Chapter 2
AI Innovations in Market Risk Analysis and VaR Modelling

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ABSTRACT

This chapter examines how AI is transforming financial risk analysis and valuation. Traditional models often overlook tail risks and complex market dynamics, but AI introduces innovative techniques that enhance risk assessment and monitoring, addressing the shortcomings of VaR models. It delves into AI fundamentals, particularly deep learning and machine learning. It offers advanced methods for data processing, predictive modeling, and feature engineering, all crucial for integrating AI into the VaR estimation process. The chapter also emphasizes the significance of AI in risk management, especially in regulatory compliance, by exploring capabilities like natural language processing and portfolio optimization, which are vital for adapting to evolving regulations. The chapter provides a comprehensive overview of AI-based market risk analysis, highlighting AI's essenAI's role in helping financial institutions navigate volatile markets and increased regulatory scrutiny. It discusses current challenges and future directions, showcasing AI's pivotAI'sontribution to the industry.

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INTRODUCTION TO MARKET RISK ANALYSIS

Market Risk

The term market risk refers to the uncertainty associated with any investment decision. Price volatility can occur due to various factors affecting the financial market (Jackson & Orr, 2019). Unlike a company's or industry's stock, systematic risk does not fall under the umbrella of one specific asset class or sector. Rather, it is determined by the overall performance of the market. Hence, investors must monitor various macroeconomic indicators, such as interest rates, inflation, and the balance of payments (CFI Team, 2023).

Alexander (2008) discussed the different types of market risks, such as Interest rate, commodity, currency, and country risks. Market risk management aims to establish a uniform framework for assessing and monitoring the risks a firm faces. This involves the aggregation of various types of risk across multiple asset classes (Saita, 2007). Understanding and managing the risks associated with investing is vital to any investor's strategy. Having the tools and resources to manage these risks effectively can help you achieve your goals and maintain financial stability.

Introduction to Value at Risk (VaR): A statistical measure of the maximum amount that could be lost in a portfolio's value over a period for which there is a confidence interval. For instance, a 1-day VaR at the 95% confidence level could mean there is only a 5/100 or simply that there are chances of about only five percent regarding how likely it would be for an investment to lose more than any leaded sum throughout even one day. The simplicity of VaR, alongside the ease at which it can be bundled into regulatory frameworks, has made VAR one of the foundation risk metrics in financial institutions.

Traditional Approaches to Market Risk Management

Before the emergence of quantitative models, market risk management was carried out through a set of established procedures.

Diversification

Hagin (2004) states that one of the most essential principles investors should consider when diversifying is the distribution of their assets across multiple asset classes. This allows them to minimize the impact of a decline on their portfolio. For instance, you do not lose everything if one asset class goes down, but other assets perform well. Diversification is not a magic shield. Even with diversification, market