



Stress testing

**A benchmark analysis of
systemically important
financial institutions**



KPMG International

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About the survey

During July and August of 2016, KPMG International conducted a benchmarking assessment of 19 Global Systemically Important Banks (G-SIBs) and Domestic Systemically Important Banks (D-SIBs). Information was gathered through a combination of questionnaires completed directly by individual institutions and in a few cases based on KPMG global lead partner and subject matter expert knowledge.

The 19 participants represent the largest banking institutions globally, with combined total assets in excess of US\$25 trillion.

Foreword

Stress testing and scenario analysis have played important roles in risk management for many years enabling banks to assess the impacts of 'what if' events on key financial measures. In the wake of the global financial crisis, the external focus on the outcome of hypothetical scenarios has increased exponentially through the imposition of regulatory stress testing exercises. Such exercises provide regulators not only with insights on the resilience of individual banks to a range of stresses but also the potential systemic impacts.

This increased regulatory focus has necessitated significant efforts by the largest banking institutions to develop and enhance their existing stress testing capabilities to meet the requirements imposed by these new mandatory exercises. Further, it has intensified the pressure on banks to demonstrate not only financial resilience under adverse conditions, but also the robustness of controls, processes and the overarching governance framework that supports stress testing.

In this report, KPMG presents the results of its 2016 global benchmarking assessment of stress testing, which draws on information surveyed from Global Systemically Important Banks (G-SIBs) and Domestic Systemically Important Banks (D-SIBs). We have leveraged our own experiences supporting major institutions in the design and delivery of stress testing programs in North America, Europe, the United Kingdom and Asia to analyse and interpret the survey data.

The results show that significant progress has been made by the industry in enhancing stress testing frameworks in recent years. However, diverging practices across regulatory exercises, their constant evolution and the structural differences that exist versus internal approaches have made it difficult for banks to achieve high levels of efficiency and effectiveness. This has manifested itself in the form of high annual running costs which for a number of banks exceeds US\$100m per annum.

With further regulatory and accounting changes on the horizon, we explore within the report the opportunity for institutions to improve and embed stress testing frameworks.

There are some learnings for regulators too, in particular, a more coordinated and aligned global approach to regulatory stress testing exercises would significantly lessen the burden on banks thereby releasing resources to focus on internal risk management.

Building a long-term strategy for stress testing will no doubt be a challenge, but it is one that should help demonstrate its value to regulators, bank stakeholders and consumers. We hope that this report will help on that journey.



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Key findings

Institutions have made significant progress in the past few years in developing stress test frameworks. As a result of this, institutions are better able to demonstrate to regulators the quality of approach and controls. Similarly, institutions stronger capital positions leads to greater capacity to absorb all but the most severe shocks while continuing to meet the minimum hurdles applied by regulators. However, even with the improvements to the technical application of stress testing, there is still work to be done to enhance the operational delivery and embed stress testing further across institutions.

Our work has highlighted six key areas and findings with associated recommendations that we believe will enhance and improve the efficiency of the future state of stress testing.



The imbalance between regulatory and internal stress testing is limiting usage

External stress testing is primarily used in validating capital resilience, with limited influence in business planning. However, firms are employing significant time and resources in meeting regulatory demands, diverting efforts away from internal stress testing and limiting the value that firms derive from this.

Recommendation: Banks and regulators need to work together to agree the right balance of effort between internal and external stress testing to preserve the value of stress testing as an internal management tool.

Fewer than

30%

of firms use external stress testing to support business planning.

1

Understanding the true cost of stress testing is critical to your investment strategy



Stress testing consumes significant time, effort and expense within institutions, however, very few institutions understand the totality of these efforts and the associated costs. Further, the allocation of these expenses across the aspects of the process are not well understood.

Recommendation: We recommend banks document the full end to end stress testing process and accurately measure the full costs of delivery in order to identify optimization opportunities and support investment decisions.

25%

of banks estimate annual spend exceeds \$100m USD.

2

More bodies on the ground is not the solution

There continues to be insufficient resources to meet the expanding schedule of both internal and external stress tests. Most institutions retain a relatively small number of staff dedicated to stress testing, while a broad range of other teams are indirectly involved.

Recommendation: Institutions should embed stress testing into existing planning and forecasting activities in order to leverage existing resources tools, and methodologies.

Only

30%

of respondents felt they had **sufficient resources** to complete stress testing.

3



This report explores the results of the survey, covering how institutions currently approach and use stress testing within the business, the costs, challenges and future development plans, as well as the relationship between the stress testing process and the value derived from it by institutions and regulators.



The future of automation

The rapid expansion of stress testing methodologies over the past few years has led to a reliance on manual processes to complete stress testing. There is a clear intention from institutions to invest in systems and tools to increase the level of automation across the stress testing process.

Recommendation: It is essential that institutions automate key stress testing processes in order to improve timescales and to support internal and external demands.

More than **half** of institutions take **three or more months** to complete an end-to-end stress test.

4



The current change agenda provides the ideal platform to reform stress testing

The collation and reconciliation of data was highlighted as a significant effort to complete within current processes and a primary concern for the future ability to manage stress testing. The introduction of new regulatory and accounting rules provides institutions with an opportunity to enhance stress testing frameworks

Recommendation: It is essential that banks leverage other programs such as BCBS 239 and IFRS9 to derive benefits and control costs.

Data quality and automation was a key concern for **nearly**

80%
of banks.

5



Challenger models are on the up!

In addition to improving the operational execution of stress testing, institutions recognize the need to continue to enhance their approach through the use of challenger models to benchmark model outputs and ensure that model risk management standards are strengthened to capture all stress testing models.

Recommendation: Institutions must continue to increase the scope and quality of model validation standards to ensure the robustness of the existing models, and to derive value from newly developed models.

30% of institutions have validated less than a third of their stress testing models.

6

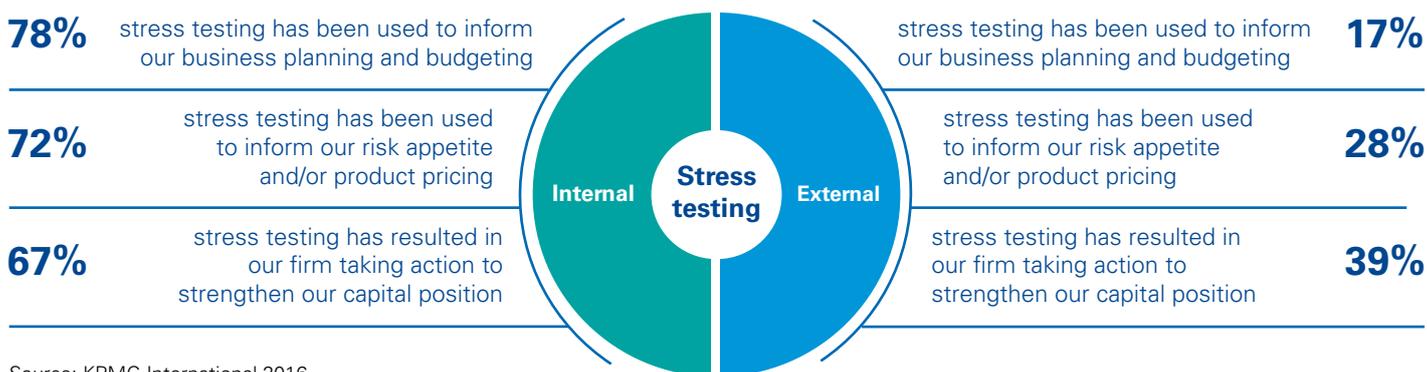
Potential benefits of stress testing

How are results used?

Institutions recognize the potential value of stress testing as a strategic tool for senior management to identify vulnerabilities within the business model. The survey shows there is a difference between the way internal stress testing and

external (regulatory) stress testing is leveraged within the business. Internal stress testing is used more widely than external testing to help manage risk and to influence strategy, risk appetite and capital decisions. By contrast, regulatory stress testing has far less influence on strategic decision making, but has supported capital planning decisions.

Figure 1: Actions taken as a result of stress testing (% of banks agreeing)



Source: KPMG International 2016

Nearly 80% of firms use internal stress testing to support business planning.

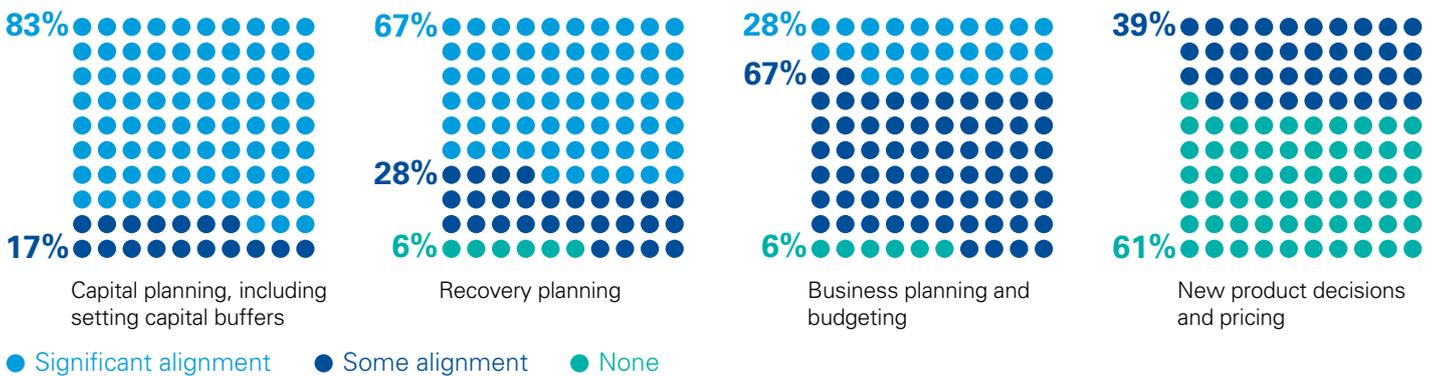
Although the results of internal and external stress testing have been used within the business, the results of these tests are often not at a granularity, or produced at a time or frequency, that is useful for business decision-making beyond annual high level planning. Internal stress testing is most closely aligned to the capital planning process and the setting of capital buffers and, to some extent, recovery planning, although it was recognized that each reflected a different severity of stress event in the business plan. Managers in business planning and product strategy make use of stress test results to help inform high level risk appetite, but generally the stress testing process is not agile enough to be fully embedded in business decisions on an ongoing basis.

Challenges to greater integration

Respondents commonly cited a lack of time or 'business as usual' pressures as reasons why there was limited alignment between stress tests and business activities. The timing of regulatory stress testing does not match internal planning cycles, and, as we discuss later, stress test exercises face resource constraints, resulting in stress testing sometimes being used only as final validation of strategy rather than proactively used throughout the planning process.

Banks that can resolve the challenges of integration will benefit from the value and insight that stress testing brings to business decision-making, but also in leveraging existing resource and processes rather than stress testing being seen as a standalone discipline.

Figure 2: Stress testing alignment with other business activities



Source: KPMG International 2016

61% of institutions do not align stress testing to product strategy.

Centralization or devolution

Internal organization of stress testing

The barriers to the more widespread integration of stress testing into business decision making can partly be explained by analyzing the manner in which stress testing is conducted. While we have observed a range of approaches and varying degrees of centralization, the majority of institutions coordinate stress testing at the center but with calculations distributed to a wider network. Overall ownership typically sits across the risk and finance functions, although some institutions use a risk-led framework. The organization of stress testing activities is under review at many financial institutions, with about 60 percent of respondents expecting to change the structure of their activities in the next three years, mostly by moving toward more centralization of the calculation processes.

The time taken to complete stress testing is increasing

The diversity of operations within the institutions increases the complexity of stress testing (including legal entity, product and geographical segmentation). This presents data challenges, potential inconsistencies in approach and a reliance on multiple manual interactions. This results in a very lengthy enterprise-wide stress test process. While timescales vary, more than half the institutions take three months or more to complete the entire process.

A move towards centralization of the execution of stress tests also potentially blurs the traditional three lines of defence. The second line is often heavily involved in the generation of results and therefore not able to perform an independent review. To overcome this, firms must have robust model risk management frameworks and a clear

framework for the review and challenge of assumptions and results. There is an increased reliance on third-line functions, such as internal audit, to test the controls and frameworks during the execution phase in order to provide assurance as part of the final results sign off.

Stress test processes require ever increasing governance

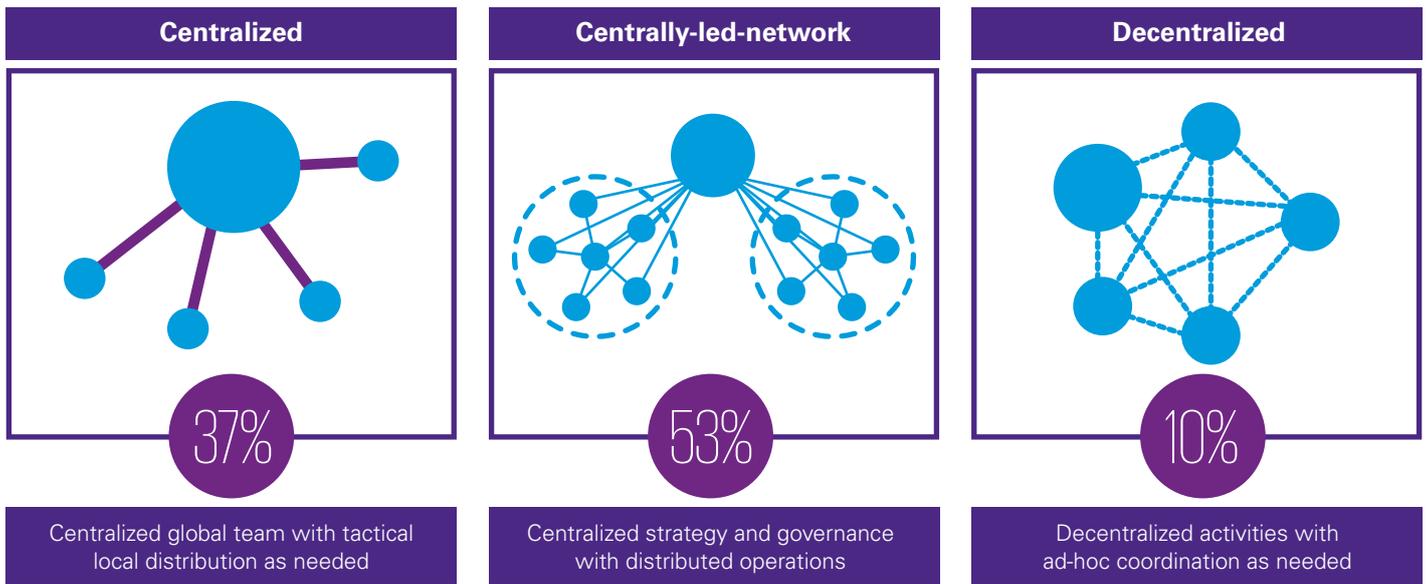
The need and desire to understand the impact of stress testing on various business units often leads to multiple reviews and sign-offs at the business-segment level prior to aggregation and final approval. This increases the numbers of people indirectly involved and lengthens the amount of time taken.

The increased emphasis on governance at all stages of the process mirrors demands for stricter controls by regulators. For example, both the US Federal Reserve and Bank of England (BoE) are increasingly focusing on qualitative aspects within their respective stress testing exercises. This is forcing leading institutions to seek approval and sign-off on an ever-more-granular set of assumptions and processes which often utilize specific stress testing committees rather than existing governance frameworks.

While the improvements in the governance frameworks are welcome and have been recognized by regulators, we perceive that institutions still find it difficult to strike the right balance between the effectiveness and complexity of the governance frameworks. As regulatory regimes stabilize and processes become more embedded, it is expected that governance frameworks will become more efficient, while continuing to ensure effective oversight using existing governance structures where appropriate.

More than half of institutions take **three or more months** to complete an end-to-end stress test.

Figure 3: Stress testing current operating model



Source: KPMG International 2016

60% of institutions plan to move towards greater centralization of stress testing processes.



Current issues and future challenges

Current issues

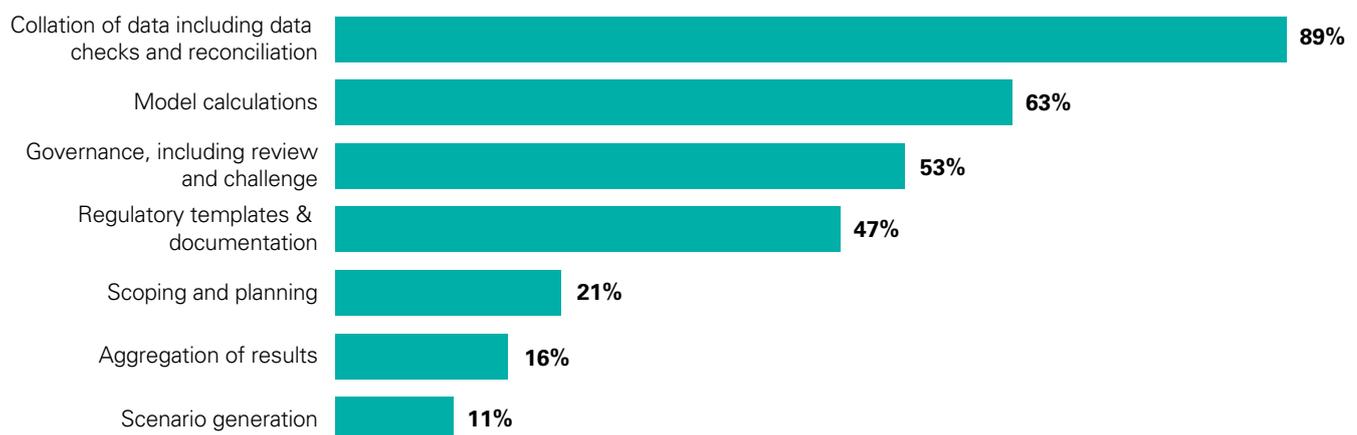
The management of data continues to represent one of the most significant challenges to institutions, and this is borne out by the results showing that the collation of data, including reconciliation checks, consume the most amount of effort in the end to end stress test process.

The calculation of test results was the second biggest effort. Governance was highlighted as the third greatest effort in completing stress testing, with senior management increasingly involved in the process, beyond simply the review. Interestingly, while populating regulatory templates is often flagged as a time consuming issue when speaking with our member firms' clients, the results do not suggest this to be a key concern.

Nearly **90%** of institutions spend the most effort on data collation and reconciliation.

Figure 4: Current stress testing effort

Aspects of stress testing requiring most effort (% ranked in top 3)



Source: KPMG International 2016

Future challenges

Data quality and system automation are the biggest concerns among stress testing practitioners (see Figure 5 below). Institutions covered by the BCBS 239 principles for risk data aggregation and reporting may be able to leverage off the investment in data infrastructure required to meet the data principles to service stress testing data requirements. However, data issues may be exacerbated by growing demands from regulators for more regular and detailed information, increasing the need for additional high-quality data.

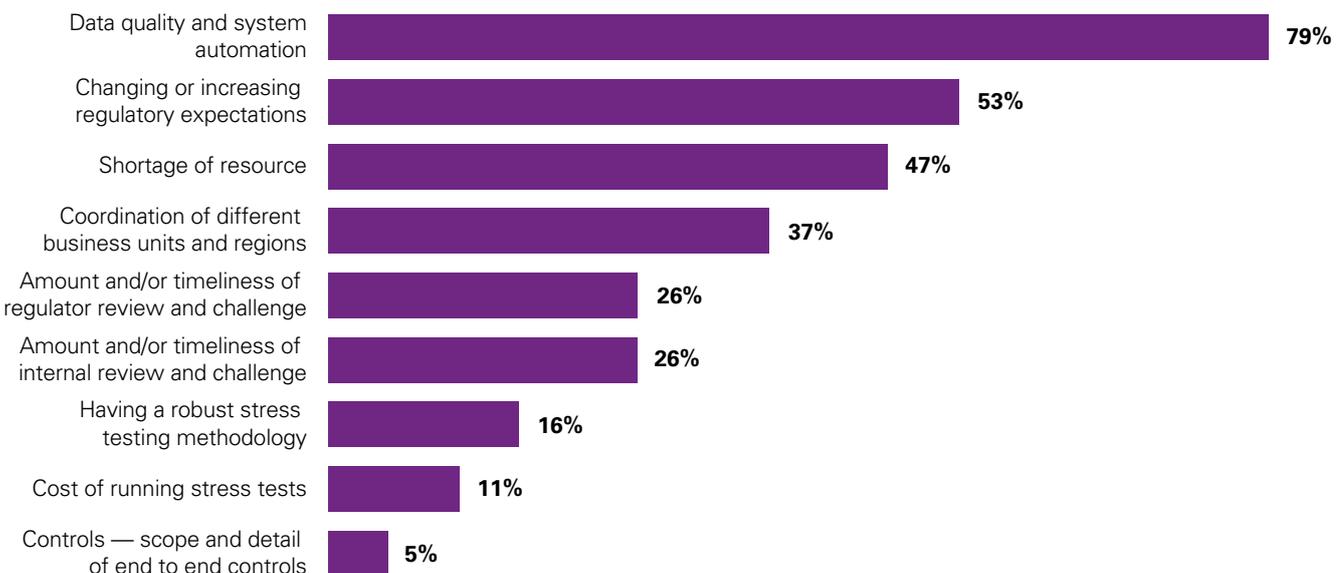
The introduction of other changes, such as IFRS9, will place additional pressure on data requirements, as institutions begin to explore the data and methodology requirements needed to implement these changes into stress testing. Institutions should look to leverage existing data and capital programs to ensure early identification of issues and challenges in the adoption of new rules and make sure these are addressed through existing development work.

Institutions also point out that regulatory stress testing frameworks and the processes developed to execute these remain somewhat immature, with changes to methodologies and data requirements expected each year. This hampers their ability to automate and streamline processes and is one reason why many institutions report that they make limited use of lower cost locations for stress testing, further exacerbating concerns over resourcing and contributing to the lengthy timescales need to complete each exercise.

Over half of institutions report 'changing regulatory requirements' as a concern to complete stress testing.

Figure 5: Stress testing concerns and challenges

Greatest concerns relating to ability to manage and execute stress testing processes (% ranked in top 3)



Source: KPMG International 2016

In the dark about costs

Value vs. investment

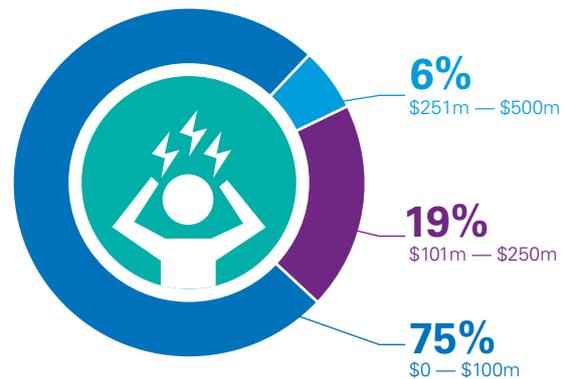
With requirements for stress testing increasing year on year, it is surprising to note the limited regular monitoring of costs, especially given the level of annual costs estimated by the participants of this survey. Only around 10 percent of institutions regularly monitor stress testing costs, while a further 50 percent of respondents have made an adhoc cost assessment. The majority of institutions surveyed estimate annual costs of less than \$100m USD for the delivery of stress testing. However, 25 percent of firms estimate significantly higher amounts are spent each year to deliver internal and external stress test results.

This lack of formal monitoring of costs could suggest that institutions have simply been responding to regulatory demands, with little thought given to optimizing processes and embedding them into the business. This is also reflected in the level of investment which, over the past three years, has been modest compared with the annual delivery costs.

Around half of institutions are expected to maintain investment in the next three years at current levels (<US\$100m) with iterative enhancements to processes expected to be completed by the existing stress test resources within existing budgets. Another 35 percent of firms have higher investment intentions, expecting to invest more than USD \$100m to develop stress testing.

This investment is expected to focus on the data frameworks that support stress testing and other risk management processes and also in supporting firms' move towards greater automation. We explore the automation opportunity and the areas where this investment can be targeted in the 'future automation' section of this report.

Figure 6: Average annual stress testing budgets and investment, 2012–2015 in USD



Source: KPMG International 2016

More than a **third** of banks expect to invest more than **US\$100m** per annum on stress testing in the next three years.

The need for skills

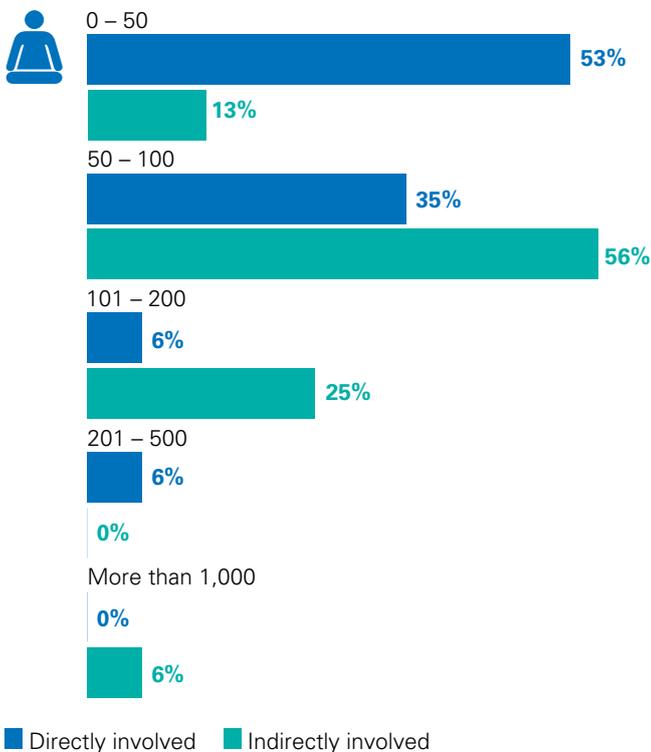
Manual processes still a challenge

The fluctuation in stress testing requirements and the failure of institutions to invest in the automation of stress testing have caused institutions to rely on largely manual processes. In addition, they often rely on the efforts of a small number of experienced staff to complete each stress test, with only about 30 percent of respondents agreeing that the volume of resources is sufficient to complete stress testing.

The shortage of resources was also highlighted as one of the top three concerns of institutions managing stress testing.

Figure 7: Resources involved in stress testing

Number of resources involved in stress testing



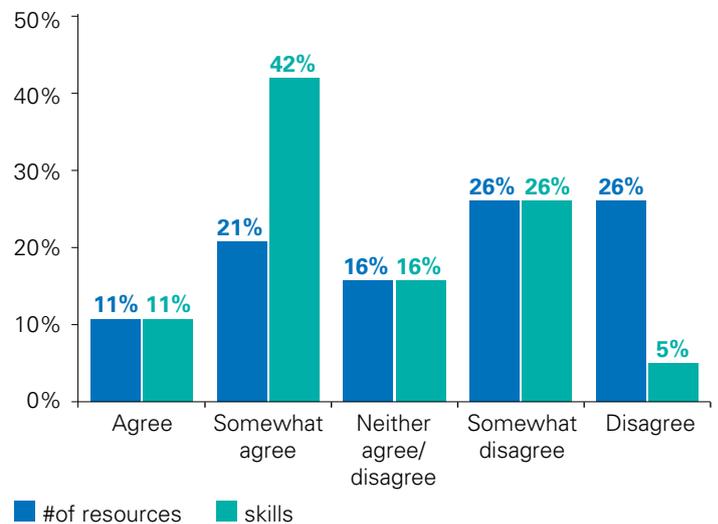
Source: KPMG International 2016

Indeed, this shortage, the workload and time pressure, could be a significant driver of attrition. The report also highlighted the diversion of resources away from internal stress testing/risk management to perform external stress testing.

To overcome the strain on existing resources, it is critical that institutions continue to embed stress testing within the existing business operations to better utilize resources across planning, forecasting and stress testing while simultaneously reducing the level of manual operations involved in stress testing.

Figure 8: Resources and skills capability vs requirements

Extent to which firms believe resource and capability matches requirements



Source: KPMG International 2016

Less than one-third of banks have sufficient resources to complete stress testing.

Future automation

A clear priority

The current level of automation employed in each of the main tasks in the end-to-end stress test process, is shown in Figure 9 below, along with the future intentions of banks to automate parts of the process.

As expected, the more established and data driven processes around model calculations and data reconciliation have some degree of moderate automation, but still consume significant time and effort to complete.

The level of automation is low across each stage of the stress tests cycle, in part due to the level of change seen over the past few years and relatively low levels of investment in technology and systems to support automation. This may be expected in areas such as scoping and planning and governance. However, there are areas such as work flow management where the lack of an automated process or management tools may contribute to institutions having poor transparency of the entire scope of stress

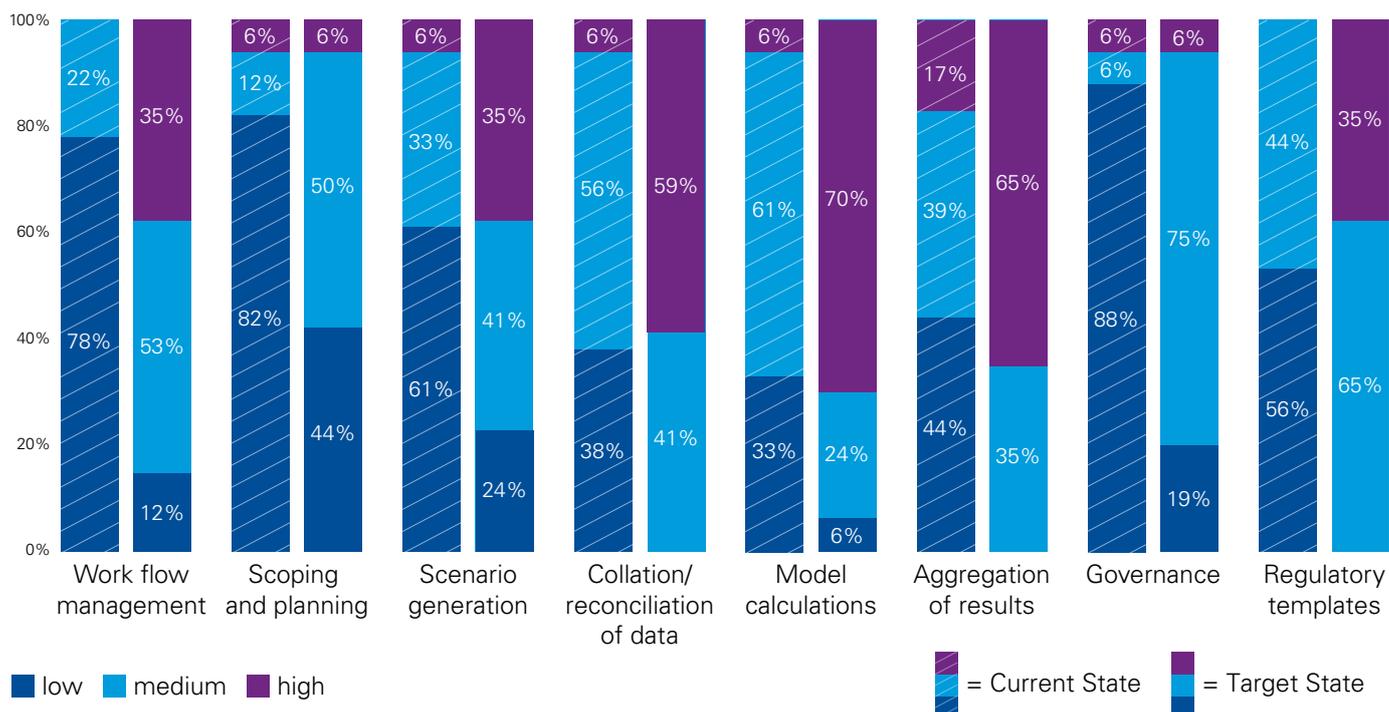
testing tasks and dependencies involved. This is having an indirect effect on cost assessments and hampers efforts to optimize processes and reduce timescales.

Investing in the future

The results show that institutions are expecting to increase the level of automation in their stress testing processes significantly in order to improve controls and reduce timescales. Investment is likely to focus on improving data capture and reconciliation, model calculation and the aggregation of results with more than 60 percent of institutions seeking a high degree of automation in these processes with automated solutions also being sought for the population of regulatory templates. To a lesser degree, but still improving from the current position, greater use of automated tools in process management and scenario generation is also expected to benefit firms.

Human judgment and expertise will continue to be needed for reviewing and challenging the test results, although potentially supported by improved analytics tools to interpret the results.

Figure 9: Automation current vs target state



Source: KPMG International 2016

Increasing focus on stress test models

One consequence of the evolution in stress testing in the past few years is in model development. Here, institutions have sought to develop new models and increase the scope of model governance beyond the traditional credit and market risk focus to include income and balance sheet forecasting models. This has placed additional pressure on existing validation teams. The majority of institutions have yet to validate all stress testing models, despite the fact that more than 80 percent of institutions say they intend to do so. The introduction of a new capital framework (Basel 4) and the implementation of accounting standards such as IFRS9 are likely to lead to a greater reliance on the use of increasingly complex models.

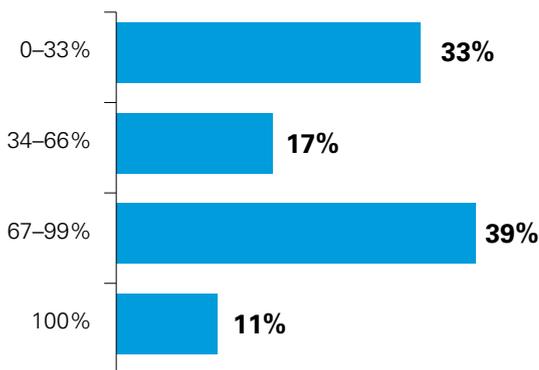
There are challenges in the development and validation of stress test models due to the limited availability of observed stress data. To overcome them, institutions are frequently using expert review and challenge to identify

potential adjustments and management overlays to the modelled results. However, there is an increasing move towards the use of challenger and benchmarking models; US CCAR regulation specifically directs institutions to develop alternative benchmarking, and challenger models to compensate for the challenges in validating primary models.

The use of challenger models

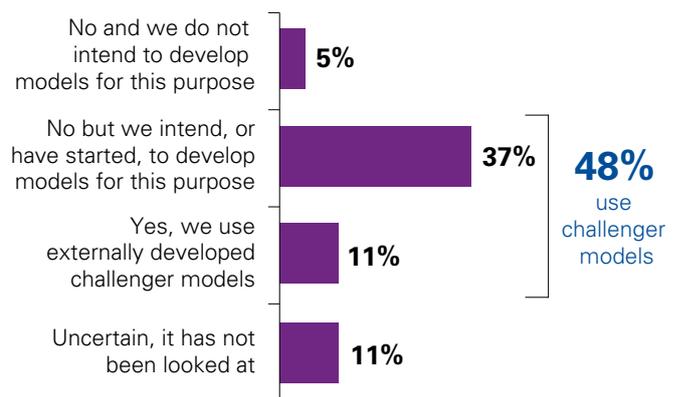
The majority of institutions surveyed recognize the benefit of using benchmarking or challenger models, with about half already using challenger models and a further 37 percent intending to develop such models. Again, this requires substantial model development resources, along with appropriate resources within the independent model validation teams. It is likely that institutions will seek to pay for development resources from 'business as usual' budgets rather than allocating specific investments for stress testing.

Figure 10: Percent of stress testing models that are validated



Source: KPMG International 2016

Figure 11: Use of challenger or benchmark models to validate results



Source: KPMG International 2016

The role of the regulators

The table below shows the most relevant regulatory stress tests for the banks surveyed.



Federal Reserve (CCAR)

2016 scope: 33 largest US Bank Holding Companies (BHCs) (2015: 31BHCs)
Frequency: Annual and semi-annual
Scenarios: Base, Adverse & S-Adverse



Bank of England (PRA)

2016 scope: 7 largest UK banks (2015: same)
Frequency: annual
Scenarios: Base, Adverse, Biennial exploratory starting from 2017



EBA(ECB)

2014 scope: 124 European banks
2016 scope: 53 European banks
Scenarios: Base, Adverse



Other

Banks are also subject to a range of additional local stress test regulations

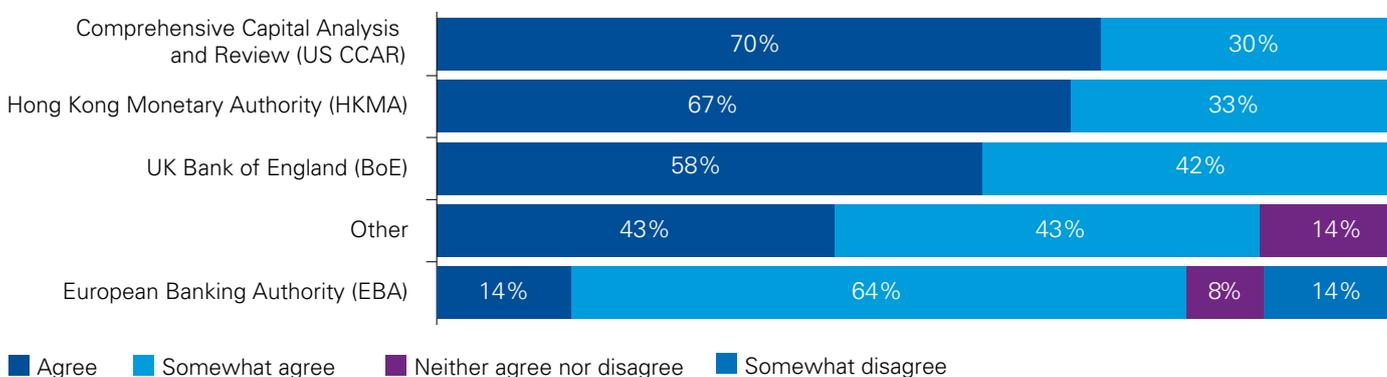
Source: KPMG International 2016

Institutions participating in the survey are subject to different regulatory stress testing regimes, and often have to comply with more than one. Each is designed to test individual bank resilience but also provide regulators with a view of potential systemic risks. It was clear from respondents that they monitor developments across regulatory regimes, including those they are not subject to, in order to enhance their own processes and to prepare for the possible evolution of the regulations to which they are subject.

Figure 12 below shows the extent to which institutions agree that each of the external stress tests are effective in assessing the resilience of institutions to a major shock. The results show there is broad agreement across institutions that each of the stress test exercises does achieve this aim.

Readers will notice that the response that stands out relates to the EBA stress testing exercise where there was less agreement in its ability to test the resilience of institutions.

Figure 12: The effectiveness of regulatory stress testing in assessing resilience



Source: KPMG International 2016

Note: Question posed to participants was, "A commonly cited objective of regulatory stress tests is to assess how resilient the institution is to a major shock. To what extent do you agree or disagree that external stress testing facilitates this?"

This can be explained by the different methodology employed by the EBA, with firms instructed to adopt a static balance sheet and greater modelling constraints to ensure consistency and comparability across the wider population of financial institutions. The static balance sheet assumption also influenced the results shown in Figure 13, where some survey participants felt the exercise provided limited additional insight to their own stress testing programmes.

Alignment of regulatory stress testing frameworks

Of the different regulatory exercises to which institutions are subject, participants in the BoE stress test considered it to have the greatest alignment with the internal process (see Figure 13). This perhaps reflects the BoE reliance on institutions' own internal methodologies rather than prescribing an approach. Institutions have also used external feedback to develop their internal methodologies to improve the effectiveness of their regulatory response.

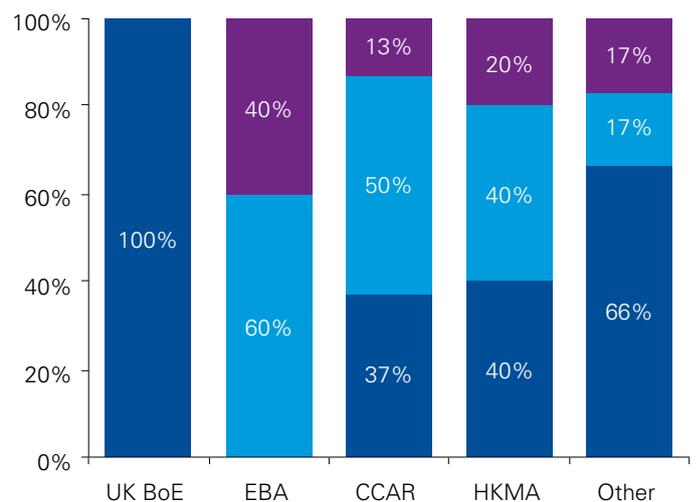
Institutions highlighted the challenges of completing multiple regulatory stress tests due to timescales and methodologies not being aligned. They cited the divergent approaches and frequent or late changes to methodologies as barriers to the effective completion of stress test exercises and the ability to leverage internal and external methodologies.

Institutions were positive about their engagement with regulators throughout the process and about the documentary guidance they received from regulators. However, they also highlighted the complexity of regulatory templates and the lack of materiality thresholds for reconciliations. They pointed out that validation processes require significant resources and offered little value to the firm, again exacerbated by annual changes in the regulatory methodology and data requirements.

Institutions would like to see regulatory requirements in terms of data, templates and the methodology stabilize in order that processes can be embedded and efficiencies delivered. If regulators could engage with institutions earlier regarding potential rule changes, it would help institutions to plan resources for the development and execution of the process.

Figure 13: Perceived alignment of regulatory stress testing

The perceived level of alignment and value of external stress tests



- The approach and methodology is different from our internal stress tests and does not provide additional insights/value add.
- The approach and methodology is different from our internal stress tests and provides additional insights/value add.
- The approach and methodology is largely similar to our internal stress tests allowing for significant leverage.

Source: KPMG International 2016

A tipping point for tougher stress tests

The evolution of regulatory stress testing requirements over the past few years has forced institutions to develop increasingly complex methodologies. There has been less focus on the efficiency of the associated operational processes. As a result, current stress testing processes may become unsustainable if the demands from senior management and regulators continue to increase.

The intellectual discipline around risk identification and the understanding of the risk drivers are valuable to institutions' senior management. But the increased granularity of the approaches and the high data and reporting requirements, along with institutions' failure to invest sufficiently in operational design, have made stress testing processes time consuming and resource intensive. The time taken to run a stress test is not yet at a level where it can be used to support specific business decisions such as individual transactions or acquisitions.

Harder to fail

Given the levels of capital accretion in recent years we would expect fewer banks to fail quantitative hurdles set by regulators except in the most extreme scenarios. However, stress testing remains a core regulatory tool to test individual and system-wide resilience and will continue to be used for internal and regulatory monitoring.

This highlights a need for a discussion between banks and regulators on the balance of effort between internal and regulatory stress testing. Currently the balance of effort is weighted toward the regulatory exercises, diluting the time and effort available to support internal stress testing despite the value of results in the management of the business.

Ever-growing complexity

We would argue that the level of complexity in stress testing has risen to the point where the degree of effort required by institutions is not matched by the value they derive from the exercise. Despite this, the push to use stress test results to help set a firm's individual capital requirements does cause management to use the tests as a capital tool, even if there is diminished value as seen in its application as a risk management and business planning tool.

Regulators, by contrast, are better able to take a system-wide view of risk as a result of stress testing. While the results undoubtedly show that financial institutions enjoy a certain degree of capital strength under the prescribed scenarios, it is important to recognize that these scenarios may not necessarily cover the full range of idiosyncratic and dynamic risks that institutions face.

Globally regulators are constantly reviewing their stress testing procedures. The US Federal Reserve has recently announced¹ the results of its review of the current CCAR regime, which is designed to make the process more effective and remove some of the regulatory burden for institutions that are perceived to present a lower threat to the financial system. Proposed changes include:

- changes to minimum capital requirements to incorporate CCAR results
- simplification of balance sheet and capital requirement assumptions
- lower qualitative thresholds for all but the largest institutions.

While these changes may make stress testing simpler this must be balanced with the value that institutions derive from these tests. The static balance sheet assumption potentially detracts from the internal value due to divergence from internal planning assumptions.

Maintaining value

There could be value to institutions' internal management in the development of simpler but directionally robust top-down tools to understand performance in a greater range of scenarios covering a broader range of risks. However, the required investment in this type of methodology conflicts with the investment needed to improve and streamline existing processes to enable institutions to continue to meet regulatory requirements where a greater degree of complexity and granularity is required.

Given the prevailing trend for ever-stricter regulatory supervision, stress testing will continue to evolve. Institutions should respond with further investments in systems that will yield business benefits while ensuring continued regulatory compliance.

¹ <http://www.federalreserve.gov/newsevents/speech/tarullo20160926a.pdf> — a speech by Daniel Tarullo, Governor, US Federal Reserve. 26 Sept 2016

Given the prevailing trend for ever-stricter regulatory supervision, stress testing will continue to evolve.

We believe a more coordinated and aligned global approach to regulatory stress testing exercises would significantly lessen the burden on banks thereby releasing resources to focus on internal risk management.



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