

**OPTIMIZING INVESTMENT PORTFOLIOS USING QUADRATIC MODELLING
FOR RISK AND RETURN MANAGEMENT**

M.L.N.V. Fernando* and W.N.P. Rodrigo

*Department of Mathematics, Faculty of Science, University of Peradeniya, Peradeniya,
Sri Lanka*

**vidyodani26@gmail.com*

The economic crises of recent years have underscored the critical role of diversification in investment portfolios to ensure stability and optimal returns in unpredictable and volatile markets. Traditional portfolio management techniques often fall short in effectively balancing risk and return, particularly during periods of financial uncertainty. As financial markets become increasingly complex, there is a growing need for advanced mathematical optimization techniques that can efficiently allocate assets while minimizing exposure to risk. This study explores the applicability of quadratic programming (QP) as a competitive portfolio optimization method, emphasizing its capability to reduce risk while maintaining adequate returns across a diversified range of asset classes. The study formulated and implemented a QP model for a case study to analyze and compare the proposed method with an existing optimization method. A comparative analysis evaluates the computational efficiency, feasibility, and performance of using QP in dynamic financial environments. The results demonstrate that QP enhances portfolio allocation strategies, ensuring better sector diversification and risk-adjusted returns. Furthermore, the research highlights the scalability and adaptability of QP in managing investment portfolios of varying complexity and size, making it a valuable technique for financial decision-making. The findings establish QP as a tool in modern portfolio management, offering a structured, data-driven approach for risk minimization, enhanced diversification, and long-term financial stability. Also, this study reinforces the potential of QP as a computationally efficient, flexible, and robust optimization technique, addressing the limitations of traditional portfolio selection methods and paving the way for more sophisticated financial strategies in fluctuating market conditions.

Keywords: Diversification, Optimization, Portfolio management, Quadratic programming, Risk management