**Abstract**

Stock index analysis is very crucial for understanding the way that stock index attributes can fluctuate with time. An in-depth study of the stock index will provide insights on a trend and forecast of the index price. With the given S&P 500 historical time series data since the 1950s, the analysis can help investors to identify risk in the index and forecast the future market turmoil by observing its trend; therefore, it allows investors to make better investment decisions. The monthly index prices are log-differenced to compute the variance at risk (VaR) for the risk-reward profile and fit the SARIMA and GARCH models for forecasting. The result shows a negative VaR, which implies that the portfolio has a high probability of making a profit. The forecast for the next three years shows a constant upward trend. The analysis emphasizes the importance of understanding the S&P 500 index price trend to observe the risk and forecast. This knowledge is essential for investors to make wise decisions to invest S&P 500 index.

**Keywords**: S&P500; stock market index; Variance at Risk; SARIMA; risk-reward; forecast