS 9 at the time of the interviews, and most were still in early

Figure 1 Demographics of banks surveyed



Source: Moody's Analytics

preparation steps. Nearly a third of respondents had not initiated any work, and almost half were still focusing on their gap analysis. That leaves a scant 20 percent that had started design or building work. Figure 2 shows the status of banks' IFRS 9 implementation progress at the time of this survey.

Both country and bank size were found to factor into preparedness levels. In Canada, the Netherlands, and the UK, most banks anticipated investment decisions in 2016, and the largest institutions were furthest along. Spanish and Italian banks generally had not begun their IFRS 9 preparations.

For most banks surveyed, IFRS 9 compliance requires more resources than they have readily available. Nearly 80 percent of respondents stated that they were or would be considering external help for their IFRS 9 compliance projects.

Banks were, however, planning to make the most

of their efforts. More than a quarter of those not currently following an internal ratings-based (IRB) approach were planning on leveraging the IFRS 9 enhancements to move to an IRB approach for regulatory capital.

Anticipated Challenges

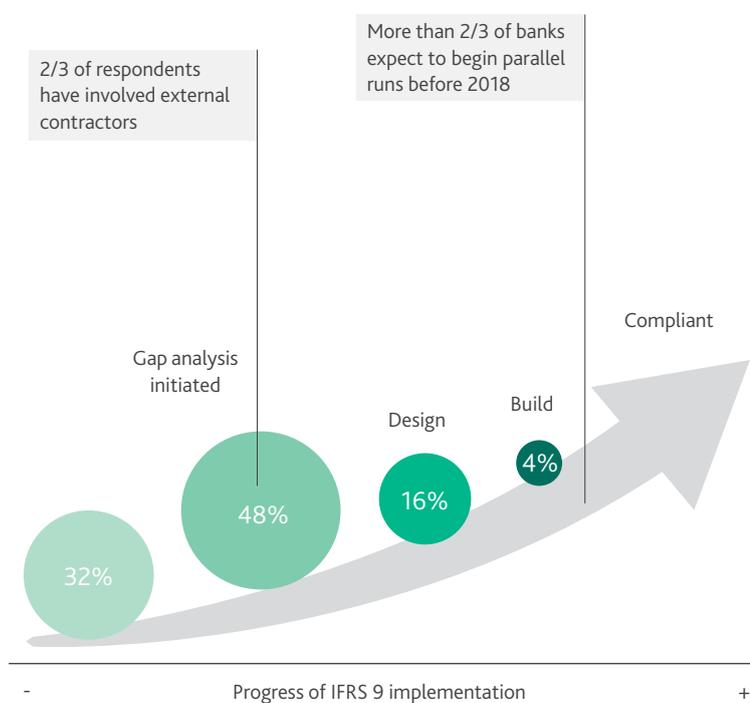
New IFRS 9 guidelines are structured in three main phases:

1. Classification and Measurement
2. Impairment
3. Hedge Accounting

Banks anticipated that Phase 2, Impairment, would pose the most challenges. Nearly all respondents expected challenges in this phase, while relatively few foresaw issues in Phases 1 and 3, as shown in Figure 3.

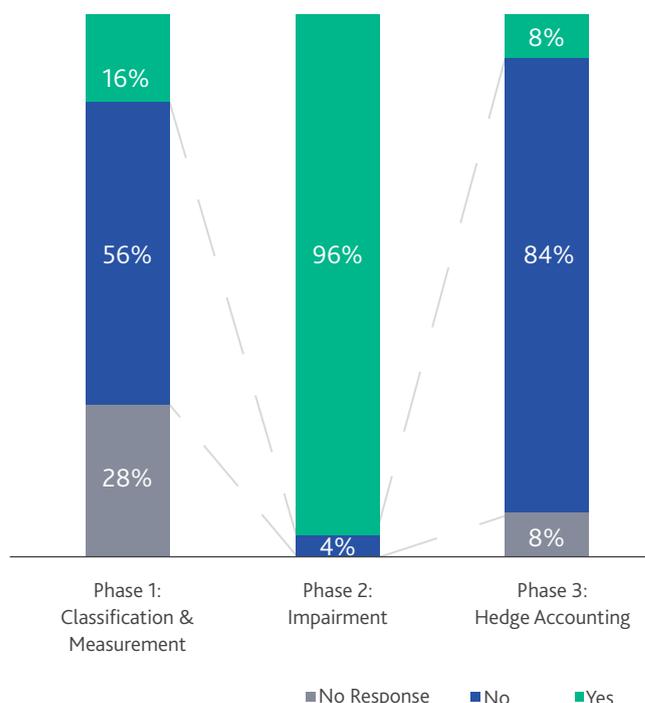
Banks expected IFRS 9 to significantly impact loan origination policies and bank provisioning, with 80 percent expecting increases in provisions. More than a quarter expected

Figure 2 Progress of IFRS 9 implementation



Source: Moody's Analytics

Figure 3 IFRS 9 phases where challenges are expected



Source: Moody's Analytics

changes to loan origination policies, with anticipated impacts on data capturing, pricing, and credit decisioning (Figure 4).

This survey found that when addressing impairment, most banks were challenged with data and modeling demands, with some infrastructure challenges, as well.

In terms of data challenges, the most critical challenge for many banks was the lack of historical data for some portfolios. Banks also faced a lack of PD data at origination, and some data characteristics which were needed for IFRS 9 were not previously gathered or stored.

Modeling challenges, the most critical for banks, included the following:

- » Lack of PD / LGD models for some portfolios
- » Lack of robustness in existing PD / LGD models
- » Issues converting Through-the-Cycle (TTC) to Point-in-Time (PIT) and estimating lifetime expected credit losses
- » Need for model enhancements to address forward-looking requirement

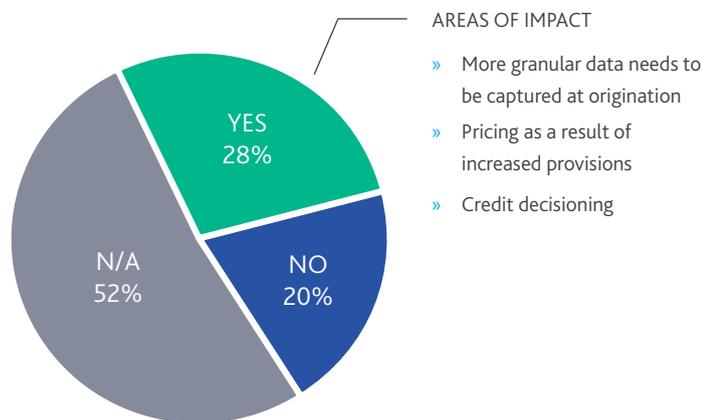
The banks interviewed also noted infrastructure challenges of low or medium criticality, including:

- » Issues related to handling larger volume of calculations
- » Data quality due to legacy system issues
- » Need for improved systems to gain automation and auditability in IFRS 9 calculations

IFRS 9 compliance requires sizable investments by banks, with a primary focus on credit modeling to overcome stated challenges. Nearly 75 percent of respondents stated they had defined an IFRS 9 budget to be used for staff cost, fees of external advisors, and tool upgrades. Banks in Austria, Canada, the Netherlands, and the UK were the most likely to spend a significant amount, with almost 40 percent reporting that they planned to invest over \$1 million.

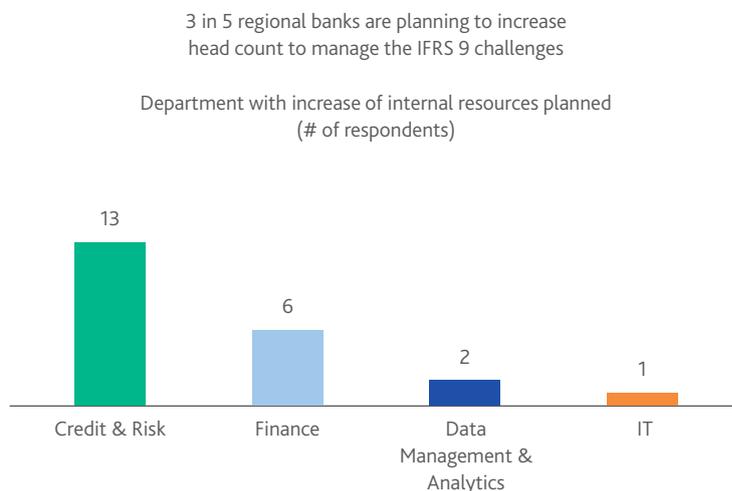
Personnel increases were a major area of planned investment among survey respondents, with 60 percent reporting they planned to increase

Figure 4 Impact on loan origination policies



Source: Moody's Analytics

Figure 5 IFRS 9 impact on resources and business areas



Source: Moody's Analytics

staffing to handle IFRS 9 challenges (Figure 5).

Other main areas of planned investment included equipment upgrades and third party vendor support.

Banks' Opinions and Reactions

While most participants agreed that IFRS 9 would bring a degree of uniformity to the international banking industry, they also voiced significant concerns about the guidelines' limitations and weaknesses.

"IFRS 9 brings 'positive concepts' to address some of the weaknesses of IAS 39," according to one respondent from a UK bank. "However, it raises issues from a practical point of view, particularly in terms of the modeling, since the new standard will not enhance comparability among institutions."

Some believed the guidelines would not effect change or improve transparency on a large scale.

"Conceptually, the framework makes sense, but in practice it's unlikely that many banks have been estimating provisions based on incurred losses only," according to a Canadian bank

representative. "There are inconsistencies in how financial instruments are accounted for and the balance sheet still will not reflect the real situation."

But despite its shortcomings, respondents expressed a general sentiment that IFRS 9 is a step in the right direction.

According to a UK respondent:

"Even though IFRS 9 will involve a lot of effort and high costs, it will help preserve quality across the entire industry by creating a more solid governance structure across all banks."

As indicated in this survey, IFRS 9 poses substantial challenges to the banks interviewed. To prepare for this new accounting standard banks will have to adapt their operations and the way they classify and manage the quality of their loans and provisions at origination. Moreover, banks will need to transform their processes and practices in terms of expected loss estimation, data management, capital calculation, and reporting.



Moody's Analytics

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Interview with Mark Almeida

PRESIDENT, MOODY'S ANALYTICS

The theme of this year's Risk Practitioner Conference is The Convergence of Risk, Finance, and Accounting. Why?

The Risk Practitioner Conference has evolved since its inception 11 years ago, and this evolution reflects the considerable change that has impacted banking and financial markets in this century. What started as a rather unique, regional seminar focused on innovations in credit risk has grown into an event that attracts risk, finance, and technology professionals from around the world. In response to the financial crisis, new regulatory forces and governance practices are driving dramatic change in financial institutions' management of risk. Stress testing programs implemented by regional banking regulators, new accounting standards, and more rigorous capital adequacy and liquidity risk requirements are bringing risk, treasury, and finance functions closer together. Because this is top of mind for financial institutions, we have organized our program accordingly.

Why is this theme important to Moody's Analytics?

We have long believed that financial institutions would inevitably leverage modern technology capabilities to undertake better, more precise, and more efficient risk management. This vision is at the core of what we do at Moody's Analytics. We believe that advanced quantitative analytics can have greater impact if they are integrated and made accessible across an enterprise – from a risk modeling professional to a front-line banker and to the CFO. Although responses to the spate of recent regulatory imperatives have been difficult and costly to implement, we believe that the investment made by banks and insurers to comply with such regulation will ultimately provide the means for better decision-making and enhanced operational oversight of financial institutions. Increasingly, we see that executives of financial institutions are recognizing this. While we're not there yet, the industry is clearly evaluating this convergence of risk and finance functions, and Moody's Analytics is eager to contribute to this process by facilitating dialogue among industry participants on these important topics.

What should participants expect at this year's conference?

This year's conference builds on what is now a well-established tradition, with sessions designed jointly by industry practitioners and Moody's Analytics subject matter experts. This results in a selection of topics that are of high priority for the industry. One enhancement that we're introducing this year is the organization of seminar streams by business function. We are planning four concurrent streams oriented toward technologists, finance and treasury professionals, credit risk managers, and specialists in quantitative risk. This structure will allow us to zero in on function-specific issues that are part of the broader industry themes. For example, we will discuss upcoming changes in impairment standards from multiple perspectives: methodology design and organizational design within the credit risk management stream, and technical architecture design within the technology stream. In a separate session, we will also solicit feedback from auditors and banking supervisors, who of course are the ultimate reviewers of any accounting standard implementation. Through this framework, we look forward to hosting a series of productive sessions that build on the ongoing conversations we have with market participants, all within a forum that brings these important issues to a larger and broader audience.

IFRS 9 IMPAIRMENT REGULATIONS: IMPLEMENTATION CHALLENGES AND POTENTIAL SOLUTIONS

By Christopher Crossen and Dr. Yashan Wang



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IFRS 9 aims to streamline and strengthen risk measurement and reporting of financial instruments in an efficient, forward-looking manner. This new accounting standard will have far-reaching impacts on accounting practices and performance results. This article focuses specifically on the IFRS 9 impairment model and challenges in interpreting the IFRS 9 requirements. We suggest solutions for meeting requirements in areas such as portfolio segmentation, thresholds for transitions among impairment stages, and calculating expected credit losses, leveraging Moody's Analytics expertise in credit risk modeling.



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Introduction: The Revised Impairment Model and Implementation Challenges

IASB published the final version of IFRS 9 in July 2014, which marked the completion of replacing IAS 39. The revised impairment model aims to provide users with more transparent and useful information regarding expected credit losses.

One of the key differences between the two standards, with large implications, is the clarification and methodology for recognizing impairment. Under the old IAS 39 "incurred loss" model, impairment depended upon how a financial instrument was classified. Under the new IFRS 9 model, impairment measurement is the same regardless of instrument type and classification. The new impairment model uses a single, forward-looking expected credit loss model that applies to all types of financial instruments within the scope of impairment accounting. The new model requires recognizing expected losses since origination or acquisition date. The major advantage of the new approach

is increasing the timeliness of loss recognition and addressing the over-complexity of the multiple impairment approaches required under the IAS 39 "incurred loss" model.

IFRS 9 requires recognition of loss allowance for expected credit losses at all times. It further requires that this amount be updated at each reporting date to reflect changes in the credit risk of financial instruments in scope. IFRS 9 provides three approaches for recognizing impairment loss:

- » A general "three-bucket" approach for regular financial instruments
- » A simplified approach for lease receivables, trade receivables, and contract assets without a significant financing component
- » A special, "credit-adjusted Effective Interest Rate (EIR)" method for purchased or originated credit-impaired financial instruments

The new impairment standard applies to all firms reporting under IFRS 9. In particular, requirements affect firms holding financial instruments such as loans, investments in debt,¹ and trade and lease receivables. The revised IFRS 9 model will impact banks and insurance firms most, due to their large financial instrument holdings. Non-financial firms with portfolios including trade and lease receivables, debt

- » Enhancements required for PD/LGD/EAD and loss rate models, in order to achieve IFRS 9-compliant expected credit loss calculation.

We discuss these specific challenges in further detail next.

Portfolio Segmentation

Firms typically segment portfolios along business lines, product types, and risk characteristics for

IFRS 9 requires a more granular and dynamic approach for portfolio segmentation.

securities, and intragroup loans must also revise current impairment loss calculations.

Firms must capture and collect historical data and other trend information required for building a forward-looking impairment model and for tracking credit risk migration since the origination and recognition of the financial instrument. Data will include the historical probability of defaults, ratings, loss amount, product features, and economic scenario variables. Firms may also need to develop new models and processes or upgrade existing models in order to identify an increase in credit risk and calculate one-year or lifetime expected losses. Gathering this granular data has been ranked the number one challenge by banks responding to a recent Moody's Analytics survey.²

Key Challenges to Implementing IFRS 9 Impairment Requirements

The primary methodological and analytical challenges that firms may encounter while implementing an IFRS 9 impairment model will arise in the following areas:

- » Portfolio segmentation techniques for credit risk modeling and expected credit losses calculation
- » Application of different thresholds for assessing significant increases in the credit risk of financial instruments

impairment calculation. IFRS 9 requires a more granular and dynamic approach for portfolio segmentation. Firms must group financial assets based on shared credit characteristics that typically react in a similar way to the current environment and macroeconomic factors. These characteristics include instrument type, credit risk ratings, industry, geographical location, date of initial recognition, remaining term to maturity, and underlying collateral. Groupings are reevaluated and re-segmented whenever new, relevant information arises, such as a change in economic conditions, or when credit risk expectations change.

Determining Significant Changes in Credit Quality

A true economic loss occurs when current expected losses exceed initial expectations. Recognizing lifetime expected credit losses after a significant risk increase reflects economic loss more accurately in the financial statements. To determine significant credit deterioration, a firm should consider reasonable and supportable information available without undue cost or effort, and then compare the following:

- » Risk of default at the reporting date
- » Risk of default at the date of initial recognition

A significant increase in credit risk assessment

¹ Investments in equity instruments are outside the scope of the IFRS 9 impairment requirements, because they are accounted for either at Fair Value through Profit or Loss (FVTPL) or at Fair Value through Other Comprehensive Income (FVOCI), with no reclassification of any fair value gains or losses to profit or loss (i.e. the FVOCI election for equity instruments).

² Gea-Carrasco (2015).

may be done on a collective basis (for example, on a group or subgroup of financial instruments), if evidence is not yet available at the individual level. While IFRS 9 does not prescribe any specific approach for assessing changes in credit risk, it allows the following operational simplifications for assigning the instrument into different stages:

- » A rebuttable presumption of a significant increase in credit risk when the borrower is 30 days past-due. This indicator is not absolute, but it is presumed to be the latest point.
- » For instruments with low credit risk, firms can continue to recognize a 12-month allowance.

The low credit risk exemption is often viewed as a suitable approach for wholesale and corporate exposures because firms can often map internal grades to external rating agencies. Likewise, the 30 days past-due criterion is often applied to retail portfolios because firms usually cannot map the portfolio to external ratings.

sophisticated “expected loss approach” for most portfolios.

Many banks may leverage their existing internal credit risk management systems and expected loss calculation processes used for Basel regulatory requirements, but they will need to modify them to comply with IFRS 9 impairment requirements. Modifications include adjustments for through-the-cycle vs. point-in-time estimates and extending the Basel one-year PD/LGD/EAD to full term structures to capture the expected lifetime of financial instruments.

Other institutions may use in-house models and processes for stress testing and adjust the forecast for the forward-looking scenario rather than the stressed scenarios. Estimating “forward-looking,” future economic conditions is only the first step of the adjustment process, for which institutions may need to develop single or multiple economic scenarios to calculate expected credit losses. The most challenging aspect of the change may be incorporating the

While IFRS 9 does not explicitly require it, Moody's Analytics recommends that banks and insurers consider a more robust and sophisticated “expected loss approach” for most portfolios.

However, the Basel committee maintains higher expectations for banks implementing IFRS 9. The committee considers both the low credit risk exemption and the 30 days past-due criterion to be a “very low-quality implementation” of an expected credit loss model. The committee has strong expectations that a bank will not fall back on the 30 days past-due assumption, unless all forward-looking information has no substantive relationship with credit risk. The appropriate approach will vary by the institution's level of sophistication, the financial instrument, and data availability.

Expected Credit Loss Calculation

The IASB acknowledges firms may measure expected credit losses (ECL) using various techniques. While IFRS 9 does not explicitly require it, Moody's Analytics recommends that banks and insurers consider a more robust and

macroeconomic factors forecast (interest rates, unemployment, GDP growth, etc.) into the PD/LGD/EAD modeling and, thus, into the expected credit loss calculation. Adjusted models must reflect how such changes in factors affected defaults and losses in the past. However, it is possible that the combination of forecast factors may never have been seen historically.

Even if all the IFRS 9-compliant models for loss rate and the different components in the expected loss approach are readily available, additional issues will arise when determining the expected credit loss. Rules require discounting the expected cash shortfalls in order to obtain the current value at the reporting date. Current regulatory calculations do not discount at all or discount only from the date of the expected default point. Firms will need to modify existing systems to better capture the expected timing of

credit losses and to discount future amounts to the reporting date. IFRS 9 requires the use of the effective interest rate at initial recognition when discounting the cash flows. Firms must also backfill the effective interest rate for financial instruments if this information is missing in the current accounting system. In addition, firms may need to enhance or replace a current loan loss calculation engine to accommodate the demanding computational loads of exposure level, cash flow-based, lifetime expected credit loss calculations.

Potential Solutions for Implementing the IFRS 9 Impairment Model

Given these challenges, we next discuss potential solutions for each of the previous areas of discussion.

Portfolio Segmentation

Implementing the IFRS 9 impairment model results in a granular and dynamic portfolio segmentation scheme. Financial instruments should be segmented based on shared credit

risk changes after initial recognition affect only some exposures within a group, those exposures should be segmented out into appropriate subgroups.

Determining Significant Changes in Credit Quality

IFRS 9 requires assessing financial instruments for significant credit risk increases since initial recognition. Firms must use change in lifetime default risk (considering quantitative and/or qualitative information), a low credit risk exemption, and a rebuttable presumption of 30 days past-due. For instruments whose default occurrences are not concentrated at a specific point in time during the expected life, firms can use changes in one-year in default risk to approximate changes in lifetime default risk.

When using a loss rate approach to measure credit risk increases, firms should use changes in credit risk isolated from other expected loss drivers, such as collateral. Also, the loss rates should be applied to groups defined in a similar

One challenge in calculating credit risk changes is the backfilling of credit risk assessment at origination. For this purpose, institutions must consider credit risk characteristics at initial recognition.

risk characteristics. Instruments grouped together should respond to historical and current environments, as well as to forward-looking information and macroeconomic factors in a similar way, with respect to changes in credit risk level. The grouping method should be granular enough to assess changes in credit quality leading to migration to a different credit risk rating, thus impacting the estimation of expected credit losses. Segmentation should be reevaluated and exposures re-segmented whenever there is relevant new information or whenever credit risk expectations change. Most importantly, exposures should not be grouped in such a way that the performance of the segment as a whole masks an increase in a particular exposure's credit risk. When credit

way to the groups for which the historical credit loss rates are calculated. Since loss rates should incorporate information regarding current and forward-looking economic conditions, firms should apply historical loss rates consistent with the current and expected economic conditions. If the historic economic conditions differ, an adjustment is needed. A possible approach for calculating loss rates dependent upon economic conditions is to develop a model linking loss rates with economic variables.

PDs can also be used to identify significant credit risk increases. If using PD changes, Moody's Analytics recommends assessing the logarithmic change instead of raw changes,³ as the significance of a specific change in PD depends on the starting point.

³ Logarithmic changes are similar to percentage changes for small fluctuations. However, logarithmic changes have more desirable properties, as they are symmetric and additive.

IFRS 9 states that firms cannot simply compare the change in absolute risk over time. Instead, they should incorporate the relationship between expected life and default risk. One possible approach to doing this is to use annualized PD values instead of cumulative PD values. For instruments whose default patterns are not concentrated at a specific point in time, one can use changes in 12-month PD as an approximation of the lifetime default risk change. This approach may not be suitable for instruments with only significant payment obligations after the next 12 months, or for which changes in macroeconomic or other credit-related factors are not adequately reflected in the default risk during the next 12 months.

In addition to using PD changes, changes in PD-implied rating, expressed as notch differences, can also determine significant increases in credit risk. Ratings are sometimes preferred over PD measures, as many institutions are more familiar with internal or agency ratings. However, implied ratings have the disadvantage of being non-continuous (like PD measures). Additionally, if using an internal rating system, it must be well-designed, incorporating a reasonable number of rating categories and avoiding too many credits classified into specific categories. For IFRS 9 purposes, an internal rating system should also incorporate the relationship between expected life and default risk. The internal rating mappings, therefore, should depend on the instrument's maturity.

One challenge in calculating credit risk changes is the backfilling of credit risk assessment at origination. For this purpose, institutions must consider credit risk characteristics at initial recognition. This requires historical information such as internal ratings, external ratings, financial statements, and economic conditions statistics.

We next discuss incorporating forward-looking information into credit risk measures, as well as other challenges in calculating expected credit losses.

Expected Credit Loss Calculation

To overcome the expected loss calculation challenges, firms can implement different solutions to comply with IFRS 9 including existing internal models or new tools. The targeted IFRS 9 solution should possess the following characteristics:

- » Applies a default definition consistent with internal credit risk practices
- » Reflects an unbiased and probability-weighted amount of expected credit losses
- » Is able to calculate expected losses for both one year and expected life
- » Incorporates information regarding past events, current conditions, and forecasts of future economic conditions
- » Discounts expected credit losses to the reporting date, using the effective interest rate as the discounting rate
- » Reflects cash flows expected from collateral and other credit enhancements as part of the contractual terms
- » Considers all contractual terms of the financial instrument
- » Estimates the portion of the commitment to be drawn down for financial instruments that include both a loan and an undrawn commitment component

Specific Models for IFRS 9 Impairment Model Implementation

Firms can leverage Basel and stress testing models for IFRS 9 purposes. They can also utilize vendor models to help comply with IFRS 9 requirements. We recommend specific adjustments in order to comply with IFRS 9.

PD Models

Most banks are subject to the Basel Capital Standards, which state three possible approaches for calculating capital requirements for credit risk: the Standardized Approach, the Foundation Internal Ratings-Based (FIRB) Approach, and the Advanced Internal Ratings-Based (AIRB) Approach. The Standardized Approach uses predefined risk weight values set

by the regulator, which are not suitable for IFRS 9 requirements. However, banks estimate PD under both FIRB and AIRB, which can be used as a starting point for calculating IFRS 9-compliant PDs.

In order to use the Basel framework to obtain PDs for the IFRS 9 calculation, firms should consider the following adjustments:

I. Align the Basel definition of default and the institution's risk management practice.

IFRS 9 states that firms shall apply a definition of default consistent with the definition used for internal credit risk management purposes. However, there is a rebuttable presumption that a default does not occur later than when the instrument is 90 days past-due. The firm may rebut the presumption if it has reasonable and supportable information to determine that a more lagging criterion is more appropriate.

II. Apply adjustment for economic cycle and incorporate forward-looking information.

The desire for stable capital requirement estimates leads many banks to adopt through-the-cycle (TTC)⁴ PDs. Since IFRS 9 requires firms to incorporate information regarding current conditions and forecasts of future conditions, TTC PDs require a cycle adjustment incorporating forward-looking information.

In particular, firms can leverage TTC PDs and apply a cyclical adjustment. The adjustment can be based on credit cycle signals from macroeconomic variables or information from the equity or debt markets, which incorporate market participants' expectations and therefore reflect forward-looking information. Since the credit cycle affects industries in different ways, adjustments should be industry-specific. If the credit signals show an increase in risk level, PD levels should be adjusted upward. If the risk level falls, PD levels should be adjusted downward.

- » One possible implementation adjustment is via a Z factor, as illustrated in Aguais, et al.,⁵ a single

parameter that represents the credit cycle.

- » Another option for incorporating forward-looking information into an existing PD is to use a stress testing approach, where the projected PD depends upon particular economic scenarios.
- » A third option is to develop a PD model that incorporates the current explanatory variables as well as forward-looking variables, such as forecasts of macroeconomic variables and/or signals from the equity market.

In addition to the aforementioned three approaches used for developing the PD model, firms can also consider simulating individual loan and collateral performance, as well as corresponding market conditions, based on historical probability distributions. With a sufficiently large number of simulation paths, the final PD becomes an unconditional risk measure, which reflects a probability-weighted outcome as required by IFRS 9.

III. Calculate lifetime PDs.

To calculate lifetime expected loss, users must construct a term structure of PDs beyond one year. Different modeling techniques include:

- » Develop separate models for different time horizons and interpolate probabilities of default for intermediate maturities; developers must ensure that PDs of long horizons are higher than PDs of short horizons.
- » Develop a model that uses the most up-to-date information at each point in time. The resulting PD is not time-dependent, but requires forecasting the risk factors for each loan's lifetime.
- » Use transition matrices, which measure the probability of moving between credit categories.
- » Develop a model in which the PD is time-dependent.

4 While there is no universally agreed-upon definition, the conventional view is that a rating system or a PD model with outputs that remain relatively stable across different macroeconomic conditions is a TTC system.

5 See Belkin, Suchower, & Forest (1998a, 1998b); Aguais, et al. (2004, 2006).

LGD Models

Some firms also develop internal LGD models for Basel and risk management purposes, which they can leverage for IFRS 9. To use the Basel framework to obtain IFRS 9-compatible LGDs, firms should make the following adjustments:

- I. Remove the downturn component.**

IFRS 9 states expected loss estimations should reflect current and forward-looking expected losses, not downturn economic conditions. This method disregards the conservative approach suggested by the Banking Supervision Committee. Therefore, for IFRS 9 purposes, the downturn component should be removed.
- II. Adjust the discount rate.**

Basel does not specify which discount rate to use for estimating the LGD. IFRS 9 requires using the effective interest rate or an approximation thereof. Therefore, in order to use Basel models, firms should align the interest rate used or apply an adjustment. Under IFRS 9, firms must also discount expected losses to the reporting date, while Basel states discounting to the default date.
- III. Incorporate forward-looking information.**

Since IFRS 9 requires expected loss to be forward-looking, firms should consider building a cyclical adjustment into the LGD model. Similar to PD, the stress testing approach can also be used to produce a forward-looking LGD.

To implement the stress testing approach, firms may choose to calculate a probability-weighted, average LGD across multiple scenarios or simply use one scenario that represents the best future estimate to produce a single LGD. The implementation method should be consistent with PD and LGD.
- IV. Extend the term structure.**

As Basel models typically have a one-year horizon, they should be extended to provide a term structure for LGDs.

Alternatively, firms can develop an LGD model that uses the most up-to-date information at each point in time. The resulting LGD requires that each explanatory variable is forecast for the entire lifetime of each loan, but it does not require an assumption on the LGD term structure.

- V. Other adjustments.**

Basel LGD estimations may include indirect costs related to collecting on the exposure and credit derivatives used as risk-mitigating instruments. Since IFRS 9 requirements do not include these components, they must be removed.

EAD Models

For financial instruments with predetermined draw and amortization terms (e.g., term loans and bonds), EAD in future periods can be calculated from known contractual terms during the cash flow generation process, taking into account probability of prepayment for prepayable loans and the probability of the call (or similar) options being exercised for bonds with contingencies.

For irrevocable loan commitment and line of credit with a loan, and an undrawn commitment component, firms may need an EAD model to estimate the instrument's exposures to credit losses. One option is to leverage the Basel EAD model, used under the AIRB approach.⁶ Basel defines EAD as "the expected gross exposure of the facility upon default of the obligor."⁷

In order to adjust the Basel EAD modeling for IFRS 9 purposes, the following modifications are needed:

- i. Remove the downturn component.**

If the EAD Basel estimation includes an economic downturn component, it should be removed.
- ii. Extend the term structure.**

For IFRS 9 purposes, the Basel EAD models should be extended beyond a one-year

⁶ Under the Standardized and the Foundation Internal Ratings-based Approaches, firms have less flexibility with EAD calculation.

⁷ Basel Committee on Banking Supervision (2015).

horizon in order to cover the expected life of the financial instrument.

Loss Rate Method

Unlike the PD/LGD/EAD modeling approach discussed above, loss rate models estimate credit losses by aggregating PD, LGD, and EAD. These models are often used for short-term portfolios such as credit cards, trade and lease receivables, and some non-material exposures. In addition, medium- or small-sized firms often rely on these simple modeling approaches for loss allowance calculations.

Commonly used loss rate models include:

- » Net charge-off rate model
- » Roll-rate model
- » Vintage loss curve model

Summary

To address the new IFRS 9 impairment model requirements, we recommend firms use a more granular and dynamic approach for portfolio segmentation by grouping financial assets based on shared credit characteristics that typically react in a similar way to the current environment and forward-looking information. Firms can implement different credit risk models

for calculating the 12-month or lifetime expected losses, including the expected loss approach based on PD/LGD/EAD modeling or loss rate approach. These models can be developed internally or provided by vendors.

Credit risk models developed for Basel capital requirement calculation or stress testing purposes can be leveraged for IFRS 9 expected credit loss calculation as well. The forward-looking information required by IFRS 9 can be incorporated into credit risk models based on signals from macroeconomic variables or from the equity or debt markets. Possible approaches for incorporating forward-looking information include transition matrices, scenario-dependent estimations, and simulation approaches. Firms must extend the one-year PD, LGD, and EAD estimations to the instrument's lifetime, for which different statistical techniques can be used. Possible techniques include transition matrices, time-dependent models, separate models for different time horizons, and models that use the most up-to-date information at each point in time. Further, institutions will need to incorporate specific adjustments to models developed for Basel requirements.

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PROBABILITY-WEIGHTED OUTCOMES UNDER IFRS 9: A MACROECONOMIC APPROACH

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In this article, we discuss development of a framework that addresses the forward-looking and probability-weighted aspects of IFRS 9 impairment calculation using macroeconomic forecasts. In it, we address questions around the practical use of alternative scenarios and their probabilities. We also include a case study to illustrate these concepts in practice.

The incoming IFRS 9 regulation provides for the use of macroeconomic forecasts and probability-weighted outcomes, particularly when accounting for the impairment of financial assets. Indeed, the spirit of IFRS 9 suggests that finance officers should be more forward-looking in their recognition of credit losses on a firm's balance sheet, with the macroeconomy often taking a central place in any impairment forecast. Paragraph B5.5.42, for example, *"requires the estimate of expected credit losses to reflect an unbiased and probability-weighted amount that is determined by evaluating a range of possible outcomes."* More specifically, two key areas of IFRS 9 suggest that macroeconomic scenario forecasts may be utilized:

1. Section 5.5.3, which outlines the method for calculating lifetime expected credit losses once an instrument has passed from Stage 1 to Stage 2.
2. Section 5.5.9, which describes the procedure for assessing whether an instrument has undergone a significant deterioration in credit risk.

This report focuses primarily on Option 1 above, and how probability weights can be derived from macroeconomic forecasts to produce

an unbiased estimate of lifetime expected losses. Given the accounting standard's goal of consistency, however, the scenario weights derived from Option 1 may also be used in Option 2.¹

Like the IFRS 9 standard itself, this article does not prescribe a specific plan of action or a one-size-fits-all approach to the use of macroeconomic forecasts and probability weights. Rather, it is designed to help institutions build a framework that addresses the "forward-looking" and "probability-weighted" aspects of IFRS 9 impairment calculation using macroeconomic forecasts. Moreover, we provide a purely quantitative approach to the problem. The use of qualitative overlays, which are allowable within the framework of IFRS 9, is beyond the scope of this article.

This report outlines three areas of discussion for banks to consider:

1. The number of macroeconomic scenarios to utilize
2. How to ensure an unbiased probability-weighted outcome
3. Where in the impairment calculation to incorporate the macroeconomy and probability weights

¹ See paragraph 54 of IFRS staff paper, *Transition Resource Group for Impairment of Financial Instruments*, December 11, 2015

The report concludes with an example from the wholesale lending space, which illustrates three different approaches to IFRS 9 compliance.

How Many Macroeconomic Scenarios?

The IFRS 9 standard does not explicitly define the number of macroeconomic scenarios that should be used for impairment calculations. Item B5.5.42 is again instructive:

the third approach uses an unconditional PD that does not require a specific macro scenario or probability weighting. Similarly, there is an upper limit to the number of scenarios that may be appropriate. Section BC5.265 suggests,² "The calculation of an expected value need not be a rigorous mathematical exercise whereby an entity identifies every single possible outcome and its probability," so the requirement of a



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The language used by IFRS 9 is intentionally vague, and the interpretation of the number and type of economic scenarios will differ by firm, portfolio complexity, geographical spread, and local regulator.

"In practice, this may not need to be a complex analysis. In some cases, relatively simple modelling may be sufficient, without the need for a large number of detailed simulations of scenarios. For example, the average credit losses of a large group of financial instruments with shared risk characteristics may be a reasonable estimate of the probability-weighted amount. In other situations, the identification of scenarios that specify the amount and timing of the cash flows for particular outcomes and the estimated probability of those outcomes will probably be needed. In those situations, the expected credit losses shall reflect at least two outcomes in accordance with paragraph 5.5.18." (Emphasis added.)

In some limited cases, then, the use of one or even zero economic scenarios may be sufficient. The illustrative example below, from the wholesale sector, outlines three approaches to the problem. The first two methods utilize macro scenarios and probability weights, while

simulation-based approach over thousands of scenarios can be disregarded.

The language used by the standard is intentionally vague ("at least two"), and the interpretation of the number and type of economic scenarios will differ by firm and portfolio complexity. In this article, we outline three approaches, two of which use multiple economic scenarios covering both upside and downside possibilities. This seems appropriate for most firms and most portfolios as the standard is designed for firms to consider a representative sample of the complete distribution.³ The framework can be extended to incorporate more scenarios or greater complexity.

How to Ensure an Unbiased Probability-Weighted Outcome Using Alternative Macroeconomic Scenarios

Moody's Analytics economics division produces monthly off-the-shelf macroeconomic forecasts under a baseline scenario and several alternative economic scenarios, known as S1 through S4.

² See Page 5, Section 10, of *Incorporation of forward-looking scenarios by the Transition Resource Group* (IFRS staff paper, December 11, 2015).

³ See paragraph 46(b) of IFRS staff paper.

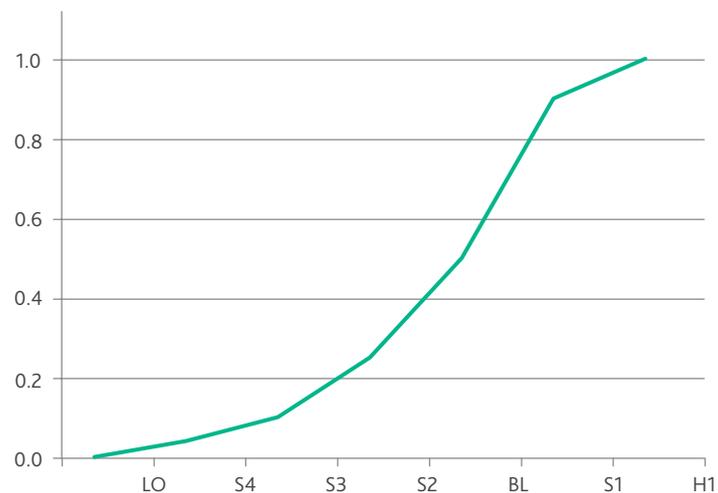
These forecasts cover 54 countries and over 90% of the world's GDP. Each scenario has a probability attached to it based on its historical distribution.

The baseline is a 50% scenario, implying a 50% probability that the actual outcome is worse than the baseline forecast, broadly speaking, and a 50% probability that the outcome is better. Similarly, the S1 upside scenario has a 10% probability attached to it (10% probability that the outcome is better; 90% probability that the outcome is worse); S2 is a 25% downside scenario; S3 is a 10% downside scenario; and S4 is a 4% downside scenario. Moody's Analytics

guidelines require expected losses to be calculated on the probability-weighted mean of the distribution, not the median, so even if a single scenario were to be used, the baseline may not be appropriate. (Other economists may forecast the mode – the most likely outcome – which is also inappropriate, without overlays, within IFRS 9.) These scenario probabilities describe a cumulative distribution function (CDF) showing probabilities for the economy to perform better or worse than a given forecast (Figure 1).

An expected value can be derived from a CDF in two ways. First, we could "integrate" the CDF to

Figure 1 Scenario probabilities – cumulative distribution function



Source: Moody's Analytics

also internally produces two "bookend" scenarios, which are 1-in-10,000 probability events that describe the upper and lower bounds of possible economic outcomes. These bookend scenarios help to illustrate the theoretical approach, but were excluded from the following wholesale example as the guidance recommends that firms "should not estimate a worst-case scenario nor the best-case scenario."⁴

The baseline scenario is therefore the median outcome, and not the mean. The IFRS 9

calculate the area under the curve. This would give a single mean economic outcome that could be conditioned on in expected loss calculations. However, as will be discussed later, it may be preferable to use several economic scenarios, push these scenarios across credit expected loss inputs (PDs, EADs, LGDs), and then weight these scenario-conditional risk parameters by the scenario probabilities. A second option is to "differentiate" the CDF, or take its slope at each point, to produce a probability distribution

⁴ See paragraph 46(d) of IFRS staff paper

function (PDF). Figure 2 describes the PDF using US GDP (in billions of 2009 USD).

We can calculate an expected value by using the probability masses from this PDF to weight either the economic data or the credit outcomes conditioned on that economic data, depending on which stage of the process the weights are applied to.

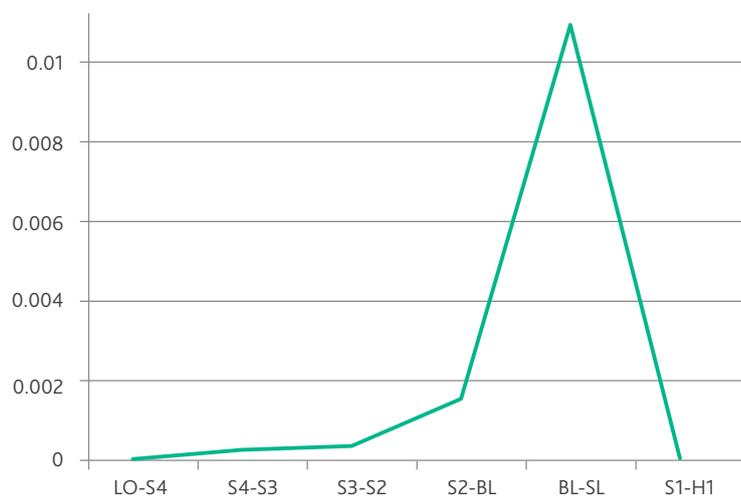
How and Where to Incorporate Macroeconomic Scenarios and Probability Weights

IFRS 9 provides no explicit guidance on how the probability-weighted outcomes should be used, although we can glean some insight from the standard itself and follow-up discussions. For

scenario may not be appropriate if the relationship between credit losses and the macroeconomy is nonlinear. This will often be the case in a properly specified credit model. Moreover, even if the credit estimate is unbiased, a single weighted scenario may be undesirable as the standard emphasizes evaluating a range of outcomes, not a range of scenarios. This is because firms may gain additional insight into the exposure of their portfolio by assessing a distribution of credit outcomes.

This can be illustrated through a simple example. Imagine it is 2006 and there are two firms that both have a large subprime mortgage exposure.

Figure 2 Scenario probabilities – probability density function



Source: Moody's Analytics

example, using the above approach, should the probability weights be applied to the economic data to produce a single, probability-weighted economic scenario which is then put through the credit model? Or should the user put all relevant scenarios through the credit model and then apply the scenario weights to obtain a probability-weighted credit outcome?

Public discussion at the Transition Resource Group for Impairment of Financial Instruments emphasized that using a single macroeconomic

Firm A models its expected credit losses under a single, probability-weighted economic scenario, showing only mild credit losses under this scenario. Firm B, however, uses several economic scenarios and notices that while its expected probability-weighted credit losses are modest, its losses under a sharp recession (such as S4) are severe enough to put it out of business.

From an accounting perspective, both Firm A and Firm B may recognize similar expected losses under IFRS 9. Yet from a statistical perspective,

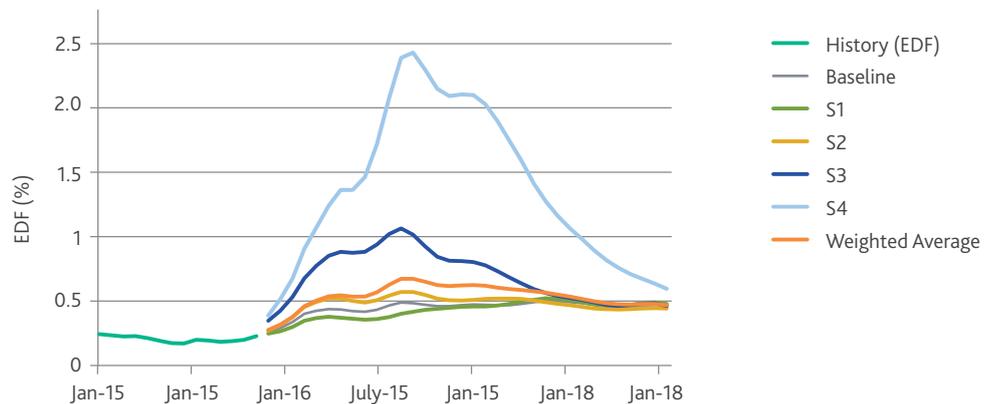
the measure of expected credit losses recognized by Firm A may be biased because of the non-linear relationship between credit losses and the macroeconomy. And from a risk manager's perspective, the information available from Firm B's accounting of expected losses provides a far richer information set and the possibility to take mitigating action if the risk of an S4-type scenario is considered material.

deteriorated by, say, three or more notches, would determine stage allocation.

Once an instrument has passed into Stage 2, lifetime EL must be calculated and accounted. There are three options for performing this calculation, based on the discussion in previous sections:⁶

1. Apply the economic scenario probability weights to the Stressed EDF forecasts

Figure 3 JP Morgan, scenario conditional 1-year PD curves & weighted average (expected value)



Source: Moody's Analytics

Case Study: Wholesale Portfolio Example

The Moody's Analytics CreditEdge model provides a suitable framework for IFRS 9 compliance with C&I exposures.⁵ This example uses the EDF metric, which provides an unconditional firm-level PD with a tenure of one to 10 years, and the Stressed EDF satellite model, which uses the core EDF metric to provide a firm-level PD forecast conditioned on any economic scenario. Stressed EDF already produces monthly forecasts conditioned on the Moody's Analytics scenarios described above, and so is well-suited to this purpose.

In this example, we may decide IFRS 9 stage allocation by comparing the unconditional EDF at the reporting date with EDF at origination to determine whether a significant deterioration in credit risk has occurred. A suitable criterion, such as if a firm's implied credit rating has

produced by conditioning on those economic scenarios. This is our recommended approach for the reasons outlined previously. Figure 3 illustrates this example using JP Morgan. The probability-weighted PD is above the baseline through the forecast period.

2. Combine the economic scenarios into a single probability-weighted scenario. This will, however, produce a biased measure of lifetime EL if the relationship between the macroeconomy and PD is non-linear. This is the case, by design, with the Stressed EDF model. Moreover, it glosses over the potential distribution of credit losses. Figure 4 illustrates the approach.
3. A third option is to use the unconditional EDF to calculate lifetime EL. That is, if an instrument has eight years left until maturity,

⁵ A modeling approach for retail portfolios is detailed in Black, Chinchalkar, & Licari, *Complying with IFRS 9 Impairment Calculations for Retail Portfolios*, Risk Perspectives Magazine, June 2016, Moody's Analytics

⁶ The IFRS staff paper outlines three approaches that broadly mirror the three options, plus a fourth possibility which uses the modal or most likely economic scenario in combination with a qualitative overlay. Our recommendations borrow heavily from this directive.

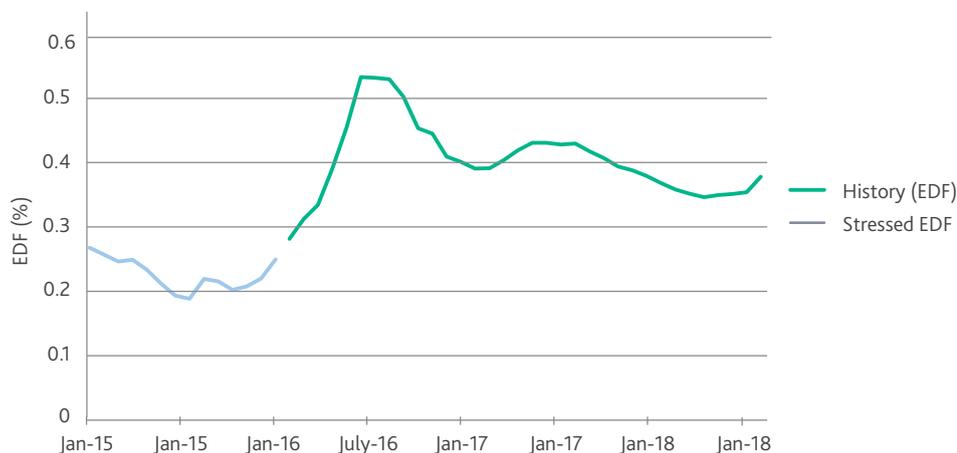
simply use the eight-year EDF as a measure of lifetime PD. The resulting EL calculation can be considered a weighted distribution of economic scenarios. That is, the EDF metric combines data from a firm's balance sheet with the firm's stock price, which is also the market's expectation of discounted future profits, with every possible profit path weighted by the probability of that path

Figure 5 summarizes the results using the two-year cumulative PD from each approach.

Concluding Remarks

In this article we have analyzed the use of macroeconomic scenarios as part of the forward-looking, probability-weighted IFRS 9 framework. Some of the key questions around the practical use of alternative scenarios and their probabilities have been answered, and a

Figure 4 JP Morgan, 1-year PD conditioned on a single probability-weighted average economic scenario



Source: Moody's Analytics

Figure 5 JP Morgan, two-year cumulative PD under the three approaches (%)

	Two-Year Cumulative PD
1. Probability weighted on the SEDFs	1.19
2. Probability weighted on the economic scenarios	0.86
3. Unconditional EDF	0.91

Source: Moody's Analytics

occurring. The measure is also unbiased by the construction of the EDF model, which is calibrated to physical default probabilities using Moody's Analytics default database.

All three options may be suitable in different situations, depending on the relationship between credit risk and the macroeconomy and the desired objective of the reporting process.

case study illustrates these concepts in practice. We argue in favor of leveraging a handful of alternative forecasts in order to comply with recent regulation. The shape and severity of the scenarios can vary over industries and firms, but the regulatory language is fairly clear when requesting the need to account for alternative outcomes under a probability-weighted framework.

COMPLYING WITH IFRS 9 IMPAIRMENT CALCULATIONS FOR RETAIL PORTFOLIOS

By Barnaby Black, Dr. Shirish Chinchalkar, and Dr. Juan M. Licari



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Dr. Shirish Chinchalkar heads the group responsible for building credit models for different retail asset classes such as US, UK, and Dutch residential mortgages, US auto loans, and credit cards, as well as for several different US and EMEA asset-backed securities. His group also implements the models in the Portfolio Analyzer platform which is used for stress testing and risk management of retail and structured portfolios. He has a PhD from Cornell University and a BTech from IIT Bombay.

This article discusses how to address the specific challenges that IFRS 9 poses for retail portfolios, including incorporating forward-looking information into impairment models, recognizing significant increases in credit risks, and determining the length of an instrument's lifetime. We describe two approaches to analyzing retail portfolios, suggest practical interpretations of IFRS 9 guidelines, and answer common questions pertaining to retail portfolios.

Introduction

When building and implementing econometric models for different asset classes, the modeler needs to carefully examine the requirements from the perspective of the final users of the models. A trader of whole loans may be more interested in the accurate modeling of loan-level cash flows and exploiting any statistical arbitrage. A servicer is likely to be concerned about delinquency transitions and time to liquidation. Regulatory stress testing requires that the models demonstrate sensitivity to macroeconomic conditions. Risk management requires that the models correctly capture the correlation between different assets in the portfolio.

The IFRS 9 guidelines pose some interesting challenges, including the following:

- » An important consideration in the impairment model in IFRS 9 is the use of forward-looking information in the models. Decisions around classification of assets into different stages and the calculation of the expected credit losses require consideration of forward-looking macroeconomic information.
- » A classification of assets into different stages requires determination of a significant increase in the credit risk.

- » Unbiased point-in-time estimates of the expected credit losses have to be computed by using a probability-weighted amount that is determined by evaluating a range of possible outcomes.
- » Depending on the stage into which an asset is classified, either a 12-month or a lifetime expected credit loss may have to be determined.

This paper addresses these considerations for retail portfolios. Retail portfolios can be analyzed with either a bottom-up approach or a top-down one. We discuss each of these approaches in more detail below.

Bottom-Up Approach

A bottom-up approach involves constructing loan-level models for each loan in the portfolio. Results can be aggregated over all the loans in different cohorts or segments to arrive at segment-level or portfolio-level results.

Loan-level models are usually hazard rate models and can be constructed in a competing risk framework. The data is naturally organized as panel data; each loan has multiple observations through time. Defaults and prepayments compete with each other in a multi-period setting. Survival models in this framework can be built using a panel logit model.

A bottom-up approach has the advantage that the results are naturally available at the highest level of granularity. The explanatory variables, such as loan and borrower characteristics and macroeconomic variables, are used at the loan level. Likewise, the performance variables, such as defaults, prepayments, cash flows, and losses, are modeled at the loan level. Heterogeneity of the loan characteristics can be easily accommodated.

Building loan-level models requires reliable historical loan-level data. This can be onerous and expensive. If the loan-level data is not reliable, the models that are built may have to be recalibrated. The implementation can also require additional resources. In situations where the portfolio consists of a large number of homogeneous assets, a loan-level approach may not be necessary.

Segment-level models are easier to build because they typically require less data. The performance variables of interest can be directly modeled as a function of segment-level characteristics. Models can be implemented faster.

Segment-level models are better suited to homogeneous portfolios. When a portfolio consists of heterogeneous assets, several segments are needed in order to accurately model the portfolio along multiple dimensions. If portfolio composition changes through time or if assets migrate from one segment to another, greater care is needed in segmenting the portfolio.

The suitability of a particular model will thus depend on the type of collateral and the portfolio composition.



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A bottom-up approach has the advantage that the results are naturally available at the highest level of granularity. Heterogeneity of the loan characteristics can be easily accommodated.

Top-Down Approach

A top-down approach involves segmenting the portfolio by vintage and risk characteristics. The segments can be as coarse or as granular as required. For example, a large homogeneous portfolio of retail credit cards could be modeled as a single segment. On the other hand, a portfolio may be segmented by vintage, geographic regions, or the borrower's risk profile. Different segments can have different models. Results can be either aggregated further to arrive at the portfolio-level results or calibrated further to instrument-level figures.

Next, we turn our attention to specific guidelines in the IFRS 9 standard, how they apply to retail portfolios, and how we can address them while building and implementing the models.

How to Use Forward-Looking Information

One of the key issues identified with IAS 39 impairment regulation is that only past events and current conditions can be considered in measuring credit losses. This leads to a notable weakness in the models developed under IAS 39 standards: that there can be delayed recognition of credit losses. In addition to considering

past events and current conditions, the new standard requires that forecast information must be used in measuring Expected Credit Losses (ECL) if available without undue cost or effort. Forward-looking information is to be used for stage allocation as well as for the calculation of the ECL. We discuss how forward-looking information can be incorporated in the models. The use of this information for stage allocation and for calculation of the ECL is discussed in later sections.

An econometric model of the retail assets, whether it is done at the cohort level or the loan level, involves relating the performance of the assets to macroeconomic factors. Once this relationship is established, forecasting the losses or determining the lifetime PD requires using these models on prescribed scenarios.

One way to include forward-looking information is to incorporate econometric panel data models that will give risk parameter forecasts under multiple scenarios. As the stage allocation should use the change in the risk of a default occurring over the expected life of the financial

the change in credit risk cannot be assessed simply by comparing the change in the absolute risk of a default occurring over time. For example, if the risk of a default occurring for a financial instrument with an expected life of 10 years at initial recognition is identical to the risk of a default occurring on that financial instrument when its expected life in a subsequent period is only five years, that may indicate an increase in credit risk. This is because the risk of a default occurring over the expected life usually decreases as time passes if the credit risk is unchanged and the financial instrument is closer to maturity.”

An econometric panel data modeling approach can help identify a forward-looking lifetime PD at the latest reporting date, but a question is raised concerning if and how to determine a forward-looking lifetime PD at origination. To use forward-looking information historically, one could either leverage historical macroeconomic scenarios on a monthly basis, or adjust origination PDs with historical macroeconomic data (i.e., utilizing what has actually happened in the economy since origination).

Our recommendation is to incorporate forward-looking information into the assessment of lifetime PDs for lending originated solely after the implementation of IFRS 9.

instrument, banks need to determine the extent to which forward-looking information will be included in lifetime PDs.

Our interpretation of the quantitative metric required for determining stage allocation is the change in the lifetime PD of an instrument since origination, relative to age. The caveat that the change is relative to age is essential for retail portfolios, as the lifetime PD will depend on time until derecognition (retail portfolios show a strong lifecycle component: nonlinear relationship between PD and time-since-origination). This is highlighted in appendix paragraph B5.5.11 of the standard:

“Because of the relationship between the expected life and the risk of a default occurring,

Our recommendation is to incorporate forward-looking information into the assessment of lifetime PDs for lending originated solely after the implementation of IFRS 9. For lending originated prior to the implementation of IFRS 9, lifetime PDs at origination can reflect the assessment of credit risk at the time of origination, which may not include forward-looking information. The usage of historical origination PDs for instruments originated prior to IFRS 9 implementation is justified by the following standards:

» Prior to the introduction of IFRS 9, there was no explicit requirement for forward-looking information to be used to adjust historical estimates of PD.

- » The work required to adjust historical PDs to incorporate forward-looking information would be considerable, going against the clause to “use information that is available without undue cost or effort” (B7.2.2).

The rationale behind stage allocation, which requires origination PD, is to compare the current view of default risk with the view that was held when the lending was agreed and the product was priced. To adjust the origination PDs for forward-looking information (or any additional data) would be inconsistent with this aim.

The only adjustments that should be made to origination PDs are ensuring these are unbiased point-in-time best estimates of the lifetime PD.

In summary, our recommendation to address the forward-looking aspect of the standard is to use panel data (vintage or loan-level models) using macroeconomic drivers for retail portfolios. These granular-level outputs can be calibrated to instrument-level figures, if required, before calculating instrument-level IFRS 9 impairment. The inclusion of macroeconomic variables allows the estimation of ECL under several different scenarios and the generation of probability-weighted outcomes. This approach captures both a range of forecasts and the non-linearity in the ECL calculation.

How to Calculate Unbiased Point-in-Time Estimates

Paragraph 5.5.17(a) of the standard states that an entity shall measure ECL of a financial instrument in a way that reflects an unbiased amount. Therefore, banks need to consider if and how their existing capital models and methodologies can be leveraged. This decision will likely be driven by the level at which downturn adjustments are incorporated into their existing models.

Banks that lack suitable models for IFRS 9 purposes can use a panel data modeling approach where the data is split by vintages. For PD modeling, the vintages refer to the month or quarter of origination, whereas for LGD modeling, the vintages refer to the month or quarter of default. Data can be split by further levels of client-specific segmentation such as

product type, region, or LTV band.

Factors influencing vintage-segment performance can be conceptually divided into three classifications: the lifecycle trends depending on a loan's age-on-books (seasoning), the factors indicating the quality of a vintage, and the characteristics of the current economic environment that depend only on calendar time. Other effects also operate across more than one of these main categories and can be modeled as interactions between them. An examination of each of these types of effects in isolation is essential to understanding the multidimensional nature of the data and the models used to forecast it. Using this approach on a panel data of marginal default rates and loss rates can help provide 12-month and lifetime ECL.

Consider a bank that already has 12-month Point-in-Time (PiT) Basel models or 12-month Through-the-Cycle (TTC) models with an easily extractable PiT component. The bank can achieve IFRS 9 compliance through a scaling process that leverages the vintage-level outputs to provide account-level lifetime expected credit losses that are consistent with the Basel 12-month PiT outputs.

For banks that use 12-month TTC models, with no possibility of extracting PiT outputs, our proposal is to use a vintage-level panel data modeling approach to estimate 12-month and lifetime ECL. The distribution of TTC PDs for a given vintage can then be used as a benchmark to define the ranking distribution of the account PiT PDs around the new vintage-level mean.

When using a loan-level model, an unbiased point-in-time estimate can be obtained by using models that incorporate lifecycle effects and macroeconomic factors. Using survival models, the dependence of the PD of a loan on its seasoning can be captured. Therefore, newly originated loans will behave differently from seasoned loans. Loan-level models use past information through changes in macroeconomic variables such as home prices and unemployment rates from loan origination to the reporting date, and forward-looking information such as future changes in macroeconomic

conditions. The output of the loan-level models is a conditional PD or LGD. Through the use of probability-weighted scenarios described later in the paper, a point-in-time estimate of the ECL can be obtained.

How to Define a Lifetime View of ECL

Paragraph 5.5.4 of the standard states:

“The objective of the impairment requirements is to recognise lifetime expected credit losses for all financial instruments for which there have been significant increases in credit risk since initial recognition.”

We address two challenges relating to providing a lifetime view of risk parameters: first, how to determine the length of an instrument's lifetime, and second, how to model risk parameters over the lifetime.

In regards to determining the length of an instrument's lifetime, the standard states in paragraph 5.5.19:

“The maximum period to consider when measuring expected credit losses is the maximum contractual period (including extension options) over which the entity is exposed to credit risk and not a longer period, even if that longer period is consistent with business practice.”

With retail products in mind, this raises the following two questions for how to define the lifetime:

1. When the terms and conditions of an instrument are amended, should this lead to the derecognition of the financial asset and the recognition of a new asset?
2. For revolving products such as credit cards or overdraft facilities where the contractual period can be as little as one day, should the lifetime for these products only be one day?

Lifetime Definition – Question 1: Derecognizing Assets

Chapter 3 of the standard answers the first question by defining both recognition and derecognition. Derecognition occurs through both the expiration of the contractual period and

financial asset transfer. This asset transfer can be identified by the transferral of the contractual rights to receive the cash flows of the financial asset. There is also a case for asset transfer where the rights are retained, as detailed in paragraph 3.2.5 of the standard:

“When an entity retains the contractual rights to receive the cash flows of a financial asset (the ‘original asset’), but assumes a contractual obligation to pay those cash flows to one or more entities (the ‘eventual recipients’), the entity treats the transaction as a transfer of a financial asset if, and only if, all of the following three conditions are met:

- (a) *“The entity has no obligation to pay amounts to the eventual recipients unless it collects equivalent amounts from the original asset. Short-term advances by the entity with the right of full recovery of the amount lent plus accrued interest at market rates do not violate this condition.*
- (b) *“The entity is prohibited by the terms of the transfer contract from selling or pledging the original asset other than as security to the eventual recipients for the obligation to pay them cash flows.*
- (c) *“The entity has an obligation to remit any cash flows it collects on behalf of the eventual recipients without material delay. In addition, the entity is not entitled to reinvest such cash flows, except for investments in cash or cash equivalents (as defined in IAS 7 Statement of Cash Flows) during the short settlement period from the collection date to the date of required remittance to the eventual recipients, and interest earned on such investments is passed to the eventual recipients.”*

Lifetime Definition – Question 2: Challenges in Retail Revolving Credit

The second question is addressed in paragraph 5.5.20:

“Some financial instruments include both a loan and an undrawn commitment component

and the entity's contractual ability to demand repayment and cancel the undrawn commitment does not limit the entity's exposure to credit losses to the contractual notice period. For such financial instruments, and only those financial instruments, the entity shall measure expected credit losses over the period that the entity is exposed to credit risk and expected credit losses would not be mitigated by credit risk management actions, even if that period extends beyond the maximum contractual period."

In order to measure over the expected period that these entities are exposed to credit risk, we propose a collective assessment of lifetime length using behavioral data. A panel data modeling approach can be leveraged to model the proportion of a vintage's instruments that are recognized over age.

For non-revolving products, our interpretation for defining the lifetime view is more straightforward. The maturity date of the contractual period helps provide the end date for the calculation of each instrument's lifetime length. Thus, for any given reporting date, the remaining lifetime over which to determine risk parameters is simply the time to maturity.

Calculating Probability-Weighted Expected Credit Losses

The measurement of an expected credit loss requires calculation of expected present value of the cash shortfalls. These credit losses are to be weighted using the probability of default. Since the models for the PD and LGD use macroeconomic drivers and loan and borrower characteristics, the calculation of the expected credit losses involves projecting the PD, LGD, and cash flows for different macroeconomic scenarios. An entity need not consider every possible scenario. However, different scenarios with their probabilities of occurrence must be considered.¹

Defining a Significant Increase in Credit Risk

Stage allocation requires determining if an asset has undergone a significant increase in credit risk since initial recognition. Paragraph 5.5.9

of the standard defines the significant increase in credit risk as a significant "change in the risk of a default occurring over the expected life of the financial instrument." This suggests that the decision should be based on the change in the lifetime PD since origination; however, there is little guidance around what quantifies a significant change. We need to first define this change in the risk of default and then set a threshold to determine what constitutes a significant increase. There are many options for the exact metric by which to allocate instruments into stages for retail portfolios.

Absolute Change

The absolute change in the lifetime PD since origination is the simplest metric for calculating the change, but would likely result in complexity for the threshold assessment. The age of the instrument at the latest reporting date would be a key driver, leading to an age-specific threshold.

Other dimensions that might warrant consideration are the length of the remaining lifetime and the size of the lifetime PD at origination. If the lifetime PD at origination is very low, the instrument could still be classified within stage 1 after an increase in risk if the PD is still considered low risk. This is documented in paragraph 5.5.10, which states, "An entity may assume that the credit risk on a financial instrument has not increased significantly since initial recognition if the financial instrument is determined to have low credit risk at the reporting date." The approach of basing the stage allocation off the absolute change in credit risk is not recommended as there are so many dimensions that would require assessment.

Relative Change

The relative change in the lifetime PD since origination would similarly require a number of dimensions in assessing the threshold. The assessment might be slightly simpler than using the absolute change, as the size of the lifetime PD at origination might not need to be a dimension. However, the age at latest reporting date and length of remaining

¹ Further discussion on generating scenarios and their associated probabilities can be found in Black, Levine, & Licari, *Probability-Weighted Outcomes Under IFRS 9: A Macroeconomic Approach*, Risk Perspectives Magazine, June 2016, Moody's Analytics.

lifetime would both need consideration, unless combined into a field to measure the percentage of expected lifetime remaining. This approach is not recommended due to the complexity of capturing the age differences between the lifetime PD at origination and lifetime PD at latest reporting date.

Absolute Change in Age-Specific Lifetime PD Forecast

The absolute change in the age-specific lifetime PD forecast compares the lifetime PD at the latest reporting month (at age α) with the lifetime PD forecast at origination for the instrument once it reaches age α . In Figure 1, a vintage of instruments are modeled using the panel data modeling approach to give a vintage lifetime PD curve. The panel data approach models marginal default rates that can be accumulated to give the lifetime PD curve. Similarly, the marginal default rates can be accumulated into 12-month PD curves over age. The vintage 12-month PD curve can be calibrated against Basel 12-month PDs to give instrument-specific 12-month PD curves through the

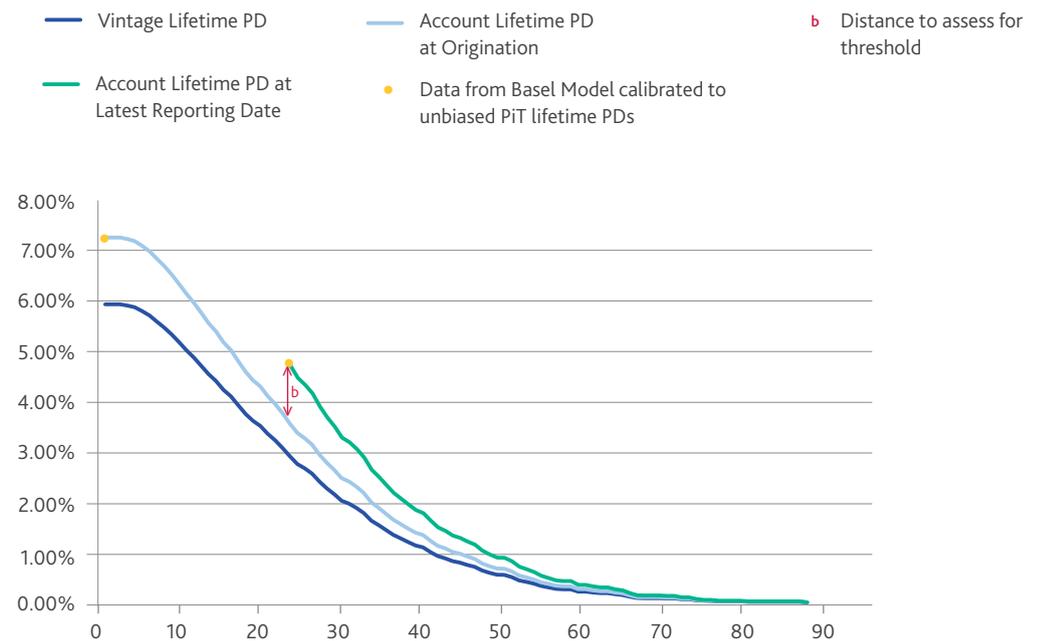
remainder of the instrument's lifetime. Lifetime views of the Basel PDs can subsequently be extracted, with the lifetime PD curves calibrated to these points, as shown in the graph. The metric that can subsequently be used for setting the threshold is the absolute distance between Basel-calibrated lifetime PD curves at the age of the latest reporting date.

Relative Change in Age-Specific Lifetime PD Forecast

Whether the absolute distance differs across age would need to be assessed. It is likely that the age dimension would remain essential in setting the threshold using the absolute change. Our recommendation is thus to consider the relative change in the age-specific lifetime PD forecast. This has the caveat of paragraph 5.5.10 as mentioned, which states that low values at origination can have notable increases but still be classified as stage 1.

Considering the options for determining the metric above has helped identify some of the dimensions that need to be assessed when quantitatively setting a threshold for stage

Figure 1 Lifetime PD



Source: Moody's Analytics

allocation. Below are some of the key areas for consideration:

- » The size of the lifetime PD at origination
- » The age of the instrument at the latest reporting date
- » The length of the lifetime remaining
- » The product type

Besides the quantitative assessment, entities also need to consider whether to rebut the presumption that a financial asset's PD has increased significantly since initial recognition when contractual payments are more than 30 days past due. On top of this, a qualitative assessment is recommended for identifying any changes in behavior that are not immediately captured in an entity's default definition.

Concluding Remarks

In this paper, we have addressed several important considerations in the modeling and implementation of the IFRS 9 standard for retail portfolios. We have shown how these guidelines should be interpreted and how they can be incorporated into loan-level and segment/vintage-level models. We have looked to address some of the key IFRS 9 issues facing banks with a focus on a retail perspective. What is clear from discussing these issues with peers across the globe is that the standard leaves room for interpretation in defining methodologies to reach IFRS 9-compliant impairment models. Time will tell as to whether any specificities of methodology design become enforced by regulators.



The background features a close-up, low-angle shot of a thick, braided rope in the foreground, with a wooden structure of beams and joints visible behind it. The scene is set against a bright, clear sky, suggesting an outdoor maritime or industrial environment.

PRINCIPLES AND PRACTICES

HOW BANKS CAN RAISE THEIR GAME IN SMALL BUSINESS LENDING

By Nancy Michael



Nancy Michael
Senior Director – Product Strategy

Nancy works to conceive and build innovative solutions for credit assessment of small businesses. Drawing on her previous experience co-founding a small business, she has built products and strategies to help financial companies better serve the needs of their customers. Nancy previously led the Client Solutions team for the Training and Certification division and headed Strategy and Marketing for the company's training and consulting businesses. Nancy received a BS in Economics from the Wharton School of the University of Pennsylvania, with concentrations in Strategic Management and Legal Studies.

Despite high demand for small business credit, small business lending at banks remains depressed and many prospective borrowers struggle to find financing. Small businesses cite onerous processes, lack of transparency, and high search costs among the challenges of obtaining credit through traditional banking channels. Alternative lenders are capitalizing on scoring and lending technologies developed in retail markets to generate profitable small business loans while optimizing the online customer experience, but they often lack deep expertise in risk management, loan monitoring, and servicing. Traditional lenders have an opportunity to change their approaches to technology, scoring, and the customer experience to meet the competitive challenge of the new market entrants, conduct profitable small business lending, and continue to serve the interests of their small business customers and local communities.

An interesting phenomenon is occurring in business funding in the US. Although the demand for small business credit remains high, banks – the traditional providers of financing for this segment – have continued a long and steady decline in their position in lending to small businesses. Small loans to businesses are down about 15% at banks since the financial crisis. Small business loans represented just 20% of business loan balances in 2015, continuing a consistent downward trend from 34% in 1995 (Figure 1). That's despite an uptick in 2015 that almost brought loan balances back to the level they were a decade ago.

Meanwhile, small businesses report persistent financing shortfalls, with only half indicating in a recent survey that all of their credit needs were

met.¹ Prospective small business borrowers cite onerous processes, lack of transparency, and high search costs among the challenges of obtaining credit. Research from the Federal Reserve found that small business borrowers spend an average of 24 hours on paperwork for bank loans and approach multiple banks during the application process.² Banks and borrowers routinely cite small business loan processing times of weeks or months from completed application to approval, not including the time to collect application information or fund an approved loan.

These factors have contributed to the rapid growth of online and alternative “marketplace” lending to small businesses. Marketplace lenders focus on using technology to improve the customer experience and “time-to-money,”

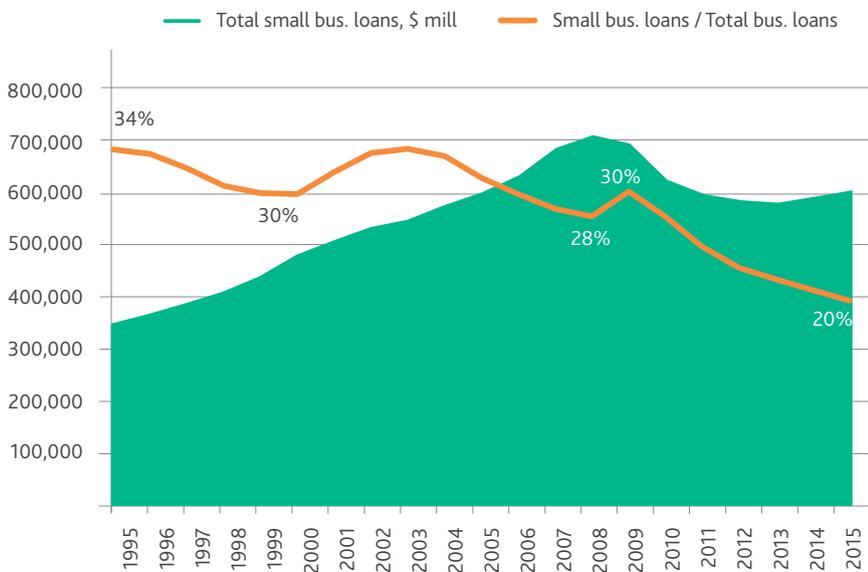
1 2015 Small Business Credit Survey, Federal Reserve, March 2016.

2 Joint Small Business Credit Survey Report, 2014, Federal Reserve Banks of New York, Atlanta, Cleveland and Philadelphia, 2014 Quarter 3.

often offering turnaround times for credit decisions in less than a day. A recent Morgan Stanley report estimated that online lenders granted nearly \$8 billion in credit to small businesses in 2015, reflecting year-on-year growth of 68%.³ At the current rate, they estimate online lending could claim as much as 20% of the small business loan market in the next five years.

by a down credit cycle. Delinquency rates and net charge-offs for business loans at banks are the lowest they've been in more than three decades. Some online lenders are using new techniques and information, like social data and educational backgrounds of borrowers, that are contributing to approval rates well above those at banks and credit unions (Figure 2).

Figure 1 Business lending at US banks, 1995-2015



Source: FDIC

The Alternative Lending Landscape

Marketplace players have the advantage of being unencumbered by legacy systems and old technology. They are scaling up quickly to tap into the unmet demand, and they are doing so profitably. While this may start to raise alarm bells among community banks and large banks whose mainstay has been lending to the small business segment, alternative lenders will face some headwinds that make it an opportune time for traditional lenders to shore up their capabilities to remain competitive in the small business space.

First, alternative lender portfolios have scaled up over the past five years and remain unchallenged

While these new approaches are driving valuable innovation in the industry, they are yet unproven in challenging credit conditions. More than a few industry observers have expressed fear that the rapid proliferation of online lenders, the application of new lending standards based on non-traditional data, and the origination-for-sale dynamics of this market are akin to the causes of the mortgage crisis. Although many alternative lenders are basing their decisions on strong credit management techniques, the next credit cycle is likely to expose gaps in credit modeling and lending expertise among some of the online players.

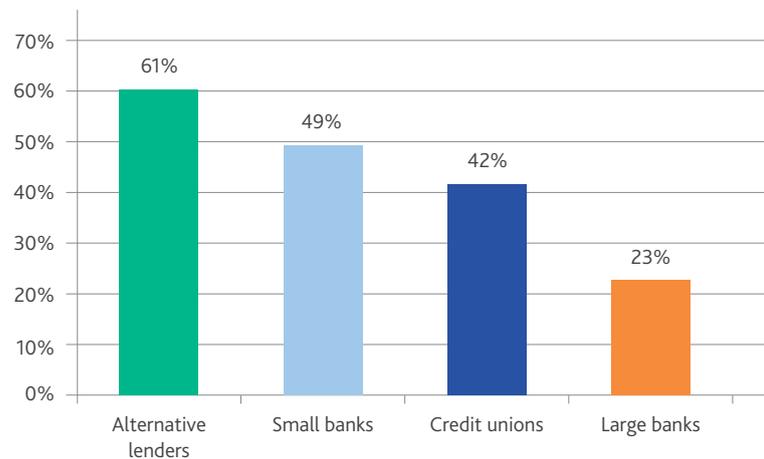
³ Rudegeair, Peter & James Sterngold, *Online Lenders Deluge Small Business*, The Wall Street Journal, October 1, 2015.

Second, while regulators have given alternative lenders some freedom for the past few years in an effort to allow innovation, the period of regulatory arbitrage for non-bank lenders may be ending. The online lending industry has made concerted and visible efforts to self-regulate, such as by creating a Small Business Borrower's Bill of Rights and committing to practices that promote fairness and transparency in lending.

between half and three-quarters of approved applicants said they were satisfied with their bank or credit union, while only 15% said the same of their online lender. The biggest reasons for dissatisfaction with online lenders were rates and payment terms (Figure 3).

A number of banks have recognized the opportunity to leverage the technology model

Figure 2 Small business loan approval rates by type of lender, February 2016



Source: Biz2Credit Small Business Lending Index

Despite these activities, regulators and advocacy groups are starting to put increased scrutiny on alternative lenders as loan volume has increased. A recent paper by the Consumer Financial Protection Bureau considers expanding the scope of consumer protection to small business loans,⁴ and the Treasury Department closed a comment period on marketplace lending in September 2015. More regulation is likely to follow, particularly in the areas of disclosure, predatory lending, and sales tactics.

Third, while small business borrowers clearly respond to the ease of getting credit quickly from marketplace lenders, banks and credit unions far outperform online lenders when it comes to satisfaction after a loan is approved. According to the 2015 Small Business Credit Survey,

of marketplace lenders in combination with their traditional strengths in credit and risk management to better serve small businesses. Some have begun developing similar process capabilities or partnering with online providers for prospecting, onboarding, and information-gathering, but these activities are still in their infancy. Traditional lenders that act now to streamline and improve their small business lending practices will be best equipped to address the funding needs of their small business customers and remain competitive and profitable as new players emerge.

Automation and Integration

For the tier of small business borrowers above branch-based microbusinesses, credit decisioning and monitoring in many banks are characterized

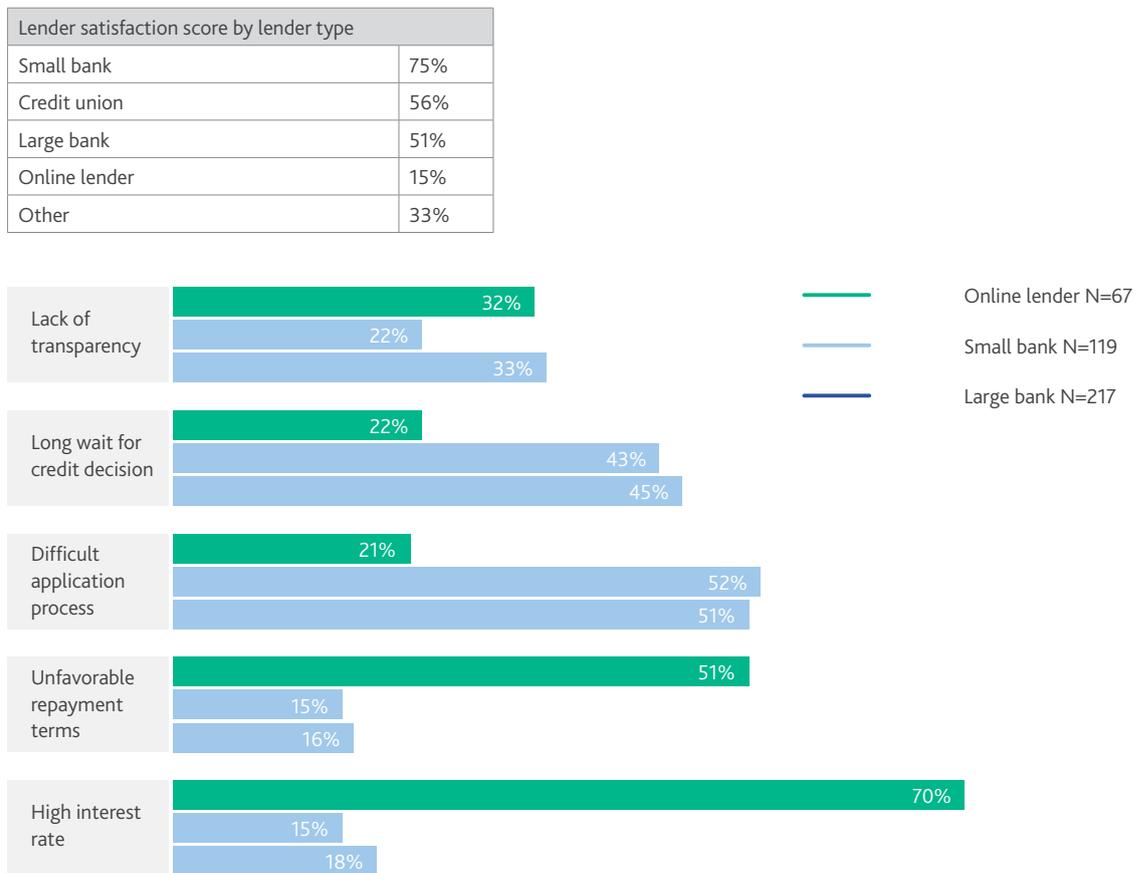
⁴ *Outline of Proposals Under Consideration and Alternatives Considered*, Consumer Financial Protection Bureau, March 2015.

by highly manual processes. Such manual processes are better suited to middle-market and larger corporate lending, where exposures (and revenue per loan) are much larger and volumes are lower.

Banks often collect customer and third-party information on paper or through static files that require data to be manually keyed into

integrated. In smaller organizations, these "systems" sometimes include spreadsheets and word processing programs for analysis and credit write-ups. In larger ones, elaborate legacy systems are often so deeply entrenched and entangled that it can be nearly impossible to adopt new technologies that could dramatically streamline workflows. Together, these approaches contribute to labor-intensive

Figure 3 Lender satisfaction rates, and reasons for dissatisfaction



Source: 2015 Small Business Credit Survey

bank systems. Compounding the problem, data often has to be re-keyed multiple times because systems used in different parts of the origination and back-office processes are not

and time-consuming processing, incomplete process tracking, and increased probability of errors. These challenges extend to small business borrowers as well. While a consumer can secure

a five- or six-figure car loan on the spot at a dealership, a small business borrower seeking the same amount of funding will have to go through time-consuming document-gathering; have back-and-forth communications with their lender in person and by phone, email, and fax; and endure weeks of waiting time while their application makes its way through the black box of the bank's process. In contrast, the always-available, fully automated, and fast-response customer experience of online lenders seems appealing, even at potentially higher interest rates and less attractive payment terms.

Many banks have focused on ways to increase lending efficiency with origination platforms and system integrations to reduce rework. According to a survey by the American Banker, nearly 30%

to prevent them from becoming obsolete and weighing down lenders as new technologies continue to emerge.

Credit Scoring and Decisioning

Lenders of all sizes report a lack of good credit decisioning tools for small business lending above the retail level. The market for external models is highly fragmented, and many rely primarily or entirely on behavioral data that is backward-looking, heavily weighted toward the financial position of the proprietor rather than of the business, or focused on the business's propensity rather than capacity to repay. Banks are left to piece together different models' outputs to make decisions, or rely on judgmental analysis for decisioning and approval, resulting in inefficiencies and inconsistent outcomes.

The always-available, fully automated, and fast-response customer experience of online lenders seems appealing, even at potentially higher interest rates and less attractive payment terms.

of bank CIOs plan to increase their technology spending on lending platforms in 2016.⁵ So far, that spending has focused mostly on banks' internal processes, and often it is invested in rebuilding or replacing in-house proprietary systems with similarly customized internal platforms that will face obsolescence in only a few years. Meanwhile, banks often continue to overlook the customer-facing systems and tools on which marketplace lenders win.

There is an opportunity to do a lot more. Streamlining banks' internal processes and offering customer tools that match the experience provided by online lenders will require active divestment in legacy systems, not just the introduction of new tools overlaid on dysfunctional or inefficient processes. To avoid legacy problems, banks must design new, modular systems and processes that leverage cloud technology, APIs, and web tools, and require less customization and implementation

The emergence of marketplace lenders as significant competitors makes this a more urgent problem. Some are starting to do auto-decisioning on loans to small businesses and moving up the size scale quickly, granting and funding six-figure loans in days.

Banks can address this challenge by standardizing their credit analyses of small businesses through adoption of automated spreading and quantitative scoring models for larger loan sizes. These models should heavily weight the fundamental financial information for the business that has proven to be most predictive of future default, while incorporating basic behavioral elements that are indicative of small business credit risk.

Our research has found that complementing financial data with limited, relatively easy-to-provide information on the prospective borrower's relationship with the bank, available

5 Terris, Harry, *Banks to Spend More on Tech in 2016 – Especially Security*, American Banker, October 15, 2015.

credit line utilization, and past delinquency substantially increases accuracy while preserving the efficiency of model-based decisioning. Incorporating these elements leads to higher predictive power among small businesses than existing financial-only or behavioral-only models based on 30 years of historical data. Scoring tools that utilize this information can also be used more proactively for early warning and loan monitoring, helping lenders prioritize credits warranting more scrutiny based on changes in scores.

Borrower Education and Enablement

The 2015 Small Business Credit Survey shows that one-sixth of employer firms that didn't apply for credit were discouraged either because they felt they would not qualify or because

their customers do business can become more valuable partners to their customers and create new lending opportunities in this segment.

Raising the Game

Strong demand for small business credit is expected to continue unabated. Online and marketplace lenders will continue to disrupt the small business lending industry by changing customer expectations with high-speed, technology-facilitated loan decisions, more accessible credit information, and vastly improved customer experiences. At the same time, alternative sources of funding will continue to expand the population of the "bankable" beyond businesses and individuals with traditional scores, making new types of data and new approaches to modeling increasingly

Complementing financial data with limited, relatively easy-to-provide information about the prospective borrower substantially increases accuracy while preserving the efficiency of model-based decisioning.

they thought the process would be too arduous to justify the time commitment. At the same time, banks continue to be the primary and most trusted sources of information for small business borrowers – 73% of applicants asked their bankers for financing advice according to the Fed's research.

Banks have an opportunity to solidify their position as trusted advisors to their business customers and prospects by providing education and tools that help the borrower understand their credit standing before they apply for a loan. Resources that provide a credit score and simple, accessible information to help the user understand what is driving it would go a long way toward addressing this untapped market. Consumer tools abound in this area, but there are few that equip businesses to better understand and manage their credit positions. Banks that provide such tools in ways that are adapted to when, where, and how

important. Across the industry, the rapid evolution of technology and new sources of data will shorten the time to obsolescence of in-house, customized, non-modular platforms and of existing decisioning models.

It is critical for banks to modernize the small business lending process now to remain competitive. This means divesting of heavy, obsolete, customized systems and adopting modular cloud-based technologies for rapid deployment and agility. It means automating processes that are typically done manually and leveraging workflow solutions that speed the process. It means buying into automated scoring solutions and innovative use of data to inform rapid and consistent decisioning, while maintaining a position of strength in traditional credit and risk management. And most of all, it means investing in the customer experience to make it easy, fast, transparent, and adapted to the way small businesses operate.





INNOVATION ZONE

ARE DEPOSITS SAFE UNDER NEGATIVE INTEREST RATES?

By Dr. Anthony Hughes



Dr. Anthony Hughes
Managing Director of Credit Analytics

Tony oversees the Moody's Analytics credit analysis consulting projects for global lending institutions. An expert applied econometrician, he has helped develop approaches to stress testing and loss forecasting in retail, C&I, and CRE portfolios and recently introduced a methodology for stress testing a bank's deposit book. He received his PhD in Econometrics from Monash University in Melbourne, Australia.

In this article, I take a theoretical look at negative interest rates as a means to stimulate the economy. I identify key factors that may influence the volume of deposits held in the economy. I then empirically describe the unique situation of negative interest rates. I delve into the asymmetries that exist in the relationship between deposits and interest rates, considering Sweden as an example case.

As the global economy sags, with many regions in or teetering on the brink of recession, central banks are looking for new ways to boost economic activity and stave off deflation. The first approach attempted in the wake of the global financial crisis was quantitative easing, which arguably enjoyed some modest success in the US but which was viewed (fairly or unfairly) as a failure in various other important jurisdictions around the world.

has been commensurately squeezed. One would expect this process to be further enhanced as monetary authorities push deeper into negative territory in a bid to boost their moribund economies.

The liabilities side provides an entirely different set of challenges. Banks want to maintain a consistent deposit base so they do not need to tap other more expensive sources of capital to fund their activities. They also want to carefully

Banks want to maintain a consistent deposit base so they can avoid using other, more expensive sources of capital to fund their activities.

More recently, a few countries have tried a new tack that involves charging banks for depositing reserve funds in the vaults of the central bank. Such policies have been implemented in Japan, which has been a pioneer in the use of radical monetary stimulation techniques; the eurozone; Switzerland; Denmark; and Sweden. The possibility that the US could chart a similar course cannot be easily dismissed.

On the asset side of the balance sheet, such a move is likely to have symmetric effects on commercial bank activity. With zero or razor-thin deposit rates, interest revenue earned by banks

control the interest and noninterest costs of retaining these depositors, especially given the tight profit margins imposed from the asset side of the ledger. Bear in mind that many large banks are restricted from increasing the riskiness of their asset holdings due to the firm grip being applied by regulators in every advanced economy around the world.

Serious questions emerge regarding the effect of negative central bank deposit rates on the volume of deposits actually held. If, under negative rates, households and businesses continue to demand bank services to store their

accumulated wealth in a risk-free manner, banks will be able to divert their attention to more profitable lending activities. Some, though, fear that negative rates will cause an exodus of depositors, forcing banks to raise capital from other places or to curtail their money-making operations. This paper seeks to cast some light on these issues from a macroeconomic perspective.

Building on Previous Research

Moody's Analytics has previously engaged in numerous studies of the effect of stressed economies on the aggregate deposit base. For example, Hughes¹ looked at developing CCAR-style stress testing models for total US deposits in various categories. While the mix of deposits held in a range of products is acutely affected by macroeconomic effects, the overall level of funds held by banks tends to be only marginally impacted by generic macro stress. Recessions do cause growth to slow, but typically with quite a long lag. Lower interest rates, holding all else equal, tend to push clients away from CDs and term deposits in favor of more convenient forms of on-demand services. "Deposit recessions" – situations where overall volumes actually shrink – are very difficult to generate even under extreme macroeconomic duress.

In more pointed analysis, Poi, Malone, Hughes, and Zandi³ considered the effect of quantitative easing policies (and their subsequent reversal) on the deposit base held by US and Japanese banks. Using a variety of champion and challenger models for both jurisdictions, they found only marginal overall effects of the radical policies on the size of the deposit pie. The implication is that if central banks want to "push on the string" in a very low interest rate environment, or to remove said impetus from said ligature, it will have little overall effect on bank holdings of deposits.

The analysis in this paper should be viewed as an extension of earlier work.

We will begin by taking a theoretical look at the problem of negative rates and try to identify key factors that may influence the volume of deposits held in the economy. This discussion will then be used to guide an empirical study that will seek to tease out the asymmetries that exist in the relationship between deposits and interest rates. We will follow a similar approach to that used by Poi et al. and seek to identify the most useful test case for empirical analysis. Specifically, here we will consider the case of Sweden, mainly because the Riksbank was the first to employ negative rates as a key plank in its monetary policy back in 2009. Sweden is

"Deposit recessions," in which overall volumes actually shrink, are very rare even under extreme macroeconomic duress.

In a similar vein, Hughes and Poi² extended this analysis to an individual institution with a long history of high-quality deposit data (North Carolina State Employees Credit Union). They found that account funds held by such an institution are likely to also grow in the midst of a recession, though pricing of services relative to the market plays an important role in determining the size of the slice eventually retained by the institution in question.

unique in that there were two distinct instances of negative deposit rates with a brief intervening period of positive rates. Poi et al. used Japan for the same reasons in their consideration of the impact of QE on overall deposit behavior.

Theoretical Analysis

In their economic activities, businesses and households generate stores of wealth. Part of this is then reinvested in risky ventures (like stocks and property) to generate additional

1 Hughes, Anthony, *Deposit Stress Testing*, Moody's Analytics white paper, June 2013.

2 Hughes & Poi, *Improved Deposit Modeling: Using the Moody's Analytics Pre-Provision Net Revenue Factors Library to Augment Internal Data*, Moody's Analytics white paper, July 2015.

3 Hughes, Malone, Poi, & Zandi, *Quantitative Easing and Bank Deposits*, Moody's Analytics white paper, October 2015.

future income streams. The dictates of a balanced portfolio and risk hedging then demand that part of the store of wealth be held in relatively riskless investment forms such as cash, government bonds, and insured bank deposits.

In a negative interest rate environment, it is safe to assume that the real economy is performing poorly. This implies both that the overall wealth generation engine is sputtering and that the range of available attractive, risky investment options is limited. The upshot of this, holding all else equal, is that investors will tend, at the margin, to retrench their risky investments but retain a high demand for the risk-free options. Though the overall wealth pie may be shrinking or stagnant, the riskless slice will tend to grow in scale throughout the period of real economic misfortune.

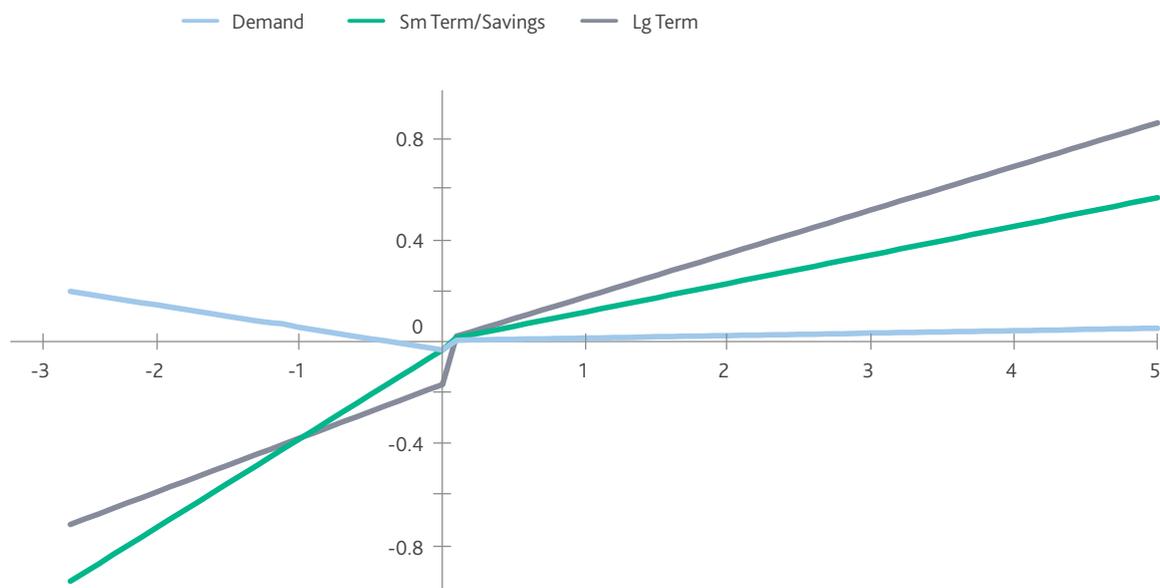
If interest rates on short-term government bonds and bank deposits are zero, in theory, people will be indifferent between holding cash, bonds, or deposits. If interest rates on bonds and deposits are negative, again in theory, people

will retrench their holdings of these assets and seek to store their accumulated wealth in the form of cash. Pieces of paper depicting dead presidents always earn precisely zero percent annual interest regardless of any actions pursued by the central bank.

This simple analysis assumes that holding cash is as riskless as holding insured deposits.

Some media speculation has picked up on these theoretical musings, often with a comedic bent. The authors will opine about the likelihood of companies and/or households withdrawing all their funds and putting \$100 bills in tin cans to be buried in the garden. Such activities carry a variety of risks that belie the notion that cash is a riskless way to store wealth. Mattresses can burn, treasure maps can be stolen, and buried notes can suffer water damage or be forgotten. On a more practical level, for households in the modern age, paychecks are electronically deposited and bills are paid automatically by remote computers. It is hard to imagine anyone with a measure of accumulated savings ever truly going off the banking grid.

Figure 1 Effects of interest rates on various deposit types



Source: Moody's Analytics

Figure 2 Regression results: Demand deposits

Dependent Variable: $(XM1MINUSM0 - XM1MINUSM0(-12)) / XM1MINUSM0(-12)$
 Method: Least Squares
 Date: 03/18/16 | Time: 11:31
 Sample (adjusted): 1999M02 2015M11
 Included observations: 202 after adjustments
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.055756	0.072641	-0.767563	0.4437
XIRDEP	0.011356	0.008902	1.275604	0.2037
XIRDEP*DUMNEGRATES	-0.110944	0.019911	-5.571941	0.0000
DUMNEGRATES	-0.297946	0.196629	-1.515266	0.1314
XIR2Y-XIRDEP	0.050152	0.015872	3.159874	0.0018
$(XRCONS(-1) - XRCONS(-13)) / XRCONS(-13)$	0.353362	0.224713	1.572499	0.1175
$(XRGFC(-1) - XRGFC(-13)) / XRGFC(-13)$	-0.020302	0.071561	-0.283701	0.7769
XIR10Y	-0.022471	0.011718	-1.917549	0.0567
XFOREXEURO	0.014548	0.008855	1.642853	0.1021
XFOREXEURO*DUMNEGRATES	0.026587	0.019757	1.345717	0.1800
$XRNETEX(-1) - XRNETEX(-13)$	-1.29E-06	1.08E-06	-1.191750	0.2348
XIRDEP-XIREURODEP	0.001477	0.010754	0.137381	0.8909

Source: Moody's Analytics

Figure 3 Regression results: Small time and savings deposits

Dependent Variable: $(XM2MINUSM1 - XM2MINUSM1(-12)) / XM2MINUSM1(-12)$
 Method: Least Squares
 Date: 03/14/16 Time: 14:25
 Sample (adjusted): 1999M02 2015M11
 Included observations: 202 after adjustments
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.721739	0.208770	-3.457094	0.0007
XIRDEP	0.103110	0.028416	3.628622	0.0004
XIRDEP*DUMNEGRATES	0.248966	0.040490	6.148816	0.0000
DUMNEGRATES	-0.074632	0.396999	-0.187991	0.8511
XIR2Y-XIRDEP	0.035101	0.042133	0.833100	0.4058
$(XRCONS(-1) - XRCONS(-13)) / XRCONS(-13)$	-1.104709	0.650064	-1.699386	0.0909
$(XRGFC(-1) - XRGFC(-13)) / XRGFC(-13)$	0.263482	0.211152	1.247826	0.2136
XIR10Y	-0.098638	0.032533	-3.031977	0.0028
XFOREXEURO	0.107095	0.023207	4.614723	0.0000
XFOREXEURO*DUMNEGRATES	0.002272	0.041499	0.054745	0.9564
$XRNETEX(-1) - XRNETEX(-13)$	-5.42E-06	4.06E-06	-1.337406	0.1827
XIRDEP-XIREURODEP	-0.052811	0.025884	-2.040287	0.0427

Source: Moody's Analytics

Figure 4 Regression results: Large time deposits

Dependent Variable: $(XM3MINUSM2 - XM3MINUSM2(-12)) / XM3MINUSM2(-12)$
 Method: Least Squares
 Date: 03/18/16 Time: 11:34
 Sample (adjusted): 1999M02 2015M11
 Included observations: 202 after adjustments
 HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.683298	0.551146	-3.054179	0.0026
XIRDEP	0.210180	0.051769	4.059956	0.0001
XIRDEP*DUMNEGRATES	-0.133712	0.156853	-0.852469	0.3950
DUMNEGRATES	-3.277907	1.299707	-2.522036	0.0125
XIR2Y-XIRDEP	0.430368	0.109546	3.928642	0.0001
$(XRCONS(-1) - XRCONS(-13)) / XRCONS(-13)$	-0.392407	2.576636	-0.152294	0.8791
$(XRGFC(-1) - XRGFC(-13)) / XRGFC(-13)$	1.862032	0.567306	3.282233	0.0012
XIR10Y	-0.222485	0.068092	-3.267405	0.0013
XFOREXEURO	0.178921	0.064444	2.776365	0.0060
XFOREXEURO*DUMNEGRATES	0.319444	0.129431	2.468068	0.0145
$XRNETEX(-1) - XRNETEX(-13)$	-1.43E-05	9.01E-06	-1.590342	0.1134
XIRDEP-XIREURODEP	0.119530	0.063208	1.891063	0.0601

Source: Moody's Analytics

For businesses and companies, the operational meshing with banks is even more extreme than it is for households.

Moreover, imagine for a moment that Apple, which reportedly holds more than \$200 billion in cash reserves, decided to avoid paying the negative interest rate deposit charges imposed by their bankers and to instead bury 200 tons of \$100 banknotes in the hills of Cupertino. Now imagine the meeting taking place between Apple's CFO and the company's army of external auditors.

It's just never going to happen.

Given that a range of unobserved risks and operational rigidities associated with holding cash remains, the question of the impact of negative rates on deposit holdings is squarely empirical in nature. We will consider other theoretical musings – notably the effect of the carry trade – in our empirical discussion of the Swedish economy.

Empirical Findings

For a variety of technical and policy reasons, and

due to a severe recession, the overnight deposit rate in Sweden first entered negative territory in the summer of 2009. As GDP growth bounced, the rate was then lifted in late 2010, though this move was highly controversial at the time due to the severe recession that was continuing to rage across much of Europe. The doubters were then proved right as economic clouds once more engulfed Sweden. Renewed recession led to a resumption of the negative rate policy in the summer of 2014. This situation remains in place today.

The set of circumstances endured by the Swedes sets up an ideal test case for an assessment of negative rates. The most important feature is that we observe two substantial, distinct periods during which the external policy treatment was applied, as well as two separate baseline periods during which more normal operations were undertaken. Moreover, the controversy regarding the initial removal of the policy in 2010 implies that the action can be viewed as exogenously undertaken by monetary authorities. Data sourced from Statistics Sweden is of high

quality, with a long history allowing precise modeling to proceed. Regression results used for the following analysis are included in the accompanying figures.

We identify various deposit categories by decomposing statistics for monetary aggregates. Sweden publishes M0 through M3 – four separate categories that progressively aggregate longer-duration forms of bank deposits. The M0 category is very narrowly defined, incorporating highly liquid forms of central bank deposits, banknotes, and coins. M1 adds in deposits available on demand; M2 adds small time deposits and other forms of savings accounts; and M3 adds large time deposits typically owned by corporations and wealthy individuals. We therefore interpret M1-M0 as “demand deposits,” M2-M1 as “small time/savings deposits,” and M3-M2 as “large time deposits.”

We augment this data using information regarding interest rates at a variety of terms. We seek to control for longer end yield curve dynamics that will allow us to focus our attention on the specific effects of the overnight deposit rate. Importantly, we also consider external channels through which the Swedish economy may interact with other countries and regions. To do this, we include net exports of goods and services, the exchange rate of the krona with the euro, and a variety of prevailing European interest rates.

battle with deflation during the early 2000s. In the current environment, where rates are low everywhere, we should expect the carry trade to be far less prominent. Nevertheless, we are happy to sacrifice a couple of degrees of freedom to control for its potential impact in the work presented here.

The final set of controls focuses on the real domestic economy. In a nutshell, we give Swedish households and businesses the option of consuming their deposits or of reinvesting their savings in more risky forms of investment. These macroeconomic factors enter our models with a lag to stave off any accusations of potential endogeneity.

We transform all control variables to ensure an absence of unit roots.

Our primary focus here is in assessing the symmetry of the observed relationships between short-term policy rates and various deposit categories. We create a dummy variable that is generally zero but switches to unity if negative deposit rates prevail within the Swedish monetary system at the time. The third variable of key interest is an interaction between the deposit rate and the dummy.

If the marginal effect of a change in rates is the same on either side of the zero frontier, the parameter on the interaction term in our regression will be precisely zero. Statistically,

Negative interest rates seemingly cause a slight – but statistically significant – reduction in total deposits held.

This set of variables allows us to consider the effect of the carry trade on the behavior of domestic deposits. If safe returns at home are elusive, one option available to depositors involves investing their funds in a foreign currency-denominated account in which positive interest will be paid. Such investments carry exchange rate risk, but these potential misfortunes are sometimes adequately compensated by the available interest rate differential. The carry trade is generally considered an important dynamic in Japan's

therefore, we can test the hypothesis that this phenomenon prevails in the data by using a t-test on the estimated coefficient in the model. Similarly, the inclusion of the dummy variable allows us to consider the specific marginal effect involved with crossing the zero frontier. If the act of moving from positive to negative rates causes a change in deposit behavior we will observe a level shift in the deposit growth rate as this unfolds. The included figures display the key regression results.

Across the range of positive deposit rates, the behavior of the key marginal effects is in line with our prior expectations. All three deposit categories are sensitive to rate shifts such that rate increases tend to accelerate the growth rate of underlying deposits. Of the three categories, again as expected, demand deposits are the least sensitive to rate changes across the positive part of the number line.

As the zero frontier is hit, large time and demand deposits both shift lower, though the latter effect is not statistically significant at the 5% level. Small time/savings deposits, meanwhile, do not suffer a noticeable level shift.

For all time deposits, the intuitive effect of an increase in rates continues to hold on the negative side of the zero rate boundary. For large time deposits, abstracting from the presence of the level shift, the effect of rates is symmetric in the sense that marginal rate changes have the same deposit growth impact on either side of zero. Going from, say, -1% to -2% will have the same growth implications for large time deposits as moving from 2% to 1%. For small time deposits, meanwhile, the rates effect is more pronounced on the negative side, implying that small time depositors become hypersensitive to rate cuts that make such holdings commensurately more expensive.

Things get really interesting when we consider demand deposits. After noting the slight downshift in such instruments when the zero mark is crossed, we can further observe demand deposit volumes tending to increase with further short-term rate cuts. Because demand deposits represent around 80% of all Swedish holdings, it is this effect that is the most economically significant of the findings across the three separate categories.

As rates fall further below zero, total deposits held by banks actually increase!

This is the most interesting finding of the empirical research. Though it is true that negative rates sap the performance of term deposits, the funds repatriated from this process do not do so in the form of cash. Rather, they exit in the form of demand deposits.

For banks, there are two implications of these findings. One is that crossing the frontier seemingly causes a slight – but statistically significant – reduction in total deposits held. For Sweden, this initial effect amounted to around 4% of the total deposit base. As further rate cuts are effected, though, part of this reduction can be clawed back in the form of perhaps higher than anticipated growth in demand deposits. The second implication is that the duration of the deposit book will tend to decline as funds are moved out of term deposits and CDs into vehicles that allow funds to be drawn instantly.

Conclusion

Radical central bank policy changes are rarely welcomed by bankers. With the global economy still trying to shake off the lingering effects of the Great Recession more than seven years post-Lehman Brothers, it is little wonder that monetary authorities are seeking new directions in their stimulative efforts. Recently, this push has moved in the direction of punishing savers for holding risk-free investment forms. Such an unprecedented move has banks worried for the safety of their deposit holdings.

In a series of papers, Moody's Analytics has explored the empirical effects of radical policy shifts on deposits. In general, it is observed that such moves often have a significant impact on the form of deposits but not an especially large effect on their scale. The findings of this paper are fully consistent with these observations. Though negative rates will cause term holdings to shrink, this effect will be more than offset by a rise in demand deposits.

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SOLVING THE COUNTERPARTY DEFAULT SCENARIO PROBLEM: A 2016 CCAR CASE STUDY

By Dr. Samuel W. Malone



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Dr. Malone develops novel risk and forecasting solutions for financial institutions while providing thought leadership on related trends in global financial markets. He also frequently leads consulting projects taken on by the Specialized Modeling Group. He is coauthor of the highly-cited book *Macrofinancial Risk Analysis*, which offered the first operational, validated systemic risk framework in the midst of the global financial crisis, as well as numerous peer-reviewed academic articles in applied and financial econometrics. He has BS degrees in Mathematics and Economics from Duke University, where he graduated summa cum laude, and a doctorate in economics from the University of Oxford.

This article introduces Credit Risk Cascades, a new model that forecasts probability of default of financial institutions under compound scenarios. The model seamlessly integrates macroeconomic, counterparty, and systemic risk projections. This article illustrates the use of the Credit Risk Cascades tool via a case study for US financial firms under the CCAR 2016 baseline and severely adverse macroeconomic scenarios.

Introduction

Thinking in terms of *compound scenarios*, which are comprised of macroeconomic, counterparty, and systemic risk components, represents the natural next step of stress testing. For eight bank holding companies, the Fed now requires layering a counterparty default scenario onto standard CCAR exercises, and has recently suggested that next-generation stress tests could feature shocks to bank interconnectedness. In fact, as reported in *American Banker*, Fed governor Daniel K. Tarullo has recently gone on record stating that he "... envisions the stress-testing process moving beyond just examining the performance of individual banks' capital levels under stress and also include the interconnection of institutions under stress as well."¹ When forecasting probability of default (PD) for such purposes, banks require a model that seamlessly integrates macroeconomic, counterparty, and systemic risk projections. In fact, some large banks that conduct sophisticated "war game" exercises as part of their risk management activities already think in these terms, but lack a model that allows a fully coherent evaluation of such shocks together. The banking industry needs a

streamlined quantitative tool to facilitate stress testing under compound scenarios.

In this article, I introduce a new model – Credit Risk Cascades (CRC) – that forecasts PDs of financial institutions under compound scenarios involving economic, counterparty, and systemic risk components. The CRC model incorporates these three main effects:

- » Direct dependence of PD forecasts on the economic scenario
- » Credit risk spillovers via network linkages
- » A user-specified path for financial sector interconnectedness

This is accomplished with the following techniques:²

- » Using Moody's Stressed EDF to obtain EDF paths under a user-selected economic scenario
- » Using a dynamic network model to obtain PD forecasts under the counterparty shock relative to an appropriate no-shock baseline
- » Adjusting the Stressed EDFs to take into account the network model results

¹ Heltman, 2015.

² The full documentation and validation of Credit Risk Cascades can be found in Malone (2015).

Here, I illustrate the use of the Credit Risk Cascades tool via a case study for US financial firms under the CCAR 2016 baseline and severely adverse macroeconomic scenarios. EDF forecasts under these scenarios, obtained from Stressed EDF, are modified in response to the default of a small set of counterparties in a way that allows credit risk shocks to propagate more strongly when bank interconnectedness is high. After discussing other regulatory applications of CRC and providing a brief methodology overview, the case study illustrates the effects that different counterparty and systemic risk events could have for a select group of major US banks under alternative paths for the macroeconomy.

Regulatory Context: Other Applications of CRC

While the counterparty default scenario that forms the focus of this article is a key regulatory application of CRC, it is not the only one. Two other regulatory applications include single counterparty credit limits (SCCL) and compliance issues related to the "living will" portion of Dodd-Frank.

Related to the first point, the Fed has recently proposed an update to the rules governing SCCLs for US bank holding companies and foreign banking organizations with at least \$50 billion in total consolidated assets. As part of the proposed rules, whenever a bank holding company's net credit exposure to an unaffiliated counterparty exceeds 5% of the bank's eligible capital, the bank must determine whether the counterparty is economically interdependent with any of the bank's other unaffiliated counterparties.³ The analysis required to determine such a relationship turns directly upon whether the financial distress of one counterparty is likely to impair the ability of other bank counterparties to make good on their liabilities to the bank. As the case study of this article illustrates, CRC quantifies precisely the extent to which the distress of one counterparty will transfer to another counterparty of interest under a variety of economic scenarios.

Regarding the living wills required of major US banks under Dodd-Frank, the Federal Reserve

and Federal Deposit Insurance Corporation (FDIC) recently said that the resolution plans submitted in 2015 by five of the largest US banks failed to pass muster and must be rewritten by the banks prior to October 1, 2016.⁴ Among the faults found in the living wills, regulators cited the failure to fully address the material financial interconnections between banks and broker-dealers that would be relevant when winding down trading portfolios. Network methodologies such as the one behind CRC are fit-for-purpose for quantifying the strength and direction of such interconnections under economic stress.

Methodology Overview

The CRC model builds on Systemic Risk Monitor⁵ for network model estimates, and on Stressed EDF⁶ for projections of EDFs conditioned only on the macroeconomic scenario. CRC combines the information in the network model and Stressed EDF to arrive at the CRC-EDF forecast paths for financial institution PDs under the compound scenario, which includes the macroeconomic scenario as well as the systemic risk path and counterparty shocks specified by the user. All of the aforementioned methodologies employ the most recent iteration of CreditEdge, the EDF9 measure, as the core input. The construction of this newest iteration of the EDF metric of default probability and differences with the previous version are documented in detail in Chen et al. (2015).

The financial network I use to drive this application of CRC is the Global Megabanks network, which consists of all publicly traded financial institutions whose book assets exceed \$100 billion in value. Historical estimates of this network's structure and associated systemic risk measures are provided in Hughes and Malone (2015), and were updated for this study using the most recent available CreditEdge data. The Global Megabanks network is the natural peer group of global CCAR-sized institutions in general and the institutions subject to the counterparty default scenario in particular. Systemic Risk Monitor estimates the extent and strength of Granger causal connections between

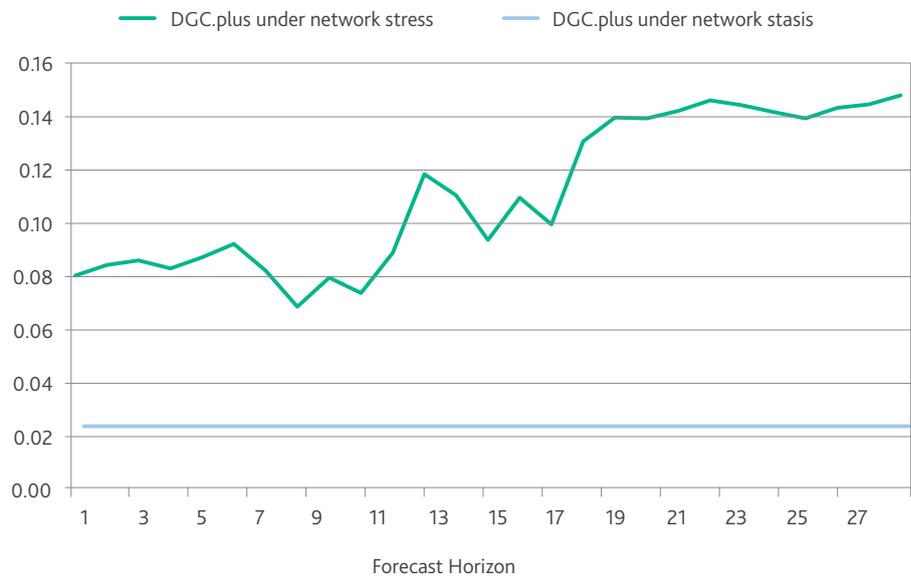
³ An unaffiliated counterparty is generally understood to be one that the bank does not control, is not controlled by the bank, and is not under common control with the bank that is the subject of SCCL regulation.

⁴ Hamilton & Dexheimer, 2016.

⁵ This is documented in Hughes & Malone (2015).

⁶ This is documented in Ferry, Hughes, & Ding (2012).

Figure 1 Interconnectedness measure under network stasis and network stress



Source: Moody's Analytics

the EDF series of all distinct pairs of financial institutions in the network, and this information is passed to CRC for forecasting.

Case Study

The base date for our compound counterparty default scenario is February 2016. For illustrative purposes, I consider shocks to two counterparties: Fifth Third Bancorp and US Bancorp. Both of these firms are subject to CCAR stress tests but are not required to do the counterparty default scenario. I adopt a 27-month time horizon and forecast default probabilities for each month during that period for two firms that are required to do counterparty default scenarios under CCAR: Bank of New York Mellon and JP Morgan Chase.

As stated in the previous section, I measure PDs using the Moody's CreditEdge EDF metric, which provides an estimate of the 1-year ahead probability of default. CRC and Stressed EDF both forecast EDFs under scenarios, and I will refer to these forecasts as CRC-EDFs and SEDFs, respectively. CRC-EDFs are compound scenario forecasts, whereas SEDFs are forecasts conditional on only the macroeconomic component of the scenario. For the same underlying Fed macro scenario, their difference can be attributed to counterparty shocks and the effect of changes in financial sector interconnectedness.

In CRC, counterparty shocks take the form of perfect-foresight PD paths. In other words, the user specifies the time series that a given bank's PD will follow over the course of the forecast horizon, and the CRC algorithm solves for the PDs of other banks endogenously using model averaging to construct forecasts. In this case study, I assume that from month 0 (February 2016) until month 27 (May 2018) of the forecast horizon, the PDs of both Fifth Third Bancorp and US Bancorp follow the path taken by the EDF of Lehman Brothers during the 28-month period from January 2008 to April 2010. During this period, Lehman Brothers' EDF reached the maximum value for financial firms of 35% for the first time in September 2008, or month 8, and remained there for the rest of the time horizon.

Compound scenarios are closed by specifying macroeconomic and systemic risk components. The macro scenario choice set for our purposes consists of the 2016 Fed baseline scenario and the 2016 Fed severely adverse scenario. For the systemic risk scenario choice set, I consider two alternatives: network stasis and network stress. Under network stasis, it is assumed that the DGC.plus interconnectedness measure for the Global Megabanks network will remain at its February 2016 value over the scenario time horizon. Under network stress, in contrast, the DGC.plus measure is assumed to follow the path

it took during the turbulent period from January 2008 to April 2010, to coincide with the same period from which the Lehman Brothers EDF values are sourced for the counterparty shock. The time paths of the DGC.plus measure under network stasis and stress are depicted in Figure 1.

The results are organized into four figures of four plots each. Each individual plot displays the CRC-EDF and SEDF of either Bank of New York Mellon or JP Morgan Chase under a specific compound scenario. Each of the four figures corresponds to a choice of macroeconomic scenario (Fed baseline or Fed severely adverse) and a choice of systemic risk scenario (network stasis or network stress). For a given figure, each of four plots corresponds to one of the four choices of shocked counterparty bank (Fifth Third Bancorp or US Bancorp) and bank whose shocked CRC-EDFs and SEDFs are displayed (Bank of New York Mellon or JP Morgan Chase).

Results

Results are displayed in Figures 2 through 5. Figure 2 shows CRC-EDF9 and SEDF9 paths under the Fed baseline macro scenario and network stasis. Figure 3 shows these series under the Fed severely adverse macro scenario and

more than that of JP Morgan Chase in response to a US Bancorp default. These findings illustrate the role that Credit Risk Cascades might play in counterparty selection in the context of bank stress testing.

It is useful to compare Figures 2 and 4. In Figure 4, the small deviations from Stressed EDF under the Fed baseline scenario are magnified when we increase the level of interconnectedness in the financial network, and the net effect of a Fifth Third Bancorp shock on JP Morgan Chase's EDF forecast turns positive under network stress. This result illustrates the importance of risk transmission via the intermediate counterparties connecting the two banks in the network.

Additionally, a comparison of the right-hand columns of Figures 2 and 4, as well as of Figures 3 and 5, shows that a heightened level of interconnectedness in the financial network would exacerbate the effect of the US Bancorp counterparty shock on both banks. In general, the counterparty-systemic interactions impact BNY Mellon and JP Morgan Chase differently depending on which counterparty we shock. These results illustrate the potential for counterparty shocks to be more damaging

Banks could incorporate private information on their own direct counterparty exposures to further increase the realism of results.

network stasis. Figure 4 shows results for the Fed baseline macro scenario and network stress, and Figure 5 shows results for the Fed severely adverse macro scenario and network stress.

As seen in the left column of Figure 2, a shock to Fifth Third Bancorp has a small negative effect on the CRC-EDF of BNY Mellon relative to its Stressed EDF. The Fifth Third Bancorp shock produces virtually no effect on the CRC-EDF forecast relative to the Stressed EDF for JP Morgan. In contrast to the case of the Fifth Third Bancorp shock, the distress and subsequent default of US Bancorp would nontrivially raise the default probabilities of both JP Morgan Chase and BNY Mellon, even under network stasis. This can be seen in the right column of Figure 2.

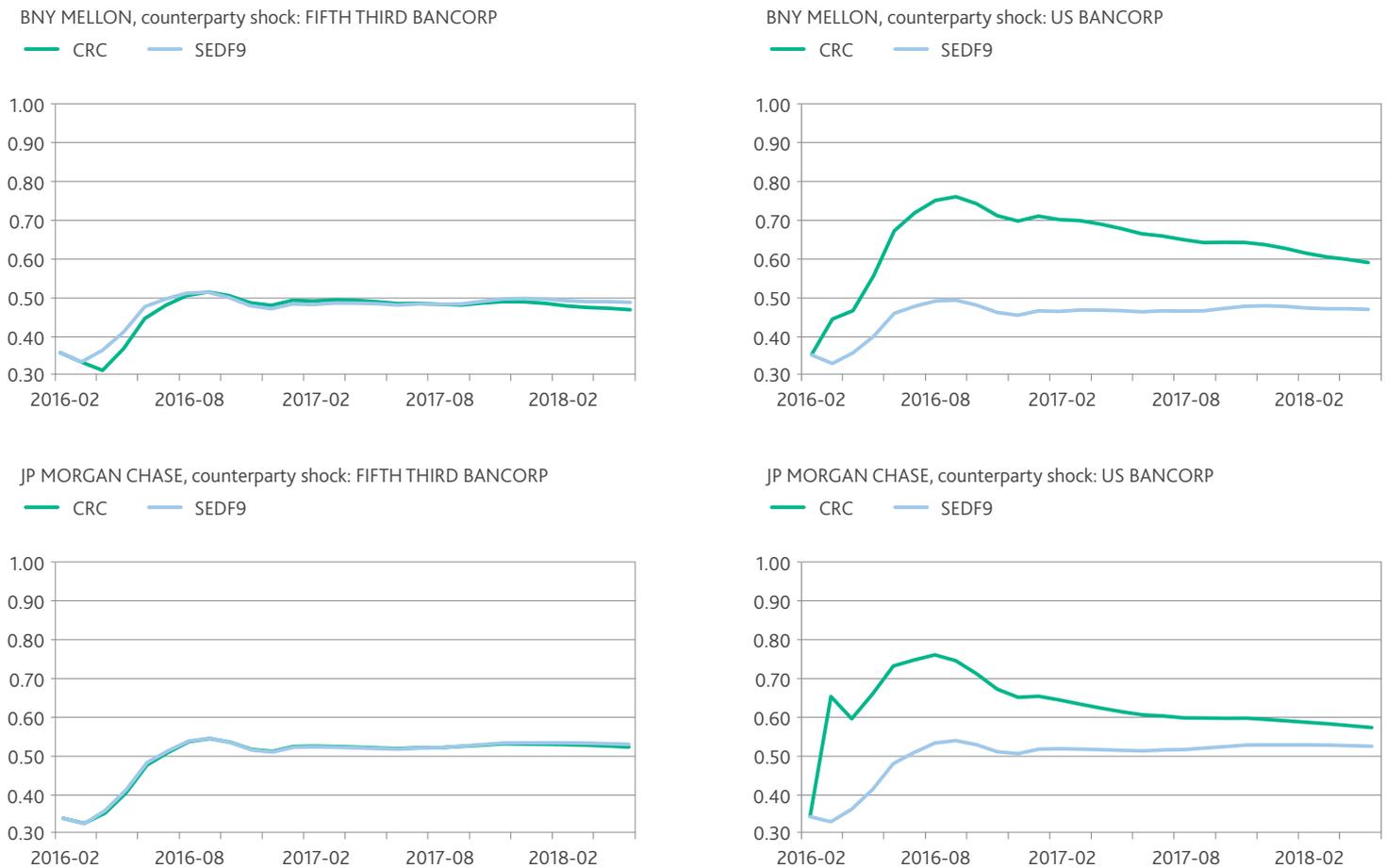
As is evident in the right-hand columns of all four figures, BNY Mellon's EDF would be impacted

when the strength and prevalence of credit risk spillovers in the financial network increase, as is the case during periods of market stress.

We can gain specific insight on the relative contributions of the three components of the compound scenario to the resulting CRC-EDF of a bank by decomposing the PD forecast on a specific date. Let us take as an example the case of BNY Mellon in February 2017, one year after the scenario begins.

In February 2017, BNY Mellon's CRC-EDF under the compound scenario involving (a) the Fed severely adverse macroeconomic scenario, (b) a counterparty shock to US Bancorp, and (c) network stress – located in the upper right corner of Figure 5 – is approximately 4.2 percent. This compares to the Stressed EDF on the same date under the Fed baseline scenario of just

Figure 2 CRC-EDF9 and SEDF9 paths under Fed baseline and network stasis



Source: Moody's Analytics

under 0.5 percent, as shown for example in the upper right corner of Figure 2. Let's decompose this difference of 3.7 percentage points.

Compared to the SEDF under the Fed baseline, adding macroeconomic stress alone accounts for an increase of 2.2 percentage points in the EDF. This gets us to a SEDF under the Fed severely adverse scenario of $0.5 + 2.2 = 2.7\%$, as shown in the upper right-hand corner of Figure 3. From there, the US Bancorp counterparty shock accounts for an additional 1 percentage point increase in the EDF, taking us to 3.7 percent under the scenario involving the Fed severely adverse macro component, the US Bancorp counterparty shock, and network stasis. This result can be seen by inspecting the CRC line in the upper right-hand corner of Figure 3. Layering on financial network stress accounts for the

remaining 0.5 percentage point increase, to bring us to the CRC-EDF of 4.2 percent under the most stressful compound scenario, shown in Figure 5. The relative magnitudes of these contributions to the CRC-EDF accord with intuition about their relative importance in most situations.

CRC does not use information on direct counterparty exposures on banks' books. Rather, it uses information from the last five years of history to estimate the presence and strength of spillovers between the PDs of all pairs of banks in the financial network. This produces real-time, market-based conditional forecasts of financial institutions' PDs under macroeconomic, systemic, and counterparty stress.

Without a doubt, banks could incorporate private information on their own direct

Figure 3 CRC-EDF9 and SEDF9 paths under Fed severely adverse and network stasis



Source: Moody's Analytics

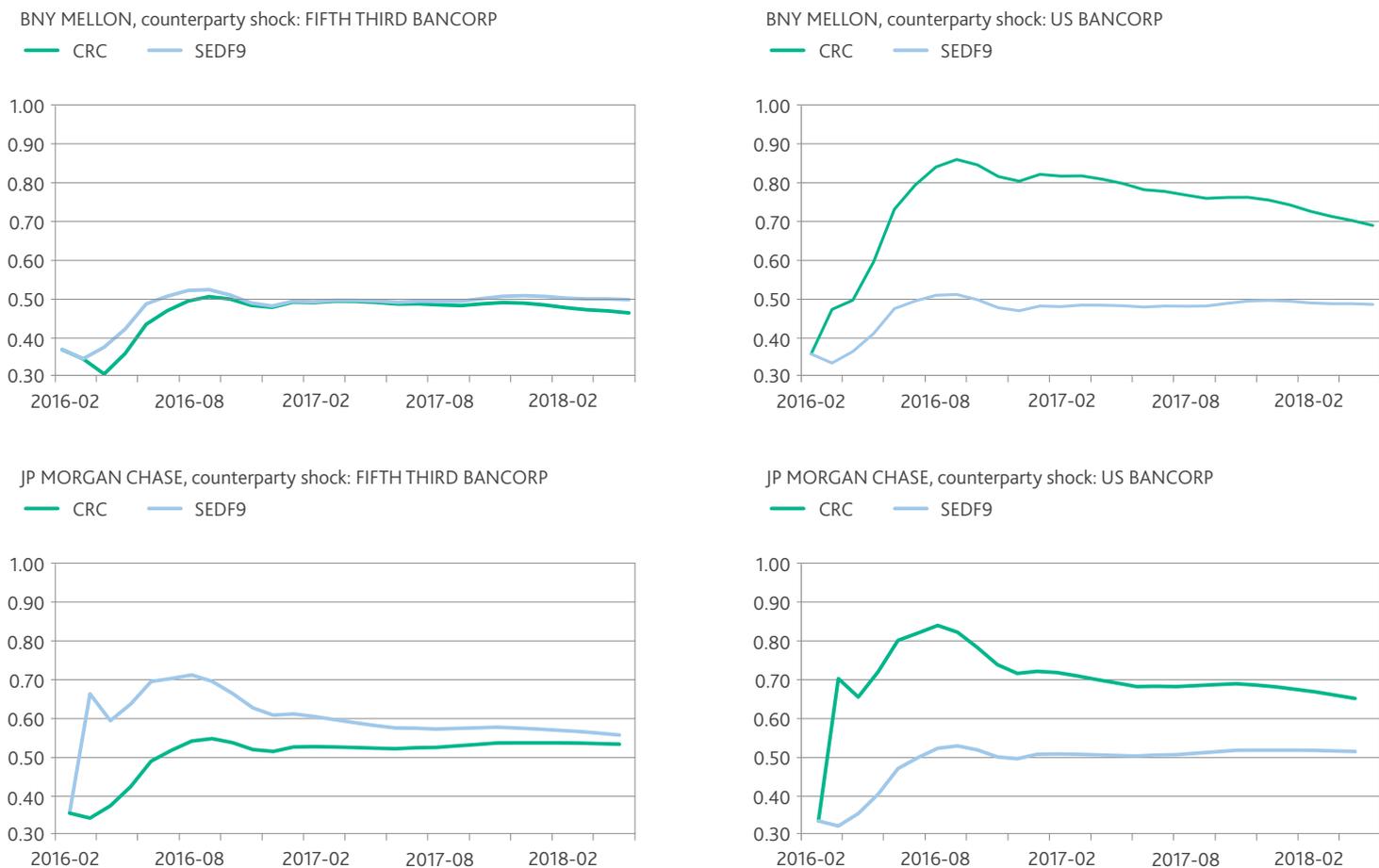
counterparty exposures to further increase the realism of results, such as by shocking their assets directly in the face of a projected counterparty default. The shocked bank assets would flow through the structural formula that drives the bank EDF, and this direct impact could be overlaid on the results provided by CRC. Alternatively, banks could use their own PD series to calibrate the model instead of using CreditEdge EDFs, so long as their PD series are available with sufficient frequency (monthly) and history (at least five years is recommended).

An important advantage of CRC is that it allows risk managers to view counterparty default as the culmination of a process of deteriorating credit quality. Such deterioration manifests itself in the form of persistent increases in the probability of default over time, and CRC allows

the user to take a granular view of how the PDs of different counterparties might evolve over the forecast horizon as their projected default events draw near.

Finally, while banks know who their own counterparties are and their exposure to them, they know comparatively little about their counterparties' counterparties. This lack of knowledge can be most dangerous precisely when it matters most: in times of market stress. Banks take it for granted that the default of a direct counterparty will affect them, but often gloss over the potential for that default (or default by a third party) to take down a second of their important counterparties. CRC uses network models and model averaging techniques to create conditional forecasts of financial firm PDs. In a backtest using data from the financial

Figure 4 CRC-EDF9 and SEDF9 paths under Fed baseline and network stress



Source: Moody's Analytics

crisis, forecasts conditional on appropriately selected compound scenarios proved superior to PD forecasts conditional on macroeconomic stress alone (Malone, 2015).

Conclusion

This article introduces a new solution, Credit Risk Cascades, for the Fed's counterparty default scenario requirement in the latest installment of

systemic risk component, and a counterparty distress or default scenario for one or multiple counterparties of interest. CRC integrates the effects of these three types of shocks together seamlessly to forecast the PDs of all firms in a user-specified financial network.

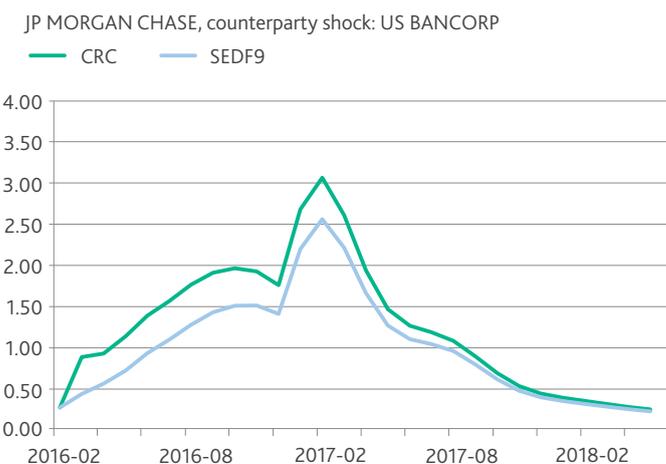
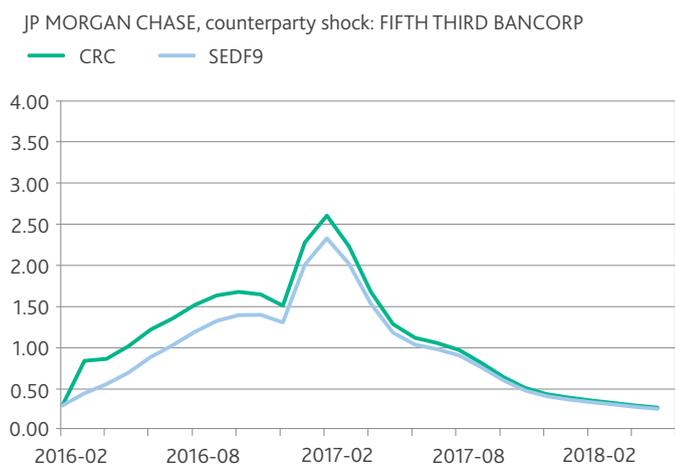
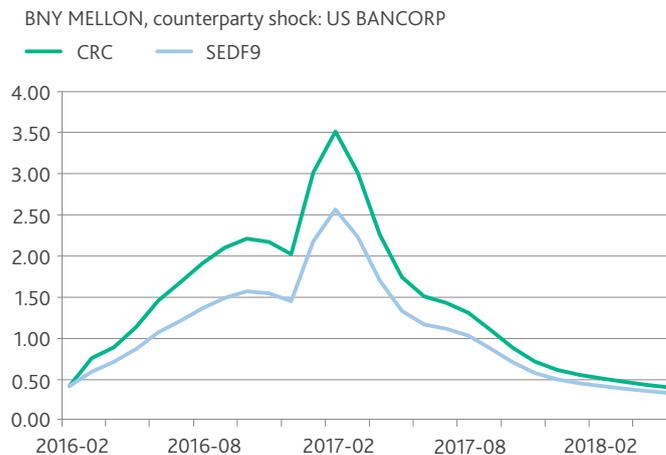
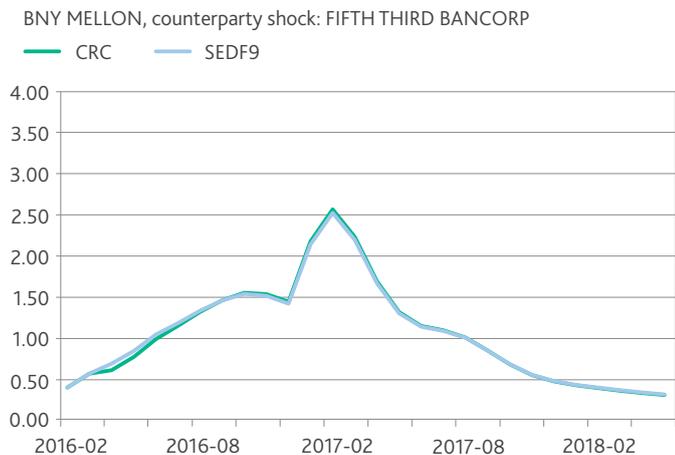
Using data on default probabilities from Moody's CreditEdge, bespoke networks can be

While banks know who their own counterparties are and their exposure to them, they know comparatively little about their counterparties' counterparties. This lack of knowledge can be most dangerous precisely when it matters most: in times of market stress.

CCAR. The CRC model allows users to evaluate the impact on firm default probabilities of compound scenarios. Such scenarios involve a macroeconomic scenario component, a

constructed and shocked for publicly traded financial institutions around the world. CRC can be used to select counterparties for default scenarios in terms of their impact, and in this

Figure 5 CRC-EDF9 and SEDF9 paths under Fed severely adverse and network stress



Source: Moody's Analytics

way can help banks construct more effective counterparty default scenarios. The case study presented here, based on the network of Global Megabanks with at least \$100 billion in assets, shows that both appropriate counterparty selection and a rise in financial sector interconnectedness can cause material changes in projected credit quality for banks subject to CCAR.

Finally, the regulatory applications of CRC are not limited to the counterparty default scenario alone. Single counterparty credit limit (SCCL) regulations and the need to better take into account interconnectedness when devising resolution plans, or "living wills," also provide highly relevant applications for this network-based solution.

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REGULATORY REVIEW

READING THE TEA LEAVES OF RECENT REGULATORY GUIDANCE

By Anna Krayn, Ed Young, and David Little



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Anna is responsible for the business development of stress testing and capital planning solutions. Her clients include a variety of financial services institutions, including those in the insurance, banking, and consumer finance sectors across the Americas.



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David Little
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David is responsible for helping financial institutions worldwide with their enterprise risk management, liquidity, and stress testing solutions. Since joining Moody's in 2002, David has been Managing Director in the Product Strategy group, responsible for a global portfolio of research, data, and analytic products across all fixed income asset classes, led end-of-day pricing business at Moody's Evaluations Inc., and headed the Global Structured Finance Sales team at Moody's Analytics.

In this article, we review the common themes reflected in recent regulatory guidelines released by the Federal Reserve and the BCBS. Regulators are putting greater emphasis on: unified risk management infrastructures, enhanced capital planning and ALLL projections, and improved decision-making with sensitivity and scenario analysis. Banks will need to reevaluate and update internal processes in order to align with new regulations.

December 2015 was a busy month for regulatory agencies and global standard setters. Throughout 2015, the industry had been waiting for additional guidance on high-impact topics including capital planning and allowance methodologies, and in the final stretch of the year, both the Federal Reserve and the Basel Committee on Banking Supervision (BCBS) complied. This paper will primarily focus on common themes in these two releases:

1. The Federal Reserve's "Guidance on Supervisory Assessment of Capital Planning and Positions" (SR 15-18 and SR 15-19)
2. The BCBS's "Guidance on Credit Risk and Accounting for Expected Credit Losses"

Recent guidance across a range of jurisdictions builds on previously voiced recognition that technology systems at many banks need

recent regulatory guidance and proposals, there are themes that will compel financial institutions to take another critical view of their information systems. Additionally, these publications confirm that scenario-driven analysis is spreading from stress testing to business-as-usual risk management, including allowance processes. While much of the recent guidance will require interpretation over the coming months, we review the common themes, summarized in Figure 1, and their interconnectedness across organizational silos of the finance and risk functions.

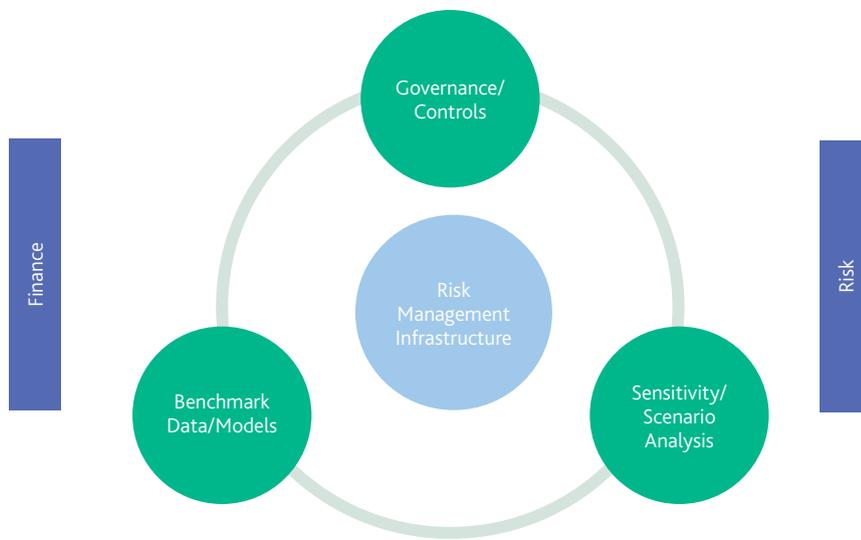
A common thread consistently emphasized by the regulators is for financial institutions to improve risk identification and measurement at the enterprise level. The traditional delineation of responsibilities between chief financial officers and chief risk officers has led to a segregation

A common thread consistently emphasized by regulators is for financial institutions to improve risk identification and measurement at the enterprise level.

improvement. Technology infrastructure has been stifled by legacy mergers and acquisitions that led to tactical system integrations, and by patched solutions to address immediate regulatory requirements. We observe that in

of duties that has greatly enhanced risk management practices at large firms. However, the changes have also contributed to fragmented risk reporting that in turn obfuscates the "top of the house" view of a firm's risk profile.

Figure 1 Unification of Risk Management Infrastructure



Source: Moody's Analytics

THEMES FOR FIRMS TO CONSIDER:

1. Focus on governance and internal controls to unify risk management infrastructure.
2. Leverage benchmark data and models to support and enhance your capital planning and ALLL projections.
3. Consider a range of potential outcomes using sensitivity and scenario analysis to improve decision-making.

Managing the complexity of data and models across business lines and developing a comprehensive strategy that is aligned with a firm's risk appetite is a challenging task. To maintain an effective process, management must focus on organizational planning, communication, and implementing robust information systems. As a result, a need for cross-organization coordination is imperative

to identify and manage risk while maximizing efficiency. In this paper, we will address three key themes that are elements in achieving these objectives.

Theme #1: Focus on governance and internal controls to unify risk management infrastructure.

When considering how to meet the spirit of the recent regulatory standards, viewing the various

standards through the lens of an effective governance framework can help identify connection points within the landscape of the organization. This first theme is a natural place to begin, because governance is the glue that unequivocally binds together the components of a bank's enterprise risk management system.

Capital Planning Guidance Leading to Infrastructure Reassessment

In its 2009 report for the Financial Stability Board, the Senior Supervisors Group stated: "Supervisors believe that considerable work remains in the areas of governance, incentives, internal controls, and infrastructure."¹ In the subsequent years, supervisors have become more and more vocal about their expectations for governance. The recent Fed guidance notes that firms must have "integrated management information systems, effective reporting, and change control processes." This message can be directly linked with the concurrent Agency Information Collection Proposal² that stated "all respondents to the FR Y-14A/Q/M reports should meet the Federal Reserve's expectations for internal controls." The proposal was recently approved³ and requires Chief Financial Officers of LISCC⁴ firms to attest to the quality of FR Y-14A/Q/M reporting "in order to encourage large firms to improve their systems for developing data necessary for the stress tests and CCAR." These latest releases can be viewed as an effort by the regulators to remediate lingering issues initially outlined in the wake of the financial crisis.

At many banks, internal audits of the stress testing processes have prompted management to take initial steps to trace data lineage for each FR Y-14A report line item. However, a significant challenge for banks to overcome is the array of decentralized systems (often dozens) that feed the capital planning process. The governance of

the process is challenged by the multitude of handoffs required to complete risk management and regulatory reports. The ad hoc nature of these handoffs and the resulting loss of data granularity, often through reliance on Excel-based manual processes, create operational risk. Increased regulatory emphasis on the active role of internal audit is creating constant pressure for firms to enhance their information systems. The adopted changes to the FR Y-14A/Q/M reports create additional pressure to enhance information systems, albeit at a staggered schedule, as follows:

1. Beginning with FR Y-14 M/Q/A reports as of December 31, 2016, LISCC firms will attest to internal controls.
2. Beginning with monthly, quarterly, and semi-annual reports as of January 31, 2017, there will be an additional attestation to the accuracy of the reported data, conformance with FR Y-14 instructions, and agreement to report material weaknesses and any material errors.
3. Beginning December 31, 2017, LISCC firms will attest to the effectiveness of internal controls around the FR Y-14A/M/Q (as a replacement to attestation described under #1 above).

As a result of the new requirements, many firms will need to reduce the number of ad hoc manual processes, replacing them with automated solutions that serve as a foundation for a transparent and auditable capital planning process, credible stress testing results, and risk appetite framework quantification.

Revised Allowance Processes Guidance Leading to Infrastructure Reassessment

Concurrently, accounting standard-setters around the globe are in the process of adopting

1 Senior Supervisors Group, *Risk management lessons from the global banking crisis of 2008*, October 2009

2 Federal Register / Vol. 80, No. 179 / Wednesday, September 16, 2015 / Notices, *Request for Comment on Information Collection Proposal*.

3 Federal Register / January 14, 2016 / *Capital Assessments and Stress Testing information collection*.

4 Firms supervised by Large Institution Supervision Coordinating Committee of the Federal Reserve. As of this writing, the LISCC Portfolio includes American International Group, Inc., Bank of America Corporation, The Bank of New York Mellon Corporation, Barclays PLC, Citigroup Inc., Credit Suisse Group AG, Deutsche Bank AG, General Electric Capital Corporation, The Goldman Sachs Group, Inc., JP Morgan Chase & Co., MetLife, Inc., Morgan Stanley, Prudential Financial, Inc., State Street Corporation, UBS AG, and Wells Fargo & Company.

standards that aim to address the many documented failures of the incurred loss model by requiring forward-looking credit loss models. The global IFRS 9 standard was published in July 2014, and in the US, the Financial Accounting Standards Board's Current Expected Credit Loss (CECL) standard is expected to be released in June 2016. With a targeted implementation in 2018 for IFRS 9 and essentially 2020 for CECL, we are only beginning to see the impact these changes will have on processes and controls, and therefore information systems at banks.

The move to forward-looking measures to inform the allowance will push firms to better integrate allowance methodologies with stress testing processes. That said, initially, the greatest challenge for the banking industry will be interpretation of the standards. In December, the BCBS published Guidance on Credit Risk and Accounting for Expected Credit Losses (ECL)

highlights that the ECL framework may lead to significant investment:

"While the implementation of ECL accounting frameworks may require an investment in both resources and system developments/upgrades, standard setters have given (or are expected to give) firms a considerable time period to transition to the updated accounting requirements. On that basis, the Committee has significantly heightened supervisory expectations that internationally active banks will have a high-quality implementation of an ECL accounting framework."

The implications are significant, and are summarized in Figure 2.

Today, many financial institutions employ different systems and processes across their accounting, capital planning, and credit risk management groups. This leads to different

Figure 2 Key considerations that will impact implementation and systems:

1. Use of economic scenarios may cause volatility of the provision expense, driving a need to run a multitude of scenarios (as highlighted in the IFRS Transition Resource Group staff paper) more frequently than current scenario analysis practices.⁵
2. Depending on interpretation, the ECL-driven allowance calculation may require more granular data, which will in turn put pressure on processing time.
3. Capital calculation and reporting will require monthly reconciliation, putting pressure on monthly data collection / cleansing activities and processing time.
4. Auditability of the results and transparency of the process is key, in particular since "the Committee ... expects management to apply its experienced credit judgment to consider future scenarios ... and the resulting impact on the measurement of ECL" and use of temporary adjustments and overrides will require "appropriate documentation, and subject to appropriate governance processes."
5. Since there is obvious commonality in data and processes used for allowance and capital adequacy calculations, "The Committee expects banks to leverage and integrate common processes" to "reduce cost and potential bias and also encourage consistency in the measurement, management and reporting."
6. IFRS 9 stage allocation (i.e., the movement from "bucket" 1 to "bucket" 2, and to "bucket" 3) will create significant workflow requirements.

Source: Moody's Analytics

⁵ Transition Resource Group for Impairment of Financial Instruments, Incorporation of forward-looking scenarios, December 11, 2015.

Figure 3 Differentiated standards for external models and data

	LISCC and Large, Complex Firms	Large, Noncomplex Firms
Use of External Data in Model Development	<p>Permitted in some cases:</p> <p>"A firm should use internal data to estimate losses and PPNR as part of its enterprise-wide stress testing and capital planning practices. However, it may be appropriate for a firm to use external data if internal data limitations exist as a result of systems limitations, acquisitions, or new products, or other factors that may cause internal data to be less relevant for developing stressed estimates."</p>	<p>Permitted:</p> <p>"A firm may use either internal or external data to estimate losses and PPNR as part of its enterprise-wide stress testing and capital planning practices."</p>
Challenger Model Expectations	<p>Expected:</p> <p>"A firm should use benchmark or challenger models to assess the performance of its primary models for all material portfolios or to supplement, where appropriate, the primary models."</p> <p>"A firm should also use benchmark models during validation as an additional check on the primary model and its results."</p>	<p>Not expected:</p> <p>"... A firm should use a variety of methods to assess performance of material models and gain comfort with material model estimates. However, a firm is not expected to use benchmark models in its capital planning process."</p>
Use of Vendor Models	<p>Permitted with "heightened expectations for... controls around the use of vendor models."</p>	<p>Permitted, with expectations that "any vendor or other third-party models [used] are sound, appropriate for the given task, and implemented properly."</p>

Source: Moody's Analytics

data hierarchies and levels of granularity. Ongoing work to interpret the IFRS 9 standard and eventual CECL standard will drive future systems requirements, but it is evident that in many instances current information systems will not suffice. There will be opportunities in some cases to leverage common data and models across an organization. Enhancing these linkages will improve governance, transparency, and efficiency for firms. However, many firms will not have the technology infrastructure to seamlessly implement efficient processes. While existing Basel and Stress Testing / Capital Planning infrastructures may serve as starting points, both will need enhancement to meet the new standards. Moving forward, governance expectations from regulators across the globe will guide firms to strengthen the symbiotic relationship between stress testing frameworks and business as usual risk management systems.

Theme #2: Leverage benchmark data and models to support and enhance capital planning and ALLL projections.

The use of external data and models is common practice for financial institutions of all sizes. Reasons to employ external data or third-party models include:

1. The cost efficiency of leveraging industry-tested solutions versus those developed in-house
2. The time savings of implementing an out-of-the-box or customized third-party tool
3. The supplementation of internally developed solutions that may have insufficient internal data for modeling due to portfolio changes or lack of internal historical data

Additionally, external data and models are often used as benchmarks to meet industry model risk management standards. However,

bank supervisors' more rigorous model risk management expectations have raised the bar for implementing these solutions with stricter "fit for use" criteria.

In the "Assessment of Capital Planning and Positions" guidance, the Fed aimed to clarify how it tailors expectations for large and complex firms versus noncomplex firms (e.g., generally large regional banks with assets between \$50 billion and \$250 billion). Figure 3 is a summary of the differentiated standard as it relates to the use of external data and models. It highlights areas subject to interpretation. For example, noncomplex firms, through conversations with the three regulatory agencies, will need to ascertain the interplay between Principle 2 of the interagency guidance on stress testing that requires "multiple conceptually sound stress testing activities and approaches" and SR 15-19 that as a minimum expectation eliminates the mandate for benchmark model use.

There are many open questions on the use of external data and models with respect to ECL-based allowance implementation, as well. BCBS guidance on ECL states that robust allowance frameworks will generally "consider the relevant internal and external factors, that may affect ECL estimates, such as ... changes in industry, geographical, economic and political factors." Some types of models applicable under IFRS 9 and expected under CECL may require more granular historical data with longer time series than available internally (to establish relationship with macroeconomic variables). The introduction of forward-looking credit loss models will inevitably increase the volatility of allowance calculations under ECL. The increased complexity of the calculation, coupled with the volatility of a forward-looking measure will have a direct impact to earnings. Thus, the lack of recognition for the increased allowance in key capital ratios will likely drive firms to conduct additional sensitivity analysis around key assumptions and increase the use of benchmarks. At the same time, any use of external tools will be subject to both an external and internal audit assessment of "reasonable and supportable tools."

Theme #3: Consider a range of potential outcomes using sensitivity and scenario analysis to improve decision-making.

In the wake of the financial crisis, risk managers have been inundated with questions from regulators about how their bank gauges uncertainty and how they incorporate uncertainty into their pro-forma estimates. However, until recently, regulators released very little public guidance on how banks should specifically address uncertainty and include "difficult to quantify" risks in their stress scenarios. The recent publications from the Fed and the BCBS continue to highlight uncertainty as a concern. Fortunately, the Fed has provided some details for minimum expectations on the topic (as it pertains to Capital Planning). While the new guidance leaves questions as to how to incorporate various difficult-to-quantify risks, there is a clear theme of using sensitivity and scenario analysis to provide perspective on the pro-forma results. Banks are expected to leverage scenario analysis and sensitivity analysis to broadly capture uncertainty in their estimates due to the inherent limitations embedded within a single deterministic stress scenario.

For capital planning, the Fed also outlined the need to address the uncertainty of model outputs through sensitivity analysis of key assumptions. These expectations span the entire capital planning process, and include identifying and sensitivity testing key assumptions in individual models, as well as collectively at the aggregated level to "inform senior management and the board of directors about potential uncertainty" associated with the firm's projections. This will require firms to ensure they have strong assumption management processes in place, and also an established, transparent and auditable process to "justify, document, and appropriately challenge" assumptions.

Scenario analysis has emerged as an effective forward-looking tool to manage risk. However, the time, effort, and technology needed to conduct a bottom-up assessment of many different scenarios is daunting. For allowance calculations, it appears that the BCBS and the

IASB⁶ are expecting banks to run a multitude of scenarios to ensure that ECL calculations are sound. Additionally, to meet the Fed's expectations related to scenario design, banks will need to run more scenarios to "collectively address all material risks to which the firm is exposed over the course of an annual planning cycle." The Fed discusses the importance of utilizing multiple scenarios "to assess a broad range of risks, stressful conditions or events," and evaluating its impact on the capital position of the firm. New, efficient tools will need to be developed to address these expectations and ensure banks are capturing all material risks in their bottom-up stress scenario analysis. Options to consider include applying simulation-driven portfolio management tools for enterprise-level sensitivity analysis and developing less granular top-down stress scenario models that are based on the firm's more detailed bottom-up approaches.

Conclusion

Contrasting recent news articles with the recently published regulatory guidance suggests that while front offices buzz with excitement of fintech and blockchain, back offices of financial institutions continue to need significant infrastructure improvements. The libretto of how banks move from the current state to the end-state infrastructure that meets the "new normal" of regulatory expectations is still being written. That said, the themes have been framed

and will define parameters for technology enhancements.

In 2016, banks will need to critically assess whether existing systems across risk and finance functions support compliance with the upcoming capital planning and accounting guidance. This assessment will need to include a multitude of facets, including data lineage capabilities, operational efficiency, linkage to business-as-usual processes, robust internal controls, and the ability to support a range of end users. Systems will need to be able to trace loss estimates back to their sources (including loss models and overlays), as well as incorporate critical "top of the house" capabilities, such as establishing the linkage between the firm's risk appetite statement and the risk profile of the current positions and the pro-forma estimates.

For many institutions, this will mean kicking off multi-year transformational projects that will shape the future of their organization. Understanding the key linkages between finance and risk will be important in developing information systems that can meet the needs of the many internal stakeholders. It may take years to fully realize the value of these changes. However, firms will have the opportunity for many "quick wins" that will lead to cost savings and better business decisions along the way, and that will ultimately lead to using their stress testing processes in a more efficient and strategic manner.

⁶ Transition Resource Group for Impairment of Financial Instruments, *Incorporation of forward-looking scenarios*, December 11, 2015.

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ANACREDIT: A NEW APPROACH TO BANKING REGULATORY COMPLIANCE

By Michael van Steen



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The European Central Bank's Analytic Credit (AnaCredit) regulation significantly expands European banks' regulatory reporting architecture and will drive more granular data reporting. It is expected that this granular reporting will likely be replicated in many, if not most, regulatory jurisdictions. To help better understand this specific effort and its larger consequences, this article summarizes AnaCredit's rationale, presents its historic and future timelines, and highlights its features and challenges. The article concludes by offering some guidance on how institutions can best meet the challenges of and benefit from the work required by AnaCredit.

During the crisis, eurozone banks were unable to identify and aggregate credit exposures, despite the widespread availability of credit data and elaborate reporting architectures.

Since the banking crisis, there has been an extensive overhaul of the global banking regulatory framework. The overhaul has been led by Basel III but also encompasses regimes including IFRS 9 and stress testing.

An overarching theme of the changes is much more extensive reporting, and banks are now required to create a much wider set of compliance reports. They must complete significantly more work to consolidate data, calculate results, and submit reports to regulators, using a predefined format.

Analytical Credit Datasets, or AnaCredit for short, is a new regulatory framework that will be introduced in the eurozone. It will take a different approach to regulating banks. Rather than submitting a report for review, it calls

for banks to submit comprehensive, granular datasets for detailed analysis by regulators. AnaCredit will run in parallel to the existing frameworks.

AnaCredit will require significantly more exposure-by-exposure credit risk information, such as collateral values and probabilities of defaults (PDs), as well as significantly more accounting metrics. It will be rolled out in phases starting in September 2018, and will feature results and provisions computed according to the new IFRS 9 accounting standard being introduced in January 2018.

Although AnaCredit will be for the eurozone, it is anticipated that its granular approach will be replicated in most regulatory jurisdictions.

This article summarizes the rationale behind

AnaCredit, as well as relevant timelines, features, and challenges. It concludes by offering some guidance on how institutions can best meet AnaCredit challenges and benefit from the work required.

Background

Credit institutions around the world are in near-constant communication with their regulators. This communication provides regulators with information about institutions' liquidity conditions, capital levels, and credit exposures. Lessons from the banking crisis have driven

other element, AnaCredit, is a much more comprehensive regulatory initiative which emphasizes more frequent and much more granular data submissions.

The goal of AnaCredit – to create a eurozone-wide Central Credit Registry – will be a new development in the European regulatory landscape. Before this, many national rules and technology hurdles inhibited the aggregation of data outside of individual states. Post-crisis, the arrival of a European Union (EU) banking union and the emergence of new powerful statistical

AnaCredit will fundamentally transform the European regulatory landscape.

regulators to have access to more specific, credible, and timely information so they can identify and address real and potential issues.

During the crisis, eurozone banks were unable to identify and aggregate credit exposures, despite the widespread availability of credit data and elaborate reporting architectures. Credit exposure data gaps around particular branches, or the total borrowings of a firm across institutions, persist to this day. In addition, the constantly evolving regulatory reporting architecture is a significant burden on regulated institutions, which are responsible for both reporting their data and monitoring regulatory changes.

To address these problems, the European Central Bank (ECB) has established a high-level roadmap. One element focuses on incremental efforts, such as common data dictionaries and a common data reporting framework. The

and data-handling technologies ("big data") have enabled the creation of AnaCredit.

AnaCredit will fundamentally transform the European regulatory landscape. It will push frequent, fine-grained, and comprehensive data submissions to the center of regulation and compliance. Regulators will use this data as their primary means to monitor and mitigate credit issues at the institutions they regulate. It is critically important for these credit institutions to implement the systems and data processes needed to successfully deploy AnaCredit.

AnaCredit Overview

The European System of Central Banks (ESCB), comprised of the ECB and the National Central Banks (NCBs) of EU member states, is driving the AnaCredit framework.

AnaCredit builds on Central Credit Registers (CCR) now used in many eurozone countries by NCBs to collect credit data and monitor and

manage credit risk. Financial institutions under the Single Supervisory Mechanism (SSM) will need to submit much more granular data, on more obligors, more frequently to their NCBs. The NCBs, in turn, will provide this data to the ECB to form AnaCredit.

AnaCredit Stages

The AnaCredit will be established in stages. The first stage will start on September 1, 2018. Submissions during this first stage will include information on debtors who are legal entities and who have instruments which 1) give rise to credit risk and 2) total €25,000 or greater. All credit instruments of these debtors will be reported.

Two subsequent stages, though not currently spelled out in the regulation, are likely to be implemented in 2020 and 2021, respectively. Stage Two will likely include information on instruments such as financial derivatives, other accounts receivables, and off-balance sheet exposures. Stage Three will likely include anonymized information on mortgage loans to households and credit granted to sole proprietors.

AnaCredit Scope

Credit institutions operating within the eurozone, along with the resident foreign branches of credit institutions, are subject to AnaCredit rules. It is not anticipated that institutions would have to report loans booked at a branch headquartered outside the eurozone; however, countries may have discretion over this requirement. Additionally, in some circumstances, national central banks may opt to exempt certain small credit institutions from reporting.

AnaCredit Data and Reporting

The key highlight of AnaCredit is that data is taking the place of reporting. Instead of specifying a report layout, the proposed regulation specifies data tables and data fields that need to be reported. Credit instruments are the centerpiece of this proposed data model, and the data is proposed to be collected on a loan-by-loan and borrower-by-borrower basis.

The regulation proposes reporting a minimum of 95 credit risk and accounting attributes, along with seven identifiers. However, at national discretion, some authorities may require reporting of additional data attributes, potentially 100 or more data elements for each credit exposure.

AnaCredit Data

The ECB proposes reporting 10 interrelated datasets, each organized around individual instruments or a single counterparty, as shown in Figure 1. All datasets would include internal identifiers, which are intended to have no meaning outside of AnaCredit. These internal identifiers would allow data to be cross-referenced and uniquely identified.

AnaCredit Reporting Frequency

The proposed reporting frequency for these data types is monthly, quarterly, or when the data changes. A significant challenge will be to keep track of the changes in data, to avoid reporting the data set twice, before and after the change.

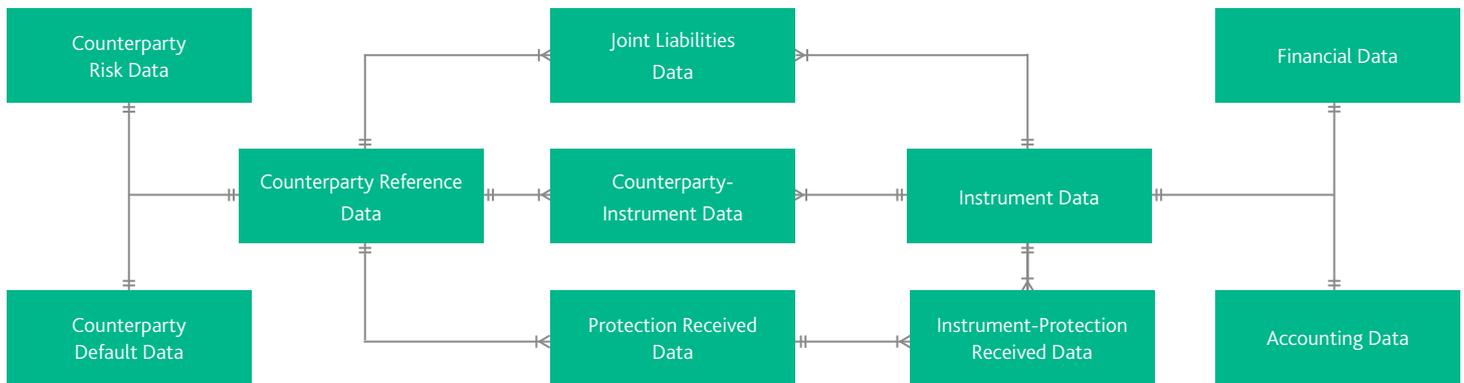
Complementary Efforts

AnaCredit will require extensive harmonization with other frameworks with regard to data and reporting concepts and definitions. Related frameworks include:

- » The European Reporting Framework (ERF): This harmonization of primary regulatory reporting covers credit, balance sheet, income, and interest rate reporting, among others.
- » The Banks' Integrated Reporting Dictionary (BIRD): This covers common banking data terminology and data transformations.
- » The ECB's Single Data Dictionary (SDD): This defines common data terminology and transformations for use in reporting within the ECB and the NCBs.
- » The ongoing LEI effort to standardize obligor identification.

Banks will need to utilize advanced analytic and "big data" tools to manage this significantly increased data.

Figure 1 AnaCredit datasets



Data Set	Composition
Instrument Data	Includes attributes such as instrument type, inception date, payment frequency, settlement date, and interest rate-related data
Financial Data	Contains an instrument's financial characteristics, such as drawn and undrawn amounts for credit lines
Accounting Data	Contains an instrument's accounting characteristics, such as the accounting classification of the instrument
Counterparty Instrument Data	Contains information about the counterparties of each instrument
Joint Liabilities Data	Contains the joint liability amount for each debtor in relation to an instrument, for any instrument where each debtor is liable at national discretion
Instrument Protection Received Data	Describes all the protection received in relation to the protected instrument
Protection Received Data	Includes protection type and value, approach and date of protection valuation, and real estate collateral location, as well as the original value, valuation date, and maturity date of the protection
Counterparty Reference Data	Contains various information about a counterparty, ideally including a unique counterparty identifier, like a Legal Entity Identifier (LEI), for each counterparty in the instrument
Counterparty Risk Data	Contains counterparty risk data as probability of default
Counterparty Default Data	Allows for a quick identification of counterparties in default, and includes default status and date of default

Source: European Central Bank

AnaCredit Changes and Challenges

AnaCredit presents institutions with significant technological, data management, and operational challenges, including the following:

- » **Consolidating and processing data from different sources in the institution.** AnaCredit requires banks to consolidate and process data from across a range of systems which can be highly complex. Banks will likely need to revisit their processes and data aggregation tools.
- » **Maintaining data quality.** AnaCredit requires an extensive set of information for individual credit exposures. Some information may be either very hard to find, or never collected in a systematic fashion. Banks will need to carefully consider how to fill in, proxy, or otherwise account for this missing data. This will likely be subject to detailed regulatory scrutiny.
- » **Implementing accurate and robust reporting systems.** Banks must ensure the data assembled for AnaCredit produces results that are consistent with all other reports of the same information, including COREP and Pillar 3 disclosures. The size and frequency of AnaCredit submissions requires a reliable and robust reporting platform.

challenges for banks, as they will likely need to enhance their data management and reporting processes. Banks have already made extensive investments in managing compliance with Basel III, stress testing, and capital planning, and now will need to do the same with AnaCredit.

There may be a light at the end of the tunnel. The ECB hopes that the comprehensiveness and granularity of AnaCredit will help reduce the volatility of reporting changes. This should help to reduce reporting implementation costs going forward. The ECB also hopes that banks will benefit from the standardized loan-level taxonomy of AnaCredit which will simplify the acquisition of new entities and ease integration of this data into new systems.

Banks also hope that modern data and statistical management tools that can scale to analyze terabytes and petabytes of volatile data can be used in AnaCredit initiatives.

A Path Forward with AnaCredit

A key challenge for banks is finding a way to balance the need for expanded and more closely monitored data requirements and more frequent reporting, with an efficient and effective data management and reporting process.

The key highlight of AnaCredit is that data is taking the place of reporting.

- » **Aggregating and presenting group and standalone data.** AnaCredit focuses on individual exposures as well as differing national Central Credit Registries across the eurozone. A bank with an obligor with borrowings across several countries in the eurozone will need to report these exposures in different ways on a country-by-country basis.
- » **Complex implementation.** AnaCredit significantly expands the data that institutions must provide. This presents

An optimal solution for implementing AnaCredit should deliver the following results:

- » The seamless consolidation of risk and finance data from different sources into a central internal repository
- » Accuracy and consistency so that common data definitions and calculations shared between AnaCredit, Basel III, and IFRS are always consistent
- » Automation to drive efficient, accurate, and cost-effective compliance and reporting

At its core, the optimal solution needs to consolidate all the loan-level and counterparty data into a unified data set to provide solid foundations for AnaCredit calculations and reports. It needs to have powerful data

AnaCredit reporting templates to streamline the reporting process and assure accuracy.

This consolidated approach to AnaCredit reporting can lend itself to integrated reporting for Basel III, IFRS 9, and stress testing.

At its core, the optimal solution needs to consolidate all the loan-level and counterparty data into a unified data set.

cleansing capabilities, so managers can quickly identify and address data that does not meet the bank's data quality standards. The solution also needs to be open and flexible, so it can import risk and balance sheet information quickly and easily.

The solution also needs to have a fully integrated, credit risk-weighted asset calculation engine so banks can compute their credit risks at loan level. Furthermore, the solution needs to have an integrated IFRS 9 calculation engine that can calculate the expected credit loss provisions at loan level.

Finally, the solution should leverage a powerful, integrated data publishing solution that can consolidate risk, finance, and other results from across the business to meet the frequent reporting requirements of AnaCredit. The solution should also allow banks to apply

Consolidated reporting helps a bank deliver a consistent, accurate message across multiple regulatory regimes, while leveraging a single data source to deliver cost-effective regulatory compliance and reporting.

Conclusions

AnaCredit is a major change to eurozone reporting architectures as it moves regulatory compliance away from ever-changing reports to a more data-rich submissions framework.

In the short- to medium-term, focus should be on ensuring reporting architecture is as efficient and transparent, both internally and externally, as possible.

In the longer term, there is potential for reduced reporting costs due to more stable reporting processes, greater use of automation, and the application of powerful new tools.

AnaCredit project, European Central Bank, 2016.

Draft: Regulation on the collection of granular credit and credit risk data, European Central Bank, December 2015.

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GLOSSARY OF TERMS

AIRB	Advanced Internal Ratings-Based	FIRB	Foundation Internal Ratings-Based
ALLL	Allowance for Loan and Lease Losses	FVOCI	Fair Value through Other Comprehensive Income
API	Application Program Interface	FVTPL	Fair Value through Profit or Loss
ASC	Accounting Standards Codification	GAAP	Generally Accepted Accounting Principles
BCBS	Basel Committee on Banking Supervision	GDP	Gross Domestic Product
BIRD	Banks' Integrated Reporting Dictionary	GL	General Ledger
BHC	Bank Holding Company	IAS	International Accounting Standard
CCAR	Comprehensive Capital Analysis and Review	IASB	International Accounting Standards Board
CDF	Cumulative Distribution Function	IFRS	International Financial Reporting Standard
CECL	Current Expected Credit Loss	IRB	Internal Ratings-Based
COREP	Common Reporting	LEI	Legal Entity Identifier
CRC	Credit Risk Cascades	LGD	Loss Given Default
CRE	Commercial Real Estate	LISCC	Large Institution Supervision Coordinating Committee
DFAST	Dodd-Frank Act Stress Tests	LTV	Loan-to-Value
EAD	Exposure at Default	NCO	Net Charge-Off
EBA	European Banking Authority	PCAOB	Public Company Accounting Oversight Board
ECB	European Central Bank	PD	Probability of Default
ECL	Expected Credit Loss	PDF	Probability Density Function
EDF	Expected Default Frequency	PIT	Point-in-Time
EIR	Effective Interest Rate	PPNR	Pre-Provision Net Revenue
EL	Expected Loss	QE	Quantitative Easing
ERF	European Reporting Framework	QIS	Quantitative Impact Study
ESCB	European System of Central Banks	SDD	Single Data Dictionary
EU	European Union	SEC	Securities and Exchange Commission
FAS	Financial Accounting Standard	SEDF	Stressed Expected Default Frequency
FASB	Financial Accounting Standards Board	SCCL	Single Counterparty Credit Limit
FATCA	Foreign Accounting Tax Compliance Act	SSM	Single Supervisory Mechanism
FCAG	Financial Crisis Advisory Group	TTC	Through-the-Cycle

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