

Final Project Proposal

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Introduction

- Forecasting stock prices has been a well-known challenge for financial analysts.
- As part of our final project we aim to predict close prices of a time series representing daily close prices of a chosen stock.
- We will build a trading set up based on signals from the predictions.
- In our project we will train two models and assess their performance on the out-of-sample period. We will tune our models to maximize the Sharpe ratio.
- Additionally, P&L will be computed (including transaction costs).

In the following slides we elaborate on the selected time series and models.

Dataset Description

- We selected an exemplary liquid and well-known stock: Johnson & Johnson.
- Our models will try to obtain the best performance from a very limited dataset containing only one stock.
 - This is why we will download a very detailed dataset containing 5-minute data from Stooq: <https://stooq.com/db/h/>
 - The data will be loaded from an appropriate CSV file

Strategy 1: AR-GARCH Model

- Autoregressive (AR) models are used to forecast time series based on previous values
- Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models are used to forecast volatility of time series based on previous values of volatility and error terms
- AR is therefore useful for determining the next period sign of the return and GARCH can show the magnitude of the anticipated return through volatility predictions as proxy
- The trading signals will be generated based on these two properties.
 - Signals can be long, short or neutral.

Strategy 2: Long Short-Term Memory Model

- Long Short-Term Memory model (LSTM) is a type of recurrent neural network.
- We think it is a suitable choice for modelling time series because it handles both short and long term features observed in data.
 - The LSTM is preferable to the 'vanilla' RNN which is biased towards more recent observations.
 - We operate under the assumption that Johnson & Johnson stock has observable long-term trends. We believe this is a reasonable assumption given market seasonality.
- The trading signals will be generated whenever the LSTM model predicts a particular sign and the magnitude breaches a threshold.
 - Signals can be long, short or neutral.

Division of Work

- Setting up the GitHub public repository and associated files: Adam
- Downloading and loading the dataset in Python: Maciek
- Data preprocessing and potential cleaning: Maciek
- Descriptive statistics of the input dataset: Adam
- Creating an AR-GARCH model and tuning the parameters: Adam
- Creating an LSTM model and tuning the parameters: Maciek
- Implementing trading based on signals (incl. trading costs): Adam
- Assessing performance of both models (Sharpe, P&L): Adam
- Visualization and strategy comparisons: Maciek