FUTUREMATTERS™
CENTRE OF EXCELLENCE

USE OF **AI / ML** IN FINANCIAL SUPERVISION BY CENTRAL BANKS

March 2024

CONTRIBUTOR

Jean Fernandes
Group Chief Financial Officer
GxS Bank

JAPAN FINTECH FESTIVAL™

USE OF AI / ML IN FINANCIAL SUPERVISION BY CENTRAL BANKS

A.   Introduction

This discussion paper delves into the dynamic realm of Artificial Intelligence (AI) / Machine Learning (ML) and its revolutionary impact on elevating regulatory supervision, particularly in the oversight of financial institutions.

Deployment of AI by supervisory agencies holds vast potential to propel supervision into a new era where predictive insights into economic, financial, and risk events become the norm. This transformative approach can deliver proactive surveillance of risk and compliance, fortify prudential oversight, and empower central banks with innovative tools to fulfil their monetary and macroprudential mandates. Several supervisory agencies are already at the forefront as they recognise that it's not just the advancements in AI tools but also the abundance of data that presents an unparalleled opportunity to dramatically enhance current supervisory methodologies or craft superior ones.

> **The sheer volume of data available to supervisors today creates opportunities for uncovering associations and elevating prediction accuracy**

The sheer volume of data available to supervisors today creates opportunities for uncovering associations and elevating prediction accuracy. Central banks are now becoming adept at seamlessly acquiring large sets of data from supervised entities leveraging technological advancements for data collection. Additionally, by leveraging data analytics,

JAPAN FINTECH FESTIVAL™

central banks have made significant strides in extracting valuable insights and patterns from high volume, dense and complex data and presenting this in a readily comprehensible way. The logical next step in this journey would be to deploy relevant AI/ML tools and expand use cases for leveraging them.

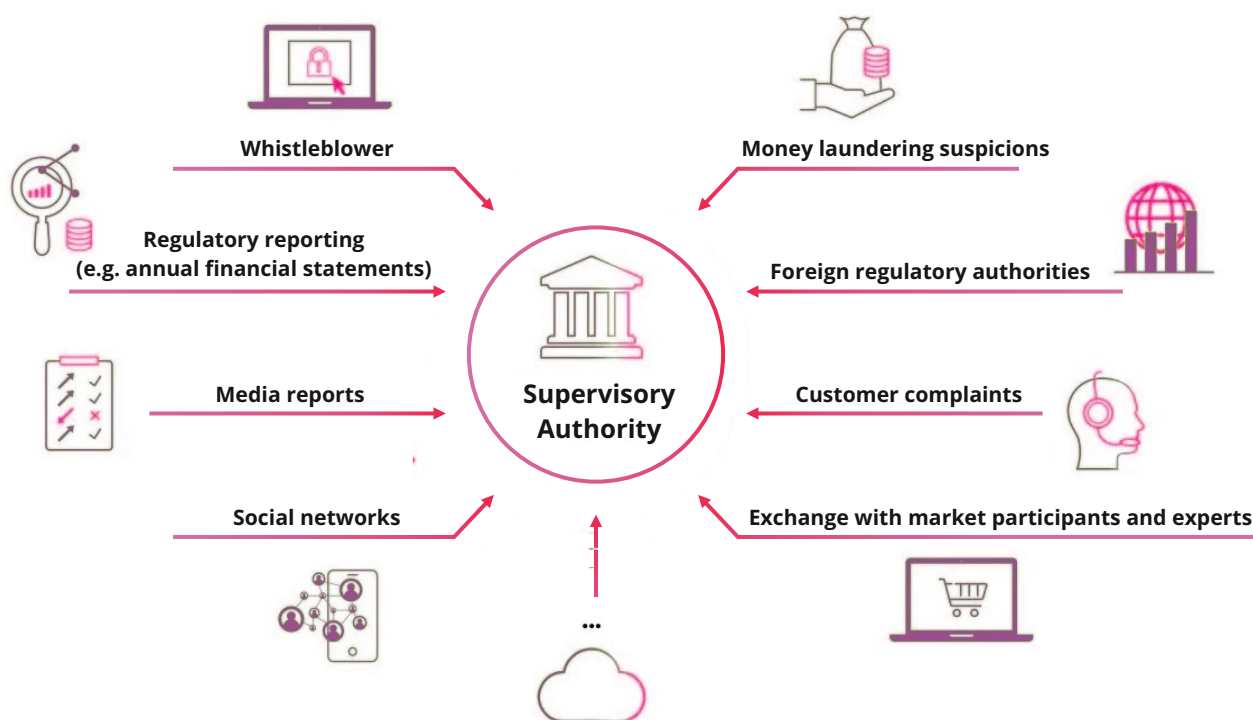> **Supervisory authorities are also facing an enormous amount of data, pacing new demands on them**

Figure 1: Sourced from Roland Berger publication titled "The data driven supervisory authority of the future" (https://www.rolandberger.com/en/Insights/Publications/The-data-driven-supervisory-authority-of-the-future.html)

B. Use Cases And Innovative Solutions

B.1 Diverse risk analysis leveraging AI/ML tools

AI/ML models offer flexibility compared to traditional statistical and econometric models and can help explore otherwise hard-to-detect relationships between variables, and amplify the toolkits used by central banks. **AI and ML analyse vast data in real-time, and can more effectively predict potential risks if they are unconstrained by traditional datasets and are able to leverage alternate data.** There are a few steps which can make this impactful:

- Apply Natural Language Processing (NLP) tools that scrape information from the web, social media channels and other publicly available web sources and provide them for analysis despite being textual in nature.

- Connect relevant data from structured sources, such as financial statements, market data, and regulatory filings with data from unstructured sources like news articles, social media, browsing history, and location data.

- Leverage Anomaly detection AI/ML tools to identify outliers in data sets.

- Apply Predictive Analytics to anticipate emerging risks, enabling a proactive rather than reactive approach to risk management.

- Use Real-time Network Analysis to analyze interconnections between institutions in real-time, identifying potential systemic risks arising from their relationships and dependencies.

Together, the deployment of these AI/ML solutions ensures that risk assessments are up-to-date, specialised towards relevant risk types and reflective of the current economic and financial landscape.Here are some examples of how AI/ML can be applied using the steps above and vendors that can potentially support this agenda:

Sr	Title	Example	Vendors
1	Climate Risk Assessments	Combining climate risk data with the financial sector's exposure to specific industries can help central banks promote sustainability and manage potential environmental impacts on the financial system	Acclimatize, Oasis Intelligence
2	Geospatial Data Analysis:	Combining geospatial data with financial data, will allow central banks to identify regional economic trends and vulnerabilities, thereby targeting their interventions on cross border related matters more effectively	Esri, Palantir
3	Healthcare Data Integration:	Combine healthcare data, such as pandemic statistics and health trends,with financial data to assess the impact of health crises on the financial system	Transcend.ai, Babylon Health
4	Cultural and Societal Data Analysis	Analyse cultural and societal data to identify cultural shifts and trends that may impact financial institutions' strategies and stability	Buzzsumo, Sprout Social
5	Economic Sentiment Analysis	Analyse social media and news sentiment to gauge public perceptions on financial institutions and potential impact thereof on deposit flows.	Sentifi, GlobalData

Contd...

Contd...

6	Supply Chain Finance Oversight	Analyse exposures to interconnected businesses and the flow of financial transactions between them to identify early alerts on supply chain blockages / risks	TradeLens, Chainalysis
7	Natural Disaster Risk Assessment:	Use AI/ML to predict and assess the financial implications of natural disasters, enabling proactive measures to protect financial institutions and clients	Risk Management Solutions (RMS), AIR Worldwide
8	Behavioral Economics Integration:	Incorporate behavioural economics principles into AI models to understand and predict how consumer behaviour influences financial market dynamics.	Bionic Analytics, Nudgeworks
9	Market Risk Prediction	Build predictive models using AI/ML to estimate market risk exposure for different financial instruments and asset classes.	Numerai, EquBot
10	Liquidity Risk Management	Utilize AI/ML for real-time monitoring of liquidity risk by analyzing cash flows, asset quality, and market conditions.	FinSight, Axiom AI

B.2   Improving efficiency in regulatory compliance by supervised entities

Frequent violations of regulations by supervised entities often stem from the overwhelming volume of regulatory requirements, misinterpretation of rules, and a lack of real-time awareness of the latest regulations. Furthermore, for financial institutions operating across diverse jurisdictions, there is a risk of erroneously identifying the most binding regulatory framework and therefore being non-compliant inadvertently. **The financial industry is grappling with the escalating cost of compliance for banks can benefit from tools which bring efficiency in compliance.**

69% 0F FIRMS are expecting regulators to publish even more regulatory Information In the next

MORE THAN 1/3 OF FIRMS spend at least a whole day every week tracking and analyzing regulatory

2% of G-SIFIs are spending more than a day creating and amending reports for the board

60% of respondents expect the **PERSONAL LIABILITY** of compliance professionals to increase in 2016

1/4 OF FIRMS outsource at least part of their compliance funtionality

2 OUT OF 3 of firms are expecting senior skilled staff to cost more in 2016

THREE QUARTERS of firms are expecting the focus on managing regulatory risk to rise in 2016

ONLY HALF of compliance functions are spending **LESS THAN AN HOUR** each week with internal audit

Figure 2: Sourced from Thomson Reuters publication titled "the cost of compliance in the changing world of regulation" (https://legal.thomsonreuters.com/en/insights/articles/cost-compliance-changing-world-regulation)

FUTUREMATTERS™
CENTRE OF EXCELLENCE

Here are some examples of how regulators can use AI/ML for supporting supervised entities and vendors that can potentially support this agenda:

Sr	Title	Example	Vendors
1	Supervisory Chatbots	Implement AI-driven chatbots for financial institutions to interact with regulators for routine inquiries, reporting, and compliance-related queries, which can help supervised entities better understand the requirements of a particular rulebook or item of legislation	Comply.ai, Evisort
2	Machine readable regulations	Converting regulatory text to a machine readable format using natural language processing (NLP) leads can help to narrow the gap between regulatory intent and interpretation. Machine Readable regulations could also help supervisory agencies to efficiently assess the impact of regulatory changes, consult on regulatory reforms, and reduce regulatory complexity	Clausehound, Regtech Solutions
3	Regulatory Change Management:	Use AI to streamline the process of tracking and adapting to regulatory changes. Machine learning algorithms can help financial institutions and regulatory supervisors stay up-to-date with evolving regulations and assess impact on operations of individual entities more effectively	Regnology, Verisk Analytics
4	Inter-connectivity of regulations	Build AI/ML-based applications for financial institutions and supervisors to quickly compare relevant regulations across geographies and assess impact on operations of individual entities more effectively	GlobalScape, Exiger

B.3   Leveraging AI to assess conduct and culture

Examining the conduct and culture of financial institutions is paramount as it has direct influence on their risk profile, level of regulatory compliance, and treatment of customers. A robust and ethical culture plays a pivotal role in bolstering financial stability and averting crises, contrasting with misconduct that may precipitate systemic risks. Employing diverse methods like Supervisory Examination, Continuous Surveillance, Whistleblower Programs, and Cultural Assessments enables a comprehensive analysis. Today, regulators have the opportunity to fortify these efforts by harnessing AI models, enhancing their capacity to discern patterns and early warning signs, thereby preempting compliance issues or unethical practices within financial institutions.

Here are examples of how AI/ML can strengthen culture and conduct assessments:

- **Behaviour-Based Regulatory Compliance:** Deploy AI models to scrutinize internal communications (e.g., executive committee meeting minutes, emails, customer

JAPAN FINTECH FESTIVAL™

communications, internal policies etc) and analyze tonality, biases, and discriminations to spotlight potential culture and governance issues or heightened risks of misconduct.

- **Customer Complaints Analysis:** Deploy sentiment analysis and advanced Natural Language Processing (NLP) techniques to uncover patterns and themes in customer complaints, serving as early indicators of systemic issues like mis-selling

Some regulators are already making progress in this area as evidenced by some of their publications:

- **European Central Bank (ECB):** "Harnessing AI for supervisory technology innovation: Detecting conduct risks in large datasets" (2020)
- **Financial Conduct Authority (FCA):** "Using artificial intelligence to assess culture in financial services" (2019)

B.4   Cross leveraging use cases

As financial systems become more intricate and global, regulatory bodies have been embracing SupTech, short for Supervisory Technology, to enhance their efficiency and effectiveness in oversight. SupTech leverages various technologies such as artificial intelligence, machine learning, data analytics, and blockchain to streamline regulatory processes, automate data collection and analysis, and ultimately strengthen regulatory compliance. Data, of course, lies at the heart of effective use of Suptech tools.
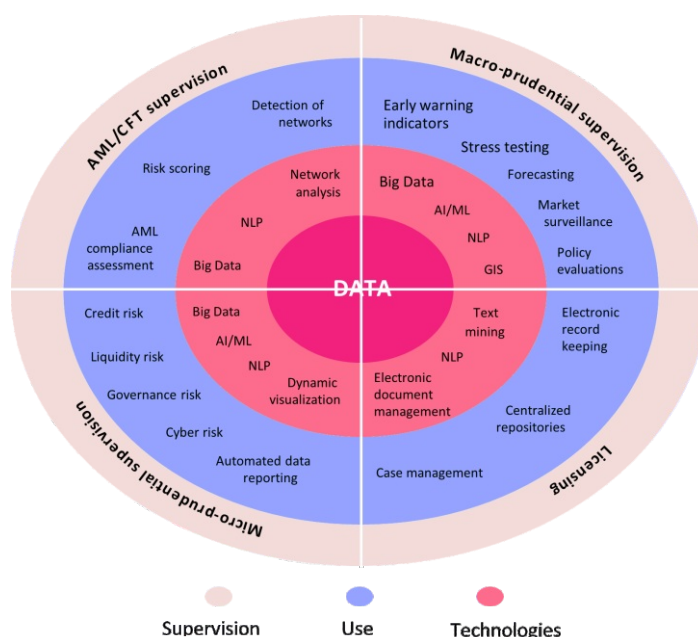

Figure 3: Sourced from Digital Transformation of Financial Regulators and the Emergence of Supervisory Technologies (SupTech): A Case Study of the U.K. Financial Conduct Authority (https://hdsr.mitpress.mit.edu/pub/palmqnaw/release/1)

Regulators across the globe, can benefits from leveraging some common Suptech / tools (particularly AI and ML) which others regulators have already deployed. Some examples are:

Early Warning Systems: Develop AI/ML models that analyse various economic indicators and financial data to provide early warnings of potential financial crises or systemic risks.

Anomaly Detection: Implement AI-driven anomaly detection systems to identify irregular or fraudulent activities within financial institutions, such as unusual trading patterns or transaction anomalies. Stress Testing Automation: Automate and enhance stress testing processes using machine learning algorithms to assess the resilience of financial institutions under various adverse scenarios.

Market Surveillance: Utilise AI/ML for real-time monitoring of financial markets to detect market manipulation, insider trading, and other illicit activities.

Regulatory Compliance Monitoring: Automate the monitoring of financial institutions' compliance with regulations by using AI/ML to analyze transaction data and reporting for adherence to regulatory standards.

Supervisory Reporting Automation: Automate the collection, validation, and analysis of supervisory reports submitted by financial institutions, improving efficiency and accuracy.

Anti-Money Laundering (AML): Enhance AML efforts by employing AI/ML algorithms to identify suspicious transactions and patterns indicative of money laundering activities.

Automated Regulatory Reporting Validation: Develop AI-powered tools that automatically validate the accuracy and consistency of regulatory reports submitted by financial institutions. This can significantly reduce the burden of manual validation and improve reporting quality.

Considerations For Supervisory Agencies

While the current use of AI/ML in central banking doesn't raise significant concerns, potential risks loom with broader deployment. Despite a strong case for integrating AI and ML into supervision, challenges, risks, and dependencies persist. **Relying solely on AI-derived analysis for regulatory decisions without human oversight introduces risks related to transparency, explainability, data bias, and poor data quality.** Difficulty in explaining AI/ML-based financial decisions arises as these algorithms uncover unknown correlations,

particularly in times of crisis, potentially leading to inaccurate decisions. The expanded use of nontraditional data sets poses risks of biases and errors. Mitigants include collaboration with academia, infrastructure investment, robust talent pipelines, and policies addressing data privacy and security.
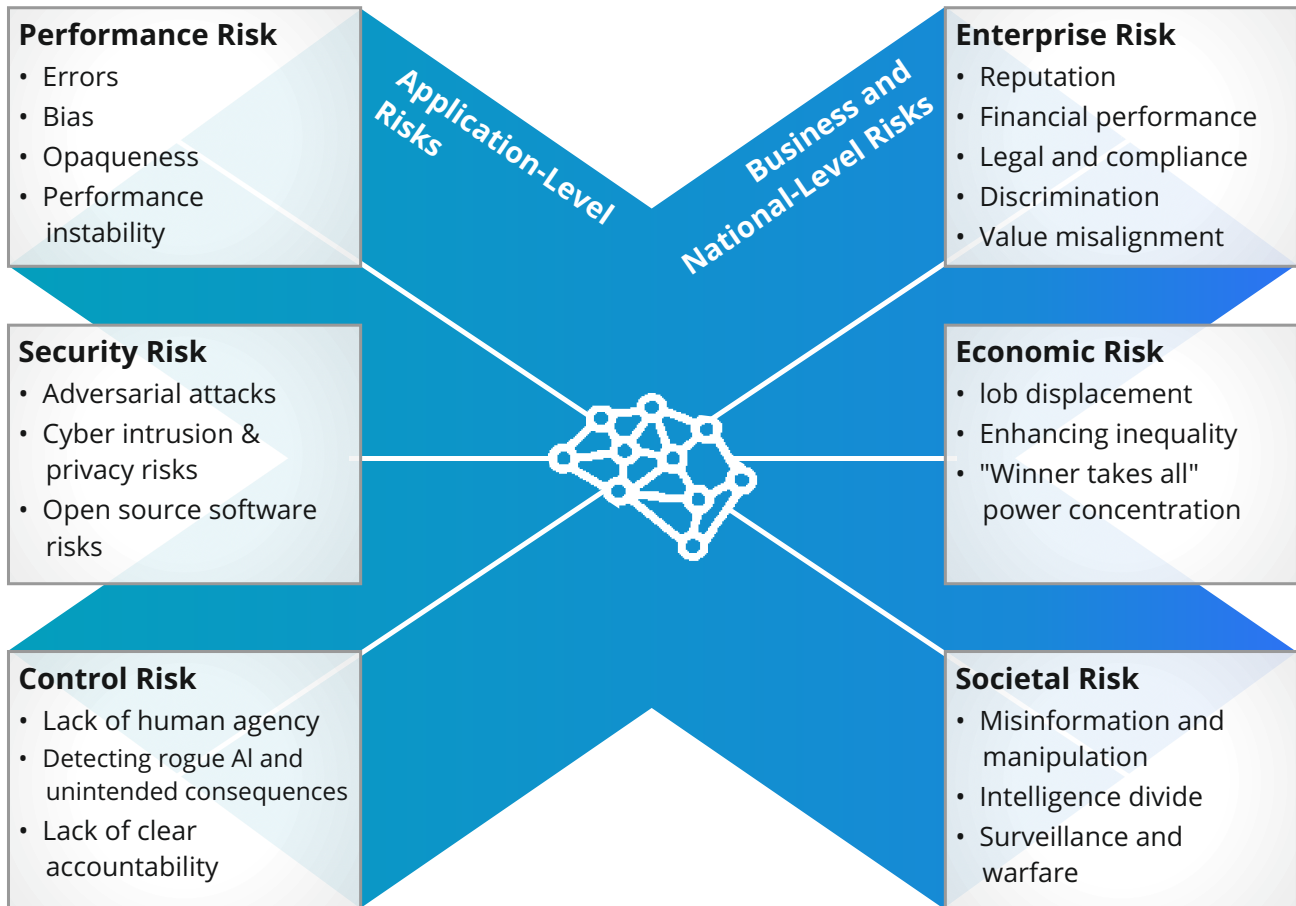

Performance Risk
- Errors
- Bias
- Opaqueness
- Performance instability

Security Risk
- Adversarial attacks
- Cyber intrusion & privacy risks
- Open source software risks

Control Risk
- Lack of human agency
- Detecting rogue AI and unintended consequences
- Lack of clear accountability

Application-Level Risks

Business and National-Level Risks

Enterprise Risk
- Reputation
- Financial performance
- Legal and compliance
- Discrimination
- Value misalignment

Economic Risk
- Iob displacement
- Enhancing inequality
- "Winner takes all" power concentration

Societal Risk
- Misinformation and manipulation
- Intelligence divide
- Surveillance and warfare

Figure 4: Sourced from PWC's publications titled "How organisations can mitigate the Risks of AI" (https://hbr.org/sponsored/2021/12/how-organizations-can-mitigate-the-risks-of-ai)

Conclusion

In summary, the increasing application of AI/ML in regulatory practices represents a paradigm shift in bank supervision. Despite persistent challenges, the potential benefits are significant, compelling supervisory agencies to navigate this evolving landscape with strategic foresight. Collaborative efforts among central banks globally are essential for sharing insights and experiences, ensuring responsible and effective AI integration into regulatory frameworks.

FUTUREMATTERS™
CENTRE OF EXCELLENCE

However, it's premature to envision AI as our next market regulator; the science isn't there yet. While today's most advanced machine learning tech can emulate human behaviour remarkably, achieving higher-level reasoning in machines remains an elusive aspiration.

I write about financial services and AI.

The author is the Group CFO at GXS Bank based in Singapore. The views expressed here are her own and do not necessarily reflect the views of GXS Bank or its staff.