Next-Gen Stress Testing for Dynamic Risk Management in Banks
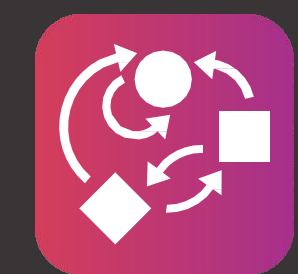
Banking, Financial Services and Insurance

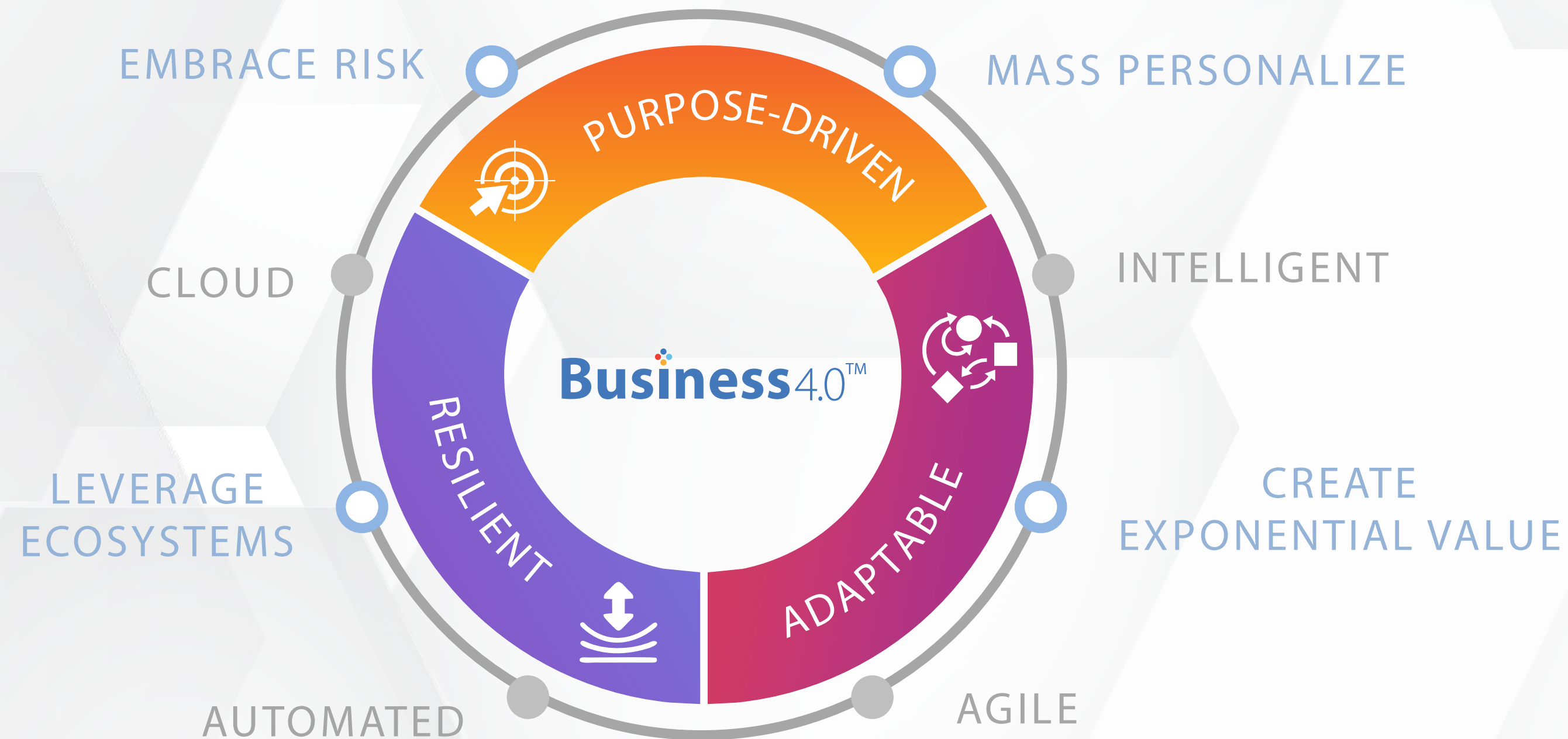PURPOSE-DRIVEN   RESILIENT   ADAPTABLE

PURPOSE-DRIVEN, RESILIENT, ADAPTABLE BUSINESS 4.0™;

EMBRACE RISK

MASS PERSONALIZE

PURPOSE-DRIVEN

CLOUD

INTELLIGENT

Business4.0™

LEVERAGE ECOSYSTEMS

RESILIENT

ADAPTABLE

CREATE EXPONENTIAL VALUE

AUTOMATED

AGILE

About the Authors

Monalisa Wardhan

Monalisa Wardhan is a functional consultant with the Industry Advisory Group (IAG) of TCS' Banking, Financial Services, and Insurance (BFSI) business unit. She has experience of more than five years across financial risk management including counterparty risk, market risk, and liquidity risk. Monalisa holds a Bachelor's degree in Biomedical Engineering from Mumbai University, India, and a Master's degree in Management Studies with specialization in Finance from the Jamnalal Bajaj Institute of Management Studies, Mumbai, India.

Nishant Kumar

Nishant Kumar is a consulting partner in the Industry Advisory Group (IAG) of TCS' Banking, Financial Services, and Insurance (BFSI) business unit. As a risk management consultant and solution architect, Nishant has been working with TCS' leading clients in conceptualizing risk management platforms for the last 10 years. He holds a Bachelor's degree in Electronics Engineering from Mumbai University, India, and a Master's degree in International Banking and Finance from the University of Strathclyde, UK.

Abstract

Regulatory agencies across the globe mandated stringent stress testing to assess banks' capital adequacy, liquidity, and resilience in weathering stress scenarios post the 2008 financial crisis. Traditional stress testing practices are largely backward looking, time consuming, and periodic, rather than event-driven, and lack the ability to assess the impact of various events on risk, in real time. The COVID-19 crisis has put these limitations in the spotlight as banks were not well equipped to rapidly perform dynamic stress testing of their portfolio to aid strategic decision-making. This underscores the need for automating the stress testing process using intelligent digital technologies. This white paper highlights the ways traditional stress testing can be made forward-looking, dynamic and cost efficient through the use of digital technologies. The paper also discusses the prevailing industry challenges and the key aspects that must be considered while building an adaptable, fit-for-purpose stress testing platform for fast-changing risk environments.
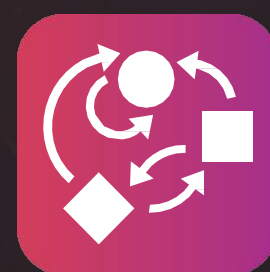
PURPOSE-DRIVEN   RESILIENT   ADAPTABLE

The Current Stress Testing Landscape

Stress testing is currently a quarterly or half-yearly exercise driven by regulatory and internal management requirements. Largely a backward-looking process, it fails to consider real-time events that may be indicative of significant risk build-up. As a result, risk identification and monitoring are largely reactive. Embedding a warning mechanism with the ability to pre-empt risk build-up early in the cycle will give banks time to initiate measures to safeguard themselves and prevent losses, thereby making the risk identification and monitoring process more proactive. Building a forward-looking, intelligent stress testing system – sensitive to market events and equipped with early warning capabilities – will require banks to leverage the power of digital technologies such as natural language processing (NLP), machine learning (ML), and cloud.

Building an Intelligent Stress Testing System

The proposed stress testing framework must have the capability to track real-time events, leverage intelligent technologies to identify events of interest, and then assess the potential impact of the event on the portfolio. Based on the probable impact, possible stress scenarios must be evaluated and the risk metrics computed using the framework. This information must then be communicated through appropriate dashboards to decision makers, in near real time, empowering them to initiate timely action to avert adverse impact of risk events (see Figure 1).

Moving to such a system will catalyze stress testing covering all types of risk such as market risk, credit and counterparty risk, liquidity risk, and operational risk. Consequently, an event that could significantly impact a bank's portfolio is assessed for all risk types leading to dynamic enterprise-wide stress testing. Adopting such a system in turn leads to dynamic and real-time risk management that can go a long way in averting crisis situations with the potential to jeopardize the stability of the banking system.
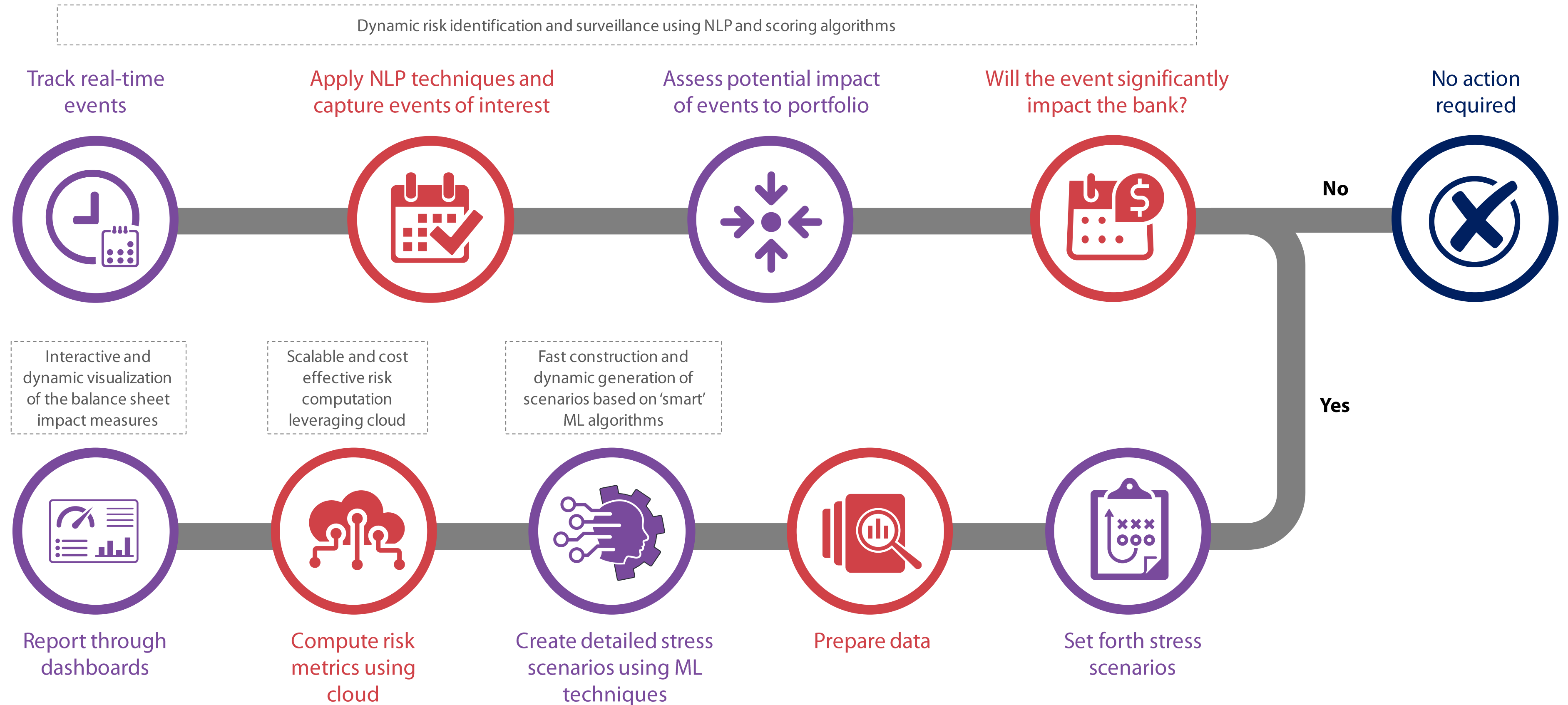
Figure 1: Using Next-gen Technologies to Raise Stress Testing Responsiveness

Tracking events

By leveraging services of news content providers, the proposed framework must scan online content to identify events of interest with the potential to adversely impact the portfolio.

Capturing events of interest

Digital technologies such as NLP must be incorporated into the framework to extract information of interest from online content. Training the models to discern events relevant to the bank such as the bankruptcy of a company, interest rate changes, increase in commodity prices, and so on, is critical to success.

Assessing potential impact

The next step is to assess the level of impact of the event on the bank's banking and trading portfolio. An event that significantly impacts the banking or trading portfolio needs to be watched and the bank must conduct stress test to predict possible worst-case scenarios that may emerge.

Determining the significance of the event

Once an event of significant potential impact, such as a rise in commodity prices or negative news about a particular counterparty, is detected by the framework, stress testing is recommended. The risk experts in the bank will take a decision on whether stress tests need to be conducted after a thorough evaluation of the event.

Setting forth the stress scenarios

Once the bank's risk experts decide to perform stress tests, the impact on the portfolio is addressed by postulating stress scenarios for execution by the framework.

Preparing data

The framework then readies the data for stress testing. Data quality is of prime importance for stress testing and the framework enhances data quality by predicting the missing time series using ML since the historical simulation method for market risk stress testing relies heavily on time series data. Compared to traditional methods of filling missing time series data, ML models such as K-Nearest Neighbor (KNN) algorithm and ridge regression technique have been found to be more accurate in approximating missing time series data. Employing these models results in more accurate risk measure estimation and more reliable stress testing results.

Creating detailed stress scenarios

By incorporating ML models into stress scenarios, the magnitude and direction of the remaining risk factors can be identified. The framework replaces manual creation of stress scenarios with ML models thereby increasing the efficiency and accuracy and reducing the overall time required for carrying out stress testing.

Computing risk metrics for stress scenarios using cloud

Calculating computationally intensive risk measures such as value at risk (VaR), expected shortfall (ES), net interest income (NII), economic value of equity (EVE), exposure at default (EAD), and potential future exposure (PFE) requires scalable infrastructure to be in place.[1] Since the lack of infrastructure may create challenges to carry out on-demand stress testing along with the normal business day run, a cloud based computation engine must be incorporated into the framework. Cloud adoption can aid ML-based scenario creation, which is also a computationally intensive process. The advantages of cloud adoption are clear; but concerns around security of proprietary data have slowed the move to the cloud. In our view, the benefits of cloud adoption, such as scalability of infrastructure and access to libraries for NLP and ML technologies, far outweigh the risks and banks must overcome these apprehensions and take steps to move to the cloud.

---

[1] TCS, Hybrid Cloud: The way forward for risk analytics computation, July 2019, Retrieved July 2020, https://www.tcs.com/risk-analytics-computation-in-banks

Generating reports for management

Depending on the bank's requirement, a dashboard can be incorporated into the framework. The dashboard can be built to display details around the stress test processes.

Clearly, an intelligent stress testing system has a lot to offer banks. To ensure a seamless transition, banks will need to perform certain pre-implementation checks.

Training the models

For the NLP and ML models to accurately track events of interest by examining unstructured data, they need to be trained well. Banks must ensure the availability of adequate data covering the areas of interest, domain experts, and technology teams for effectively training the models.

Data quality principles

Banks that have made significant progress in the implementation of BCBS 239 principles will be in a better position to kick start the transformation since the accuracy and reliability of the computed risk metrics is dependent on the quality of the trading and banking book data and other reference market data. Banks must build and maintain a golden source of data for use by different systems to provide accurate and quality data.

Investment

Considering stress tests merely as a regulatory exercise would be short-sighted given its potential to improve strategic business decisions. However, setting up an intelligent and agile stress testing system from the outset will be investment-intensive. Getting management buy-in to ensure adequate funding must therefore be the first step in the transition to an intelligent and automated stress testing platform.

Our experience of working with global banks reveals that some large banks have already begun striding toward digitalizing their stress testing system. A US-based financial services firm recently conducted a proof of concept (PoC) for negative news screening. Leveraging technologies like NLP and ML, priority alerts were generated when financially negative or significant adverse events about a counterparty were detected.

The Way Forward

Banks are increasingly recognizing the need to incorporate stress testing into strategic decision making and are striving toward a more automated stress test process. In addition to providing timely visibility into risk, adopting an intelligent and dynamic system makes stress testing simpler, proactive, more efficient, and cost-effective compared to traditional stress testing. Depending on strategic priorities and business objectives, individual banks will need to take a call on whether to opt for a big bang enhancement or adopt an incremental approach to upgrading stress testing systems. In case a big bang enhancement is not viable, banks must incrementally adapt, enhance, and digitalize stress testing mechanisms to improve the quality of business decisions and gain an edge over the competition.

Contact

For more information on TCS' Banking & Financial Services,
please visit https://www.tcs.com/banking-financial-services

Email: bfsi.marketing@tcs.com

About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match.

TCS offers a consulting-led, integrated portfolio of IT and IT-enabled infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model^{TM}, recognized as the benchmark of excellence in software development. A part of the Tata Group, India's largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

For more information, visit us at **www.tcs.com**

PURPOSE-DRIVEN

RESILIENT

ADAPTABLE