

AI in Market **Risk Management**

Predictive Modeling, Explainable AI, and the Future of Governance

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The Breaking Point

In late 2025, Global Horizon Bank faced a sudden, unprecedented market shock triggered by cascading geopolitical events. Traditional risk models failed to predict the rapid drying up of market liquidity.

Millions were at risk within hours as asset correlations broke down. The risk management team realised that using statistics with, historical-data were not sufficient.

To survive future crises, the bank initiated a digital transformation. They deployed an AI-driven risk architecture capable of real-time adaptation and predictive insights.



Enhancing Value-at-Risk (VaR) with Deep Learning

How the AI Model Works: LSTM Networks



1. Multidimensional Ingestion

The model continuously ingests structured tick data and unstructured alternative data (sentiment, macroeconomic indicators) in real-time, moving beyond rigid historical lookback windows.



2. Sequence Processing

Using Long Short-Term Memory (LSTM) neural networks, the model identifies non-linear dependencies and temporal patterns across thousands of asset classes simultaneously.



3. Predictive Tail Risk

Rather than assuming a normal distribution bell curve, the AI forecasts a dynamic probability distribution, generating a highly accurate VaR that anticipates sudden market shocks.

The Value at Risk (VaR) Upgrade

Traditional VaR often fails during crises because it relies on historical simulation or variance-covariance matrices that assume markets behave "normally."

By implementing Deep Learning, the AI model captures complex, hidden correlations that trigger extreme tail events. It allows risk managers to run predictive, forward-looking stress tests dynamically, calculating potential portfolio losses under unprecedented market conditions.

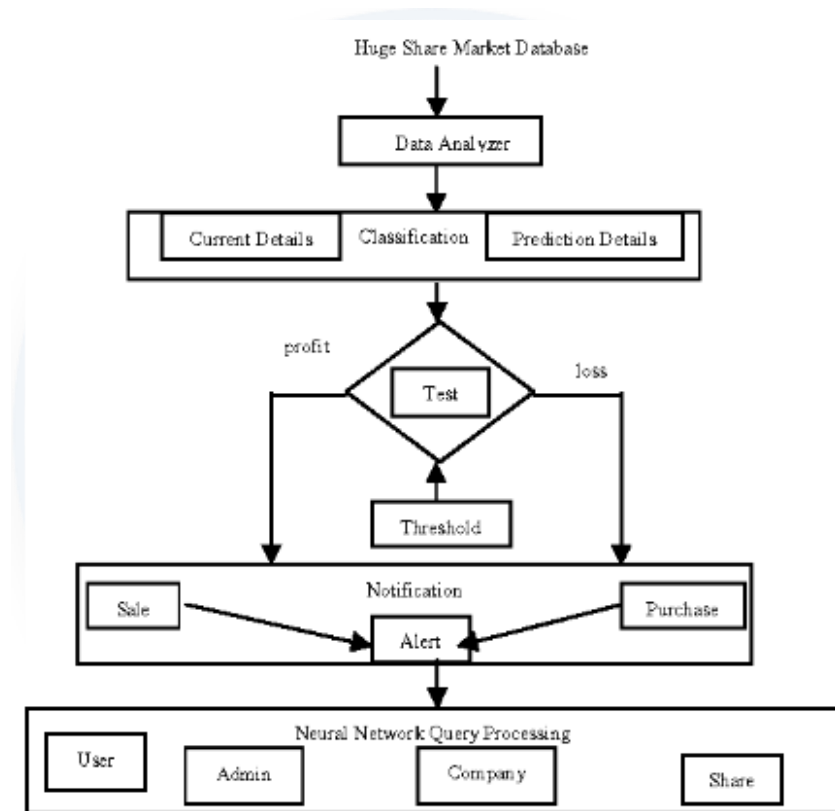


FIGURE 1. Value at Risk (VaR) Upgrade

AI Ethics and Governance

Solving the "Black Box" Problem with Explainable AI

The Governance Challenge: Opacity

Deep learning models are more accurate, but they operate as "black boxes." A neural network might output a severe VaR warning, but without reasons given, risk officers cannot confidently act on it.

In highly regulated financial environments, opaque decision-making is unacceptable. Regulators require institutions to justify capital reserve adjustments. If a model's logic cannot be explained, it breaches core ethical and governance standards, which breaks the trust between the financial institution and the public.



Implementing Explainable AI (XAI)

SHAP Values for Global Impact

SHapley Additive exPlanations (SHAP) is rooted in cooperative game theory. It allows us to calculate the exact marginal contribution of every single input feature to the final VaR calculation.

Implementation: SHAP dashboards show risk managers exactly which macro factors (e.g., inflation rates vs. sector volatility) are driving the overall risk score upward across the entire portfolio.

LIME for Localised Decisions

Local Interpretable Model-agnostic Explanations (LIME) simplifies the complex neural network by creating a localised, linear approximation around a specific prediction.

Implementation: If a specific asset class suddenly flags for high risk, LIME breaks down that single, isolated prediction, allowing a trader to understand the micro-factors triggering the alert.

Integrating XAI into Governance



Regulatory Alignment: Implementing SHAP and LIME ensures that AI-driven VaR models align with MAS FEAT guiding principles, MAS AI Risk Management Guidelines and MAS Technology Risk Management (TRM) Guidelines



Bias Detection: By surfacing feature importance, XAI reveals if the model is disproportionately weighting biased historical data, allowing governance teams to manually recalibrate the algorithm.



Human-in-the-Loop: XAI translates complex math into actionable insights, empowering risk managers to override the machine when qualitative judgment is required during extreme, unmodeled crises.



Auditability: Every prediction is accompanied by an automated explanation log, creating a transparent audit trail for both internal compliance teams and external regulators.

Thank you