

Research Article

Applied Value at Risk in the South East Asia Stock Market, Does it Work?

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Abstract

This study uses historical data to calculate VaR, a widely accepted approach due to its simplicity and empirical basis (Olson & Wu, 2017), in the Southeast Asian stock market. The results show that the index with the highest VaR value at the 1% confidence level is the Hanoi Stock Exchange Index from Vietnam. High VaR values in these indices reflect the potential for significant losses in a worst-case scenario. The study also shows that the VaR value increases with the confidence level. This means that, at a higher confidence level, for example, 1%, the VaR value will be greater than at 5% or 10%. A higher confidence level reflects a desire to account for more extreme and rare scenarios. By considering the study period, which includes financial crises such as the 2008 crisis and the COVID-19 pandemic, this study provides relevant insights for investors on the dynamics of risk and return in Southeast Asian stock markets. This study emphasizes the importance of using VaR as a risk management tool to help investors make more informed, prudent investment decisions.

Keywords: South East Asia, Stock Market, VAR

JEL Classification: G32, G17, F36

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1. Introduction

Value at Risk (VaR) has become a crucial measure in financial risk management, particularly in volatile global markets (Chapman et al., 2022). Because it estimates potential losses in an investment portfolio under normal market conditions, VaR serves as the basis for regulatory frameworks and internal risk assessments (Dimitrova et al., 2021). In an increasingly complex and uncertain financial world, VaR is an essential tool for identifying risks and managing potential losses. Comparative analysis of VaR across various indices not only helps identify which markets have lower risk but also provides in-depth insights into the risk-reward trade-off in investments (Almeida et al., 2024). This is crucial for investors, portfolio managers, and policymakers to optimize their investment strategies by balancing risk exposure with potential returns (Olson & Wu, 2017).

This study makes a significant contribution to the broader discussion of investment strategies and risk management by emphasizing the practical application of VaR across different economic conditions. This paper focuses on the application of VaR to 6 stock indices in Southeast Asian countries over a relatively long period, from 2005 to 2024. Financial markets in Southeast Asia have demonstrated remarkable resilience and growth (Anwar & Iwasaki, 2023; Mohapatra & Mishra, 2020; Mosolova, 2021; Rahman & Vu, 2020) but remain vulnerable to global economic fluctuations (Basri & Hill, 2020; Tsiaplias & Wang, 2020). Asia and Australia have demonstrated remarkable resilience and growth, but remain vulnerable to global economic fluctuations. For example, China's economic policies and growth patterns have significantly impacted the economies of neighboring countries and global trade (Chuai et al., 2021). Similarly, Australia's resource-based economy is heavily influenced by global commodity prices (Aftab et al., 2021; Nikonenko et al., 2022). By examining the VaR of stock indices in this context, this study highlights financial movements across Asia and Australia and provides VaR calculations for consideration in investment decision-making.

The importance of VaR analysis in modern finance cannot be overstated. The study period, 2005–2024, encompasses several significant economic events and transitions. The 2008 global financial crisis and the economic disruption caused by the COVID-19 pandemic have highlighted the need for robust risk management tools (Chang et al., 2020; Cheema et al., 2022; Felipe & Estrada, 2020). VaR provides a quantifiable measure of risk exposure, enabling financial institutions and investors to prepare for potential adverse market movements (Trucíos et al., 2020). Each event influences market behavior differently, making longitudinal studies such as this one more apt for understanding the evolving risk profile of the analyzed stock index. By analyzing data over a long period, this study can identify patterns that may not be apparent in short-term analysis.

This study uses the historical data method to calculate VaR, a widely accepted approach due to its simplicity and empirical basis (Olson & Wu, 2017). Historical VaR is based on the historical performance of an asset or portfolio, making it a straightforward method that does not rely on normal distribution assumptions or other model-specific parameters. This method's reliance on real-world data makes it well-suited to capturing market realities and providing more practical and accurate risk estimates. By using historical data, this study can provide a more realistic picture of potential losses and risk exposure. This paper emphasizes the empirical reliability of the historical data method, particularly in Southeast Asia's diverse and often volatile markets. In volatile market environments, the use of historical data can help capture and understand unexpected market movements.

2. Literature Review

Value-at-Risk (VaR) measurement has become a crucial tool in financial risk management since its formal introduction in the early 1990s by J.P. Morgan through its publication, "RiskMetrics" (Malhotra, 2021; Sargen, 2020). VaR estimates the maximum possible loss in an investment portfolio over a given period with a certain level of confidence. The application of VaR was further emphasized after the 1987 stock market crisis, which demonstrated the need for a more formal and precise risk measurement tool (Adamko et al., 2015; Duffie & Pan, 1997; Stambaugh, 1996). The history of VaR shows that this tool began to be widely adopted by financial authorities in the mid-1990s. VaR helps financial institutions identify and manage market risk more effectively (Adamko et al., 2015; O'Sullivan et al., 2019).

In the context of the stock market, VaR is used to measure the risk associated with various stock indices. Stock indices are an important tool for measuring the performance of a group of stocks representing a specific sector or the entire market. Stock indices help investors diversify their portfolios and manage investment risk. According to Sharpe's theory, a well-designed stock index reflects broader economic conditions and provides insight into how different sectors behave under different market conditions (Sutcliffe, 2018).

Return and risk are two key elements in investing. Return refers to the profit earned from an investment, which can be in the form of dividends, capital gains, or a combination of both. Risk, on the other hand, refers to the uncertainty associated with investment returns. In modern portfolio theory, developed by Markowitz, risk is measured by the standard deviation of returns, which indicates how much an investment's return can vary from the average. Portfolio diversification can reduce risk without sacrificing returns, thereby serving as the basis for risk management in investment portfolios (Adnyana, 2020; Reilly & Brown, 2019).

Global financial and economic conditions play a significant role in determining stock market performance and associated risks. Financial crises, such as the 2007-2008 crisis, can cause significant market volatility and increase investment risk (Felipe & Estrada, 2020). Research by Bouras et al. (2019) and Spulbar et al. (2020) indicates that stock markets in developing countries tend to be volatile. This is relevant to this study because the indices analyzed are from developing Asian countries, which exhibit higher volatility and greater risk than those in more stable markets in developed countries.

The use of VaR in stock portfolio risk management provides an estimate of the maximum possible loss in an investment portfolio over a given period with a certain level of confidence (Dimitrova et al., 2021). VaR helps investors understand the risks associated with their investments and make better investment decisions. Furthermore, this study highlights the importance of accounting for global financial conditions and stock market volatility in risk analysis and investment decision-making in developing countries.

3. Data and Method

Methodology

This study uses historical data (closing prices) to calculate Value at Risk (VaR) for 6 stock indices from various Southeast Asian countries. The data covers the period from January 2005 to March 2024, with daily data frequency. This time period was chosen to encompass a range of market conditions and significant economic events that can affect stock market volatility, including the 2008 global financial crisis and the COVID-19 pandemic. The primary focus of this study is the calculation and comparison of VaR across various stock indices, as well as the identification of the indices with the lowest and highest risk.

The first step in calculating VaR is calculating daily returns from the index's closing price data.

$$R_i = \frac{(P_t - P_{t-1})}{P_{t-1}} \quad (1)$$

Moreover, calculate the daily standard deviation of the daily return values. This standard deviation reflects the volatility of the daily returns of the analyzed stock index. The daily data frequency was chosen to achieve high accuracy, enabling a more in-depth analysis of market volatility.

$$\sigma_i = \sqrt{\sum_{j=1}^n (R_{ij} - E(R_i))^2} \quad (2)$$

Next, the VaR calculation is carried out using the formula:

$$VaR = V_0 \times \sigma \times Z \times \sqrt{t} \quad (3)$$

In the study, three levels of confidence were used: 90%, 95%, and 99%.

Table 1. Analysis uses Microsoft Excel

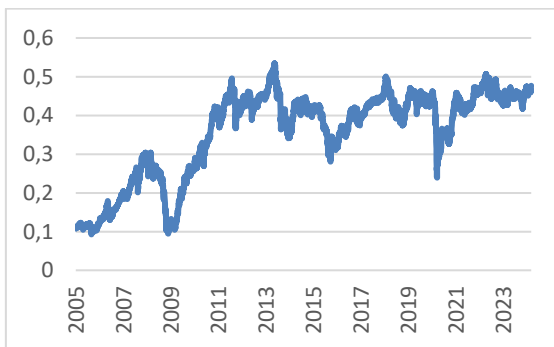
Confident Level	Z-score
99%	2,33
95%	1,65
90%	1,28

For analysis, this study uses Microsoft Excel. Excel was chosen for its ease of performing the necessary statistical calculations and its ability to handle large datasets. The Excel functions used include return calculations, accumulated returns, standard deviation calculations, and a special formula to calculate VaR.

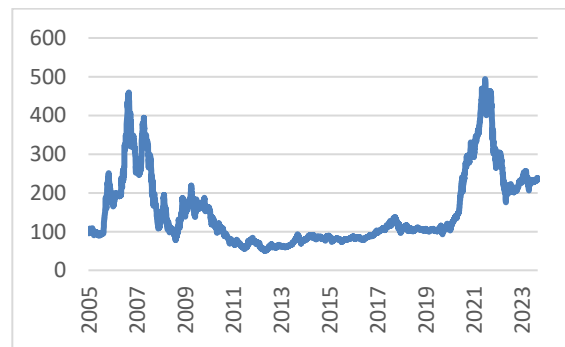
Data

This study uses historical closing price data for stock indices from 15 Asian countries and two Australian countries. The data covers the period from January 2005 to March 2024, with daily data frequency. The indices analyzed include:

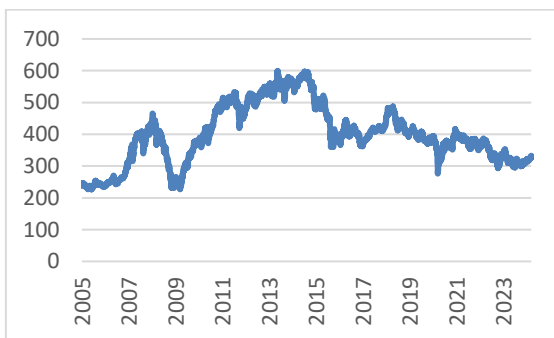
Jakarta SE Composite Index (Indonesia)



Hanoi Stock Exchange Index (Vietnam)



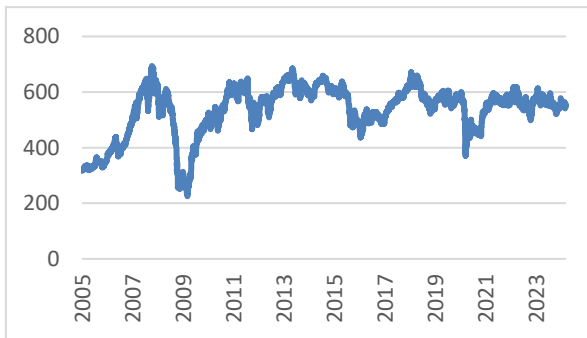
FTSE Bursa Malaysia KLCI Index (Malaysia)



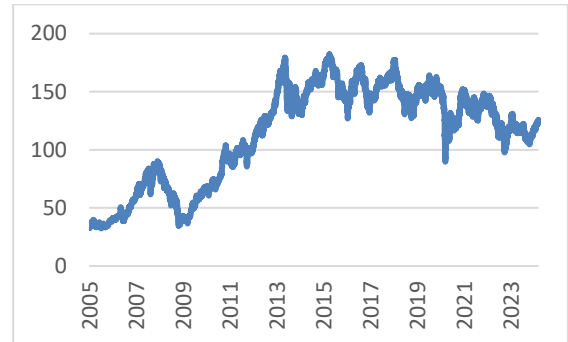
FR Thailand Price Return Index (Thailand)



PSEi Index (Filipina)



FTSE ST All-Share Index (Singapura)



During the study period, from 2005 to 2024, each stock index analyzed experienced fluctuations. Based on price observations at the beginning and end of the study, there were striking differences in the performance of stock indices across countries. Several countries experienced significant increases, more than doubling, including Indonesia, Vietnam, Thailand, and the Philippines. On the other hand, Singapore and Malaysia showed increases, but not nearly as much as the prices at the beginning of the study period.

However, not all countries experienced increases. Vietnam actually saw declines in its stock indices during this period. These fluctuations reflect how each index reacted to changing global financial conditions, including the 2008 financial crisis and the COVID-19 pandemic. Most countries recovered their economies quickly after the crisis, as evidenced by significant increases in their stock indices.

4. Results

Table 2. Expected Returns and Risk

No	Country	Index	Expected Return	St. Deviation
1	Indonesia	Jakarta SE Composite Index	0,000425	0,014871
2	Malaysia	FTSE Bursa Malaysia KLCI	0,000113	0,009327
3	Philippine	PSEi Index	0,000379	0,013896
4	Singapore	FTSE ST All-Share Index	0,000175	0,011033
5	Thailand	FR Thailand Price Return Index	0,000302	0,015871
6	Vietnam	Hanoi Stock Exchange Index	0,000355	0,018125

Table 2 above shows the expected returns and risk (measured by standard deviation) of two stock indices across Southeast Asian countries. Overall, this Table provides an overview of the expected returns and risks associated with each stock index during the study period. Overall, there is significant variation in expected returns and risks across different stock indices.

The risk, measured by standard deviation, also varies across stock indices. The index with the highest risk is the Hanoi Stock Exchange in Vietnam, with a standard deviation of 0.018125. In contrast, the index with the lowest risk is the FTSE Bursa Malaysia KLCI in Malaysia, with a standard deviation of 0.009327. A high standard deviation indicates greater volatility and, therefore, higher risk.

Table 3. Value-at-Risk (VaR)

No	Country	Index	VaR		
			1%	5%	10%
1	Indonesia	Jakarta SE Composite Index	-0,03417	-0,02404	-0,01863
2	Malaysia	FTSE Bursa Malaysia KLCI	-0,02158	-0,01523	-0,01184
3	Philippine	PSEi Index	-0,03195	-0,02248	-0,01743
4	Singapore	FTSE ST All-Share Index	-0,02549	-0,01797	-0,01396
5	Thailand	FR Thailand Price Return Index	-0,03662	-0,0258	-0,02004
6	Vietnam	Hanoi Stock Exchange Index	-0,04181	-0,02946	-0,02287

Table 3 above shows the Value-at-Risk (VaR) values for six Asian and Australian stock indices at the 1%, 5%, and 10% confidence levels. VaR is a risk measure that indicates the maximum possible loss for an investment portfolio over a given period with a given confidence level. A lower VaR value indicates a greater potential loss.

In general, Table 3 shows that indices with higher VaR values at the 1% confidence level also tend to have higher VaR values at the 5% and 10% confidence levels. The index exhibiting the highest risk at the 1% confidence level is the Hanoi Stock Exchange Index from Vietnam, with a value of -0.04181. This means that, in the worst-case scenario, these indices could experience significant losses in a short period.

Based on the two tables above, a correlation between expected return, risk (standard deviation), and VaR is apparent. This is also reflected in the high VaR value, indicating that this index has the potential for high returns but also a significant risk of loss. Meanwhile, an index like Malaysia's FTSE Bursa Malaysia KLCI has a relatively low VaR across all confidence levels (-0.02158 at 1%), which aligns with its low expected return of 0.000113 and its lowest standard deviation of 0.009327. This indicates that this index is relatively more stable and carries lower risk compared to other indices.

This VaR Table also shows that VaR increases with the confidence level. This is evident in all stock indices analyzed, where the VaR value at the 1% confidence level is consistently higher than at the 5% and 10% confidence levels. This suggests that the hypothesis "the higher the confidence level, the higher the VaR value" is confirmed in this research Table.

VaR is calculated based on the quantiles of the portfolio's return distribution. A higher level of confidence (e.g., 1%) will display a lower quantile of the return distribution, reflecting more extreme losses compared to a lower confidence level (e.g., 5% or 10%). A higher confidence level reflects a desire to account for more extreme and rare scenarios. Therefore, VaR at a higher confidence level will indicate greater losses because we anticipate more unusual and adverse events. This is also because, in risk analysis, we want to ensure we are adequately protected against highly adverse events, even if their probability of occurrence is minimal.

5. Discussion

Research also shows that at higher confidence levels, VaR values consistently show higher returns. (Jo-Yu Wang et al., 2020) stated that a 99% confidence level may be too conservative in reflecting risk, while a 95% confidence level better reflects the likelihood of risk. This finding has significant practical implications for investors making investment decisions in Southeast Asian stock markets. This study also shows that global financial crises, such as the 2008 crisis and the COVID-19 pandemic, have impacted the volatility and risk of Southeast Asian stock markets, as has been demonstrated by several other researchers (Bhardwaj et al., 2022; Glick & Hutchison, 2013; Goodell, 2020; Habkhonglek & Maneejuk, 2022; Huynh et al., 2021; Rahman & Vu, 2020). The use of historical data in this study supports an accurate predictive approach in both normal and crises, in line with previous research findings that suggest historical data can provide precise predictions for determining VaR (Astuti & Gunarsih, 2021; Irsan et al., 2022).

6. Conclusions

Value at Risk (VaR) is an important tool for measuring risk in stock markets, including six stock indices from various Southeast Asian countries. The study found that the index with the highest VaR value at the 1% confidence level was the Hanoi Stock Exchange Index from Vietnam. High VaR values in these indices reflect the potential for significant losses in a worst-case scenario.

Furthermore, this VaR analysis revealed a clear correlation between expected return, risk (as measured by standard deviation), and VaR. Indices with high expected returns and standard deviations tend to have high VaR values, indicating that despite the potential for high returns, the risk of loss is also significant. Conversely, indices with low risk and expected returns, such as the FTSE Bursa Malaysia KLCI, exhibit lower VaR values, reflecting greater stability.

This study also shows that VaR increases with the confidence level. This means that, at a higher confidence level, for example, 1%, the VaR value will be greater than at 5% or 10%. A higher confidence level reflects a desire to account for more extreme and rare scenarios. By considering the study period, which includes financial crises such as the 2008 financial crisis and the COVID-19 pandemic, this study provides relevant insights for investors on the dynamics of risk and return in Southeast Asian stock markets. This research emphasizes the importance of using VaR as a risk management tool to help investors make more informed, prudent investment decisions.

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