

Project list for the course “Financial Modelling and Analysis”, MSc Business Analytics

You have to present the results of the 4 projects.

The projects consist of the two parts: technical realization and interpretations. Both sides shall be presented. More precisely: the projects should include a short presentation and discussion of the methodology used, description of data, a realization in R and interpretations/conclusions/implications. It can be done in R notebook.

Projects

Team projects – 30% of the final grade

Project 1 - Exploratory analysis

You are the financial analysis team. You are thinking about better investment. Select any 10 financial time series of interest (prices, volumes), e.g., stocks, bonds, commodities, cryptocurrencies etc. Min 5 years of observations (the longer – the better) from YahooFinance or other platforms. Provide motivation, why those time series are selected. Show a reason of this exercise for you.

Estimate the following:

- General statistics, i.e., mean, median, variance, quantiles, kurtosis and skewness.
- Check a potential presence of outliers.
- Univariate tests for each series: Shapiro-Wilk, Kolmogorov-Smirnov, Jarque-Bera, D’Agostino test of skewness, Anscombe-Glynn test of kurtosis, Bonett-Seier test of kurtosis, Anderson-Darling goodness of fit test.
- Multivariate tests: Pearson’s product moment correlation coefficient t-test, Spearman rank correlation test, Kendall’s tau correlation coefficient test
- Two sample t-test for the difference in sample means
- Different causalities.
- Volatilities

Visualize. Interpret all results. Provide detailed implications and recommendations. Conclude.

Project 2: Regression specification and transformation

Macroeconomic factors can have a significant impact on stock prices as they reflect the overall health of an economy and its prospects for future growth. Some of the key macroeconomic factors that can influence stock prices include (potential sources: World bank, IMF, Eurostat, FRED, central banks, etc.; the sources indicated below can also be used):

Gross Domestic Product (e.g., Real GDP Growth Rate, e.g.
<https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG>): GDP is a measure of a country's

economic output, and changes in GDP growth rates can affect corporate earnings and, in turn, stock prices. If not available, use nominal GDP.

Interest Rates (long-term; e.g., <https://fred.stlouisfed.org/>): Central banks set interest rates to manage inflation and stimulate economic growth. Rising interest rates can lead to higher borrowing costs for companies, which can negatively impact their profitability and stock prices. Conversely, lower interest rates can stimulate borrowing and investment, leading to higher stock prices.

Inflation (CPI, PPI; eg. <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG>): Inflation erodes the purchasing power of money, and high inflation can lead to higher input costs for companies, affecting their profitability. In some cases, companies may be unable to pass these increased costs on to consumers, which can negatively impact stock prices.

Unemployment (Unemployment Rate, e.g., <https://data.worldbank.org/indicator/SL.UEM.TOTL.ZS>): High unemployment rates can lead to lower consumer spending, which can negatively impact corporate earnings and stock prices. On the other hand, low unemployment rates can signal a strong economy and lead to higher stock prices.

Exchange Rates (Nominal Exchange Rates, Real Effective Exchange Rates, e.g., <https://fred.stlouisfed.org/>; https://www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates/html/index.en.html): Fluctuations in exchange rates can affect companies that rely on international trade or have significant operations in foreign countries. A stronger domestic currency can make exports more expensive and imports cheaper, potentially impacting corporate earnings and stock prices.

Fiscal and Monetary Policies (Government Budget Balance, Money Supply; e.g., <https://data.worldbank.org/>; <https://fred.stlouisfed.org/>): Governments and central banks use fiscal and monetary policies to manage economic growth, inflation, and unemployment. These policies can have both direct and indirect effects on stock prices by influencing interest rates, government spending, and overall economic activity.

Global/local uncertainty (index of economic uncertainty- <https://www.policyuncertainty.com/>): Wars, terrorist attacks, political unrest, and trade disputes can create uncertainty in financial markets and affect investor sentiment, leading to fluctuations in stock prices.

Consumer Confidence and Sentiment (e.g. Consumer Confidence Index, <https://data.oecd.org/leadind/consumer-confidence-index-cci.htm>): Changes in consumer confidence can influence consumer spending and, in turn, impact corporate earnings and stock prices.

This is the preliminary list of the factors and sources. Please feel free to add/subtract any, given the data availability and research interests.

Task: Please select the country of interest, download its stock market index(es) historical data (they show “health” of the respective financial market), download this country’s macroeconomic factors. And:

1. Test the data. Identify any features, for instance outliers, mean, variance, skewness, kurtosis etc.
2. Which variables can be used to get a better prediction in your regression? Estimate a regression.

3. Build ANOVA. What does ANOVA table advise?
4. Which variables are better to remove from the model, and in what order? (use stepAIC function)
5. Do you want to add other variables, despite the results from stepAIC? If yes – which ones and why?
6. Was the improvement large/significant?
7. Check the leverage.
8. Test which data transformation can derive the better results.
9. Visualization/interpretation/implications/conclusions

Individual projects – 70% of the final grade

Project 3 – Herding.

- Select your market of interest. Explain why.
- Download the needed data. Clean. Test. Explain the market.
- Estimate herding, incl. on up/down days and high/low volatility days.
- Test. Visualize. Interpret the results. Explain potential reasons and consequences.

You can apply different models (TV, Markov switching, Bayesian etc.). Select the best fit model. Explain.

Optional: try to apply information cascade models that are provided, modify/adjust it. Explain.

Project 4 – Cryptocurrency vs traditional finance

Download closing prices of min 10 financial assets (50% cryptocurrencies, 50% any traditional assets, e.g., stocks, bonds, metals, etc).

- Prepare the dataset, calculate correlations, causality, volatilities. Run the necessary tests. Motivate. Explain.
- Estimate a statistical factor model. What is the pattern of factor influence? Interpret.
- Select the essential economic factors. Provide motivation.
- Estimate an economic factor model. What are the factor loadings? What are the variances of the unique risks? Is the model fitted well?
- Predict the prices of the selected assets using Monte Carlo simulation (and/or by means of other method that you know)
- Put everything together/Interpretations /implications/conclusions.

Note: be creative!