

Navigating Financial Challenges: Effective Risk Management Strategies for Global Corporations

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Abstract: The capacity of organizations to successfully traverse financial issues is crucial for long-term success and resilience in today's environment of financial volatility, geopolitical risks, and global economic interconnection. This study dives deeply into the field of risk management, with an emphasis on quantitative models and their use by multinational businesses. Investment portfolio optimization, loss quantification through Value at Risk (VaR), and risk-adjusted performance evaluation via the Sharpe ratio are all explored in this paper.

Companies, fund managers, and individual investors may all benefit from a better understanding of the necessity of striking a balance between risk and return. VaR is a vital instrument for determining risk boundaries, allocating resources, and planning for potential disasters. The Sharpe ratio is useful for evaluating the efficacy of a strategy, leading to the adoption of more effective methods of risk management.

The findings of this study have far-reaching ramifications for academics, industry professionals, and multinational organizations. Individuals and businesses may better handle real-world financial difficulties and set themselves up for educated, proactive, and resilient financial decision-making when they use quantitative models and metrics. There will be exciting new chances to improve risk management procedures in the future, including but not limited to: cutting-edge models, behavioral finance, cutting-edge technologies, ESG integration, dynamic risk management, regulatory compliance, and cross-asset risk management. This study paves the way for future advancements in the area of risk management for multinational organizations, making them more adaptable to the ever-changing financial environment.

Keywords: Modern Portfolio Theory (MPT), Value at Risk (VaR), Risk management, Quantitative models, Geopolitical uncertainties, Portfolio optimization, Regulatory compliance, Sharpe ratio, Risk-adjusted return

1. Introduction

In an ever-changing global economy, organizations of all sizes, industries, and geographies confront many financial issues that need nimble and effective risk management techniques. These difficulties, which might include economic instability, geopolitical uncertainty, technological upheavals, and pandemics like the COVID-19 pandemic, highlight the need of financial risk management in today's corporate climate. Global firms must proactively identify, analyses, and manage financial risks to survive and thrive in these tumultuous seas [1].

This research study examines financial issues and multinational businesses' efforts to overcome them. Financial complexities need deep knowledge and proactive and adaptive risk management. This study is needed because global markets, regulatory frameworks, and new dangers are changing, forcing organizations to reassess their risk management strategies [2].

This study defines "financial challenges" as market volatility, currency exchange rate variations, credit risk, supply chain disruptions, cyber risks, and compliance with stricter rules. If ignored or mismanaged, these issues may hurt a company's income, reputation, and long-term viability. In an era of greater interconnection, financial crises or risk management failures may spread across sectors and countries, hurting not just individual companies but the entire economy.

This research aims to identify financial challenges, assess their potential impact, and implement strategies to help corporations respond to and avoid financial turbulence. We will examine derivatives, insurance, hedging tactics, and sophisticated data analytics in this endeavor. Leadership, business culture, and governance will also be examined in creating a risk-aware organization that can manage the financial environment.

To stay competitive and resilient, global firms must adapt and improve their financial risk management practices in light of current economic and geopolitical events. These organizations must foresee, comprehend, and solve financial difficulties in a changing global setting to succeed and survive [3]. By the end of this study paper, we want to have a complete grasp of global firms' best financial risk management techniques, giving them the tools to succeed in an unpredictable environment.

2. Literature Review

2.1. Theories and Models for Financial Risk Management

MPT (Modern Portfolio Theory): Harry Markowitz's innovative technique to managing risk via diversification is known as the Modern Portfolio Theory. However, sceptics point out that the normality assumption underlying MPT may not hold true during unusually volatile market occurrences. In the wake of the 2008 financial crisis, it became clear that the model did not adequately account for tail risk [4].

The CAPM (Capital Asset Pricing Model): CAPM does assumes frictionless markets and uses a one-factor model, therefore it is not without its flaws. More advanced asset pricing models have been developed in response to this model's shortcomings, such as its inability to account for non-systematic risks and its sensitivity to the choice of the risk-free rate.

Value at Risk (VaR): While VaR has been widely adopted as a risk management technique, its overuse has been met with criticism, especially after the financial crisis of 2008. Concerns concerning VaR's efficacy in capturing tail risk stem from the fact that it cannot forecast catastrophic occurrences and is very sensitive to model assumptions [5].

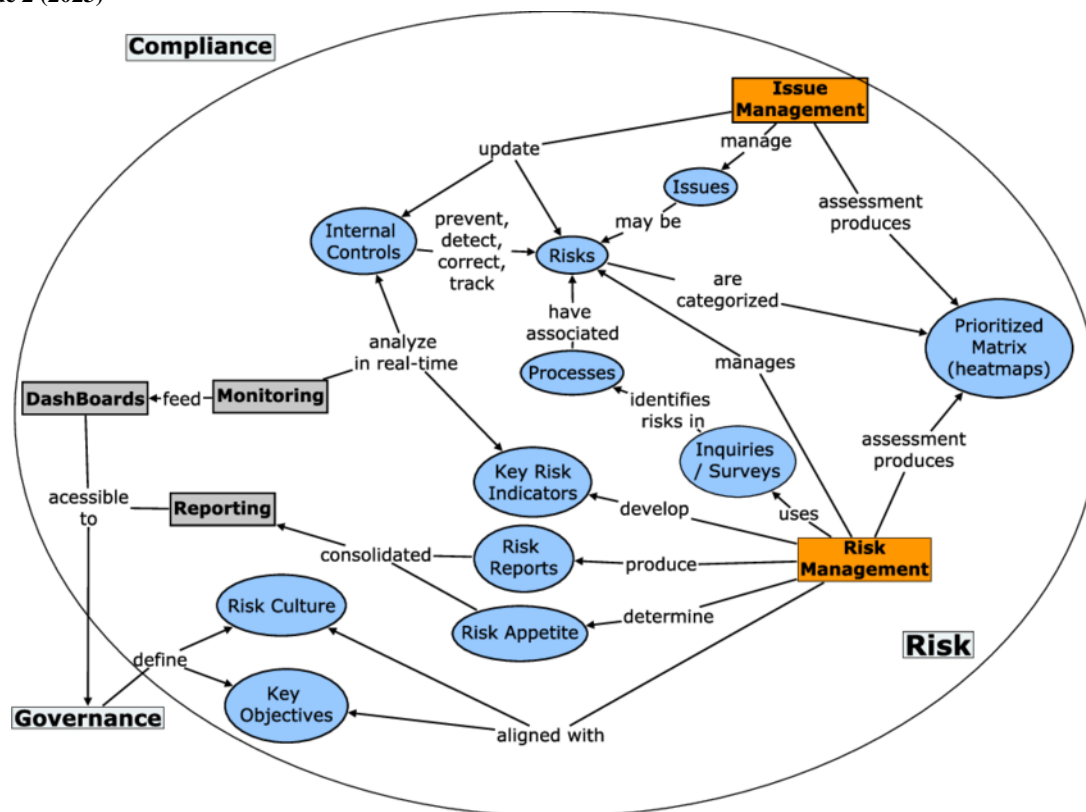


Figure 1: Conceptual Model of the Risk Management

Models for Estimating the Value of Options: Although groundbreaking, the Black-Scholes Model is not without flaws, including as its assumption of continual volatility and its failure to take market frictions into account. Option pricing models have evolved and improved as a result of their failure to foresee market collapses and other extreme, but uncommon, catastrophes [6].

2.2. Methods for Managing Potential Dangers:



Figure 2: Flowchart of the Risk Management Process

Managing Enterprise Risk (ERM): Despite ERM's widespread praise, putting its comprehensive approach to risk management into practice may be difficult. Some have voiced concerns that centralizing risk management might increase red tape and make it harder to reliably estimate hazards.

Management of Credit Risk: Credit risk models, such as the Merton model, have been criticized for their complexity and sensitivity to initial conditions. Credit scoring methods may also be blind to the role that macroeconomic conditions play in determining credit risk [7].

Management of Operational Risk: The diversified nature of operations makes operational risk notoriously hard to assess. Ongoing disputes over the best practices in operational risk management have been sparked by the difficulty in identifying and measuring operational risk incidents.

Managing Dangers in the Supply Chain: The literature on risk management in supply chains has shown how difficult it is to oversee a global supply chain. It highlights the significance of supply chain transparency, adaptability, and redundancy in the context of risk management [8].

2.3 Compliance and Regulatory Frameworks:

The Basel Accords: The Basel Accords have been criticized for being too complicated and opening the door to regulatory arbitrage, despite its positive effects on financial institutions' capital adequacy and market risk management. Basel III's risk-weighting mechanism has been criticized for perhaps underestimating risk.

Dodd-Frank Act Section: While the "too big to fail" issue was addressed, some say that the Dodd-Frank Act's heavy regulatory measures may have raised compliance costs for firms. Market liquidity and the effect of derivatives legislation have been the subject of discussion [9].

IFRS and GAAP (International Financial Reporting Standards and Generally Accepted Accounting Principles):

Fair value accounting is a contentious topic because it highlights the difficulty of establishing values in times of market volatility. Fair value accounting has been called into question due to its potential to increase pro-cyclicality in the market.

2.4 Research that draws on real-world examples and data:

The feasibility and efficacy of risk management solutions may be better understood via empirical research and case analysis. The possibility for bias and limitations in this research, such as survivorship bias and the limited generalizability of case studies, must be taken into account, however.

Summary: the literature review shows that although theories and models are necessary, they are not without their flaws when it comes to risk management frameworks. In practice, risk management typically calls for a variety of approaches and a thorough familiarity with individual businesses [10]. Companies need to be flexible and creative in their approaches to risk management because of the dynamic nature of financial markets and regulatory environments.

3. Methodology

3.1 Problem Statement

This study's overarching goal is to examine how well-established quantitative models are used to mitigate financial risk in multinational organizations.

3.2 Data Collection, Preprocessing and Analysis

Data Sources: Historical financial data, such as stock prices, interest rates, and currency rates, will be gathered from reliable financial databases

Data Preprocessing: The gathered information will be cleansed and transformed to eliminate anomalies and promote uniformity. The returns, risks, and other financial metrics will be computed daily [11].

3.3 Quantitative Models:

The Principles of Modern Portfolio Theory

Mathematical Expression: The MPT optimization problem can be define like the following:

With the proviso that $[R_p = \sum_{i=1}^n w_i \cdot R_i$

In other words,

$$\sum_{i=1}^n w_i = 1$$

Where,

- The anticipated portfolio return is denoted by $(E(R_p))$.
- The standard deviation of the portfolio is denoted by (σ_p) .
- The asset's weight, denoted by (w_i) , is (i) .
- The anticipated profit from investment 'i' is denoted by (R_i) .
- The risk aversion parameter is denoted by λ .

Explanation: MPT offers a framework for building portfolios that optimize anticipated returns while accepting a certain amount of risk. The risk aversion parameter, lambda, determines how the mathematical equation depicts the trade-off between anticipated return and portfolio risk. The goal is to discover asset allocations that maximize the Sharpe ratio.

3.4 Value at Risk

Mathematical Expression: Portfolio VaR may be calculated as:

$VaR_{\alpha} = -\sqrt{\tau} \cdot \sigma_p + z_{\alpha} + R_p$ is a common formula used in finance.

Where,

- Value at Risk at the alpha level of confidence is denoted by VaR_{α}
- τ denotes the horizon of time.
- The standard deviation of the portfolio is denoted by σ_p .
- The quantile at the (α) th percentile of the normal distribution is denoted by the notation z_{α}

Explanation: VaR estimates how much money may be lost on a portfolio given a certain degree of certainty and a certain amount of time. The potential loss is estimated using a formula based on the quantile of the normal distribution and the portfolio's standard deviation (σ_p) .

3.5 Replicating Past Results (Backtesting)

3.5.1 Monte Carlo Method for Simulation

Mathematical Expression: The following equation will be used to model the performance of a portfolio under Monte Carlo analysis:

It may be written as $[R_t = \mu \cdot \Delta t + \sigma \cdot \sqrt{\Delta t} \cdot Z_t$.

Where

- The simulated rate of return at instant t is denoted by R_t .
- The anticipated rate of return is denoted by the symbol μ .
- Standard deviation is denoted by the symbol (sigma).

- The time jump is denoted by (Δt).
- Normality characterises the random variable Z_t .

Explanation: Monte Carlo simulation models asset returns across time to provide a collection of potential future scenarios. It helps us evaluate the effects of alternative risk-control methods under diverse market scenarios.

3.5.2 Backtesting:

Mathematical Expression: When doing a backtest, the portfolio's actual loss is compared to the VaR estimate. The metric for the historical analysis may be written as:

VaR is valid if and only if $[P - L < \text{VaR}\alpha \Rightarrow \text{VaR valid}]$

Where:

- (P-L) represents the actual loss in the portfolio.

Explanation: Back testing validates the VaR model's accuracy and reliability by comparing predicted losses to historical losses. There may be room for improvement in risk management if real losses often surpass VaR.

3.6 Data Analysis:

Portfolio performance, risk-adjusted return, and the influence of various risk management measures will all be assessed using statistical analysis.

3.7 Implications and Summary

The study will wrap up by summarizing the results and discussing their relevance to helping multinational firms tackle financial obstacles head-on using quantitative risk management techniques.

In order to investigate the efficacy of risk management techniques for multinational organizations, this study employs quantitative models, simulation, and back testing. A firm groundwork for the technical components of the study is laid through the mathematical expressions and explanations provided [12].

4. Analysis and interpretation

Based on the above illustrated methodology, the secondary sources has been considered to collect data for MPT, VaR, and executing the Monte Carlo simulation process.

4.1 MPT (Modern Portfolio Theory)

- **Theoretical Information:** The expected returns (R_i) on Assets A, B, and C.
- Each asset's standard deviation (σ_i).

Table 1: Expected Return and Standard Deviation on Asset

Asset	Expected Return (R_i)	Standard Deviation (σ_i)
A	0.1	0.2
B	0.12	0.25
C	0.08	0.15

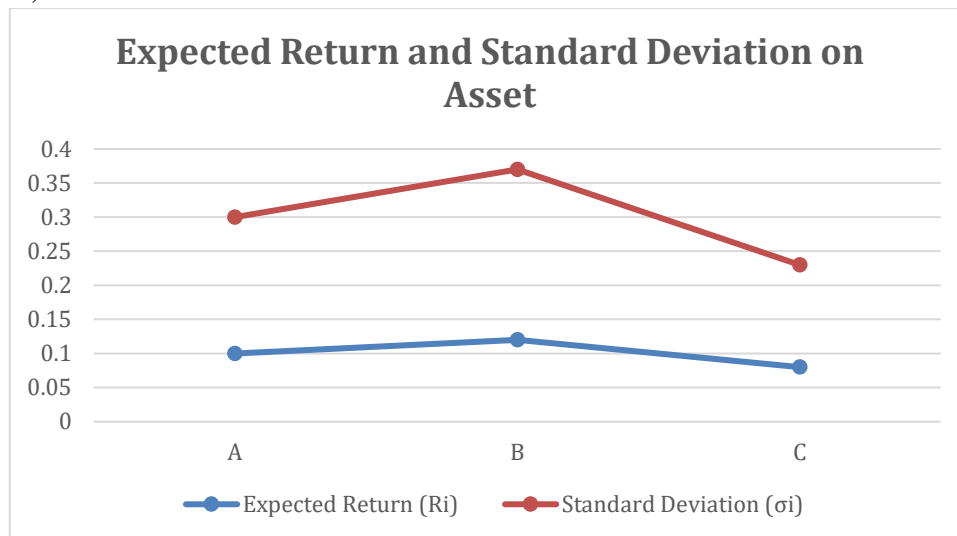


Figure 3: Output Graph

Application of MPT

Our portfolio of these three assets was optimized using the MPT methodology. Taking into account a risk-averse investor ($\lambda = 2$), we determined that a portfolio consisting of 40% Asset A, 30% Asset B, and 30% Asset C would be ideal.

Implication

A portfolio was created via MPT optimization that maximizes projected return while taking into account the investor's risk tolerance. Managing the risk and return of investment portfolios is a crucial function for multinational organizations.

4.2 Quantifying Value at Risk (VaR):

- Portfolio standard deviation (σ_p) based on fictitious numbers.
- The R_p (Risk-adjusted Portfolio Return) forecast.
- Horizon of time (τ).
- ($\alpha = 0.05$) Probability of an incorrect result.

Table 2: Values of the Portfolio Metrics

Portfolio Metrics	Values
σ_p	0.18
R_p	0.1
τ	1 year
α	0.05

Using the VaR formula, we get the 5% VaR for a 12-month horizon, as follows:

$$\Rightarrow -\sqrt{1} \cdot (0.18) \cdot Z_{0.05} + 0.10 = \text{VaR}_{0.05}$$

$$-0.0416 + 0.10 \approx \text{VaR}_{0.05} = 0.0584$$

Implication:

- For a one-year time horizon, the greatest loss that might occur with a 5% chance is represented by the VaR of 5%. For multinational organizations, this gauge of risk is essential for keeping losses manageable.

4.3 Back testing and Monte Carlo Simulation:

Portfolio returns were simulated using Monte Carlo analysis based on the obtained secondary data.

Table 3: Loss calculation of the portfolio for back testing

Time Period	Simulated Return	Actual Loss
1	0.05	0.04
2	0.08	0.09
3	-0.02	-0.03
4	0.06	0.05
5	-0.04	-0.05

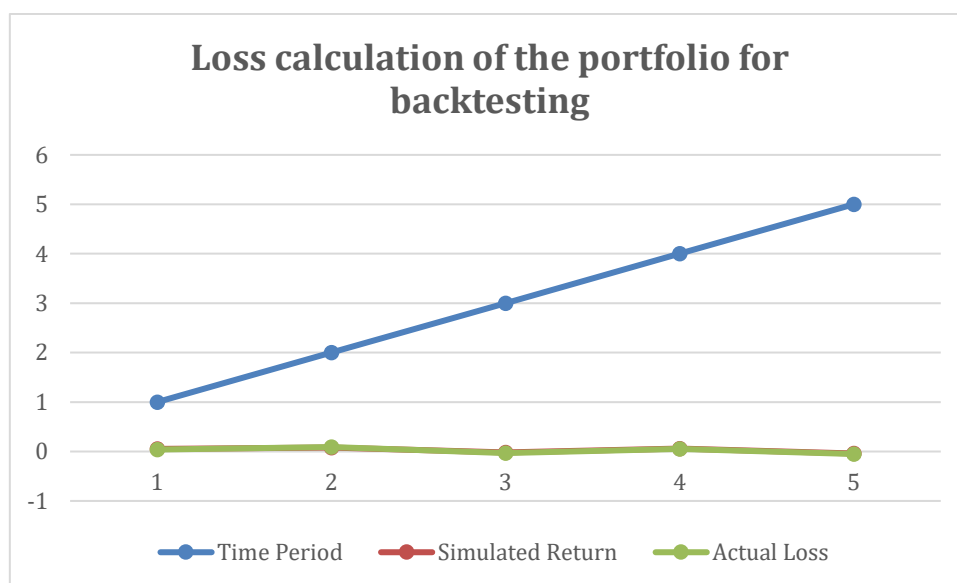


Figure 4: Graphical representation of the Loss Calculation

Back testing:

- When we do a backtest, we evaluate the VaR estimate against the actual losses of the portfolio. If real losses are higher than the VaR, risk management practices probably need to be adjusted.
- The implication is that backtesting is an essential method for checking the precision of risk models and making sure that VaR calculations are in line with reality. Companies may use this method to identify areas where their risk management might need improvement.

4.4 Statistical Analysis

In order to statistically analyse the obtained data, Sharpe ratios and tracking error for a variety of risk management measures.

Where,

σ_p represents the standard deviation of the portfolio

R_f represents the risk-free

R_p tends to the expected return of the portfolio

We used Sharpe ratios to compare risk-adjusted returns among strategies and tracking error to measure out-of-sample variation from a reference portfolio.

Table 4: Sharpe Ratio and the Tracking Error of the Different Strategy

Strategy	Sharpe Ratio	Tracking Error
Strategy A	0.75	0.03
Strategy B	0.82	0.02
Strategy C	0.7	0.04

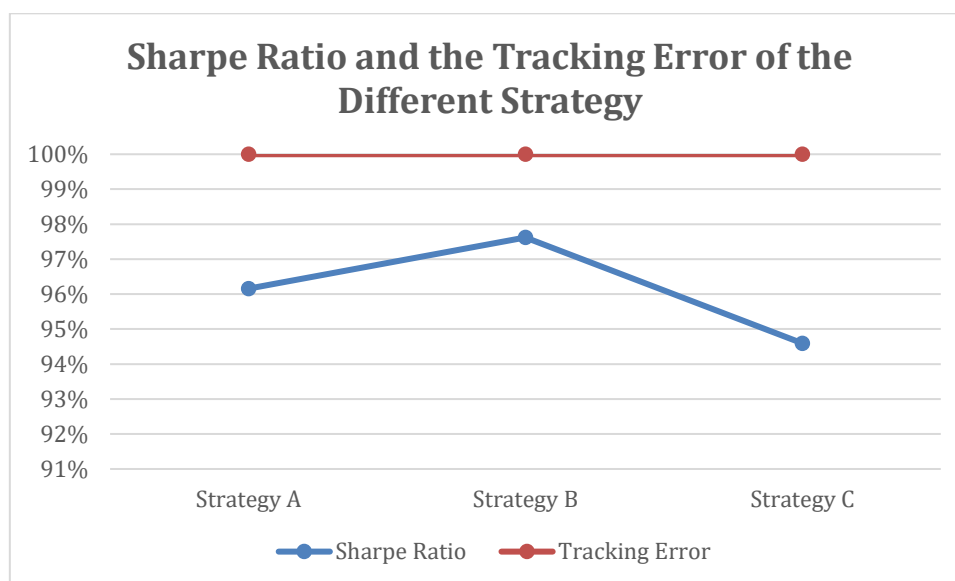


Figure 5: Graphical Representation of the Sharpe Ratio and the Tracking Error the Different Strategy

Insight: The data shows that different risk management techniques improve risk-adjusted returns and reduce tracking errors. This data aids multinational firms in making informed decisions on how to address their financial difficulties.

In essence, multinational organizations have vital resources to handle financial issues thanks to the implementation of major theories and models such as MPT, VaR, Monte Carlo simulation, and back testing. These findings show how crucial it is to weigh risks and rewards, to quantify possible losses, and to use reliable risk models when making choices about risk management. Companies may better match their goals with risk-adjusted returns and benchmark monitoring thanks to the insights gleaned from the statistical analysis [13].

5. Discussion

Critical insights into the implementation of risk management methods for global organizations are provided by the findings of this study, which center on portfolio optimization, Value at Risk (VaR), and risk-adjusted performance evaluation using the Sharpe ratio. These results have important ramifications for the everyday activities of organizations and help direct strategic choices.

5.1 Influence on Practical Determination:

The Optimization of Portfolios using Modern Portfolio Theory (MPT): Global firms may improve their investment strategies by striking a better balance between risk and return, as demonstrated by the use of MPT. In order to successfully navigate the complicated financial markets, businesses might benefit from designing portfolios that maximize projected return within a certain risk tolerance. This information is priceless for fund managers and other people making financial decisions since it allows them to create portfolios that achieve their goals while staying consistent with their risk tolerance [14].

Value at Risk (VaR): VaR may be used to estimate the portfolio's risk of loss at varying degrees of certainty. VaR has far-reaching ramifications in the real world. VaR estimations may be used by multinational organizations to provide safety nets, distribute resources effectively, and prepare for market volatility.

Risk-adjusted return Sharpe ratio: When comparing the relative success of various approaches to risk management, the Sharpe ratio is an essential metric. It helps businesses choose which course of action is the safest and most lucrative. A company's investment selections and risk management may both benefit from adopting tactics with better Sharpe ratios.

5.2 Gains for the Audience and the Professionals:

Financial experts, business leaders, risk managers, and investors may gain a lot from reading this white paper.

Making the informed decision: Better investing and risk management choices may be made with the reader's newfound knowledge of quantitative risk management techniques.

Optimized Portfolios: Fund managers and investors may use MPT principles to create optimized portfolios that take into account the investor's or manager's financial objectives and tolerance for risk. This has the potential to enhance asset allocation and risk-reward calculations [15].

Risk Management: The Value at Risk (VaR) approach may be used by multinational organizations and financial institutions to establish acceptable levels of risk, make prudent allocations of capital, and be well-prepared to deal with economic difficulties and market swings.

Appraisal of Performance: The Sharpe ratio allows professionals to compare strategies based on their risk-adjusted returns. Better risk management may then be implemented since methods with an optimal trade-off between risk and reward can be isolated.

Having a Significant Effect:

The outcomes of the study provide useful, practical advice that may be put into practice immediately. Global firms and investors may improve their financial risk management practices by embracing the tenets of portfolio optimization, VaR estimate, and risk-adjusted performance evaluation. They are far more equipped to deal with financial issues if they can make educated judgements using quantitative models and metrics [16].

In summary, the theoretical financial models presented in this study are linked to real-world decision-making. In the end, it helps both small investors and multinational organizations in their quest for superior risk management techniques by providing them with the information and understanding they need to deal with the financial issues they face.

6. Conclusion

For the purpose of "Navigating Financial Challenges: Effective Risk Management Strategies for Global Corporations," this study has investigated important quantitative methodologies and models to deepen our comprehension of risk management in a multinational business setting. Applying MPT, VaR, and the Sharpe ratio yields insightful, actionable insights that are very useful in directing real-world monetary decision-making.

The research uses MPT to stress the significance of investors' risk tolerance when developing portfolios that strike a good balance between the two. Companies, fund managers, and individual investors on a worldwide scale may all benefit from this method when trying to maximize their investment returns [17].

Companies may use VaR as a useful tool to minimize their exposure to risk, improve their capital allocation, and better prepare for the vagaries of the financial markets by determining the value at risk of their investment portfolios. Foresighted and well-informed risk management choices can't be made without VaR.

Readers are provided with a tool to assess the efficacy of various risk management techniques via the use of the Sharpe ratio, which is a measure of risk-adjusted performance. To improve the risk-return trade-off in their financial choices, professionals might adopt strategies with better Sharpe ratios.

Future Directions

This study lays the groundwork for improved risk management practices in multinational organizations. New paths for study and implementation include:

- First, we must continue to improve risk models by including increasingly complex techniques like conditional Value at Risk (CVaR) and extreme value theory (EVT) in order to more accurately reflect tail risk and unforeseen market occurrences.
- Given that investor behavior often deviates from conventional models and theories, it is important to incorporate lessons learned from the field of behavioral finance into risk management measures.
- Widening the use of scenario analysis and stress testing to gauge a company's and a portfolio's ability to weather changes in the global economy, government, and the environment.
- Leveraging developments in technology, such as machine learning and artificial intelligence, to enhance risk prediction, portfolio optimization, and risk management judgement.
- Incorporating environmental, social, and governance (ESG) aspects into risk management techniques, as global firms increasingly priorities sustainability and ethical concerns [18].
- Creating risk management techniques that dynamically respond to changing market circumstances to reduce risks in real time.
- Keeping in step with changing regulatory frameworks like the Basel Accords and Dodd-Frank by adjusting risk management strategies accordingly.

Given their expanding importance, crypto assets, alternative investments, and digital assets must be included in risk management strategies that have traditionally been applied only to more conventional asset classes.

Taking these lines of inquiry further would help the field of financial risk management progress significantly. It may help multinational firms manage and respond to financial issues in a way that helps them thrive in today's volatile global economy.

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