

Deloitte.

Together makes progress

Stress testing
modernization and
strategic impact

Contents

| | |
|--|----|
| Introduction | 3 |
| Why modernize stress testing? | 4 |
| Technology's role in driving modernization across the stress testing lifecycle | 5 |
| Trustworthy AI governance for stress testing | 7 |
| Stress testing modernization can start today. What to do now? | 8 |
| Stress testing modernization is a strategic imperative for many banks | 9 |
| Authors | 10 |

Introduction

Requirements and expectations for financial institution stress testing are entering a period of substantial transition as new technologies, such as artificial intelligence (AI), could drive robust capabilities. Advances in technology, particularly AI are reshaping bank operating models for stress testing. AI-enabled platforms can automate risk and financial data aggregation, scenario analyses and design, and reporting, enabling more dynamic, granular, and frequent analysis. AI enablement can further support near real-time analytics and faster sensitivity testing, improving agility and efficiency in capital planning and risk-based responsiveness.

What this looks like is AI-supported workflows and controls will deliver repeatable runs, expanded scenarios, ad hoc capabilities, explainable drivers, and auditable control evidence, including lineage, improving both management decisioning and supervisory defensibility.

Capital planning is evolving from an annual application of standardized, required scenarios to include more use-case-driven, institution-specific approaches, explicitly connecting emerging exposures to measurable balance sheet, earnings, and capital adequacy outcomes; better informing strategic decision-making beyond regulatory compliance.

AI can enable this shift by accelerating data mapping and reconciliations between financial data, models, and risk variables producing clearer, faster scenario design, faster documentation of scenario rationale, key assumptions, and overlays, while improving orchestration.

Stress testing modernization can benefit smaller banks to the largest banks subject to a range of regulatory requirements, even though the scale and level of capital management program maturity will differ by the size and complexity of the institution. For example, large and complex global banks with the most stringent capital requirements may pursue scale plays such as cloud-based adoption for faster and automated end-to-end processes, while smaller banks and regionals may start by targeting areas providing high-ROI such as AI-supported data mapping and reconciliations, and automated documentation.

Modernization of stress testing, including AI enablement, matters for both regional and large banks, even if risks and regulatory capital requirements are tailored differently.

Why modernize stress testing?

Stress testing is no longer a one-and-done exercise limited to an annual or semiannual regulatory capital process. The same capabilities needed to satisfy supervision such as clean data lineage, explainability, and disciplined governance can unlock real business value including lower costs, faster decision cycles, and a clearer view of balance-sheet capacity in periods of diverse stress. Modernized stress testing transforms a critical portion of a bank's capital management program from an annual drill into an "always-on" engine informing day-to-day decisions regarding growth, capital, liquidity, and risk.

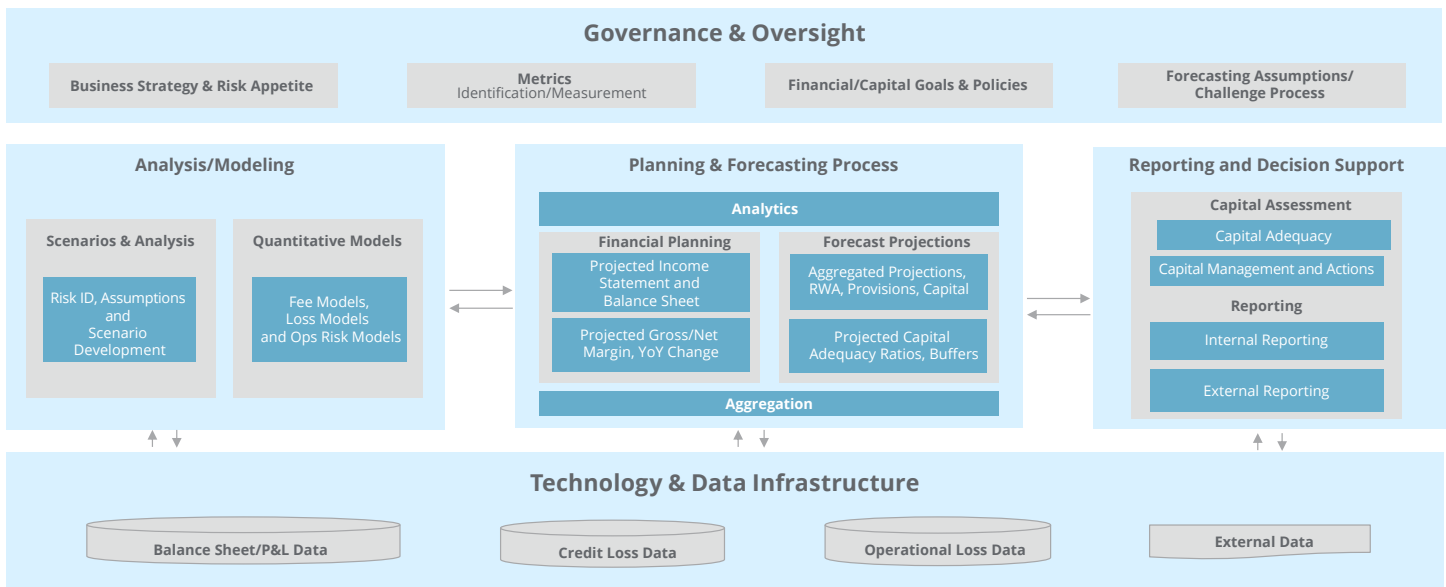
- **Volatility is changing faster than testing cycles, raising the opportunity for AI to drive speed and insight.** Faster and higher-quality analytics across stress testing processes will give management an advantage as firms can run credible "what-if" analyses more frequently to gain decision advantages such as hedging, limits, and contingency actions along with the ability to make pivots based on deposit behavior, funding costs, market shocks, and operational disruption.

Bottom line
 Modernizing is less about compliance and more about converting high-cost, high-friction financial stress testing into a scalable capability that improves portfolio decisions and risk control while delivering better transparency and explainability.

- **Cost pressure is real, and the current execution model is structurally inefficient.** Manually intense, spreadsheet-heavy stress testing processes and manual reconciliations drive rework, errors, and reproduction or resubmissions. Modern platforms can reduce cycle time and errors by industrializing data pipelines, QA/QC, attestations, orchestration, and evidence collection.
- **Management and regulators want better answers and more explainability.** Supervisors, bank boards, and executives are demanding better explanations and clearer linkage between capital composition, usage, loss/risk trade-offs, deployment, and allocation strategy. Modernizing helps deliver that desired clarity.

Stress testing lifecycle

AI enablement should be assessed across the stress testing lifecycle to provide maximum benefits



Technology's role in driving modernization across the stress testing lifecycle

Better data, better readiness to execute and validate

Modern stress testing should start with clean, reusable inputs, common data definitions, consistent exposure tagging, and clear traceability from source systems to stress test outputs; AI and other tools help ensure data issues are found early (not at the end), reconciliations are repeatable, and control evidence is captured as part of workflows so that stress processes and results are audit and regulatory exam ready.

AI can reduce manual work by auto-advising on data mappings from source fields to data models, detecting anomalies and breaks in reconciliations (e.g., totals don't tie to GL or subledger), summarizing data-quality issues in plain language, and generating draft lineage and control notes. It can also help data users reuse or rely on curated data sets across risk programs, portfolio decisioning, capital, liquidity, and FP&A activities so teams stop rebuilding similar data sets in parallel.

AI tools can also propose mappings or segmentation for new data sources or feeds (e.g., deposits by product/channel). Workflows can route anomalies and exceptions to the right owners, capture the "fix" and solicit or record approvals, and store the evidence so the same issue doesn't reappear during the next run.

More sensitive and supported scenarios and analysis

Modern scenario design for stress testing should be bank specific, business informed, thoroughly challenged—and should explicitly connect capital planning narratives and reporting to well-supported risk drivers, key variables, business or product realities, and exposures at portfolio or market levels. Banks should be able to quickly produce and review stress scenario-aligned risk factors and variables, and test sensitivity, without losing explainability.

AI can help generate scenario variants, create sensitivity menus, and pressure test whether narratives and variable paths align (e.g., equity prices, rates, unemployment, deposit betas). AI tools can also draft documentation that links a scenario to transmission channels (deposit substitution, third-party/platform dependencies) and to the most affected portfolios, while keeping humans in control of approvals.

AI can produce translation tables that (1) list key risk elements, (2) list quantitative variables that could or should move (and direction/magnitude ranges), and (3) identify which portfolios and models are

impacted. Scenario owners can then review, adjust, and approve that data and the outputs thus creating a clearer audit trail and reducing last-minute rework.

Repeatability and agile configuration in forecasting

Modernized stress testing execution should enable repeatable runs, clear versioning of data, model configurations, and faster turnaround for "what-if" questions. The bank should be able to explain what has changed between runs (data vs. assumptions vs. portfolio mix vs. management adjustments or overlays) and connect outputs cleanly into capital and liquidity management processes.

AI can accelerate QA/QC by spotting unusual movements, surfacing data breaks earlier, and summarizing run issues and root causes. It can improve attribution by parsing forecast changes into understandable drivers. In addition, it can help teams keep assumptions consistent across stress-focused use cases (e.g. capital, liquidity, credit, market) by highlighting mismatches before results are finalized.

After a rerun, AI can produce driver-based explanations that are easily understood and offer expressive insights (for example, "losses increased mainly due to portfolio mix shift, and a deposit beta change") with links to the underlying inputs and approvals. Reviewers still validate the logic, but they spend less time hunting for the cause and more time challenging whether it's reasonable.

Credible rationalization when incorporating judgment

Overlays and judgment-based approaches that adjust or condition stress testing inputs or outputs should be minimized, if possible. But should be rationalized and evidence-driven if used. Each overlay should have a clear purpose, application trigger, rationale, sizing method, and appropriate approvals for scoped use; banks should be able to show how overlays interact with quantitative models used in capital planning to avoid double counting or other distortions in final stress testing results.

AI tools can create or standardize overlay profiles and descriptions, can check completeness (trigger, rationale, sizing, governance), maintain or establish overlay-to-model mappings, and flag overlaps or contradictions across use cases. They can also assemble support packs (data extracts, memos, meeting notes, approvals) so reviewers can quickly see an overlay's evidence trail.

AI can compare overlays across portfolios and identify where multiple teams may be adjusting differently for the same underlying risk (e.g., different teams adding different levels of conservatism in an overlay designed for deposit outflows or operational disruption). AI can flag the overlap driven by data or by human decision, reduce an overlay, clarify boundaries, or document why both are needed.

Cleaner paths for data aggregation, consistent application of assumptions

Capital stress testing processes rely on—and are often the product of—aggregated data sourced from multiple systems under the ownership of varied data owners and production methods, pathways or cycles. Modernized stress testing should produce consistent and confident results from well-aggregated data shaped by shared assumptions across risk, finance, and treasury teams, and their programs and objectives (e.g., balance-sheet optimization, funding methods, capital allocation, loss estimation, risk identification, business strategy).

AI can help by detecting data type, data mapping, and hierarchy inconsistencies, highlighting data and also applicable assumption misalignment across sources and data ownership or data processing domains or roles; and it can flag potential issues before consolidation occurs for use in stress testing.

If risk and finance use slightly different products or legal-entity hierarchies, for example, AI can flag where roll-ups don't reconcile and suggest the specific mismatches causing the break. Business-led data availability issues, unique insights, or other quantitative inputs about product or portfolio characteristics may create specific assumptions that should be sustained into stress testing. AI can integrate those assumptions across all data flows.

The fix via AI tools is controlled mapping tables and assumption inventories, with approvals captured so any misalignments or issues don't compound into aggregated data sets used in stress testing.

Greater transparency for more effective independent review

Modern stress testing should drive timely, truly independent challenge to stress scenario design outcomes and variable selection, to overlays and assumptions, to the data reported to boards and supervisors. Reviewers should be able to quickly see what is material and relevant data; whether it changed; why it changed; and whether it's consistent with the scenario, the bank's risk profile, and overall capital management objectives and planning requirements.

AI can surface outliers and unexpected movements, decompose "what changed" into key drivers such as data, assumptions, overlays, and organize evidence into traceable review packages.

This reduces manual research and increases time spent by first-line and second-line teams on substantive challenges, without compromising reviewer independence.

AI can flag that a segment's losses moved materially versus prior run, then pre-populate a short document showing the top drivers, related input changes, and approvals. The reviewer validates the facts, then focuses on the real question: Is the movement reasonable and consistent with the scenario?

Explainability for actionable management decision-making

Modern stress testing should result in useful, simple narratives for management and supervisory stakeholders that link complex forecasts and results to fundamental drivers, uncertainties, and proposed management actions with a defensible and auditable evidence trail. Messages about stress testing outcomes and impacts to capital over a planning horizon or for strategic purposes should be tailored based on the audience such as board vs. senior management vs. supervisors, and the bank should be able to answer "why" questions quickly and consistently.

AI can draft audience-appropriate narratives that are anchored to documented assumptions, models, overlays, and source data; and it can help translate any projected risks or vulnerabilities into actionable levers such as limits, hedging, funding, and balance-sheet and capital actions. Strong access controls and approvals remain essential, particularly for regulatory-facing materials.

AI can generate a draft review package such as "Why did Net Interest Income (NII) fall?" or "What drove the Common Equity Tier 1 (CET) trough?" using only approved outputs, assumptions, and overlay rationales and linking each answer to supporting exhibits. Owners review and approve the language, which speeds preparation while keeping control of messaging.

Trustworthy AI governance for stress testing

As AI becomes embedded in stress testing workflows, institutions must implement governance commensurate with regulatory expectations for material model risk management, transparency, and operational resilience—while also addressing elevated cybersecurity considerations in cloud-connected environments.

Core governance requirements include:

- **Use-case boundaries:** Explicit definition of permitted versus restricted applications (e.g., automation of controls and documentation versus autonomous model changes or unreviewed overlays).
- **Explainability and traceability:** Preservation of lineage from source data through transformations to AI-assisted outputs and approvals; auditable and reproducible artifacts for all AI-influenced steps.
- **Continuous validation and monitoring:** Periodic validation and ongoing performance monitoring, including data drift detection and control testing, consistent with model risk management standards.
- **Human accountability:** Clear ownership, approval requirements, and segregation of duties for scenario changes, overlays, and narrative outputs.
- **Data governance:** Control of data sources, permissions, retention, and sensitive data handling to prevent leakage of confidential data.
- **Cybersecurity controls:** Layered access controls, penetration testing, real-time monitoring, and safeguards against model manipulation or unauthorized access.

Stress testing modernization can start today. What to do now?

Firms are increasingly using AI in stress testing and enterprise risk programs to streamline repeatable execution work, tighten traceability and controls, and accelerate review cycles without changing the core governance or accountability model.

To get started, consider the following:

- **Identify scope and success criteria:** Define initial scope in terms of processes and portfolios, and define measurable outcomes such as speed, ability to rerun, and traceability.
- **Baseline the current state:** Map the end-to-end process, pinpoint rework and control gaps, and identify root causes.
- **Set the roadmap:** Prioritize foundational fixes first such as common data definitions, controlled reruns, evidence capture, and traceability with clear owners and dependencies.

- **Run a focused pilot:** Prove the target workflow on a representative area, using selective AI for mapping, QA, driver explanations, and draft documentation with human approvals.
- **Govern and scale:** Lock standards and approvals across Risk/Finance/Treasury, then expand and track performance against the success criteria.



Stress testing modernization is a strategic imperative for many banks

AI and modern data infrastructure can materially streamline end-to-end stress testing by automating data controls, accelerating scenario and sensitivity workflows, and producing consistent and robust documentation, if deployed with robust governance, explainability, and cyber resilience.

Banks that build bank-specific scenarios, run a repeatable and well-controlled stress testing process, and use AI carefully, always with a human in the decision loop, to speed up work and strengthen documentation will be better positioned to make stress testing more useful for real decisions.

Success in this transformation requires not only technological innovation but also strong leadership, intentional workflow redesign, and ongoing technology adaptation. Institutions that act decisively now, integrating AI, data governance, security, and proactive regulatory engagement into their stress testing modernization will be better equipped to thrive in an increasingly complex, dynamic, and competitive financial environment.

Authors

Courtney Davis

Principal
Deloitte & Touche LLP
coudavis@deloitte.com
+1 516 918 7322

Craig Brown

Managing Director
Deloitte & Touche LLP
cbrown@deloitte.com
+1 212 436 3356

Johan van Duyvendijk

Managing Director
Deloitte & Touche LLP
jvanduyvendijk@deloitte.com
+1 973 602 5039

Jenny Fennerty

Senior Manager
Deloitte & Touche LLP
jfennerty@deloitte.com
+1 312 307 8132

Tarpan Gupta

Senior Manager
Deloitte & Touche LLP
tagupta@deloitte.com
+1 678 514 8216

Marcel Wijnen

Senior Manager
Deloitte & Touche LLP
marwijnen@deloitte.com
+1 916 288 3278

Allan Cadreau

Manager
Deloitte & Touche LLP
acadreau@deloitte.com
+1 602 631 4644



Deloitte.

Together makes progress

This publication contains general information only and Deloitte is not, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your business. Before making any decision or taking any action that may affect your business, you should consult a qualified professional adviser.

Deloitte shall not be responsible for any loss sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.