1. Introduction

Data points collected over time may have internal structures (like autocorrelation, trend, or seasonal variation) that need to be taken into account. Time series analysis takes this into account. Forecasting the behavior of time series variables, like exchange rates, is irrational because they exhibit inconsistent behavior. Despite these claims, a large number of multinational corporations, foreign exchange dealers, exporters, importers, and speculators still base their hedging decisions on forecasted rates and ex-post data.

These hedging decisions are based on the assumption that patterns in the ex-post data exist and that these patterns, at least in the short term, provide an indication of future movement of exchange rates. Modern mathematical techniques such as ARIMA model could theoretically be used to identify such patterns if they exist.

1. Project background
2. Intended model use

A.1 ARMA

The Autoregressive AR and the Moving Average MA are the two processes that make up the ARMA model. If we have a series Xt, we can model the relationship between the level of the current observations and the level of the lag observations. The AR model can serve as a representation of this way of thinking. Additionally, we can simulate how shocks that occurred before time t also have an impact on the observations of a random variable at time t. The MA model can serve as a representation of this way of thinking.

A.2 ARIMA

Using linear relationships with their previous values, autoregressive integrated moving average (ARIMA) models aim to describe the current behavior of variables. It has an Integrated (I) component (d) that indicates how much differencing needs to be done on the series in order for it to become stationary. The second part of the ARIMA is an ARMA model for the series that has been differentiated stationary. The ARMA component is further divided into the previously discussed AR and MA components. The values of the orders of the AR and MA processes are estimated using the autocorrelation function (ACF) and partial autocorrelation function (PACF), respectively. The statistical package R is used to analyze the data

A.3 Log time trend (series ~ log(time))

A.4 Linear time trend (series ~ time)

A.5 Log-linear time trend (log(series) ~ time)

A.6 Seasonal (series ~ s2 + s3 +s4)

A.7 Linear trend + seasonal (series ~ time + seas)

A.8 Linear time trend \* seasonal (series ~ time \* seas)

A.9 Holt-winters additive

A.10 Holt-winters multiplicative

A.11 Decomposition (hard)

1. Objective

The purpose of this study is to conduct a statistical analysis on the stock series of the Viet Nam Steel corporations. Basic time series techniques are used on the data while the details about the data are described. Some of the graphical tools used to analyze the series include series plots, autocorrelation functions, and partial autocorrelation functions. In order to generate reliable forecasts from the model, we also aim to fit a model (ARMA, ARIMA) to the data.

For each of the model above, we will go through 5 steps:

1. Fit + summarize model

2. Explain coefficients if possible

3. Graph actual, fitted value, forecast value

4. Model evaluation: F-test (overall significant), coefficients' significance, R-square

5. Comments on RMSE, MAPE

1. Data Overlook

C.1 Sources

The data used for this analysis is the open and close price of three Viet Nam steel corporations : HPG ( Hoa Phat ), HSG ( Hoa sen ), NKG ( Nam Kim ). The data was downloaded and exported from the stock website ([Chứng Khoán, Cổ Phiếu, Tin Chứng Khoán, Thị Trường Chứng Khoán, Chứng Khoán Việt Nam (cophieu68.vn)](https://www.cophieu68.vn/)) from 2021 till the end of 2022

C.2 Explore

The data is the stock price of 3 corporations, each of which has around 500 components. Which make the data consist of nearly 1600 components.

C.3 Analysis and Descriptive of Statistics

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VI. References for report and way of analyze.

1. [Time series project report report (slideshare.net)](https://www.slideshare.net/JaideepAdusumelli1/time-series-project-report-report)

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1. Time series analysis of daily exchange rate between the British Pound and the US dollar (GBP/USD)

[project final (unr.edu)](https://www.cse.unr.edu/~harryt/CS773C/Project/Time%20series%20project.pdf)

Data source: [Historical Currency Converter | OANDA](https://www.oanda.com/fx-for-business/historical-rates) ( need VPN to access the page )

1. Analyzing and forecasting industry sale for printing and writing paper:

[Time-Series-Analysis-Project/Final Report.pdf at master · sallyblockchain/Time-Series-Analysis-Project (github.com)](https://github.com/sallyblockchain/Time-Series-Analysis-Project/blob/master/Final%20Report.pdf)

Data source: [(PDF) Forecasting: Methods and Applications (researchgate.net)](https://www.researchgate.net/publication/52008212_Forecasting_Methods_and_Applications)

1. Report and some aspections for it

[ts-write\_up.pdf (weebly.com)](https://timeseries.weebly.com/uploads/2/1/0/8/21086414/ts-write_up.pdf)

1. Some Time Series competition and code on Kaggle:

Store Sales – Time series forecasting

[Store Sales - Time Series Forecasting | Kaggle](https://www.kaggle.com/competitions/store-sales-time-series-forecasting/overview)

[Exercise: Hybrid Models | Kaggle](https://www.kaggle.com/code/panini92/exercise-hybrid-models)

[Exercise: Forecasting With Machine Learning | Kaggle](https://www.kaggle.com/code/panini92/exercise-forecasting-with-machine-learning)

Analysis and models fitting

[Breast Cancer Dataset Analysis | Kaggle](https://www.kaggle.com/code/lbronchal/breast-cancer-dataset-analysis)