Moody's Analytics

IFRS 9: Addressing Validation and Benchmarking challenges

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Agenda

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Current challenges and growing demands

IFRS 9 & Beyond

Overall Objective : Finalize IFRS 9 project and move into BAU mode

2017 H2

2018

IFRS 9 methodologies

- Fine-tune lifetime PD and LGD methodologies
- Finalize stage allocation criteria
- Set-up approval and review committees
- Coverage of smaller/specialized portfolios (treasury/investment, structure finance)
- Parallel run
- Latecomers for IFRS9 tactical implementation

IFRS 9 Compliance

- Parallel run
- **Validation/Benchmarking**
- Discussiosn with external auditor
- User training for IFRS 9 in the BAU
- **Familiarity of senior management with impairment methodologies, dynamics and volatility**
- Preparation of 2018 ST and ICAAP exercises

IFRS 9 & Beyond

- **Ongoing validation/ monitoring**
- Tactical into strategic IFRS 9 implementation
- Managing the volatility that IFRS 9 brings
- Integration of IFRS 9 with stress testing
- Capital and business planning under IFRS 9
- Submit results for local regulators ST and ICAAP exercises (linkage to TRIM)

Current Challenges

Analytics Model Parameterization

Data and IT

Forward-Looking Parameterization

Macro Variable Selections

Correlation Estimates and Regime Dynamics

Inclusion of Credit Migration

Staging Logic Criteria

Quantitative & Qualitative Criteria

Ratings vs Absolute PDs

Data Governance

Macro Scenarios Update

Frequency of Updates

Quality Checks

Data coverage for materiality

Architecture

Tactical “Light Weight” vs Strategic deployments

Centralized vs Decentralized

Stress Testing Models Leverage

Governance & Automation

Use test and Appropriateness of results

Industry Growing Demand with Model Risk

Regulatory Pressure

One of the most persistent and important drivers for model risk management across financial services is regulatory pressure (e.g. TRIM)

Stakeholder Pressure

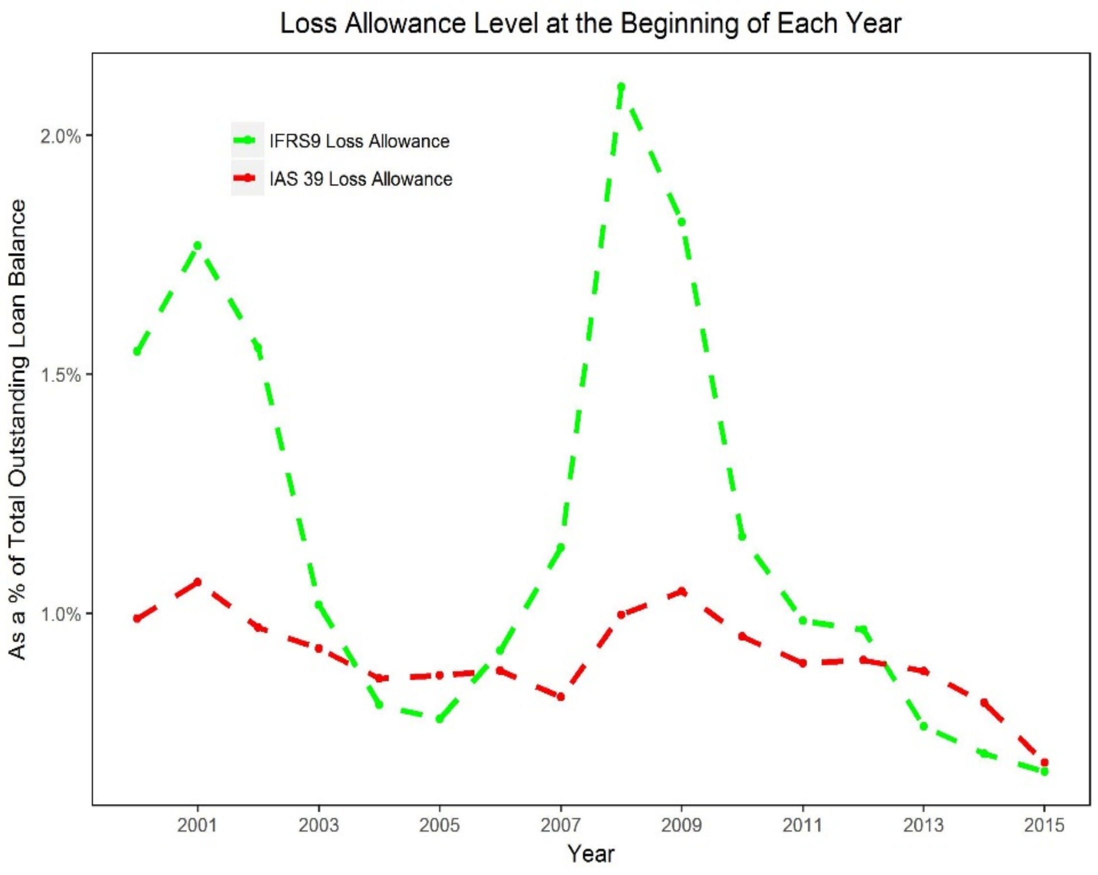
Stakeholders are paying closer attention to the process of managing risk, especially the use of risk models

Management of business volatility

Managing Reputation

Firms realize that model failures could cause significant reputational damage and want to be able to include reputation as part of model risk assessment

The Challenge of Volatility under IFRS 9



"75% of the banks anticipate that IFRS 9 impairment requirements will **increase volatility in profit or loss**."

Report on Results from EBA Impact Assessment of IFRS 9, EBA, 2016

"Volatility of loan-loss provisioning from new accounting standard demands additional own-funds protection, say banks."

Banks mull dedicated IFRS 9 capital buffers
Risk.Net, May 15, 2017

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IFRS 9 2018 Themes

Bank Challenges in the post-IFRS 9 World

Regulatory requirements and challenges

IFRS 9	- Fine-tune ECL methodologies for all portfolios - Fine-tune stage allocation criteria - Governance - Parallel run - Validation/benchmarking - Managing volatility - Integration with Stress Testing and Planning
Stress Testing	- P&L impact will need to be quantified in terms of IFRS 9 numbers from 2018 - Forecasting stocks and flows of stage 1, 2 and 3 assets under stress - Scenario design - Heavy reporting requirements
Integration	- Integrate scenario-based analysis across the institution to include a unified framework for Stress Testing, IFRS 9, and Business/Capital Planning - Centralize scenario generation process across all areas and link to business planning - Unify and ensure consistent data for modelling, reporting and business decision making - Risk-based culture and integration compliance-related risk initiatives in decision-making - Optimization of balance sheet

Market comments

Views on IFRS9 validation/benchmarking

Benchmarking analysis should leverage "representative, comparable, up to date data"

One validation framework does not fit all
Differences in portfolio

Senior Management clarity on provision levels and their alignment to market benchmarks

Linkages of model validation / benchmark in context of IFRS9, ST and TRIM

Belief an annual external service for data and models

Understanding the gaps in historical data and scenario estimates for forward looking component

Providing linkages of results to Capital Planning, ICAAP and Business strategies

Top-down view of new portfolio strategies on impairments from an external view

Validation on data and models is useful, however comparison of data/models to external sources resonates better with auditors and senior management

Linkage to Stress Testing

Stress Testing emergence

01

- IFRS 9 reinforces the necessity for projecting assets values and their corresponding loss allowances in conjunction to future CET 1 requirements

Key components

02

- Enable banks to have a forward looking understanding of the risk and earnings profile based on business and regulatory stress scenarios
- Project Capital and Regulatory ratios

Impacts

03

- Volatility measurement and impacts under IFRS9
- Understanding the behaviour or earnings and risk under distressed conditions allows for connecting the capital « reserves » and surplus to the earnings and losses

Stress Testing in context of Model Validation for IFRS 9

May 2017- Guidelines on credit institutions' credit risk management practices and accounting for expected credit losses

Page 31: **4.2.5 Paragraph 64** – ECL model validation: "ECL assessment and measurement may involve models and assumption-based estimates for risk identification and measurement. Models may be used in various aspects of the ECL assessment and measurement process at both the individual transaction and overall portfolio levels, including credit grading, credit risk identification, measurement of ECL allowances for accounting purposes, **stress testing** and capital allocation. ECL assessment and measurement models ("models") should consider the **impact of changes to borrower and credit risk-related variables such as changes in PDs, LGDs, exposure amounts, collateral values, migration of default probabilities and internal borrower credit risk grades based** on historical, current and reasonable and supportable forward-looking information, including macroeconomic factors.

June 2017 - 2018 EU-Wide Stress Test

Page 13 Paragraph 25 :"This means that for banks commencing to report under IFRS 9 in 2018, the 2018 EU-wide stress test takes the impact of the introduction of IFRS 9 into account in starting point data as well as in the projections of banks"

Page 21 Paragraph 39 : "Banks are requested to **forecast credit impairments** influenced by the materialisation of a set 39.of single scenarios (baseline and adverse) on the basis of IFRS 9 as prescribed in the methodology laid down in this section."

Linkages with broader regulations

Targeted Review of Internal Models

Key TRIM activities:

- Provide overview of regulatory compliance with the model framework, including compliance to estimation of PD and LGD (based on EBA guidelines)
- Produce evidence of adequate model validation processes
- Show policies and procedures for model governance and data systems, including audit trails

Organisation	Decision making influence on processes and models
	Top-down strategy linkages
	Volatility management
Governance & Processes	Documentation reviews and details on management overrides
	Process for early warning indicators
	IT system robustness
Models	Modelling techniques/approaches
	Best practice consideration /benchmark
	Validation and model governance
Data & IT	Appropriateness
	Representativeness
	Quality
	BCBS 239

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IFRS 9 Model Validation and Benchmarking

Model Validation and Governance

Model Verification	Model Governance	Model Validation
Analytical & Numerical Methods Implementation Correct Application to Risk and Pricing	Benchmarking Automation Evolution	Calibration Financial Soundness and Correctness Economic Intuition Reality Check Stress Testing

Validation and refinement of IFRS 9 models

A multi-faceted requirement

Quantitative

- ✓ Validate macro models used to generate scenarios and Scenario probabilities
- ✓ Credit risk models used to generate lifetime PD, LGD, EAD
- ✓ Lifetime EL
- ✓ Staging criteria

Qualitative

- ✓ Model specification, assumptions and design
- ✓ Econometric modelling technique
- ✓ Model Inputs / Data quality
- ✓ Review of the model validation process
- ✓ Documentation quality
- ✓ Regulatory compliance

Independence

- ✓ Clear roles and responsibilities
- ✓ Adequate independence from development process
- ✓ Prompt and timely reporting
- ✓ Institution to ensure the work done by the external party meets the elements of a sound model validation framework

Documentation

- ✓ Document the procedures
- ✓ Changes in validation methodology and tools,
- ✓ Range of data used
- ✓ Results and any remedial actions
- ✓ Regularly reviewed and updated

Validation and refinement of IFRS 9 models

A holistic solution for validation and benchmarking

- **Raw data**

  Default & Recovery Database
- **Credit Models**

  RiskCalc, CreditEdge
- **ECL Methodologies**

  ImpairmentCalc

Validation/ **benchmarking service** to cover:

- Conditional & unconditional PD, LGD and ECL
- TTC to PiT credit parameter conversion
- Sensitivity to scenarios and stage allocation rules

Framework

Design validation and ongoing monitoring framework

- **Modelling**

  Bespoke modelling using banks' and Moody's data

Unbiased and quantitative **scenario forecasts** including:

- Baseline, IFRS 9, Stress Testing and Planning scenarios
- Severity and probability of realization for each scenario

Validation and refinement of IFRS 9 models

A holistic solution for validation and benchmarking

Models

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- **ECL Methodologies**
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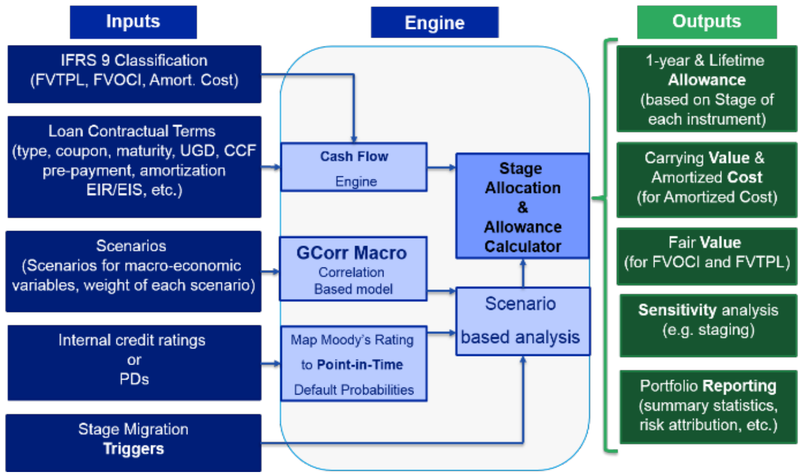

Credit Research Database (CRD™)

- World's largest historical time series of private firm loan data for C&I borrowers
- 18 million borrowers globally with over 2.2m private company defaults
- **CRD** contains borrower financial statements, facility and loan information
  - Facility information: origination date/amount, contractual maturity, unpaid balance
  - Borrower information: internal rating/PD, industry, geographical info, size, etc.
  - Forward looking, PIT PD term structures from Moody's Analytics RiskCalc™

The **Default & Recovery Database** is an expansive data set that allows you to slice data in a way that is relevant to your needs while still having enough observations to create meaningful results. The DRD consist of the following:

- Over 550,000 individual debt securities
- 60,000 distinct issuers
- Corporate and sovereign coverage
- Historical defaults back to 1920

Validation and refinement of IFRS 9 models

A holistic solution for validation and benchmarking

Validation/ **benchmarking service** to cover:

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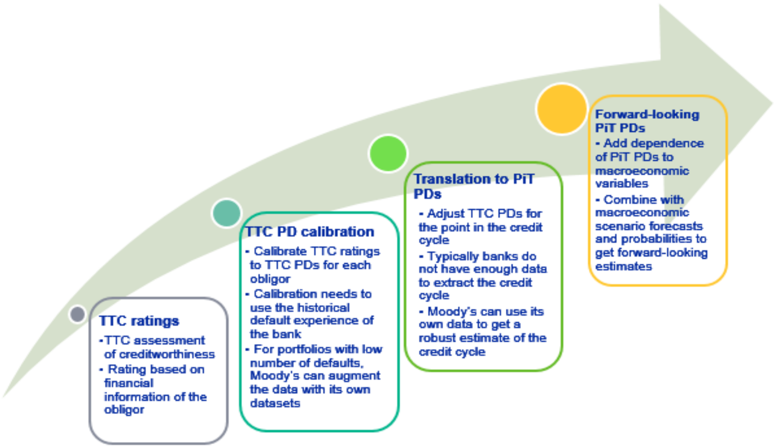
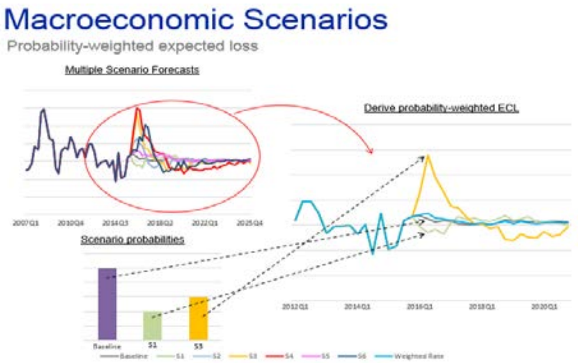
Expected Credit Loss Calculation

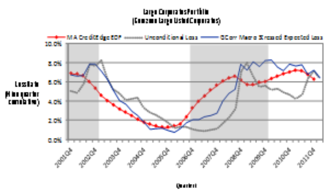
Calculations steps





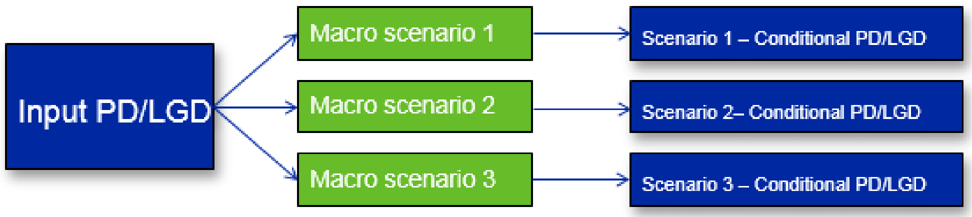
A transparent model

- » Our Analytics have been used by 100+ organizations and regulators since few decades
- » Analytics are updated, validated and backtested on yearly Basis
- » Our IFRS 9 Impairment Model is fully documented and maintained (calibration, parameterization)
- » Full Access to Quant Research



Forward-looking adjustments

- » The methodology utilizes a scenario based model to convert input PD/LGD to conditional PD and LGD term structure for a single or multiple set of macroeconomic scenarios. These conditional PD/LGD values are utilized for IFRS 9 stage allocation and impairment calculations.



IFRS9 Validation / Benchmarking case studies

Current examples of IFRS9 validation and benchmarking services across EMEA and Asia.

Organisation
- Provision communications
- Understanding IFRS9 Volatility case studies
- Impact on business strategies
- Linkage of capital management from board level
- Workshops
- Top down analytical level business impacts

Governance & Process
- Management Override process
- Watch lists governance
- Model documentations
- Compliance with external requirements (e.g. accounting and regulatory requirements)
- Early Warning Indicators
- Forward looking implications

Data & IT
- Implementation Testing (portfolio segmentation, inputs, sources, adjustments)
- Data quality, history and use in context of portfolio materiality
- Robustness and adaptability checks
- Outcome analysis
- IT infrastructure review (BCBS 239 principles)

Models
- PD, LGD, EAD Models including for Low Default Portfolios
- Benchmarking Ratings/PDs of Public and Private Firms
- Stress Testing / IFRS 9 linkages
- Model and Basel Pool Validation
- Compliance in accordance with TRIM

Wholesale (dedicated Advisory team)
- SME (big ticket size)
- Middle Market Enterprise
- Large Corporates
- Commercial Real Estate
- Project finance
- Banks / Sovereigns (+ Local Governments)
- Private Banking Loans

Retail (dedicated team with economists)
- SME Loans (low ticket size)
- Credit cards
- Personal / Mortgage Loans
- Auto Loans
- Secured and unsecured lending portfolio

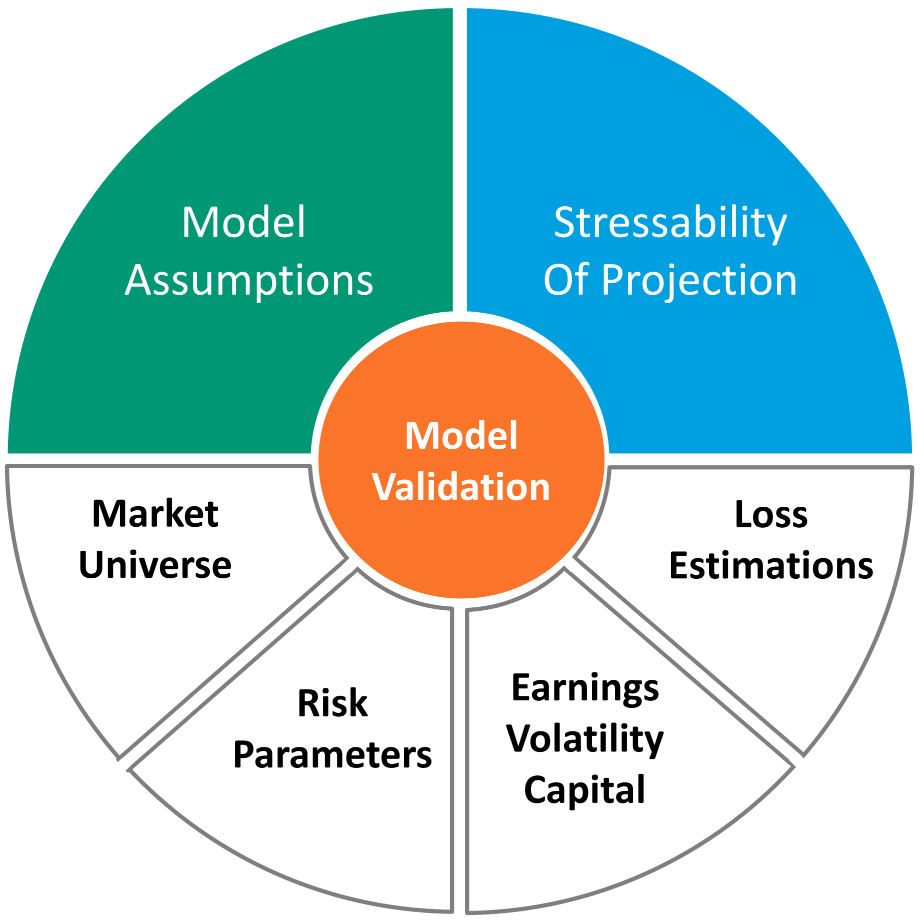
Credit Policy
- Group policy alignment
- Regulatory alignment
- Regulatory understanding

France
Netherlands
Portugal
UK
South Africa
Middle East (UAE, Qatar)
Asia (Japan, Malaysia)

Stress Testing Focus as a validation tool

» Stress Testing as a model validation tool where the process includes:
  - Model Assumptions
  - Stressability of Projections

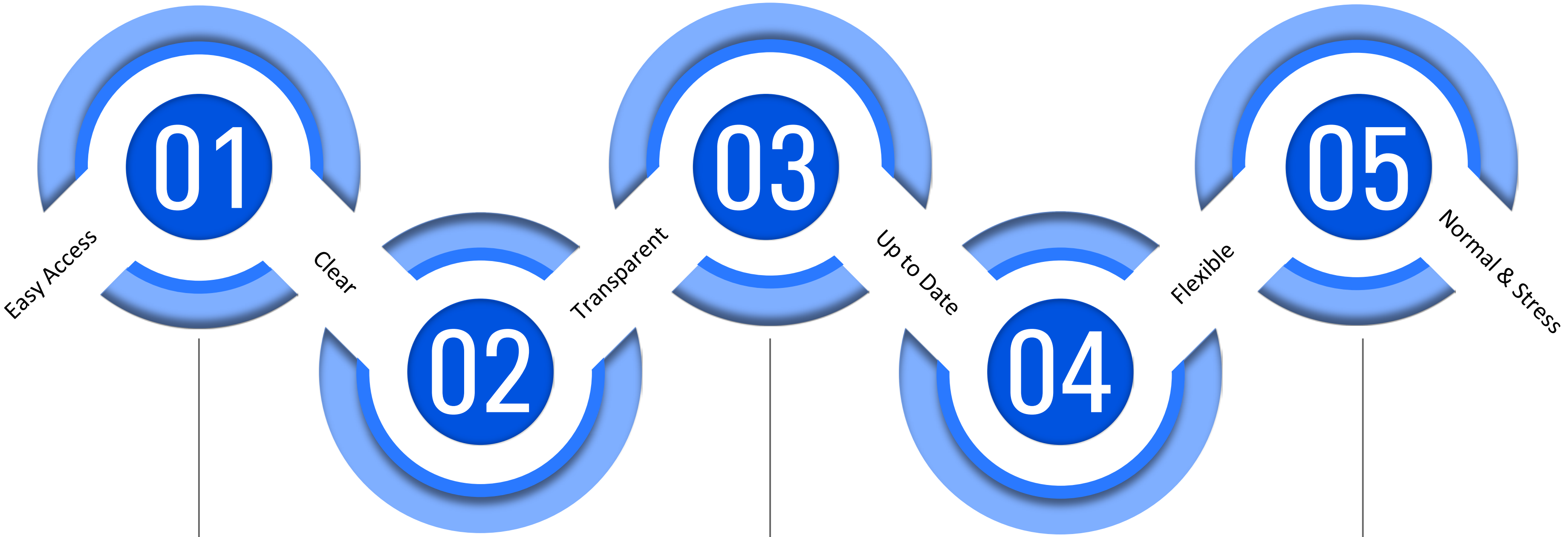
1. Model Assumptions characterize the scope of stress
   › Market Conditions: macro and financial variables selection and applied shocks
   › Risk Parameters /Identification: PD, LGD, Correlations, Migrations;
2. "Stressability" of Projections :
   › Loss Estimation
   › Credit Earnings and Volatility of ECLs to identify
   › Regulatory Capital and Tier 1



» **Main Objectives are :**
  - Capture/Manage Volatility Magnitude over time
  - Identify and Understand Portfolio Vulnerabilities
  - Take actions for managing volatility

An Integrated and Holistic Approach to Data Governance

The solution should ensure the appropriate data is in the right place at the right time, provide control of the reporting by making it easy to collect, consolidate and submit reports correctly.



Consolidate risk and finance data from different source systems, subsidiaries and divisions, populate missing data.

Production of reports in the appropriate format and timely manner.

In-depth visibility and control of the data.

Automated processes in order to reduce operational risk occurrences (i.e. manual processes).

Offer a forward-looking risk assessment.

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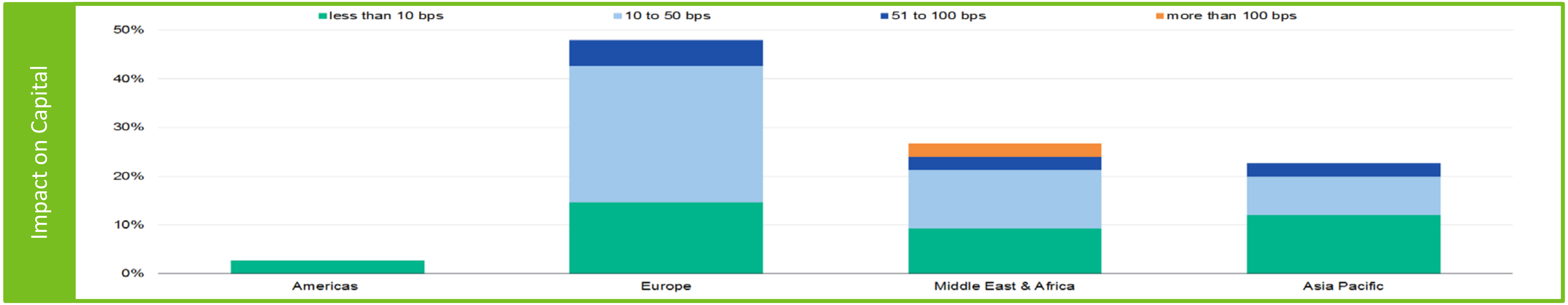
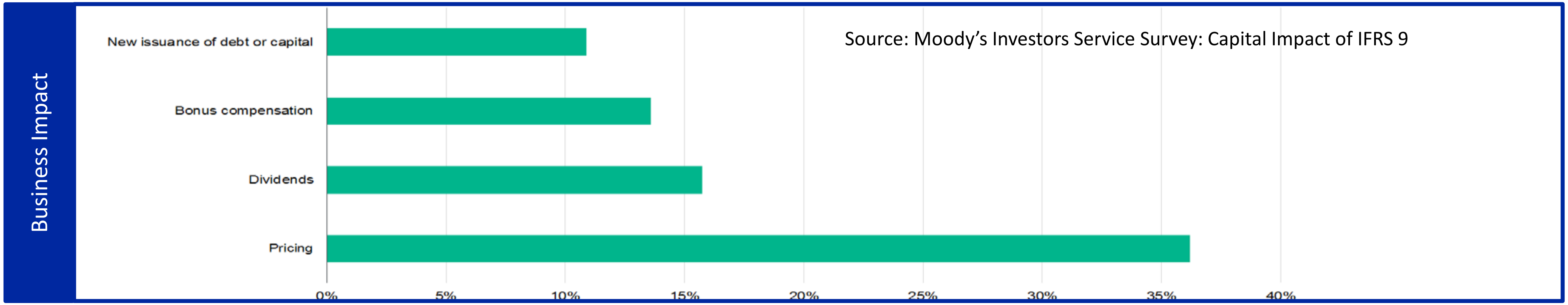
Assessing the Impact of IFRS 9 on Earnings Risk and Portfolio Strategies

Business Impact of IFRS 9

What do the banks say?

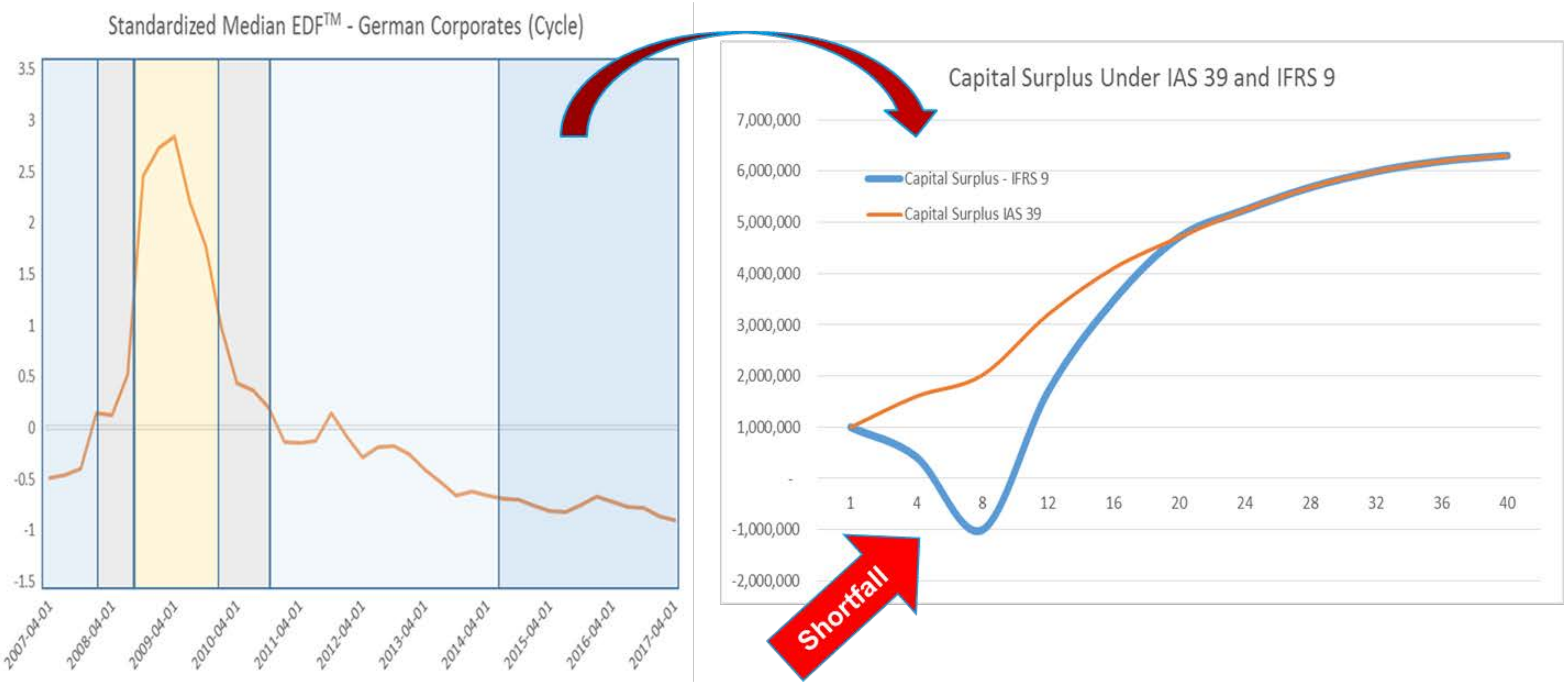




Source: Moody's Investors Service Survey: Capital Impact of IFRS 9

Impact on Earnings and Capital Volatility

Stage allocation and the state of the credit cycle can lead to capital shortfalls



Simplified Example

- 1% coupon rate
- 40% LGD
- Profits held as surplus capital
- $1million initial capital surplus

Sources: Moody's Analytics, CreditEdge™, ImpairmentCalc™

Existing Capital Buffers Need to Be Reassessed

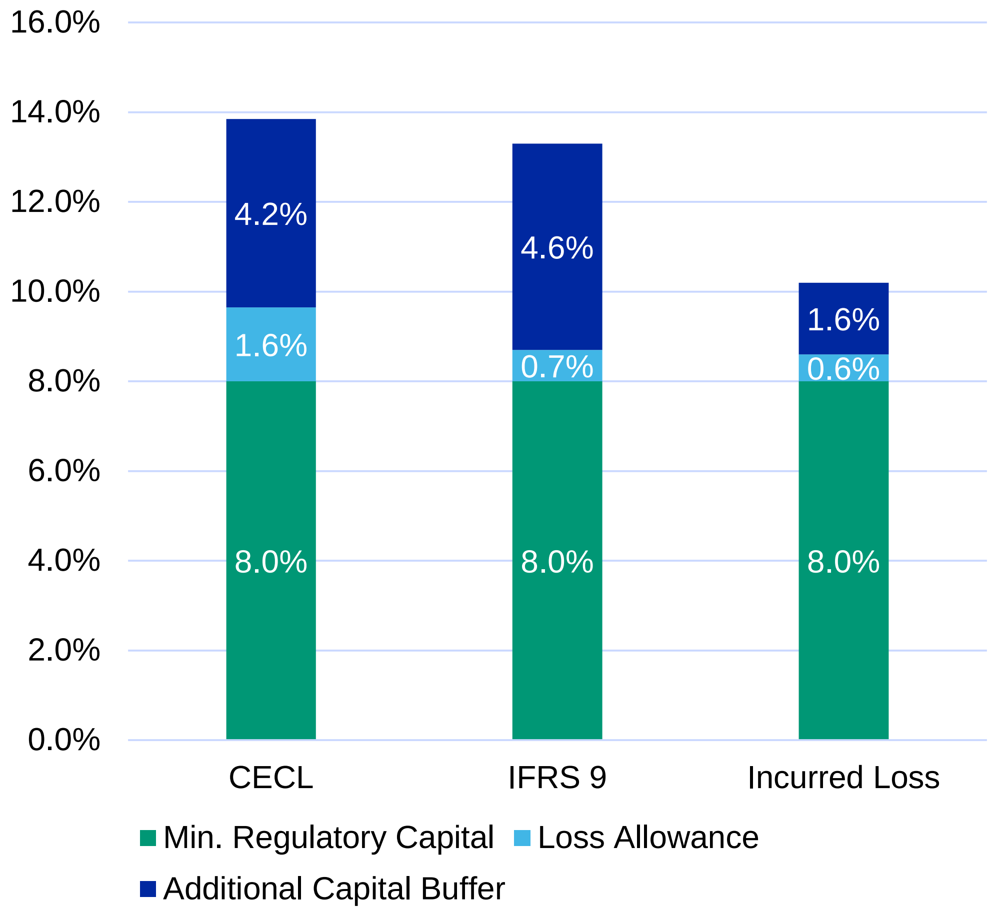
» **Level**

– The higher level of loss allowance at origination reduces available capital under CECL and IFRS 9 compared to incurred loss.

» **Volatility**

– Increased earnings volatility IFRS 9 due to loss allowance raises the additional capital buffer needed.

Effective Capital Breakdown



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Summary

Assess, Communicate, Act

IFRS 9 would imply impacts in respect of:

» More volatile provisions

» More volatile P&L

» Higher probabilities of recapitalization needs

» Higher cost in pricing and generally more competition on pricing

IFRS 9 would imply a strong Governance around:

» Method, Model and Risk Parameters consistent with Stress Test analytics/processes

» Validation / Benchmarking against market best practices / peers

» Process Automation

» New Paradigm designed behind a strong reinforcement on **stress testing**

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ENTERPRISE RISK SOLUTIONS

Moody's Analytics

WHITEPAPER
MAY 2017

Reducing volatility in IFRS9 provisions & earnings, through governance and credit decision.

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As preliminary IFRS9 results are being released, many institutions are sharing common concerns about variations of point-in-time credit assessments and forward-looking credit forecasts. Indeed, these measurements are responsive to the current economic environment and display high dependencies on the constant evolutions of the macroeconomic outlook. Moreover, this variance in provision charges is amplified by asset transitions from stage 1 to stage 2 or 3, that may simultaneously affect correlated segments of the portfolio.

As provision charges are therefore bound to fluctuate significantly under IFRS9, many institutions are now bracing for an increased levels of volatility in earnings as well as in deductions from core equity tier 1 under the Basel capital eligibility rule.

This document discusses risk measurements that can assist in the communication of the provision levels to senior stakeholders. It also describes techniques available to anticipate earnings volatility, and manage it through the diversification of risks in the credit portfolio. Finally, we explore how IFRS9 scenarios and related portfolio management strategy can be leveraged by front office as part of the credit decision process.

1 SEPTEMBER 2017

MAY 2017

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MODELING METHODOLOGY

A Composite Capital Allocation Measure Integrating Regulatory and Economic Capital, and the Impact of IFRS 9 and CECL

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Abstract

In this paper, we propose a composite capital allocation measure integrating regulatory and economic capital. The approach builds upon the economic framework underpinning traditional RORAC-style business decision rules, allowing for an optimized risk-return tradeoff while adhering to regulatory capital constraints. The measure has a number of depictions, and it can be viewed as a weighted sum of economic and regulatory capital, as economic capital adjusted for a regulatory capital charge, or as regulatory capital adjusted for concentration risk and diversification benefits. Intuitively, when represented as economic capital adjusted for a regulatory capital charge, the adjustment can be represented as the additional top-of-the-house regulatory capital, above economic capital, allocated by each instrument's required regulatory capital. We show that the measure has ideal properties for an integrated capital measure. When regulatory capital is binding, composite capital aggregates to the institution's top-of-the-house target capitalization rate. We find the measure is higher than economic capital, but lower than regulatory capital for instruments with high credit quality, reflecting the high regulatory capital charge for this instrument class. Finally, we address how IFRS 9/CECL impacts the CCM and discuss the broader implications of the new accounting standards.

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METHODOLOGY

IFRS 9 Probability-Weighted Scenarios

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The IFRS 9 accounting standard for impairment of financial assets requires calculation of expected loss defined as a probability-weighted product of probability of default, loss given default, and exposure at default *across scenarios*. This document describes the process of constructing three globally consistent IFRS 9 scenarios: a baseline scenario that captures the most likely economic future, one scenario that presents adverse economic conditions, and one scenario that presents favorable economic conditions. The three scenarios are constructed in accordance with target severity for each of the scenarios. While the baseline

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