Term Project for MF753 - Financial Econometrics

Fall 2025

Submission Deadline: December 1, 2025
Presentation Date: December 2, 2025
Submission Method: Dropbox via MyLS. Both Report and Presentation Deck need to be submitted

Groups and Company

This is a group assignment; select your group with a maximum of 3 members. Once you have your group ready, enrol in MyLS. Select a publicly traded company that trades in the US market. Make sure that the company has at least **15 years of data publicly available data.**

You cannot use the companies in the list of banned companies posted in MyLS.

Objective and Report

The objective of this project is to analyze the company's risk and return trade-off, and earnings forecast to make recommendations about possible investment strategies in the company. You must use your knowledge of basic statistics, probability, hypotheses testing, simulations, regression, and time series models.

You must provide a report with a 1-page executive summary and a maximum 10-page report. You can use an unlimited number of appendices with tables and graphs. You also need to prepare a 15-minute presentation about your results. **The idea is that you will present the company you selected to the audience and provide an investment recommendation based on your results.**

You are free to build the report in any format and order. Use the information below to guide your analysis.

Data

Obtain data for one company of your choice and five competitors. The required data is the adjusted price, company financial information (as sales), returns on S&P500 and the Fama French factors, and the

momentum factor. Also, any other economic variables that you think will be important for your forecast model.

Sources of Data are Capital IQ , Kenneth French online data library, and CRSP and Compustat data from the WRDS library. You can send your team request to download data from WRDS to the instructor. However, please note the turnover of data from the instructor could be slow if the number of requests is high.

Also, Laurier Library gives you access to Market Atlas which provides business and financial information.

You can use any other data set to build the regression model.

Analysis

The following questions can guide your analysis, but you are not restricted to them and I encourage you to go as deep as you can in your analysis. Use all your results to make recommendations about an investment strategy.

1 Basic Company Return Analysis

1.1. Analyze the performance of your company returns (you can select the frequency) in the last 5 years. Describe the data, and check for central tendency, dispersion and normality. Construct a 95% confidence interval for the company expected stock return, interpret the results. Test if your company expected return is positive at different levels of significance. Try with and without the COVID19 periods.

1.2. How does the performance (expected return and volatility) of your company compare its competitors in the same time-period? Use the relevant hypothesis test.

1.3. How the performance (expected return and volatility) of your company compares with the market in the same time period? Use the relevant hypothesis test.

2 Company Beta

Company beta is an important measure of risk. It is used for investment and portfolio analysis and also for valuation and estimation of the cost of capital. You are required to estimate company beta, for your company.

2.1. Calculate beta using monthly frequency, with the S&500 as market proxy and 5 years of data. Also explore two different asset pricing models, CAPM, and Fama-French 3 factor model and discuss the

differences. Also explore changes in beta before and after the pandemic. What will be the implications for using beta as risk measure? How this beta compares with the ones reported by Yahoo Finance and Google Finance and Reuters. Test for autocorrelation and heteroskedasticity in the models and correct the model accordingly. Are the factors significant?

2.2. Compute beta for the competitors, how the company level of risk compares with the competition?

2.3. Compute the industry beta, that is constructed an equally weighted portfolio using the 5 competitors, and estimate the beta of this portfolio, under the same two specifications above. How the company risk compares with the industry?

2.4. Covid Effects. Suppose that you want to test the effects of Covid on: i) the company returns and ii) the company beta. Design and estimate a model that let us answer questions as, what was the effect of the Covid pandemic on the company stock returns, and on the company beta. How this results compare with the competition and with the market.

3 Relative Valuation

3.1. Obtain the relative valuation for your company using PE, PBV, PS, EV/Invested Capital using industry multiples, or competitor multiples.

3.2. Use the regression analysis approach to estimate the multiples.

4 Sales Forecast

Several company valuation methods require estimation of company's future sales and growth rates. You will need to provide an estimate of your company future net income.

4.1 Regression based sales forecast

Using quarterly sales provide a regression-based forecasting model of the form:

$$Sales_t = \alpha + \beta_1 Sales_{t-1} + \beta_2 X_{1,t-1} + \beta_3 X_{2,t-1} + \cdots + \beta_{N+1} X_{N,t-1} + \varepsilon_t$$

Where Sales are SALEQ – Sales/Turnover (Net) from Compustat, and $X_{1,t-1}, X_{2,t-1}, \cdots, X_{N,t-1}$ are variables that you must select to forecast sales (you can use more than one lag). You are open to select any variables, be creative in your modeling. Make sure that these explanatory variables are stationary, if not take

first differences. Notice that these explanatory variables are from previous periods, you can use several lags of these variables if you need. The selection of the explanatory variables is open.

Check if your model works using out of sample forecast. In this case estimate the model using data until 2024, and forecasting the 2025 quarters. How results compare with reality? Using all data available until 2025 Q2 (or Q3) forecast the quarterly Sales of your company for 2025Q3 and 2025Q4. How it compares with analyst forecast.

4.2 Forecast with ARMA

Using ARMA time series models, estimate the best model to forecast Sales. Use the Box Jenkins methodology to select the model and report all steps used to construct the forecast. Check if your model works using out of sample forecast. In this case estimate the model using data until 2023, and forecasting the 2024 quarters. How results compare with reality? Using all data available until 2024 Q2 (or Q3) forecast the quarterly Sales of your company for 2024Q3 and 2024Q4. How good is your forecast? How it compares with analyst forecast and with 4.1.

5 Investment and Simulations

For this question, assume that the market stock returns follow a normal distribution with the parameters estimated from the last 5 years for the S&P500. Assume that the CAPM holds with risk free rate=0, and your company expected returns and volatility are as in the last 5 years. Use weekly data for all calculations and assume that you capitalize on a weekly basis. Your initial investment will be $100,000

5.1. How much you will expect to have after 1 year if you decide to invest all your money in your company today. What is the probability of doubling your money, the probability of ending with less than 100,000, less than 150,000?

5.2. Suppose you want to remove the normality assumption in the previous question. To do so, instead of simulating market returns from the normal distribution, randomly select returns from your data in the last 5 years. How did your results in 5.1 change?

5.3. Suppose you want to analyze three scenarios for question 5.1; the neutral scenario is as in question 5.1. The optimistic scenario assumes that the volatility of the returns is half of what it was in the last 5 years. The adverse scenario assumes that volatility is double of what it was for the last 5 years. How do your investment perspectives change? Describe the effects of different volatilities.

5.4. Assuming the neutral scenario, suppose you want to evaluate the 4 investment strategies below. Analyze which is better regarding the expected distribution of your final investment value.

a. Invest all money in S&P500
b. Invest all money in your company
c. Invest 50% in your company and 50% in the market
d. In month 0 invest 35% in your company, 35% in the market and 30% in cash (paying 1% return). Then at the end of each month, rebalance the portfolio according to the following rule. If your stock's average weekly return for the last month is **LARGER** than the Market's average return for the last month, then move an additional 10% to the stock from the Market. Otherwise, move an additional 10% of the balance to the Market from the stock. However, if the market had a negative average return for the last month then move 100% to cash for 1 month and start next month with 35%, 35% and 30%.

Analyze your stock performance based on the all previous results, what will you recommend to an investor?

6 Value at Risk (VaR) and GARCH

The objective of this question is to estimate the yearly 95% value at risk for the 4 investment strategies in the previous question

6.1. For strategies a) b) and c) Use the parametric method assuming that market stock returns follow a normal distribution with the parameters estimated from the last 5 years and the company returns follow CAPM.

6.2. Can we use the historical method? Explain and do it if you can.

6.3. Use Monte Carlo simulations for all strategies.

6.4. Use Bootstrap method, assuming i.i.d. returns, for all strategies.

6.5. Use the Bootstrap method, under the assumption that return volatility follows a GARCH (1,1) model.