MGT 6203 Group Project Proposal

Team #42

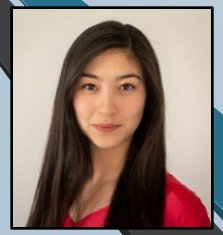
Team Members

- Xi Lu (xlu355): This is my 5th course in the program, and recently I have worked on a project predicting wildfire spread using SMOTE and XGBoost models for CSE 6242. My undergrad degree is in Public Planning.

- Ligeng Peng (lpeng61): I have a bachelor's degree in engineering from the University of Calgary. I am a Project Manager in BI and Data Service, and my current working project is Vision AI to detect movement from Crane in construction site.

- Daniel Tong (dtong31): I am an aspiring data analyst, recently graduating from UCSD with a Bachelor's in Data Science. This will be my 3rd course of the program.

- Guchuan Gao (ggao43): I am a data scientist/mechanical engineer working in Canadian oil sands, with a primary focus on developing autonomous haulage technology in the mining industry. I am passionate about exploring AI applications in image recognition and natural language processing.



- Isabelle Victoria Zelazny (izelazny3):I am a geologist working in the Canadian oil and gas industry with a specialty in unconventional geochemistry. My goal is to develop analytical skills so I can improve how exploration and development is done in the industry.

Understanding the Effects of Financial Ratios on Stock Performance

- **Background:** A company's stock price fluctuates every day by market forces, but it is also strongly influenced by its own financial fundamentals. Financial ratios provide investors with opportunities to evaluate a company's true performance and are often crucial fundamentals used in stock analysis.

- **Business Justification:** Understanding how to make successful investments is important for both investment businesses and individuals, as effective allocation of capital is extremely important for their success and financial health. Therefore, by understanding which financial ratios best predict the returns of a stock, investors can make better informed, data driven decisions.

- **Impact of Analysis:** The results of this analysis can help businesses seeking investors tailor company financial ratios to align with ones that predict better performance [1], while also helping both companies and individuals with their own investment decisions.

Approach

- **Problem Statement:** The key objective of this project is to analyze financial ratios' correlations with stock prices among Dow 30 stocks and use factor driven analysis to understand how financial ratios drive stock performance in different industries.

- **Primary Research Question:** Which of the financial ratios (Dependent Variable) best predicts the returns (Independent Variables) of a stock from the Dow 30?

- **Supporting Research Questions:** Which combinations (interaction terms) of financial ratios best predicts the return of a stock from the Dow 30? Which combinations of financial ratios suggest poor performer/good performer for a stock in the next 3 months? Do different industries have different financial ratios as their predictors?

Approach Continued

- The main technologies we would use for data analysis, visualization, and model predication are R
- Understand potential multicollinearity between financial ratios
- Potentially use PCA or Lasso regression to reduce financial ratios dimensionality to identify key financial ratios that have major impact on stock price
- Create training, validation, and test datasets to aid with selecting best model
- Create multi linear regression models to establish correlations between financial ratios and stock prices [2]
- Create clusters among Dow 30 stocks to understand patterns
- Use back-testing to assess the viability of a trading strategy or pricing model by applying CUSUM analysis on historical financial ratios combined with regression models to see how stock price would have played out retrospectively using historical time series data

Datasets

- Wharton Research Data Services: https://wrds-www.wharton.upenn.edu/
  - Dow 30 stocks' 75 Financial ratios by month from Jan 2010 to Dec 2022
- Yahoo Finance via R tidyquant
  - Dow 30 stock prices by month from Jan 2010 to Dec 2022

- Dependent variable: Stock Price
- Independent variables: 75 different Financial Ratios

Sample Data from Wharton Research Data Service

public_date	TICKER	CAPEI	bm	evm	pe_op_	pe_op_	pe_exi	pe_inc
20100131	MSFT	17.445	0.181	9.091	17.835	17.949	18.299	18.299
20100228	MSFT	17.365	0.166	9.138	15.332	15.582	15.84	15.84
20100331	MSFT	17.722	0.166	9.138	15.662	15.917	16.181	16.181
20100430	MSFT	18.48	0.166	9.138	16.329	16.595	16.87	16.87
20100531	MSFT	15.296	0.181	9.939	13.163	13.368	13.368	13.368

Expected Outcomes

- We will have a better understanding of the relationship between financial ratios and stock prices: for example, by analyzing the correlation between financial ratios and stock prices, we can gain insights into how changes in a company's financial performance impact its stock price.
- Through factor analysis, we will have identification of key factors that drive stock performance, and this information can be used to predict how stocks might perform in the future and to make investment decisions.
- By implementing factor analysis to predict future stock performance, we can make more informed investment decisions and potentially generate higher returns on our investments.

- **Anticipated Conclusions/Hypothesis:** The following 6 financial ratios are typically expected to influence stock prices: working capital ratio, the quick ratio, earnings per share (EPS), price-earnings (P/E), debt-to-equity, and return on equity (ROE) [3]

Plan

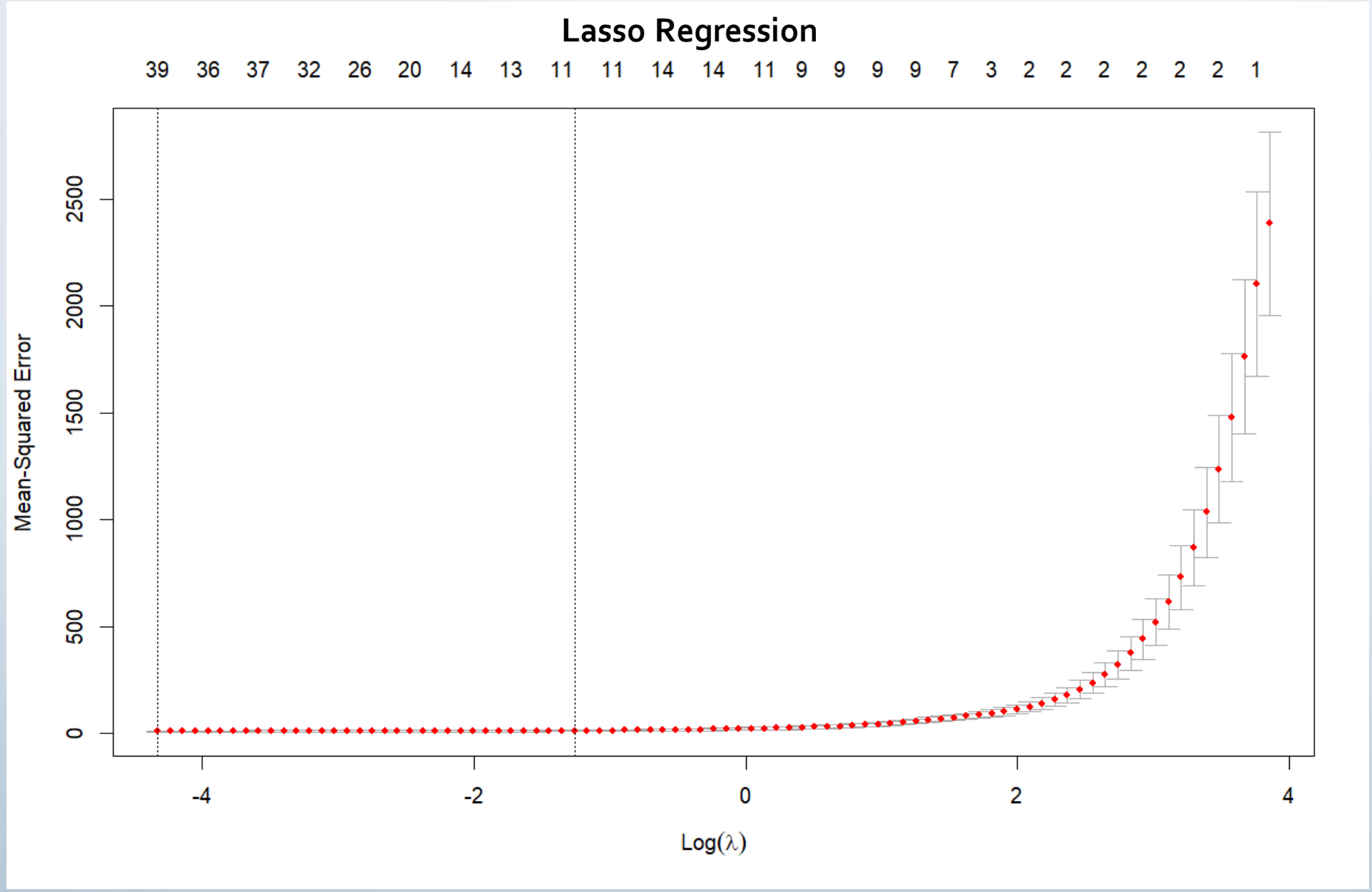
Task	Task Details	Assigned To	Progress	Start	End
Topic & Proposal	Topic Research and Selection	Everyone	100%	2-16-23	3-02-23
	Dataset Research and Selection	Everyone	100%	2-16-23	3-02-23
	Proposal	Everyone	100%	3-02-23	3-12-23
	Proposal Presentation	Everyone	100%	3-12-23	3-26-23
Data	Data Collection, Cleaning and Prep.	Everyone	100%	3-12-23	3-26-23
	Data Exploration/ Variables Selection	Everyone	10%	3-12-23	3-26-23
	Analysis/Modeling	Everyone	0%	3-19-23	4-02-23
	Progress Report	Everyone	0%	3-26-23	4-02-23
Evaluation & Visualization	Experiment and Evaluation	Everyone	0%	4-02-23	4-09-23
	Final Report	Everyone	0%	4-09-23	4-16-23
	Final Presentation	Everyone	0%	4-09-23	4-19-23

We will review project milestones such as data collection, cleaning, variable selection, modeling, visualization, and completion of the progress report as part of our "midterm exam." As part of our final deliverables, our "final exam" will focus on finishing the final report, creating a solid model to categorize financial ratios into 5 factors and determine which factor plays the most significant role in stock performance. The project activities and progress are tracked using a Gantt chart and Azure DevOps. We also have weekly meetings to show the progress to the team members.

What we have completed so far

- Data collection
- Initial data cleaning:
  - Remove NA values in stock_prices dataset
  - Remove financial ratios with >500 NA values in Dow30_FinancialRatios dataset
  - Impute remaining financial ratios NA values using ".direction=downup"
- Test Example: using Lasso Regression to remove features for AAPL stock

(see next slide)


Lasso Regression
39 36 37 32 26 20 14 13 11 11 14 14 11 9 9 9 9 7 3 2 2 2 2 2 2 1
Mean-Squared Error
0
500
1000
1500
2000
2500
-4
-2
0
2
4
Log(λ)

References

- [1] B Korcan Ak, Patricia M Dechow, Yuan Sun, and Annika Yu Wang. (2013) The use of financial ratio models to help investors predict and interpret significant corporate events. Sage Journals. Vol 38. Issue 3
- [2]Subramanian, K. & Prabhu, M. K. (2014). Predicting Stock Prices Using Financial Ratios: A Multiple Linear Regression Analysis. Journal of Finance and Accounting, 2(7), 383-387.
- [3] Glenn Wilkins. 6 Basic Financial Ratios and What They Reveal. Investopedia. 2022. https://www.investopedia.com/financial-edge/0910/6-basic-financial-ratios-and-what-they-tell-you.aspx#:~:text=There%20are%20six%20basic%20ratios,return%20on%20equity%20(ROE).