

An Empirical Analysis of Stock Price Volatility: A Study of Samvardhana Motherson International Ltd using Historical Data

Dr. H. Mickle Aancy, Mr. Somnath S

Dr. H. Mickle Aancy, Professor, Panimalar Engineering College, Chennai - 600123 Mr. Somnath S, Student,
Panimalar Engineering College, Chennai - 600123

Abstract

This study analyzes the stock price volatility of Samvardhana Motherson International Ltd over a five-year period from 2021 to 2025 using historical data to understand its price movements, trends, and risk-return characteristics. The research is based on secondary data collected from reliable financial sources and uses simple statistical tools such as returns, standard deviation, variance, beta, and moving averages to measure fluctuations and performance. The findings show that the stock experienced noticeable ups and downs during the study period, with phases of strong growth as well as periods of decline and market corrections, indicating that the stock is not completely stable and carries a moderate to high level of risk. At the same time, a recovery trend was observed in the later stages, particularly towards 2025, suggesting potential for improved performance. The study also highlights the role of overall market conditions and investor behaviour in influencing stock price movements. Although the analysis provides useful insights into the stock's past behaviour and helps in understanding its volatility, it is limited to historical data and basic analytical methods, and therefore may not fully predict future market conditions. Overall, the study offers valuable information for investors and analysts to make more informed investment decisions.

1.0 Introduction

Volatility is one of the most important concepts in finance as it shows how much the price of a financial asset changes over time. It is commonly used as a measure of risk because assets with large price movements are considered more risky than those with stable prices. Due to this, volatility plays a major role in investment decisions, risk management, and financial analysis. Understanding volatility helps investors and analysts deal with uncertainty and make better decisions in the market.

Volatility is not only a measure of past price movements but also reflects expectations about future market behaviour. It helps in understanding how uncertain or stable a financial asset is over a period of time. In modern financial markets, volatility is also treated as an important factor that can influence pricing and trading strategies, making it both a risk indicator and a useful analytical tool.

Volatility is mainly divided into two types: historical volatility and implied volatility. Historical volatility is based on past price data and helps in analyzing how the asset has performed earlier. It is usually calculated using statistical tools such as standard deviation. On the other hand, implied volatility is forward-looking and is derived from option prices, reflecting market expectations about future price changes. Together, these two types give a better understanding of both past trends and future possibilities.

Volatility can be measured using different methods such as standard deviation, variance, and annualization, which allows comparison across different assets. It can also be observed through market indicators like the CBOE Volatility Index (VIX), often called the "fear index" because it shows the level of uncertainty in the market. In financial markets, volatility affects areas such as derivative pricing, portfolio management, and risk control, as higher volatility increases both potential risk and return.

Volatility is influenced by several factors including market events, economic conditions, investor sentiment, liquidity, and global developments, making it dynamic and constantly changing. It has many practical uses such as option pricing, portfolio diversification, risk forecasting, and trading strategies. It also affects investor behaviour, where high volatility

can lead to panic and low volatility may create overconfidence. Therefore, understanding volatility is essential for analyzing financial markets, managing risk, and making informed investment decisions.

2.0 Problem Statement and Research objectives

2.1 Problem Statement

Stock price volatility is one of the major concerns for investors as it creates uncertainty in returns and increases the level of risk involved in investment decisions. Many investors find it difficult to understand whether a particular stock is stable or highly risky due to continuous price fluctuations. In the case of Samvardhana Motherson International Ltd, the stock has shown noticeable ups and downs over the years, making it important to study its price behaviour in detail. Despite its growth potential, there is limited clarity regarding the consistency of its performance and the level of risk associated with it. Investors often lack proper analysis to evaluate how the stock reacts to changing market conditions and economic factors. Without a clear understanding of volatility, it becomes challenging to make informed decisions regarding buying, holding, or selling the stock. Moreover, there is a need to examine whether the stock offers a balanced risk-return profile or exposes investors to higher uncertainty. The absence of simple and structured analysis makes it difficult for beginners and small investors to interpret stock performance. Therefore, it becomes necessary to study the historical price movements of the stock using basic statistical tools. This helps in identifying trends, measuring fluctuations, and understanding the overall stability of the stock. Analyzing past data can provide useful insights into how the stock has behaved under different market situations. It can also help in assessing whether the stock shows consistent growth or irregular movements. Such analysis is important for improving investment planning and reducing potential losses. Hence, this study focuses on evaluating the volatility and performance of the stock to provide a clearer understanding for investors and analysts.

2.2 Research objectives

- To analyze the stock price movements of Samvardhana Motherson International Ltd over a selected period using historical data.
- To measure the level of volatility and risk associated with the stock using statistical tools such as returns, standard deviation and beta and trend analysis.
- To identify trends and patterns in the stock price behaviour over time.
- To evaluate the risk-return relationship of the stock and understand its investment potential.

3.0 Review of Literature

Robert F. Engle (2012) explained that volatility in financial markets is not constant and tends to change over time due to market conditions. His work highlights the importance of using models to measure time-varying volatility, which helps investors understand risk patterns and make better decisions.

Euan Sinclair (2013) emphasized that volatility is not only a measure of past price movements but also a tradable factor in financial markets. The study shows that understanding volatility can help traders identify opportunities and develop strategies based on expected price fluctuations.

Aswath Damodaran (2015) discussed the relationship between risk and return in stock markets, stating that higher volatility generally leads to higher expected returns. His study highlights that investors must carefully analyze risk before making investment decisions, especially in volatile stocks.

John C. Hull (2018) explained that volatility plays a crucial role in pricing financial derivatives, particularly options. The study shows that even small changes in volatility can significantly affect option pricing and overall market valuation.

Andrew W. Lo (2017) introduced the idea that market behaviour changes over time due to investor behaviour and market conditions. His research highlights that volatility is influenced by both economic factors and human psychology, making it an important factor in understanding stock price movements.

4.0 Research Methodology

4.1 Research design

The research design adopted for this study is analytical in nature, as it focuses on examining and interpreting the stock price behaviour of Samvardhana Motherson International Ltd using historical data. The study involves detailed analysis of numerical data to measure volatility, risk, and return, rather than just describing the data. A quantitative approach is used, where statistical tools are applied to evaluate patterns, trends, and relationships in stock price movements. The study is based on time-series data, which helps in understanding how the stock has performed over a period of time and how it reacts to changing market conditions.

4.2 Data Collection Method

The study is based on secondary data, which has been collected from reliable financial sources such as stock exchange websites, financial portals, company annual reports, and other online databases. The data mainly consists of daily closing prices of Samvardhana Motherson International Ltd. Secondary data is used because it is easily available, cost-effective, and suitable for analyzing historical stock price movements. The collected data is organized and processed systematically for further analysis.

4.3 Period Of Study

The study covers a period of five years from 2021 to 2025. This time frame is selected to understand the recent performance of the stock and to analyze its behaviour under different market conditions, including both growth phases and declining periods. The selected period provides sufficient data to measure volatility, identify trends, and evaluate the risk-return relationship of the stock.

4.4 Tools And Techniques Used

The study uses simple statistical tools to measure stock price movements, volatility, and risk. The main tools and techniques applied in the analysis include:

- **Standard Deviation:** Used to measure the degree of variation in stock returns and to assess the level of volatility.
- **Beta:** Measures the sensitivity of the stock in relation to overall market movements and helps in understanding systematic risk.
- **Trend analysis :** Used to identify trends and smooth out short-term fluctuations in stock prices.

5.0 Results and Discussion

5.1 Calculation of Standard Deviation

5.1 Table Showing Year-wise Closing Prices and Returns

Date	Closing Price	Returns
2021	99.38	57.00
2022	49.43	-50.26
2023	68.00	37.57
2024	104.10	53.09
2025	119.90	15.18

Mean of Returns = 22.516

$$\sigma = \sqrt{\frac{\sum(R_i - R)^2}{N}}$$

$$= 43.8$$

Interpretation

When we look at the data, the average return is around 22.5%, which seems quite good. It shows that overall the investment is giving positive returns. But at the same time, the standard deviation is 43.8, which is very high. This tells us that the returns are not stable and keep changing a lot. In simple words, the investment is not consistent — sometimes it gives very high returns, and sometimes it can give big losses. So, even though the average looks attractive, the risk involved is also very high.

Discussion

If we see the year-wise performance, we can clearly understand this fluctuation. In 2021, the return is very high at 57%, but suddenly in 2022, it drops to -50.26%, which is a huge loss. After that, the investment starts recovering in 2023 and 2024 with good returns, and in 2025, it shows steady but lower growth. This up-and-down movement shows that the investment is highly unpredictable. Because of this, we can say it is a high-risk, high-return investment. It may be suitable for investors who are ready to take risk and stay for a long time, but not for those who want safe and stable returns.

5.2 Calculation of Beta

5.2

Table Showing Stock Returns and Market Returns

Date	Stock Returns	Market Returns
2021	57.00	24.12
2022	-50.26	4.33
2023	37.57	20.03
2024	53.09	8.80
2025	15.18	10.51

$$\beta = \frac{Cov(R_i, R_m)}{Var(R_m)}$$

$$= 3.72$$

Interpretation

The Beta value of 3.72 indicates that the stock is highly volatile compared to the market (Nifty 50). This means the stock is very sensitive to market movements and tends to react more strongly than the overall market. Specifically, for every 1% change in the market, the stock is expected to change by approximately 3.72% in the same direction. Hence, the stock carries a high level of systematic risk and shows amplified price movements.

Discussion

The high Beta value suggests that the stock follows an aggressive investment pattern, offering the potential for higher returns during bullish market conditions but also exposing investors to greater losses during market downturns. The significant fluctuations in stock returns over the years have contributed to this elevated Beta, indicating strong responsiveness to market changes. Therefore, such a stock is more suitable for risk-taking investors seeking higher returns, while conservative investors may avoid it due to its high volatility and uncertainty.

5.3 Trend Analysis

5.3 Table Showing Year-wise Closing Prices and Returns

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2025	119.90	15.18



Interpretation

From the trend line, it is clear that the stock’s returns are not stable and keep changing over time. In 2021, the stock shows a strong positive return, but in 2022, there is a sharp fall into negative returns. After this drop, the stock recovers well in 2023 and continues to grow in 2024. In 2025, the return decreases slightly, but it still remains positive. Overall, the trend shows that the stock faced a major decline but then recovered and continued to grow, though with some fluctuations.

Discussion

This trend indicates that the stock is quite volatile, as its returns increase and decrease significantly from year to year. The sharp fall in 2022 may be due to market or company-related issues, while the strong recovery in the following years shows improvement in performance and investor confidence. Even though there is a slight decline in 2025, the stock is still performing positively. This suggests that the stock has the potential for growth in the long run, but it also involves risk. Therefore, it may be more suitable for investors who are comfortable with ups and downs and are willing to invest for a longer period.

6.0 Implications of Future Research

This study is mainly based on past data and simple tools like returns, standard deviation, beta, and trend analysis. In future, the study can be improved by using a longer time period and more detailed data such as monthly or daily prices. This will help in understanding the stock's movements more clearly and give more accurate results.

Future research can also compare the performance of Samvardhana Motherson International Ltd with other similar companies in the same industry. This will make it easier to understand whether the stock is doing better or worse compared to others and will give a clearer picture of its risk and return.

Another important area for future study is to include factors like economic conditions, inflation, interest rates, and overall market trends. These factors have a strong impact on stock prices, and studying them will help in understanding why the stock price goes up and down.

Finally, future research can also focus on investor behaviour and market sentiment. Sometimes, stock prices change not only because of data but also because of how investors feel and react to the market. By including these aspects, future studies can give a more complete understanding and help investors make better decisions.

7.0 Conclusion

This study analyzes the stock price volatility of Samvardhana Motherson International Ltd over the period 2021 to 2025 using historical data and basic statistical tools such as returns, standard deviation, beta, and trend analysis. The results show that the stock has experienced significant fluctuations, indicating high volatility and risk, even though the average returns appear attractive. The high standard deviation and beta value suggest that the stock is not stable and is highly sensitive to market movements, often reacting more strongly than the overall market. At the same time, the trend analysis highlights a recovery after a major decline, showing the stock's potential for growth in the long term. Overall, the stock follows a high-risk, high-return pattern, making it suitable for investors who are willing to accept volatility for better returns, while it may not be ideal for those seeking stability. Although the study provides useful insights into past performance, it is limited to historical data and simple methods, and therefore cannot fully predict future market behaviour.

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