ECS163 (2017 Spring) Final Project Report

Topic: Stock Analysis Visualization for S&P 500 Companies

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Source from: http://us.spindices.com/indices/equity/sp-500

Introduction

The dataset that we chose for our final project is a list of companies in the S&P 500 (Standard and Poor's 500). The S&P 500 is a free-float, capitalization-weighted index of the top 500 publicly listed stocks in the US (top 500 by market cap). The dataset includes a list of all the stocks contained therein and associated key financials such as price, market capitalization, earnings, price/earnings ratio, price to book etc. Up to now, all the information on S&P 500 index used to be available on the official webpage on the Standard and Poor's website: http://us.spindices.com/indices/equity/sp-500.

We chose this dataset to be our final project target. Our initial target was due to make an attractive and useful data analysis tool. In recent years, more and more people have chosen to buy stocks to invest in their own assets. Some of the college students would like to shelter in the stock market in order to earn and accumulate their future capital. As we all known, one of the primary benefits of investing in the stock market was the chance to holder's grow money. However, not all the stock holders could make big profits with a small capital. Most beginners got lost in the daily rising and falling for the prices of individual stocks. Our original intention for this dataset was to obtain some suggestions for those beginners in the stock market. After a series analyzing and organizing for our dataset, the project was designed to present a stock analysis visualization for S&P 500 companies. This stock analysis visualization would display the stock fluctuations in previous years exquisitely. In addition to, our visualization was planned to show the financial situation and stock trend of each company. The visualizing images of our project would also analyze the financial situation and stock trend's relationship in its sector. In our opinion, this project would help a lot of stock rookies to have a general idea about how to judge the quality of a stock and filtering stocks without foreseeable and hidden economic risks.

Initial Mock-ups of the Data Visualizations

For the initial mock-ups of our stock analysis visualizations, we planned to make an overview visualization in interactive force directed graph with the basic category of S&P 500 companies and the companies' name in different colors. When the user clicked the category's bubble, there would be an interactional line and candlestick chart to show the stock movement for each company in the past two years. If the users diametrically chose a company-bubble that they want to know, there would be two different detail views appeared on the bottom. One of the detail views was designed to be parallel coordinates with an interactive brush component as the detail view. It would represent all the companies that belonged to this category and the comprehensive information from them by clicking and dragging along any axis, users can specify a filter for that dimension. For the other detail view, we would be used a redesigned radar chart to reveal the overall strength of each company with the general information about its price, market capitalization, earnings, price/ earnings ratio, price to book etc. Moreover, we also planned to add some extra visualizations to supplement more information. The first extra visualization would be a US states map that use red pots to mark the city addresses for all the 500 companies' headquarter. The second one would be a force bubble chart, exposed the communication network of each S&P 500 companies, which included all the competition and cooperation companies for them.

We would like to visualize the dataset in this way because this design could classify all the S&P 500 components to several groups by their sector in the overview visualization. It might help users to simply go through all the profile information for each S&P 500 companies and their basic attributes. This layout would also be able to filter the right stocks for the user by their preferences since the radar chart displayed the precise data with the financial situation and economic strength of the chosen company and compared those data with other company. Additionally, our visualized system could make a brief analysis of individual stocks the future trend by showing the pasted stock movement for each company an interactional candlestick chart. For those extra visualizations, they would help our users to avoid risk-averse or overly conservative investment strategies by providing more analytical data with the American map and the force bubble chart.

Adjustment and Change from the Initial Design

In the process of achieving our plan, we made a lot of adjustments to improve our design. The interactive force directed graph seemed too complicated to be an overview visualization because we needed to set 500 category's bubbles in many different colors. The visualize graphic looked very

messy in this way, so we changed the overview map to be parallel coordinates. Moreover, we changed the detailed view to be a world map with a candlestick chart thumbnail since the S&P 500 companies were not only located in the USA, but also built up in England.

Final Visualization System

In the final visualization system, we made parallel coordinates, visualizing dimensional geometry and analyzing our multivariate data, to be our overview visualization. Our parallel coordinates showed a set of points in a 7-dimensional space, a backdrop was drawn consisting of seven parallel lines, typically vertical and equally spaced. The parallel lines displayed one important information to reveal the company's financial situation and economic strength by displaying its numerical relationship between the sector, market cap, price, book value, earnings/share, earnings before interest, tax, depreciation, and amortization (EBITDA), and price/sales. In this visual image, users were able to select the specific data that they wanted to see by filtering along any dimension or entering the value in the selection box setting on the right side of the map.
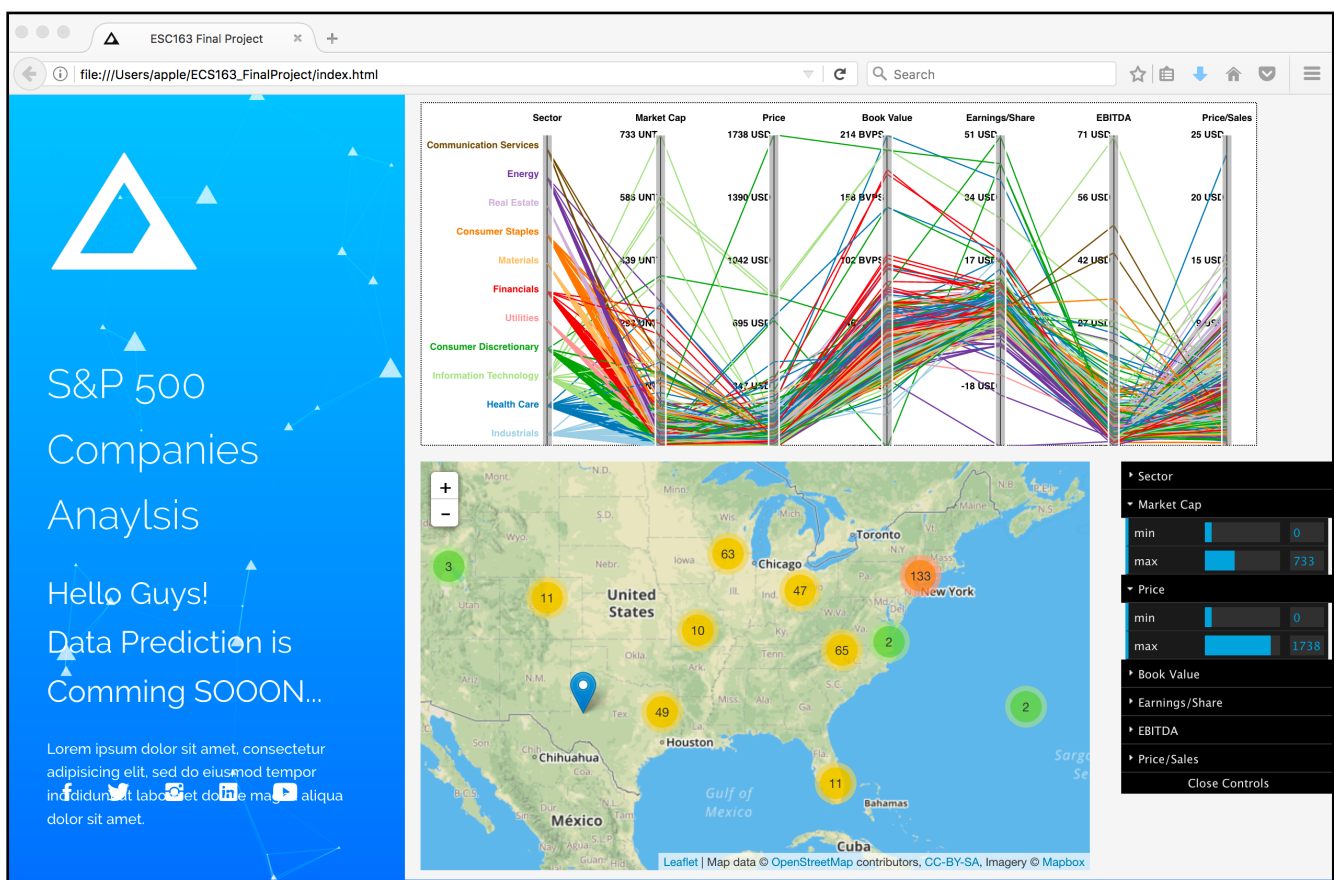
As a detailed view of parallel coordinates, the presented data on the map would change following the selected data from the overview. When the user clicked the company's bubble on the world map,

there would be an interactional candlestick chart to show the stock movement for each company in the past two years. The interactional candlestick chart came with its own filter that helped users to select the specific time range for displaying the data. A Sankey diagram would set as another detailed view, in which the width of the arrows is shown proportionally to the data quantity. Our Sankey put a visual emphasis on the major transfers or flows within a selected sector. It would be helpful in locating dominant contributions to an overall flow of economic trend for one stock sector. Based on the numerical basis from parallel coordinates, we used the economic formula to calculate the basic attributes for each stock in the selected sector and roughly divided them into three categories: undervaluation, overvaluation, and financial loss. When users clicked the category, the category data would feedback back to the overview visualization to display the financial situation and economic strength of this category's companies. Additionally, the presented data on the world map would also update after clicking since the world map was linked with the parallel coordinates.
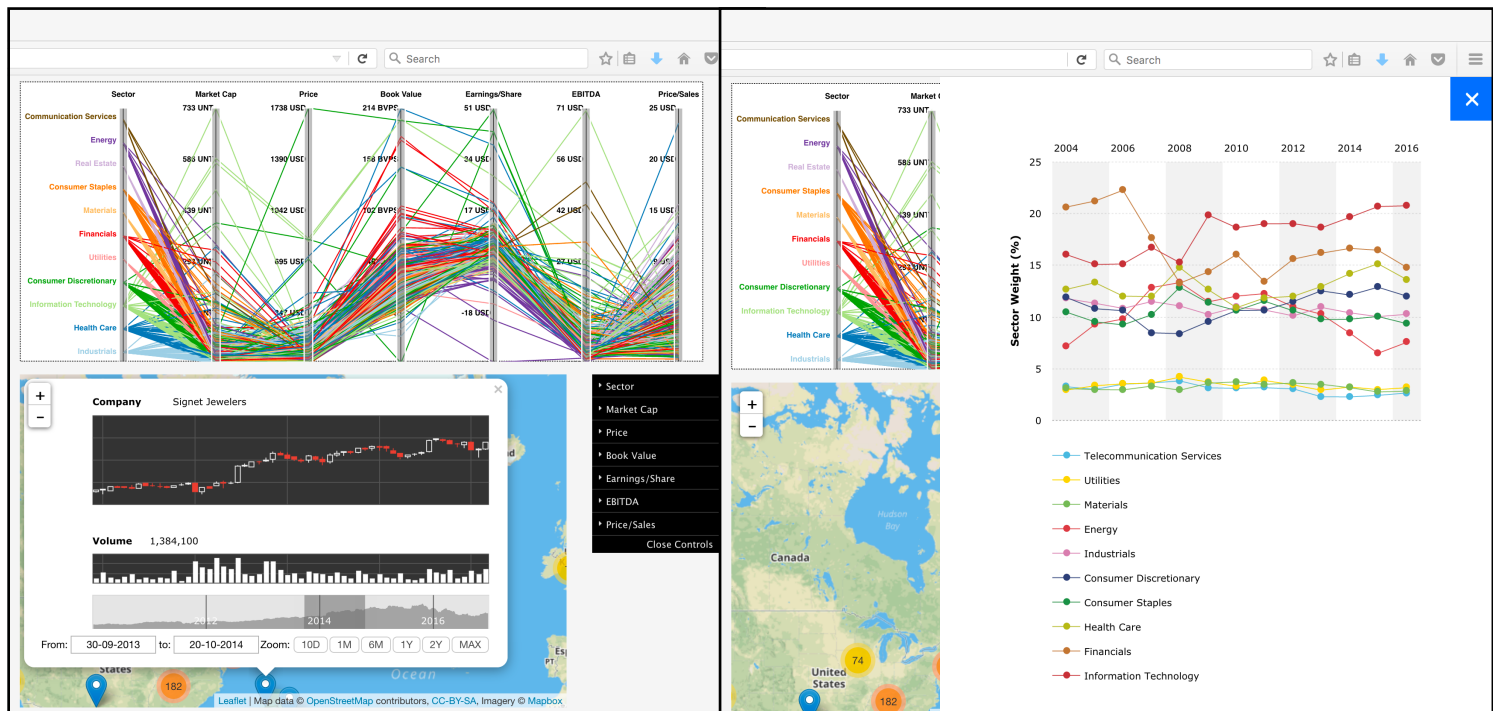
As a result of adjusting the initial design, the three tasks in our original plan has changed also. The three specific tasks that we used to formulate were mostly focused on expectations of future stock market development. However, we wanted to pay more attention to helping users to master the ability to judge the pros and cons of one stock and to analyze its potential strength. At the moment, the first specific task that we planned our visualized system to do was to display the financial situation and economic strength information of all the S&P 500 companies with its sector. For the second specific task, the final visualized system would be able to provide the current development

and trends for each stock by showing its price fluctuation in the past two years with the company's name and location. The last specific task for our final visualized system was to make a brief analysis of individual stocks for its basic economic attributes: undervaluation, overvaluation, and financial loss. By using our stock analysis tool, the users could be able to effectively filter stocks for themselves and have a general idea about the important influencing factors of the stock trends.

Evaluation Section

		Mental Demand	Physical Demand	Temporal Demand	Performance	Effort	Frustration
Task 1	Xiang Wang	15	15	5	5	15	5
	Cheng Gai	15	15	5	5	10	5
	Giulia Lubet	10	15	10	10	10	5
	Yihang Tang	15	10	5	5	10	5
	Alan Wei	10	15	5	5	5	10
	Brandon Pun	5	10	5	5	10	5
Task 2	Xiang Wang	15	10	10	5	15	5
	Cheng Gai	10	15	15	10	15	5
	Giulia Lubet	15	10	10	5	5	5
	Yihang Tang	15	5	10	5	10	5
	Alan Wei	15	10	10	10	15	5
	Brandon Pun	10	10	10	5	10	5
Task 3	Xiang Wang	5	5	5	10	5	10
	Cheng Gai	5	10	5	5	10	5
	Giulia Lubet	5	10	5	10	5	10
	Yihang Tang	10	5	10	10	5	15
	Alan Wei	5	5	5	5	5	5
	Brandon Pun	5	5	5	5	5	5

Mental Demand [0 ~ 100 => very low ~ very high]

How much mental and perceptual activity was required? Was the task easy or demanding, simple or complex?

Physical Demand [0 ~ 100 => very low ~ very high]

How much physical activity was required? Was the task easy or demanding, slack or strenuous?

Temporal Demand [0 ~ 100 => very low ~ very high]

How much time pressure did you feel due to the pace at which the tasks or task elements occurred? Was the pace slow or rapid?

Overall Performance [0 ~ 100 => perfect ~ failure]

How successful were you in performing the task? How satisfied were you with your performance?

Effort [0 ~ 100 => very low ~ very high]

How hard did you have to work (mentally and physically) to accomplish your level of performance?

Frustration Level [0 ~ 100 => very low ~ very high]

How irritated, stressed, and annoyed versus content, relaxed, and complacent did you feel during the task?

Group Division

First Task (parallel coordinates): Xuanwen Zheng

Second Task (world map & candlestick chart): Declan Zhang

Third Task (Sankey diagrams): Jing Li

Extra Visualizations: Jing Li

Interactions: Xuanwen Zheng & Jing Li & Declan Zhang

Visual Encodings: Jing Li & Declan Zhang

Web Design: Declan Zhang

Final Report: Xuanwen Zheng