



OLIVER WYMAN



Financial Services

IACPM/OLIVER WYMAN SURVEY: PERSPECTIVES ON THE EVOLVING ROLE OF ENTERPRISE-WIDE STRESS TESTING

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1. INTRODUCTION

Enterprise-wide stress testing, as a formal discipline for risk and capital management, was born out of the financial crisis.

Stress tests had previously been carried out for certain types of risk or for specific portfolios, but rarely for all risks faced by the entire enterprise. For example, market risk stress testing was widely adopted in the

1990s to supplement Value-at-Risk (VaR) measures, whose calculation tends to underestimate extreme losses. While these narrow stress tests were useful for managing specific risks or portfolios, they shed little light on the overall effect that a “stress event” would have on an institution.

IACPM/OLIVER WYMAN ENTERPRISE-WIDE STRESS TESTING SURVEY

In 2013, the International Association of Credit Portfolio Managers (IACPM) and Oliver Wyman jointly conducted a survey with leading financial institutions around the world focused on the existing, and planned uses of enterprise-wide stress testing. The participants include the world’s largest banks and insurance companies across North America, Europe and Asia-Pacific. Throughout this document, “surveyed institutions” and “survey respondents” refers to this survey.

Key survey facts:

- 55 survey respondents, including both banks and insurers
- 59 questions, including both multiple choice as well as free form responses
- Topics covered include: scope & process, stress testing applications, organization and governance
- Follow-up interviews were held with a small set of participants

During the 2000s, some institutions began enterprise-wide stress testing, typically estimating the losses from a single risk factor, such as an equity price crash or a housing price decline. These stress tests tended to be ad-hoc, with no systematic way of articulating the scenarios or estimating the consequent losses, and they focused more on earnings than on capital or solvency.

To assess their solvency position, or capital adequacy, banks instead relied on regulatory capital and economic capital. Regulatory capital has been the most important lens for capital adequacy. Provided that an institution’s capital exceeded the regulatory minimum, it was taken to be adequate, even though it might be inadequate to maintain solvency during a stressed period. Economic capital was developed in the 1990s to remedy some of the known shortcomings of regulatory capital, such as failing to account for all risks and conflating materially different risks. By avoiding these issues, economic capital

provided banks with a better measure of relative risk and a better foundation for making business decisions.

However, economic capital took a purely probabilistic view of capital adequacy, aiming to answer the question, “How much capital is needed to ensure the institution remains economically solvent except in a very extreme event?” This approach overlooked the underlying dynamics of bank failure – both the *causes* and the *process* of failing, where the point at which creditors’ confidence is lost is more important, and usually comes sooner, than the point at which the bank can no longer pay its depositors.

During the financial crisis, many banks failed despite having capital well in excess of the regulatory minimum. The market judged banks’ solvency not by their current capital, but by the capital that would remain once losses were fully recognized.

WHAT IS “ENTERPRISE-WIDE STRESS TESTING”?

Enterprise-wide stress testing is a process that a financial firm uses to explore the impact of economic scenarios on its financial condition over multiple periods, typically using regulatory capital metrics. The impact is estimated for all businesses and risks, using models that link financial performance to macroeconomic or other factors. In capital adequacy assessment, the “test” is typically whether the institution retains sufficient capital to remain a going concern at the worst point of the forecasted period.

Banks realized that the salient questions were: “What will your capital levels be in a year or two if this crisis continues?”; “Will the bank still be able to operate as a going concern?”; and, “Will the bank need more capital?” Regulators also demanded answers to these questions, starting with the Supervisory Capital Assessment Program (SCAP) in 2009 in the US, and soon followed by similar exercises in other jurisdictions. Enterprise-wide stress testing in roughly the form now seen at banks was born.

Since 2009, stress testing has advanced rapidly to meet increasing regulatory demands for this new perspective on capital adequacy. Because stress testing requires a projection of losses conditional on a specific macroeconomic scenario, it has required most banks to

develop new methodologies, models, and infrastructure beyond those used to calculate economic capital. This has been the main focus of risk management at financial institutions in the years since the financial crisis.

This article discusses the state of enterprise-wide stress testing five years after the start of the financial crisis, with a focus on how financial institutions are using this new capability. It begins by reporting on the current role of enterprise-wide stress testing, especially the use banks make of it and the ways they combine it with measures of economic capital. Then, banks’ aspirations for the next generation of stress testing are explored. Finally, this article discusses some of the challenges banks face in taking their stress testing capabilities to the next level.

2. WHAT IS THE CURRENT ROLE OF ENTERPRISE-WIDE STRESS TESTING?

The impetus for setting up enterprise-wide stress testing in most jurisdictions was a regulatory requirement around capital adequacy assessment. As a result, the early use of enterprise-wide stress testing was narrow, focusing on whether there was sufficient capital to survive a stress event and which capital actions, such as making dividend payments, were possible. However, financial institutions have since built up their stress testing capabilities and have been exploring ways of using these to meet broader risk management and business objectives, such as: “For which applications or decisions will stress testing be a key input or driver?”; “Should risk appetite be articulated based upon tolerances in a stress environment?”; and, “Should capital requirements from stress testing be used for performance management or loan pricing?”

Banks have cited a number of reasons for incorporating enterprise-wide stress testing results into a broader set of such risk and business applications:

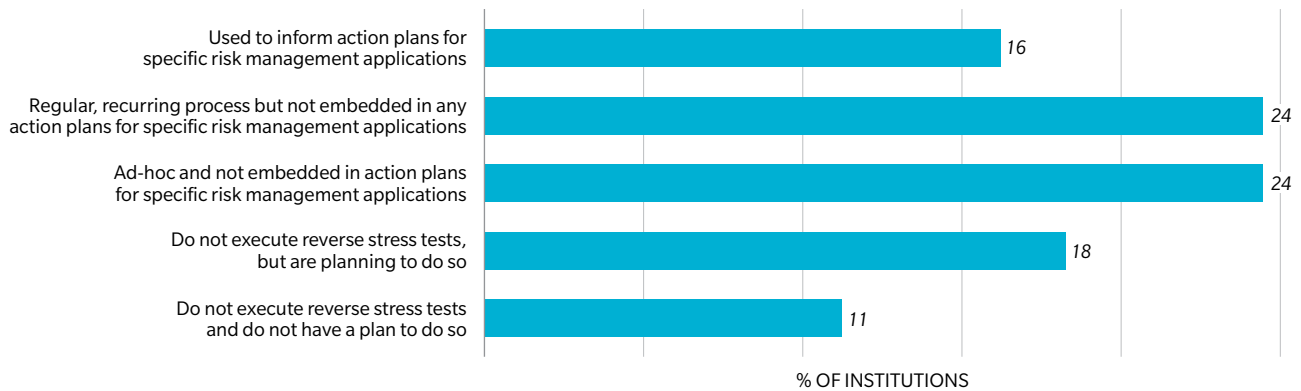
- **Binding constraint:** Enterprise-wide stress testing results have now become the binding constraint for evaluating capital adequacy and the key driver of dividend policy for many institutions.
- **Management attention:** Given its linkage to dividend payments, as well as the governance requirements demanded by regulators, enterprise-wide stress testing now has the attention of senior management and the Board of Directors.
- **Intuition:** Many users find enterprise-wide stress test results to be more intuitive than other risk metrics because they are presented in an accounting

framework, similar to other external communications regarding the institution’s financial condition.

- **Transparency:** Because outcomes are linked to causal factors in enterprise-wide stress testing, such results are also more transparent and easier to understand than other risk metrics such as economic capital.
- **Consistency:** The enterprise-wide stress testing process usually “piggy-backs” on the budgeting and planning process, which gives it a degree of consistency with the inputs and approaches accepted already in a well-established process.

Enterprise-wide stress testing is widely employed in banking institutions – all surveyed institutions reported having some level of enterprise-wide stress testing. The objective of enterprise-wide stress testing is typically to understand the impact of a stress environment on the institution’s capital position and performance. In addition, some institutions also reported employing reverse stress testing, which “works backward from the answer” to identify the scenario that leads to a particular adverse outcome. Reverse stress testing shares many of the features of traditional enterprise-wide stress testing, but is still evolving across the industry as a consistent feature or integral component of stress testing (see Exhibit 1).

EXHIBIT 1: USE OF REVERSE STRESS TESTING*



* Note that figures do not add to 100% due to assorted other responses
 Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

2.1. CURRENT APPLICATIONS OF ENTERPRISE-WIDE STRESS TESTING

As seen in Exhibit 2, almost all surveyed institutions use enterprise-wide stress testing to measure capital adequacy. Typically, this is done by assessing the impact of a stress scenario on the organization’s capital base to evaluate whether post-stress, a minimum amount of capital remains to ensure the viability of the organization. Two key elements of this framework are the specification of the stress scenario and the requirements placed on post-stress capital.

In the CCAR¹ process in the US, regulators have defined requirements on both of these elements. Each year,

regulators release the parameters of the Severely Adverse Scenario that institutions must apply in their capital forecasts. In addition, institutions also define scenarios tailored to their organization (“BHC scenarios”). In practice, these scenarios are typically at least as severe as the regulator-defined Severely Adverse Scenario. Regulators in the US also define the acceptable capital ratio level after incorporating the impact of the stress scenario. This minimum post-stress requirement is defined in terms of regulatory capital ratios. Likewise, European regulators have also defined these two core

1 Comprehensive Capital Analysis and Review.

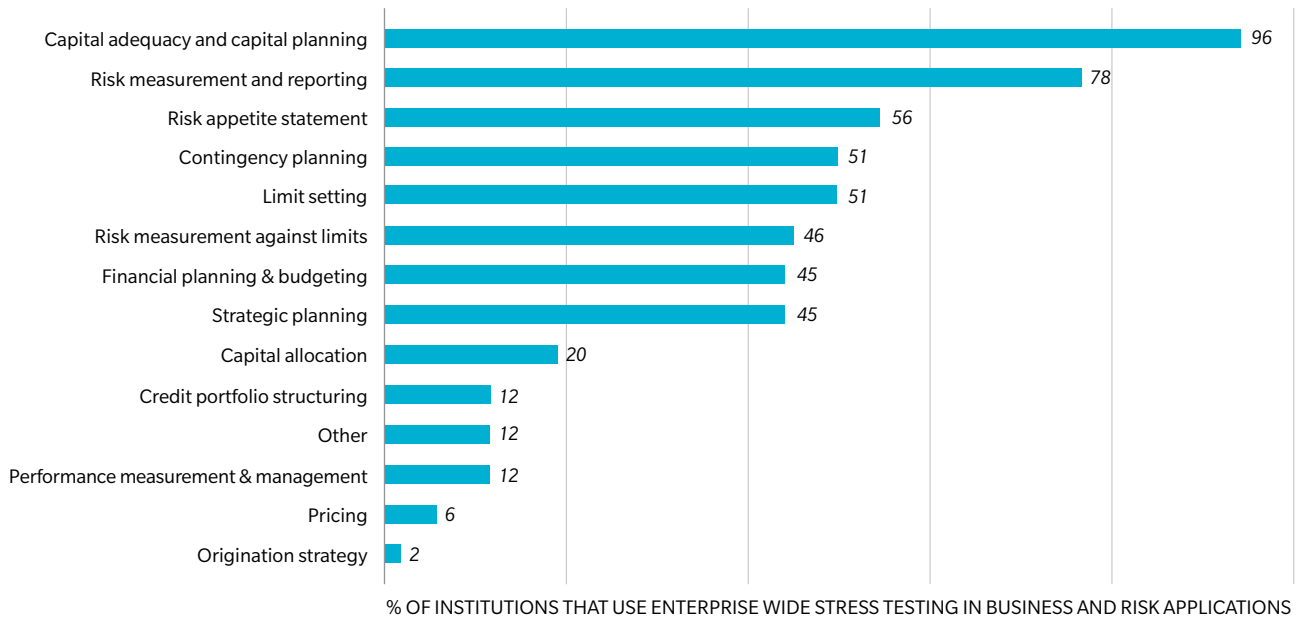
elements in industry stress tests, including the CEBS²/EBA³ run stress tests in 2009, 2010, and 2011, as well as during the stress test in Spain in 2012, and during the Prudential Capital Assessment and Review (PCAR) in Ireland in 2011.

The specification of the minimum post-stress requirement may differ across institutions. For example, some insurers use minimum local capital requirements for each of their legal entities for their post-stress minimum requirement, with such requirements differing by insurer type (e.g., life versus property and casualty insurance) and jurisdiction of the legal entity. In other cases, institutions use an economic capital metric to define the minimum post-

stress requirement. Multiple specifications may also be used: One institution surveyed indicated use of statutory capital requirements, economic capital, and capital required by rating agencies to define acceptable post-stress capital levels. The institution considers its risk appetite with respect to these various measures. For example, the rating agency capital stress evaluates the ability to maintain a certain range of ratings after a stress scenario.

A large share of surveyed institutions also use enterprise-wide stress testing for risk reporting, risk appetite, limit setting and management, and various planning exercises (e.g., financial, strategic, contingency).

EXHIBIT 2: CURRENT ROLE OF STRESS TESTING BY BUSINESS APPLICATION



Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

Examples of such extended uses of enterprise-wide stress testing results include:

- **Risk reporting:** Enterprise-wide stress testing results are often used to report levels of risk in business activities, for example, by reporting the credit losses by portfolio in various stress scenarios would cause
- **Strategic planning:** Enterprise-wide stress testing results are increasingly integrated into business planning as institutions look to understand the impact of stress scenarios on alternative strategies, and especially on the ability to pay dividends.

² Committee of European Banking Supervisors.

³ European Banking Authority.

For some institutions, the use of stress testing in strategic planning is formally required by policy, with approval of the strategy taking into account the stress results. Often, however, the linkage to strategic planning is less formal. For example, one institution described an informal process where the strategy team requests ad-hoc analysis of strategic alternatives. Creating this linkage to strategic planning can lead to a cycle of positive reinforcement of stress testing, where use in strategic decision-making highlights the value of stress testing to the most senior managers in the institution. At the same time, this level of scrutiny also drives enhancements to the approaches and results, potentially leading to further integration into decision-making.

- **Risk appetite:** Stress testing is increasingly being integrated into risk appetite, using tolerance for outcomes in a stress test to set risk appetite and cascade it down to risk tolerances for individual products/businesses. Some institutions directly tie risk appetite statements to stress results by including statements expressing a maximum loss or minimum income in a stress scenario. The stress testing process also motivates institutions to re-specify their risk appetite on an ongoing basis in a tangible manner. The range of stress scenarios that is used

to test the institution's capital adequacy is itself an expression of the institution's risk appetite, with the view that scenarios outside of this range may lead to insufficient capitalization.

- **Limits:** An institution's use of stress testing in risk appetite is sometimes cascaded into limits at the enterprise level, such as limits placed on enterprise-wide credit losses. Enterprise-wide stress testing is also used to inform the magnitude of more traditional exposure-based limits. For example, one institution interviewed tests alternative limit levels by evaluating the impact of the limits on forecast losses in stress scenarios.

To a lesser extent, banks are also using enterprise-wide stress testing to inform capital allocation, credit portfolio structuring, performance measurement and management, pricing, and origination strategy. Given theoretical and practical challenges of using stress testing for these applications (further discussed in Section 2.2), institutions tend to use stress test results informally to inform decision-making for these applications, rather than in a formalized framework. As an example, one institution noted that stress test results help inform decisions regarding credit portfolio structuring by highlighting concentrations in the portfolio that are likely to react similarly in a stress scenario.

2.2. BALANCING ENTERPRISE-WIDE STRESS TESTING AND ECONOMIC CAPITAL

ENTERPRISE-WIDE STRESS TESTING

- Accounting-based
- Considers the entire P&L including revenues, losses, expenses, etc.
- Short- to medium-term forecast (e.g., typically 9 quarters in the US)
- Reveals mechanics of how potential risks arise
- Loss level defined by a specific macroeconomic scenario, loosely linked to a probability (e.g., "adverse")
- Adverse loss typically not an insolvency event

ECONOMIC CAPITAL

- Value-based
- One-year forecast (but often embeds changes in long-term value)
- Loss level defined at a specific confidence level (i.e., probabilistic), typically not linked to a specific macroeconomic scenario
- Adverse loss typically an insolvency event

Banks have traditionally used economic capital metrics for many core risk management applications. Stress testing is now competing with economic capital for influence across these applications. The outcome is currently mixed, as shown in Exhibit 3, with enterprise-wide stress testing being used alongside economic capital in a subset of largely top-of-the-house applications, while economic capital remains the dominant risk metric in other applications, such as performance measurement and risk-based pricing, that require greater granularity and consistency in the risk metric applied across the portfolio.

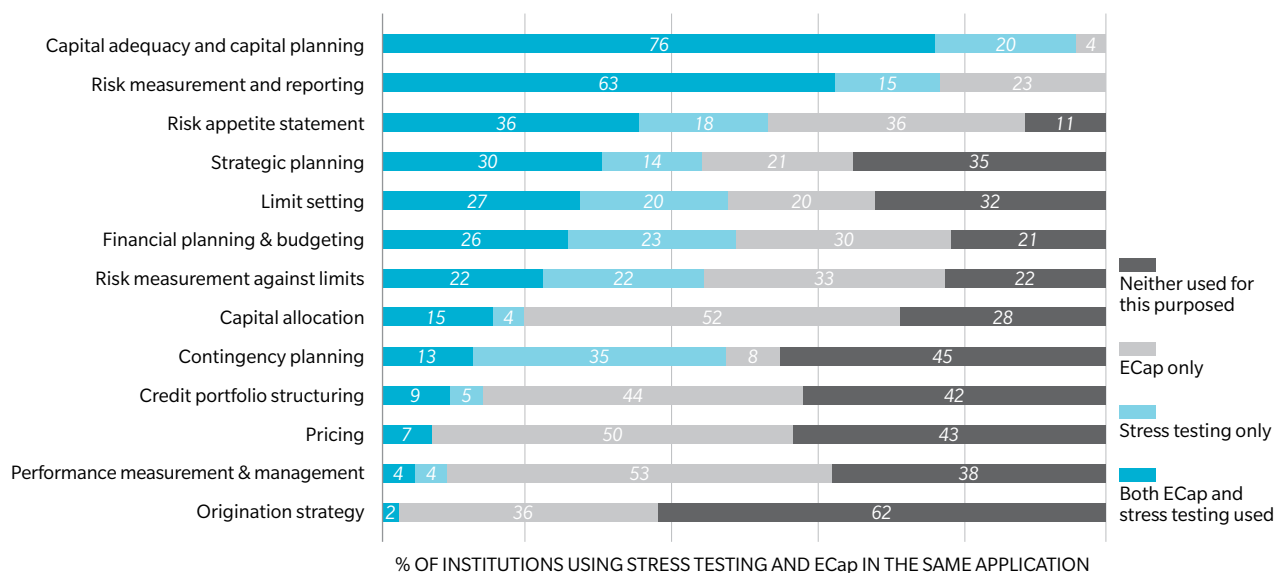
Applications where economic capital and enterprise-wide stress testing are both used include risk reporting, risk appetite, limit setting and management, and strategic and financial planning. Over half of the surveyed institutions that reported using enterprise-wide stress testing in these applications also report use of economic capital as a complementary measure. Having two perspectives on potential losses or capital consumption is useful, and also can help to identify the modeling limitations of either approach. Stress test results, for example, are often considered more intuitive and actionable because they are typically less severe and more plausible than events leading to an economic capital-sized loss. A number of institutions surveyed indicated that they are more likely to make hedging decisions, portfolio composition decisions and business strategy decisions based on these more plausible outcomes. However, when enterprise-wide stress testing results and economic capital suggest different courses of action, banks must either reconcile the two perspectives to produce consistent answers or have a process for deciding which metric should guide decision-making.

For other applications, such as capital allocation, credit portfolio structuring, pricing, performance management, and origination strategy, economic capital is still the dominant risk metric. The use of stress testing in these areas faces theoretical and practical limitations (see Exhibit 4 for a description of key challenges by application).

The theoretical limitations arise from the fact that stress testing looks at the short term accounting losses caused by stress scenarios and therefore fails to consistently capture risks that materialize over a longer horizon (such as ALM risks). This is inappropriate for applications that concern long-term value creation. Economic capital captures risks that may not materialize in financial statements over the short time horizon of a stress test, but which are required to understand the long-term value of a business or activity. Economic capital also facilitates comparisons across products and geographies because, given its calibration to a consistent confidence interval, each dollar of economic capital represents the same quantum of risk. By contrast, enterprise-wide stress testing results are conditional on specific macroeconomic scenarios; different stress scenarios of equal probability could produce different losses across products/geographies.

And, in practice, using stress tests for purposes that require comparisons between products, regions or customer segments is limited by the fact that stress testing often does not specify losses at this level of granularity. Many uses of risk metrics require even position-level specificity and an ability to capture position-level drivers of risk. Economic capital can deliver this level of granularity but, as so far developed, enterprise-wide stress testing cannot.

EXHIBIT 3: USE OF STRESS TESTING AND ECONOMIC CAPITAL *



* Note that figures do not add to 100% for all applications due to rounding

Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

EXHIBIT 4: APPLICATIONS OF STRESS TESTING AND THEIR CHALLENGES

APPLICATION	DESCRIPTION	KEY CHALLENGES FOR USE OF ENTERPRISE-WIDE STRESS TESTING
Capital adequacy	Ensuring institution maintains sufficient capital in line with risk appetite	<ul style="list-style-type: none"> Managing across regulatory, stress testing-based and economic capital views of required capital and risk
Risk measurement & reporting	Communicating risk exposure across the organization	
Risk appetite statement	Definition of the institution's high-level risk-related objectives and constraints	
Contingency planning	Definition of contingency measures such as capital raising and B/S reduction	<ul style="list-style-type: none"> N.A.
Strategic planning	Medium-term planning of strategy and targets around business units, geographies and products	<ul style="list-style-type: none"> Cultural shift in some cases to incorporate stress scenarios as a planning scenario
Financial planning & budgeting	Annual exercise to forecast revenues, expenses and allocate budget across businesses	<ul style="list-style-type: none"> Some stress scenarios may be perceived as too unlikely to occur for use in planning Organizational challenge to achieve Finance buy-in on risk metrics
Limit setting	Setting risk limits at business, product, portfolio and single-name level	<ul style="list-style-type: none"> Scenario severity used for establishing limits and measuring risk against limits is difficult to define objectively
Risk measurement against limits	Measuring and monitoring usage of risk limits	
Capital allocation	Allocation of economic and regulatory capital at granular portfolio and business line level	<ul style="list-style-type: none"> Stress testing produces a narrow, scenario-conditional view of risk that may not be well-suited to allocation and achieving consistency across exposures
Performance measurement & management	Measurement of risk-return of portfolios and business lines	<ul style="list-style-type: none"> Stress results are less accurate at granular levels at which capital allocation is needed for performance measurement and pricing purposes
Pricing	Transaction-level pricing and decision support	
Credit portfolio structuring	Reshaping of credit portfolio based on risk metrics	<ul style="list-style-type: none"> Stress results are less accurate at granular levels needed for transaction and portfolio-level decision-making
Origination strategy	Transaction level decision-making on loan origination	

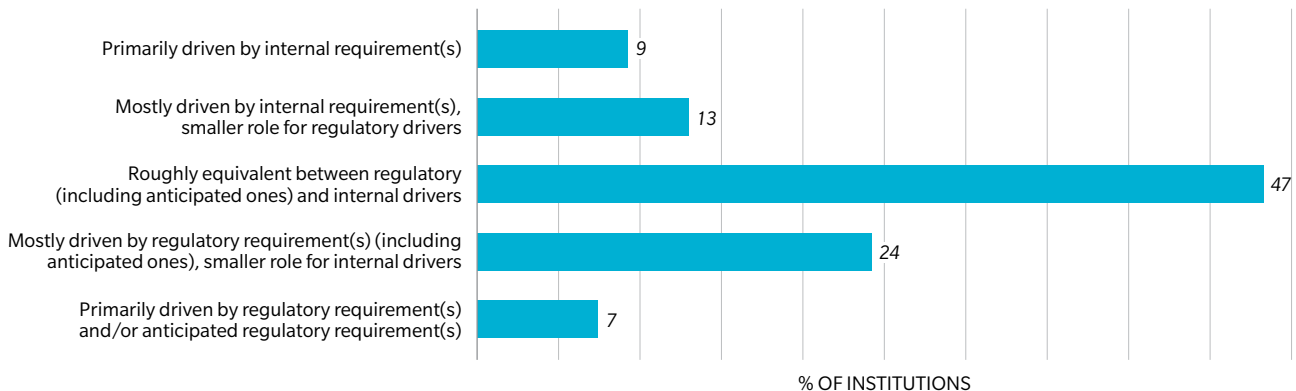
3. WHAT WILL BE THE FUTURE ROLE OF ENTERPRISE-WIDE STRESS TESTING?

The expectations for enterprise-wide stress testing have increased across the globe. At large US banks, the requirements and expectations have increased each year in the CCAR and CapPR⁴ processes. And the Dodd-Frank Act Stress Test (DFAST) rules now require smaller banks to conduct enterprise-wide stress tests, too. Most of them will need to make rapid progress from their currently rudimentary stress testing capabilities. European regulators are also demanding the increased use of stress tests, and Asian regulators are beginning to take the same position.

Beyond regulatory pressure, financial institutions consider enterprise-wide stress testing as a valuable management tool in its own right. About half of the surveyed institutions characterized their current enterprise-wide stress testing as being driven equally by regulatory requirements and internal mandate⁵. Senior managers believe that the benefits of stress testing go beyond regulatory compliance.

Finally, financial institutions now have another set of metrics (in addition to economic capital and regulatory capital) being produced, and have often made significant investment in the stress testing tools. Institutions recognize the need to have a coherent approach and framework for managing across these metrics to ensure clarity within their organizations and in decision-making processes. It should be clear within an organization how the different tools are applied to each decision, and how the answers provided should be used. In a world of multiple measures, this clarity is critical to efficiently and effectively making decisions.

EXHIBIT 5: MOTIVATION FOR ENTERPRISE-WIDE STRESS TESTING



Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

⁴ Capital Plan Review.

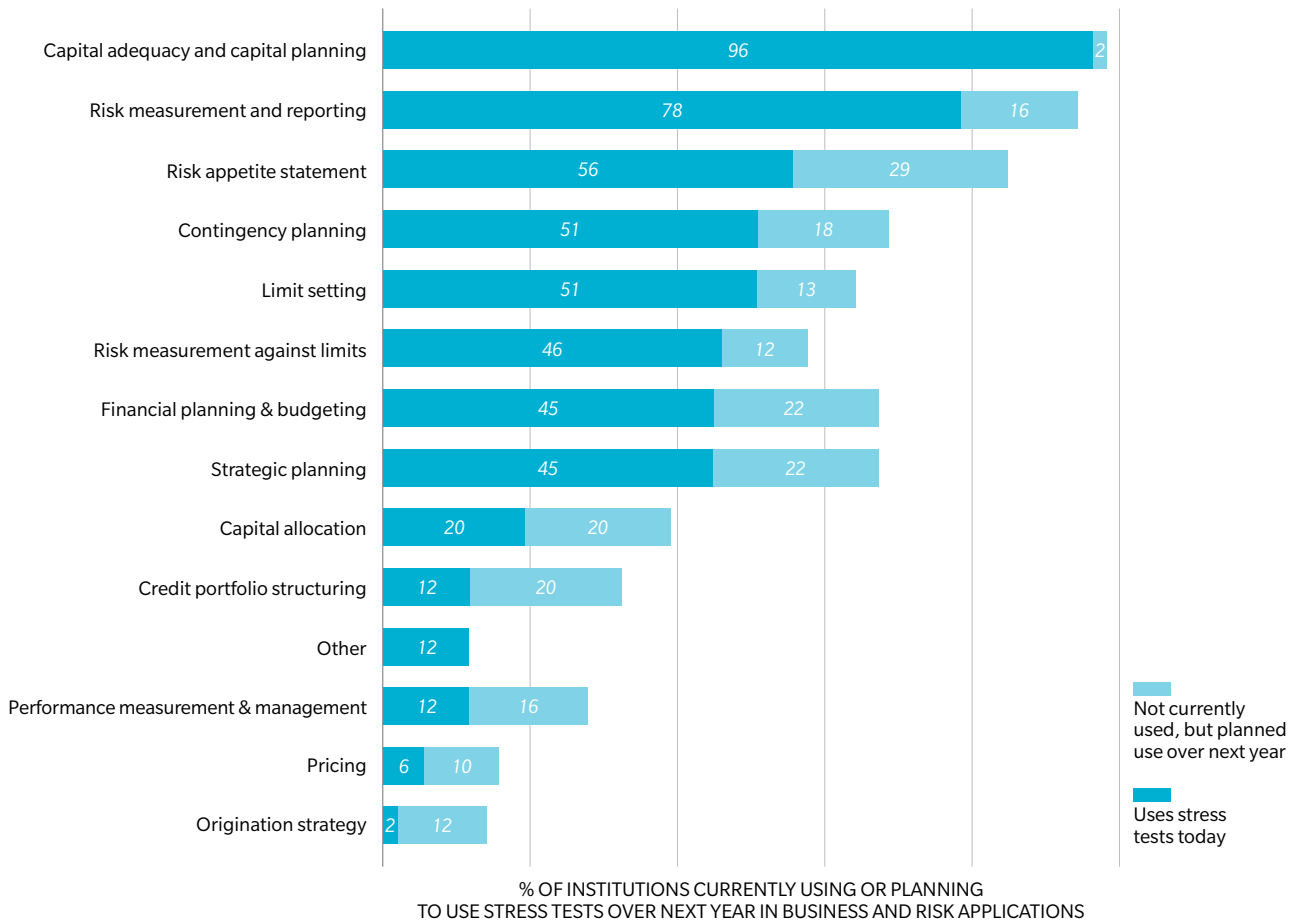
⁵ IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey.

3.1. FOR WHICH APPLICATIONS IS ENTERPRISE-WIDE STRESS TESTING BEING PLANNED?

Most financial institutions plan to extend their use of enterprise-wide stress testing across the range of core risk management applications. Nearly all surveyed institutions have aspirations to incorporate enterprise-wide stress testing into capital adequacy and capital

planning (if not doing so already) and into risk reporting and risk appetite statements. Approximately two-thirds either already or plan to link enterprise-wide stress testing to their planning processes and to their limit setting and management.

EXHIBIT 6: CURRENT AND PLANNED USE OF STRESS TESTING BY BUSINESS APPLICATION



Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

However, many institutions remain focused on improving the underlying approach to enterprise-wide stress testing and the infrastructure that supports it. With continued methodological improvements, and growing experience, we expect stress testing results to be further integrated into business applications. One of the institutions interviewed described recent

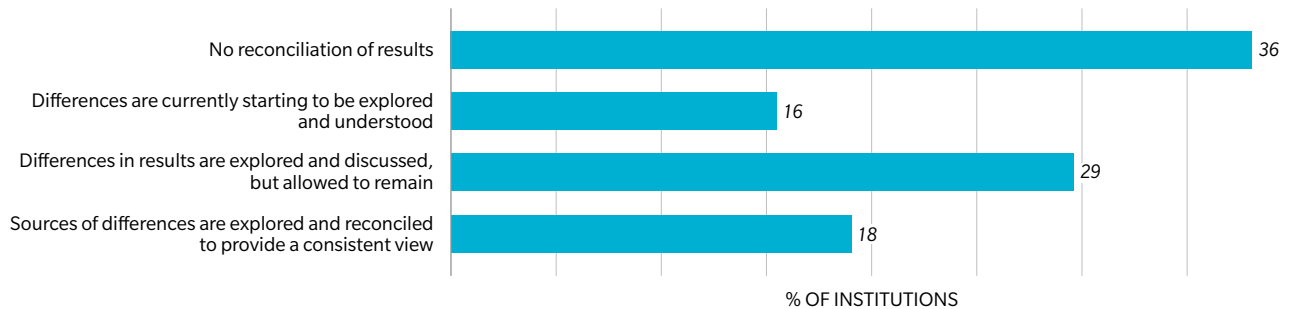
success in achieving higher levels of business and senior management buy-in, a critical precursor to greater integration of stress testing in business applications. As methodologies are further refined, and as results can be better supported at granular levels, this institution hopes to use stress test results much more broadly for applications such as capital allocation and pricing.

3.2. ALTERNATIVE FUTURE PATHS FOR ENTERPRISE-WIDE STRESS TESTING AND ECONOMIC CAPITAL

Surveyed institutions overwhelmingly expect to maintain both economic capital and enterprise-wide stress testing as risk management tools. However, maintaining multiple frameworks could lead to challenges in decision-making as they may appear to generate conflicting results. For example, approximately three-quarters of surveyed institutions intend to continue to develop and maintain both metrics, but only about a fifth report currently reconciling differences between the two approaches to provide a consistent view of risk (Exhibit 7).

Moreover, economic capital and stress testing results are often challenging to reconcile. This is, in part, due to theoretical differences between the metrics, such as conditionality on specific macroeconomic scenarios, differences in time horizon, and accounting versus economic views of risk. However, even after accounting for these theoretical differences, fundamentally different methodologies and inputs can further complicate reconciliation, as Exhibit 8 illustrates.

EXHIBIT 7: RECONCILIATION BETWEEN STRESS TESTING AND ECONOMIC CAPITAL



Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

The industry has not settled on an answer to the question of how to balance stress testing and economic capital. Will the two be applied in largely separate domains, with minimal correspondence or overlap? Or will they be used as complementary metrics for the same risks and business purposes? Or will banks try to unify their underlying frameworks to the extent possible? Each of these approaches is discussed below.

ALTERNATIVE 1: Economic capital and enterprise-wide stress testing are used in separate areas

In this approach, enterprise-wide stress testing becomes a critical tool for capital adequacy, capital management contingency planning, and strategic and

financial planning. Economic capital continues to be the primary risk metric for capital allocation, performance measurement and pricing. For other applications, such as limit setting and risk reporting, institutions may make different decisions about whether enterprise-wide stress testing, economic capital or both should be used. In short, this alternative achieves a balance between enterprise-wide stress testing and economic capital by generally avoiding situations where these metrics give different answers to the same question and, hence, recommend different courses of action. However, this can obscure inconsistencies that, if seen, would prompt risk analysts to a more thorough examination of data or assumptions and a deeper understanding of the real risk situation.

ALTERNATIVE 2: Economic capital and enterprise-wide stress testing co-exist as competing measures of risk, with both informing similar applications

In this alternative, both economic capital and enterprise-wide stress testing are used across many of the core risk management applications. Institutions would accept the various benefits and shortcomings of each metric. For cases where the two metrics suggest different courses of action, institutions would apply a framework to decide which metric should be given priority for the matter at hand. Such a framework could allow some use of management judgment. However, a well-defined process is needed to avoid bias in selecting the metric to be used.

ALTERNATIVE 3: Economic capital and enterprise-wide stress testing are integrated into a common framework

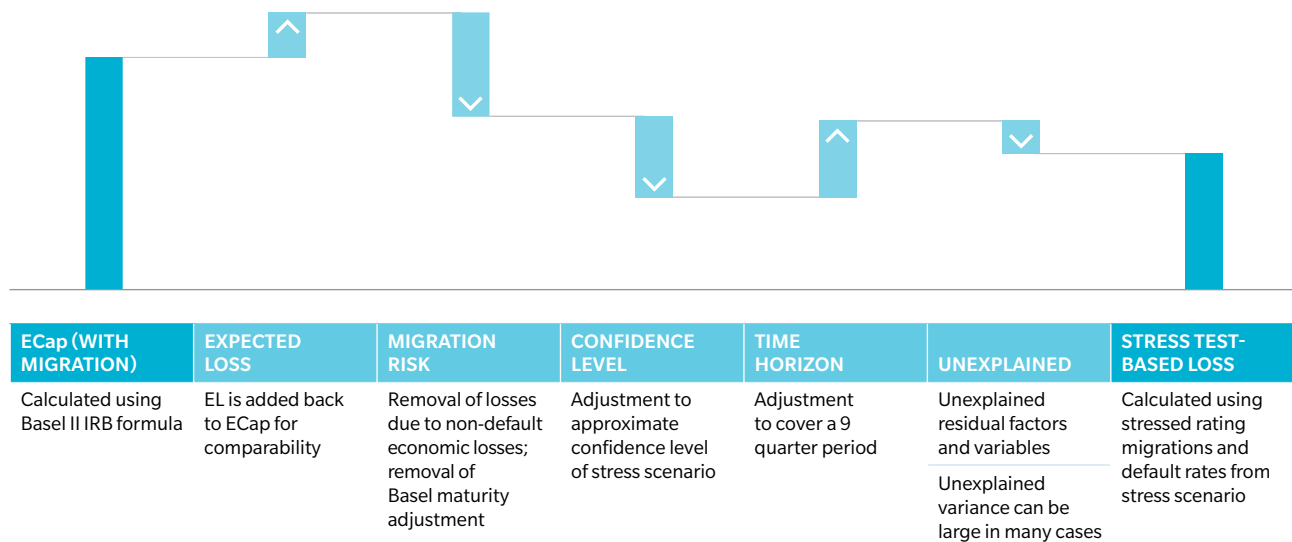
In this alternative, institutions find ways of producing enterprise-wide stress test results and economic capital results using common underlying data, approaches and assumptions. For example, consistent joint approaches for credit risk could involve the combination of a stress

testing platform for evaluating conditional credit losses with an economic scenario simulation generator⁶. This alternative requires significant advancements in modeling capabilities and enterprise-wide stress testing processes (compared to where the industry is today) in order to measure economic capital.

Economic capital numbers would now be more intuitive, because they are grounded in clearly defined, causal scenarios. Differences in results can then be attributed to accounting-based versus value-based considerations and to differences in the severity of the stress scenario and the economic capital scenario.

This approach allows banks to use multiple risk metrics for risk management applications while minimizing their potential inconsistencies. Banks would still need to decide when to use which measure of risk, but such decisions could be based on fundamental differences in the metrics and then formalized in policy rather than being evaluated case-by-case.

EXHIBIT 8: EXAMPLE RECONCILIATION OF ECONOMIC CAPITAL AND STRESS TEST RESULTS



Source: Oliver Wyman analysis

⁶ See *Improving the Measurement of Capital Adequacy – The Future of Economic Capital and Stress Testing*, McGee and Cope, December 2012, Oliver Wyman Point of View.

POINT OF VIEW

While we view each of these as plausible long term alternatives, we believe that most institutions will likely end up in Alternative 2. In a post-crisis world, there are a larger number of objectives and constraints to manage, and making some decisions based on a single metric may lead to suboptimal decisions. For example, while today's binding constraint may be capital under a regulatory stress test, an institution would not want to make decisions that look favorable under this measure but less favorable on an economic basis.

Effectively managing in a world of multiple constraints and multiple measures is much more challenging than choosing a single measure – not only in terms of the measures themselves, but also in communicating to stakeholders and decision-makers across an institution. To do this effectively, each institution should develop a comprehensive metric framework that clearly articulates:

- What are the measures that are used across the institution? What are the advantages and limitations of each?
- What measures will we use for each application? Where multiple measures are used, how do we use them jointly? Is one measure primary/secondary?
- What do we do when the measures disagree? What does it mean?

4. ONGOING CHALLENGES IN STRESS TESTING

Despite much progress in enterprise-wide stress testing across the industry, there remain challenges to greater usage in business decision-making. There are methodological and technical challenges to meeting users' demands for increasingly granular, accurate and timely information.

And there are broader process and organizational challenges that currently limit the use of enterprise-wide stress testing results within the institution.

EXHIBIT 9: COMMON STRESS TESTING CHALLENGES AND "PAIN POINTS"

	METHODOLOGY AND TECHNICAL	PROCESS AND ORGANIZATIONAL
Frequently cited	<ul style="list-style-type: none">• Data limitations prevent granular customization• Poor, ad-hoc infrastructure	<ul style="list-style-type: none">• Difficult to coordinate across groups• Excessive manual interventions
Occasionally cited	<ul style="list-style-type: none">• Methodologies are not appropriate• Challenges with attributing stress test results to the necessary level of granularity	<ul style="list-style-type: none">• Individual elements of process are too slow• Excessive review periods

4.1. METHODOLOGICAL AND TECHNICAL CHALLENGES

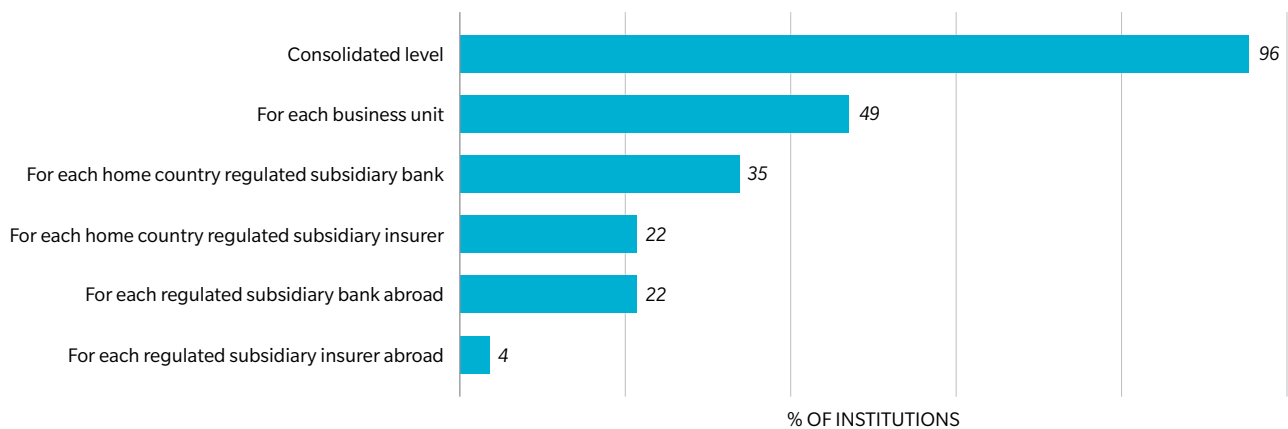
CHALLENGE: Increased granularity is needed for tailored use of enterprise-wide stress testing results

Enterprise-wide stress testing results must be accurate at the portfolio or sub-portfolio levels to be effective in business applications such as capital allocation, pricing, and performance measurement. So far, however, enterprise-wide stress testing has focused mostly on capital adequacy, which requires accurate results at only the enterprise level⁷. In many institutions, enterprise-wide stress test results are still relatively crude at position-level or even portfolio-level. Currently, approximately half of the institutions surveyed produce enterprise-wide stress testing results at the business unit level, and still fewer institutions produce them at the portfolio level⁸. Several institutions interviewed indicated that the lack of accurate results at more granular levels limits the amount of buy-in achieved, which in turn limits the use of stress testing in the organization.

Getting more granular enterprise-wide stress test output requires advances in three areas:

- **Data:** Institutions identified data limitations as the top impediment to greater use of enterprise-wide stress testing. Over half the surveyed institutions report that data limitations prevent modeling and customization at a sufficiently granular level⁹. For example, obtaining good historical data to support loss given default (LGD) modeling is well-known to be a challenge for many institutions.
- **Methodology:** In some institutions, enterprise-wide stress testing is still predominantly top-down, relying, for example, on high-level loss regressions. Such top-down approaches may be accurate for the enterprise as a whole but not at more granular portfolio levels, especially when portfolio composition has changed over time. Many of the simplest top-down approaches have now been replaced by more granular models. But even some such granular approaches do not fully account for the characteristics of specific portfolios and changes in their quality over time. For example,

EXHIBIT 10: GRANULARITY OF ENTERPRISE-WIDE STRESS TEST RESULTS AND REPORTING



Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

⁷ However, in many cases approaches that are developed to achieve accuracy at enterprise level may fail to achieve this if they are insufficiently granular. See *Stress Testing Bank Profitability*, Duane, Schuermann, Reynolds, Forthcoming, *Journal of Risk Management in Financial Institutions*.

⁸ IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey.

⁹ IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey.

commercial loan losses are often forecasted using a credit quality migration matrix. However, many institutions have not modeled the relationship of migration and default to macroeconomic variables based on factors such as industry, or company size. To do so, models can either incorporate more loan-level characteristics into the forecast directly (that is, as independent variables in the model) or segment the macroeconomic relationships using these characteristics.

- **Segmentation:** Segmentation is a common way of tailoring models to specific portfolio segments. The segmentation process is often driven by the readily available data or business definitions of segments. Ideally, however, segmentation would explicitly consider the trade-offs between homogeneity of exposures within a segment, data availability at the granular segment level, and materiality of the exposures. In cases where homogeneity and materiality indicate the need for a distinct modeling segment, but data is not readily available, further avenues such as external data or alternative sources for internal data should be explored.

Although modeling granularity will be an ongoing challenge, we expect significant advances in this area for many institutions. In the US, regulators are pushing institutions to improve the accuracy and timeliness of granular data. They require quarterly submission of loan-level data as well as Pre-Provision Net Revenue (PPNR)-related data. Institutions continue to develop data capture mechanisms to support these demands and will benefit from the improved modeling this data allows. Recent regulatory guidance¹⁰ has also emphasized the importance of appropriate and systematic segmentation. Demands for greater customization of model parameters and approaches are also likely to come from business line staff, as enterprise-wide stress testing results are used in more business applications.

CHALLENGE: Improved data and modeling infrastructure is needed to support enterprise-wide stress testing

Institutions often cite data and modeling infrastructure as a limitation on current stress testing approaches. This infrastructure impacts both the range of approaches available to institutions and process efficiency in executing the enterprise-wide stress tests. Difficulties arise because the infrastructure used for stress testing has largely been a collage of tools developed for other processes at financial institutions, such as planning, asset liability management and ad-hoc risk modeling. Similarly, the existing data infrastructure has proven insufficient for the needs of enterprise-wide stress testing. The data is often spread across the organization and is typically unavailable in centralized systems. As a result, institutions often rely on a patchwork of systems, ad-hoc tools and manual processes to execute enterprise-wide stress tests. Many of the tools and systems used were not designed to interface with one another, and end-to-end automation that ensures the traceability of inputs through a reliable, consistent platform is not yet available.

These infrastructural weaknesses have impacted both methodologies and processes. Methodologies are stymied by the unavailability of the data needed to execute more customized and sophisticated modeling, especially in the timeframe required of stress testing. For example, while front-office systems may have the most granular position-level data, this may not be readily available to the areas executing the enterprise-wide stress testing process. Processes are also hindered by the many different tools and hand-offs required by the lack of appropriate infrastructure.

Institutions that most successfully manage the challenges of stress testing do two things:

- **Invest in integrated modeling tools:** The breadth of the enterprise-wide stress testing means that institutions often employ many platforms in the process. Individual risk models, such as those that estimate credit losses, may be combined with

¹⁰ See "Capital Planning at Large Bank Holding Companies: Supervisory Expectations and Range of Current Practice", Federal Reserve, August 2013.

financial forecasting platforms. Integrating these various tools greatly increases the efficiency of the process, requiring less effort to complete stress tests within the short timeframes demanded. For example, some asset-liability management (ALM) tools can also be used to house financial statement data, portfolio data, and forecasting models. With the core models embedded in a central tool, those conducting the stress tests can use their time on ensuring the models receive the right inputs rather than on running many models across the organization and then aggregating the results. This requires significant upfront investment to set up, but such platforms can reduce the cycle time from weeks to days.

- **Focus on consistent data processes:** Some institutions have designed data infrastructure and processes for enterprise-wide stress testing that are consistent with existing regulatory reporting. They rely on shared data infrastructure and thereby reduce the challenges of reconciling the various data used in enterprise-wide stress testing. Alternatively, those that rely on more ad-hoc portfolio or other data often face process inefficiencies because reconciling to reported balance sheet data can be difficult.

CHALLENGE: Modeling profitability dynamics is at a relatively early stage of sophistication for many institutions

Forecasting profitability (i.e., PPNR in the US) under stress scenarios requires modeling net interest income, non-interest income and operating expenses. Historically, for banking institutions, PPNR forecasting has resided within financial planning functions rather than with risk management, the latter of which has typically focused on modeling credit and market risks rather than the drivers of PPNR. However, with multi-period enterprise-wide stress testing, PPNR is a major driver of the capital position of the institution in the stress scenario, and modeling

PPNR increasingly needs to satisfy the requirements of rigorous, sound modeling approaches.

PPNR is driven by external market factors as well as an institution's own business plan and expected behavior, all of which can drive volume and, to a lesser extent, pricing decisions across products and markets. Forecasting of PPNR in annual planning processes also often includes a strong element of goal setting for the institution's businesses. For these reasons, PPNR forecasting for the purposes of planning and budgeting has often been heavily based on business judgment rather than empirically grounded modeling.

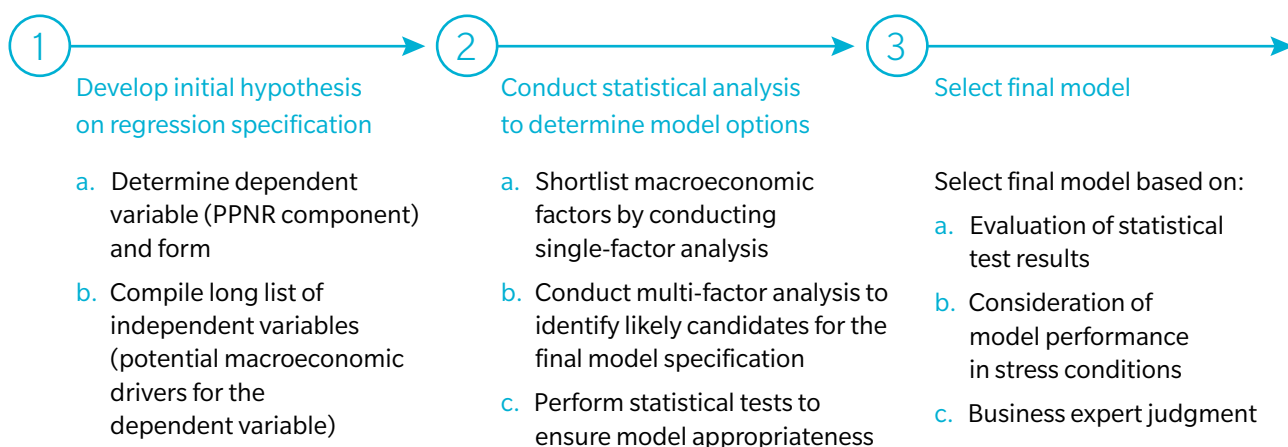
Over the past couple of years, institutions have focused on developing and enhancing PPNR modeling for use in enterprise-wide stress testing, but discussions with survey participants have highlighted that there is still significant work to be done in this area. The key challenge is to convert traditional PPNR forecasting into an empirically-based, analytically rigorous modeling process that satisfies the expectations of risk management functions while remaining intuitive and realistic from the perspectives of the Finance and Business teams. Key factors to success include:

- **Linkage to the budgeting and forecasting process:** Conceptually, there should be no difference between budgeting and stress testing PPNR projections – the budget should be a PPNR scenario with different macroeconomic inputs. While conceptually simple, in practice this requires a shift towards driver-based budgeting, where a budget projection for a line item is a function of a macroeconomically-driven industry growth rate, and an institutional “share” overlay taking into account specific strategies and tactics that are planned. In a stress test, the institutions would run the models to generate a stress input for the industry growth, resulting in its stress output. Moving to this type of driver-based process is critical to ensuring ongoing alignment.

- **Rigorous model development process:** PPNR forecasts must be linked to macroeconomic variables to effectively capture the impact of the stress scenario. Development of these macroeconomic relationships should follow a rigorous approach in order to provide an accurate forecast in the stress scenario and to justify the appropriateness of the final model to regulators as well as internal constituents. Macroeconomic relationships that are

developed judgmentally may not use the optimal macroeconomic variables, are more likely to be inaccurate in their forecast results, and typically fail to pass muster with regulators. A rigorous development process also leaves room to incorporate business expert judgment in the final form of the macroeconomic relationship; Exhibit 11 illustrates such a development approach.

EXHIBIT 11: EXAMPLE PPNR MACROECONOMIC LINKAGE DEVELOPMENT APPROACH



- **Appropriately granular approaches¹¹:** Successfully modeling profitability requires tailored, institution-specific approaches that segment the components of the P&L across products and business activities. Insufficient granularity can obscure different sensitivities to macroeconomic factors and reduce the accuracy of stress forecasts. Segmentation should consider the components of PPNR such as business volumes, pricing and fee categories. Segmentation should also aim to distinguish drivers of PPNR that are contractual from those that are macroeconomically-driven or behavioral. For example, volume modeling should focus on new business volumes and non-contractual prepayment rather than on the modeling of aggregate balances that include contractually defined repayments. Segmentation may also consider differences in geography, business

lines, products and industry sectors. P&L across these segments may be impacted differently depending on the stress scenario and may warrant separate macroeconomic relationships.

- **Attention to data:** A key challenge is the availability of data at a level needed to develop empirically based macroeconomic relationships. While more aggregate P&L data is commonly available from finance systems, data that splits PPNR into components such as new business volumes and pricing is often more difficult to obtain at a granular segment level. In some cases, this information is available somewhere in the institution, or suitable external proxies are available, but would require material effort to locate and adapt to the task. Institutions sometimes hesitate to make this

¹¹ For more on this topic see *Stress Testing Bank Profitability*, Duane, Schuermann, Reynolds, Forthcoming, *Journal of Risk Management in Financial Institutions*.

investment in obtaining the data – to the detriment of the ultimate quality of the modeling.

- **Participation in the development effort:** Modeling PPNR should incorporate expertise from Risk, Finance and Business teams. Modeling efforts, without sufficient input from those with an

understanding of key business drivers, may result in spurious macroeconomic relationships that may not be intuitive and ultimately have poor results and buy-in from the organization. Implementing a process for model development that explicitly incorporates all relevant parties can help mitigate these issues.

4.2. PROCESS AND ORGANIZATIONAL CHALLENGES

CHALLENGE: Clear ownership and governance is critical to an efficient process and to organizational buy-in

Many institutions have struggled to define and agree on an efficient organizational and governance model for enterprise-wide stress testing. About three-quarters of surveyed institutions cite coordination among groups as the biggest “pain point” in the overall enterprise-wide stress testing process¹². For example, enterprise-wide stress testing requires the forecasting of new business volumes under a stress scenario. Under the baseline scenario in the budgeting processes, business units and financial planning teams often specify their anticipated volumes given market considerations, internal strategy, and some constraints, such as the limits defined by Risk. To forecast stress scenarios, however, greater involvement is needed from Risk as the forecast can have a large impact on anticipated capital ratios. An overly ambitious forecast of volume reductions can distort the view of capital adequacy.

Governance is further complicated by the fact that the key participants – Finance, Risk and the Business Units – often approach enterprise-wide stress testing with different perspectives and objectives:

- Business units may have the deepest understanding of likely behavior of the business and the market under stress, and they often have the best understanding of the underlying data needed to develop the appropriate models. On the other hand, business units may be reluctant to admit the size of losses

they would incur in the stress scenario and thus be inclined to understate risk.

- Finance generally owns the planning process that often forms the backbone of enterprise-wide stress testing and often also owns the capital management process that is a key consumer of enterprise-wide stress testing results. Given the responsibility for capital management, Finance has a tendency to focus on achieving appropriate capital returns for shareholders.
- Risk is responsible for measuring and managing the risk profile of the institution. However, it often does not house all the capabilities needed to execute the full enterprise-wide stress testing process. It needs to coordinate with Finance and the Business units; and therein can lie disagreements about the control and ownership of key parameters and processes.

The governance challenge varies significantly across institutions surveyed. Much of the success observed to date can be attributable to regulatory pressure and resulting senior management attention. The threat of a withheld dividend can be a significant motivator to overcoming organizational and governance challenges. In the US, where the regulatory focus on enterprise-wide stress testing has been very high, institutions were more than twice as likely as non-US institutions to report that they are highly satisfied with their current organizational model¹³.

This challenge cannot be easily remedied by simply moving accountability or responsibility – the nature of the process is that it inherently cuts across functions.

¹² IACPM/Oliver Wyman Enterprise-Wide Stress Survey.

¹³ IACPM/Oliver Wyman Enterprise-Wide Stress Survey.

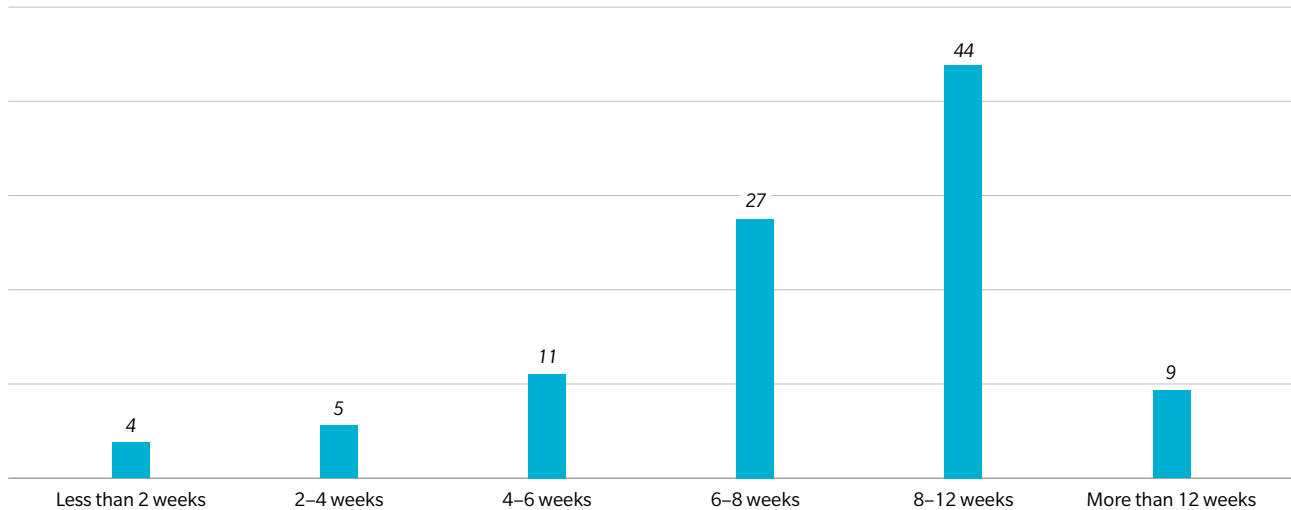
Firms where the organizational and governance model works best tend to have clearly defined accountabilities for each of the major stakeholders, and effective coordination processes for managing the inevitable issues as they arise.

CHALLENGE: Process integration and appropriate resourcing are needed to achieve the level of responsiveness demanded of business applications and key stakeholders

The end-to-end stress testing process often takes significant time due to the number of participants, range of required models, and lack of turn-key solutions. However, regulators have placed increasing demands on institutions to produce results quickly. For example, CCAR institutions in the US typically have 7 to 8 weeks between the issuance of a scenario and finalization of capital plans for submission to the regulators. This allows for only a few weeks of stress testing, due to significant review and discussion needed in the capital management process.

EXHIBIT 12: ENTERPRISE-WIDE STRESS TESTING CYCLE TIMES*

% OF INSTITUTIONS BY DURATION OF STRESS TESTING CYCLE



* Cycle time here is defined as the time between scenario definition and presentation of final results
Source: IACPM/Oliver Wyman Enterprise-Wide Stress Testing Survey

As enterprise-wide stress testing plays an increasing role in business applications, the demand for quick execution will also increase. For example, senior management may request ad-hoc analyses to evaluate the potential impact of a business acquisition. To be a useful input into such decision-making, enterprise-wide stress testing analyses would need to be available quickly and reflect current conditions. Processes that are cumbersome and primarily anchored to annual business planning or regulatory reporting calendars will be of limited value for business applications.

Agile stress testing requires the kind of infrastructure development and governance discussed above. It also requires a process that takes account of when data becomes available, when end results are needed, and

how long the Board of Directors and senior management need to review them. Institutions must design the process by “working backward” from these constraints. There is little room in the process for failed hand-offs, so the content and format required for each link in the process must be clearly specified.

Appropriate resourcing is also critical for effective and timely execution of enterprise-wide stress testing. Institutions report that having sufficient dedicated resources, as well as external advice and perspectives, are key lessons learned in the recent past. In general, budgets and resource allocations for stress testing have been increasing. Much of the challenge, however, remains in finding individuals with the appropriate background and skill sets.

5. CONCLUSIONS

Enterprise-wide stress testing has been rapidly evolving and gaining prominence as an important management tool. It is now widely used as a critical tool for evaluating capital adequacy. Institutions have also begun linking enterprise-wide stress testing results to risk reporting, planning, limit setting and limit management.

As stress testing exits its infancy and becomes a “business as usual” process, institutions face the challenge of how to integrate stress testing into broader risk and capital management applications such as performance measurement, capital allocation and pricing, as well as to define the relative role for stress testing, economic capital, and (pre-stress) regulatory capital measures. Institutions need to think carefully about the strengths and limitations of each measure, and how they will utilize them together. We believe that the industry will move towards managing across multiple, co-existing measures of risk, which presents challenges not only in terms developing and maintaining the various measures themselves, but also in communicating effectively and clearly to stakeholders and decision-makers.

More broadly, in order to continue the trajectory of increasingly using enterprise-wide stress testing in decision-making, the industry will need to tackle a number of key challenges:

- **Granularity:** Increased data and modeling granularity is needed for tailored use of enterprise-wide stress testing results.
- **Infrastructure:** Improved data and modeling infrastructure is needed to support enterprise-wide stress testing.
- **Profitability modeling:** Modeling profitability dynamics is at a relatively early stage of sophistication for many institutions.
- **Governance:** Clear governance is critical to an efficient process and to organizational buy-in.
- **Process:** Process integration and appropriate resourcing are needed to achieve the level of responsiveness demanded by business applications and key stakeholders.

Given the current and anticipated attention given to enterprise-wide stress testing, we expect to see significant developments in the coming years.

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