Hedging US ETFs during the trade war conflict with China

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1 Introduction

This project uses the SPY ETF, which tracks the S&P 500, the main stock market index in the United States. It also uses the ASHR ETF, which tracks the CSI 300, the primary index in China. The objective is to compare the two markets and identify potential correlations. For ARIMA forecasting, only SPY ETF will be used. For forecasting with GARCH, both will be used to provide hedging opportunities if they have one.

2 Dataset & Source

Our dataset comes from the Yahoo! Finance API, which allows us to download market data, including stock prices, indices, bonds, and ETFs.

3 Analysis Methods

The forecasting of price levels and volatility is conducted by splitting the data sets into a 95:5 train-test ratio. The first 95% of the data is used to train the model, while the remaining 5% is reserved for testing and performance evaluation. ARIMA is used to forecast price levels, while GARCH is used to forecast volatility. ARIMA relies on past values and forecast errors to predict future price levels. Similarly, GARCH uses past volatility and returns to model and forecast future volatility. This helps give a sense of where the market might be headed.

4 Key Findings

4.1 ARIMA model

The ARIMA model struggled to predict the market at the start of 2025 due to increased volatility from Trump's inauguration and the tariff war. Despite low error metrics, it failed to capture the correct direction and magnitude of market movements.

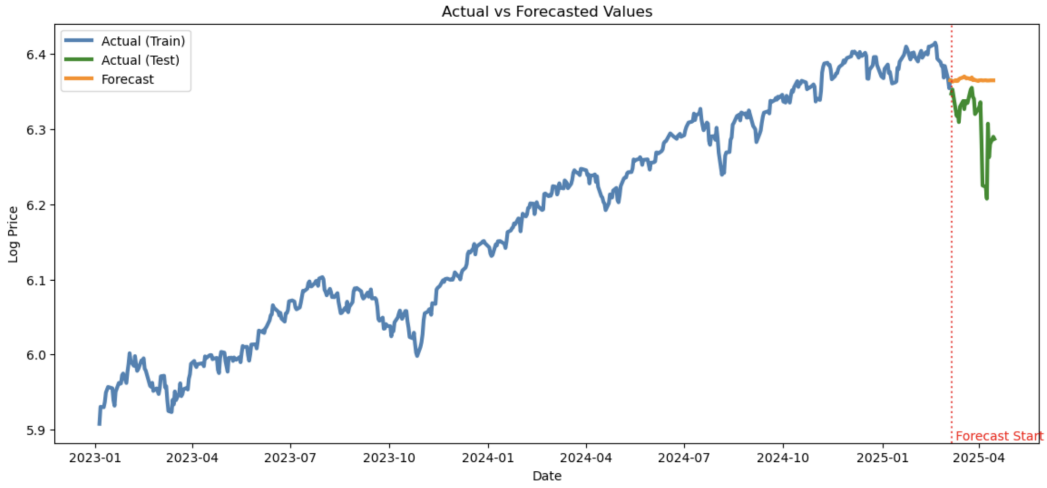

Figure 1: ARIMA forecasting result

4.2 GARCH model

After implementing the GARCH model, the plot shows how our predicted volatility compares to actual market returns, demonstrating fairly accurate predictions. When the market drops significantly, the predicted volatility is high, and when there's little movement, the volatility approaches zero.

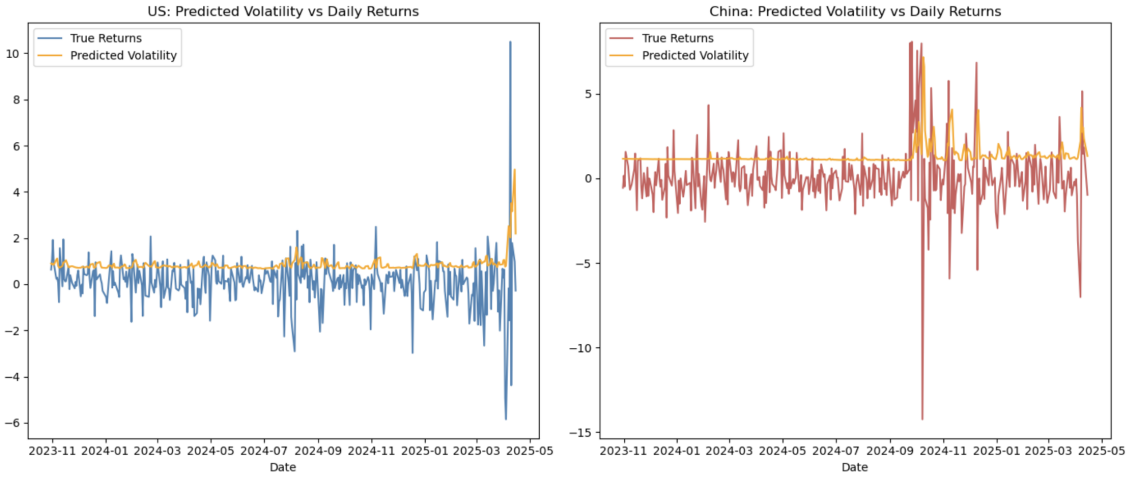

Figure 2: GARCH predictions

The volatility in the US seems to move in the opposite direction as did the volatility in China during the time of conflict (trade war). By doing so, it becomes possible to further hedge movements in the US market using Chinese stocks, or vice versa. Furthermore, FX rates can also influence hedging strategies, which will be explored in later findings.

Figure 3: GARCH 7 days Forecasting

5 Reflection

After researching Box-Cox, ARIMA, SARIMA, GARCH and other useful metrics, I've learned a lot from this project. It has opened up my perspective on the quantitative field and helped me discover what I truly enjoy doing.