

Introduction of the organization:

Finco is a financial services company. It chiefly deals in investment services. It aids clients in managing their money through various products such as custom-made portfolios based on customer requirements. By drawing on the data from the companies listed in the S&P 500 index the team will be providing portfolio suggestions as per customer requirements. The companies listed in the S&P 500 represent a wide exposure to different industry sectors such as Technology, Finance, Healthcare, Energy etc.

Scope of project:

Financial data for 500 companies can be overwhelming to make an investment decision. To make the process more intuitive and user friendly Finco built an app that can be used by an end user through the already popular actions of click, select and slide to give them a visual representation of their decisions. Our goal is to bring the power of decision-making ability closer to the user by simplifying the obscurity that a plethora of data represents. To achieve this Finco will use financial data used zacks.com as well simulated financial metrics in order to formulate the data. We built a sample database for 10 companies which are a part of the S&P 500 for two years. The Finco app allows investors to choose stocks as per their risk appetite and return expectation.

A centralized database was built using the data. This database served as the basis of the application. The database would provide a secure and persistent data source that can be accessed by any user with access rights. The portfolio management tool was built in Shiny. Shiny app accesses the database and does the calculations and visualizations. The end goal was to make an application which can be used by people without much finance knowledge and to help them make decisions based on their requirements.

Goals of project :

- Historical trend view to review the past performance of stocks
- Clustering analysis for portfolio diversification
- Scatter plot of P/E ratio and market capitalization
- Bar chart of P/E ratio of based on chosen industries
- Allow the user to select a bunch of stocks based on the key metrics to see what the average return was in last 3 months, 6 months, 9 months and 2 years. Allow customers to see how risky their portfolio is through various metrics.

As a financial service company, our goal is to help clients track S&P 500 companies' performance and suggest a winning investment portfolio according to their risk tolerance, annual income, capacity to invest. In order to build the portfolio and find the winning stock combination, we utilize the metrics below.

The intended end-users for this finance portfolio app include individuals interested in diversifying their investment options and are looking for assistance for the same from an online broker or traditional human brokers. Finco app is designed to aid the individuals handle their investment decisions personally by providing them with the all necessary metrics

to decide on. Visual representations are incorporated in the app to help budding investors who are very new to trading, make informed decision.

ERD :

We created 5 tables which were customer, industry, stock, metrics and risk profile. The customer table contained the customer information such as the first name, last name, age, job, marital title and education. The industry and stock table contain information regarding a sample of industries and stock in the S&P 500 index and some of this data was randomly simulated. We have a separate table containing the metrics which has all the relevant data regarding metrics which is useful to make choose a stock, we made this a separate table as it would be useful to make calculations and we wouldn't be overloading the risk table.

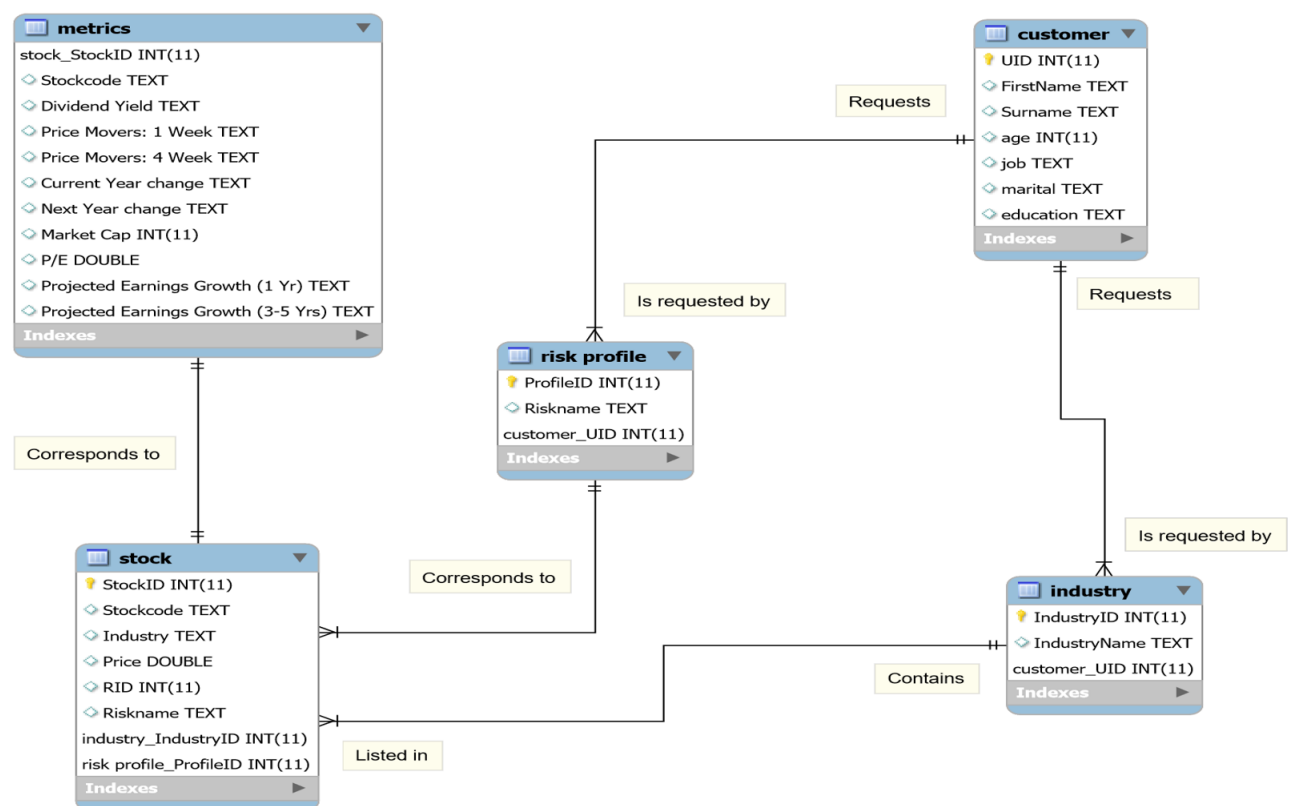


Figure 1: Finco's portfolio management app ERD

Riskname Text and Stock code text are included as they are foreign keys.

Shiny Interface and use workflow:

In order to build dashboards, Maria DB in R was connected with MySQL workbench. The dashboard was set up as shown in Figure 2 below. The dashboard consists of 5 sidebar menu tabs – Create, Read Initial data, Display user selected data, Update and Delete in the order from top to down. This setup follows the CRUD methodology of Create, Read, Update, Delete. In the following paragraphs the functionality of each of the tabs is briefly discussed.

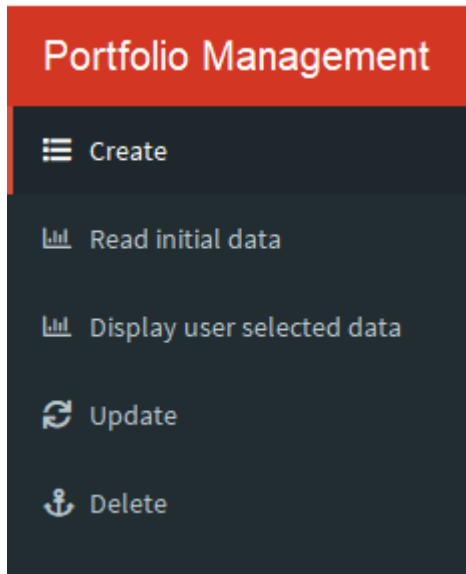


Figure 2: Dashboard setup

Insert Tab:

This tab is to be used by the portfolio manager to insert the details of a new customer. The details of the user as required in the fields represented on the dashboard is to be entered manually to enter a new user. All the fields are required for the consumer table to be updated. The data thus entered inserts a new row in the Customer table as shown in the ERD diagram (Figure 1).

The example shown below shows the user details of a fictional character Jimi Hendrix. After making sure that all the fields are entered, when the 'Update' button is clicked, it updates the customer table with the new user information as shown in the Figure 4

Portfolio Management

Create

Read initial data

Display user selected data

Update

Delete

Customer Details

User ID

222

First Name

Jimi

Surname

Hendrix

Age

27

Job title

Guitarist

Marital Status

Single

Education Level

Unknwon

Insert data

Figure 3: Create tab

Jimi

Surname

Hendrix

Age

27

Job title

Guitarist

Marital Status

Single

Education Level

Unknwon

Insert data

Report of data from Customer table after insertion

Show 10 entries

Search:

UID	FirstName	Surname	age	job	marital	education	
111	222	Jimi	Hendrix	27	Guitarist	Single	Unknwon

Showing 111 to 111 of 111 entries

Previous

1

...

8

9

10

11

12

Next

Figure 4: Updated consumer table

Read Initial Tab:

This tab provides the financial manager to display the current stocks that are available in Finco's database. By showing the data table, barplots of the P/E ratio, Market cap and K-means cluster, it aims to give the financial advisor/customer an overview of the market. It performs four actions – Display the table of data, Barplot of P/E ratio, Barplot of market cap and Cluster plot.

Create

Read initial data

Display user selected data

Update

Delete

Display all industries

Display

Show 10 entries

Search:

stockid	stockcode	Industry	Market Cap	P/E	Dividend Yield	Price Movers: 1 Week	Price Movers: 4 Week	Current Year change	Next Year change	Projected Earnings Growth (1 Yr)	Projected Earnings Growth (3-5 Yrs)	
1	1010	AUO	Oil and Gas	3984	10.35	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
2	1030	SHI	Financial	5055	0.8	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
3	1040	SMFG	Electronics	53663	7.23	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
4	1070	FLY	Energy	365	5.09	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
5	1080	MPX	Internet	781	25.89	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
6	1103	NRIM	Medical	255	12.55	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
7	1162	AEZS	Computer	48	6.59	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
8	1210	ETFC	Technology Services	13269	13.56	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
9	1230	MAG	Manufacturing	639	9.55	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
10	1291	OLP	Mining	509	12.3	0.09	0.04	0.11	0.05	1.6	-0.65	0.1

Showing 1 to 10 of 31 entries

Previous

1

2

3

4

Next

Figure 5: Data table of the available stocks in Finco's database

P/E ratio is one of the two financial metrics used to judge the value of the available stocks. The stocks are grouped by the industry to display the net P/E ratio of an industry. It shows that 'Electronics', 'Automotive', 'Chemical' are some of the most valued industries.

Bar plot of P/E ratios of all industries

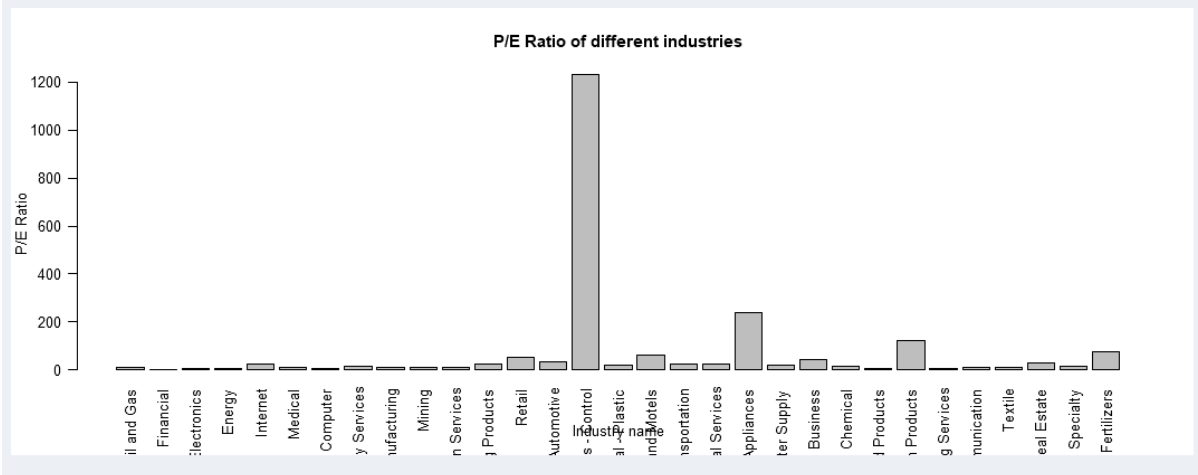


Figure 6: Barplot of P/E ratio of all the stocks in Finco's database

Market cap tells how big a company is. Here again the stocks are grouped by Industry. The biggest industry by market cap are – Electronics, Chemical, Technology Services, Automotive

Bar plot of Market cap of all industries

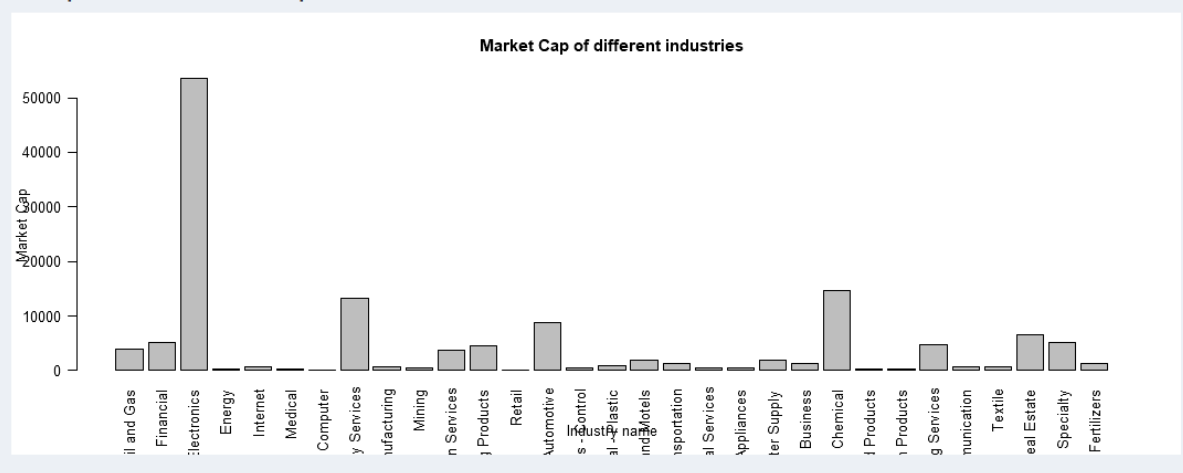


Figure 7: Barplot of Market cap of all the stocks in Finco's database

Scatterplot of all industries by Market Cap and P/E

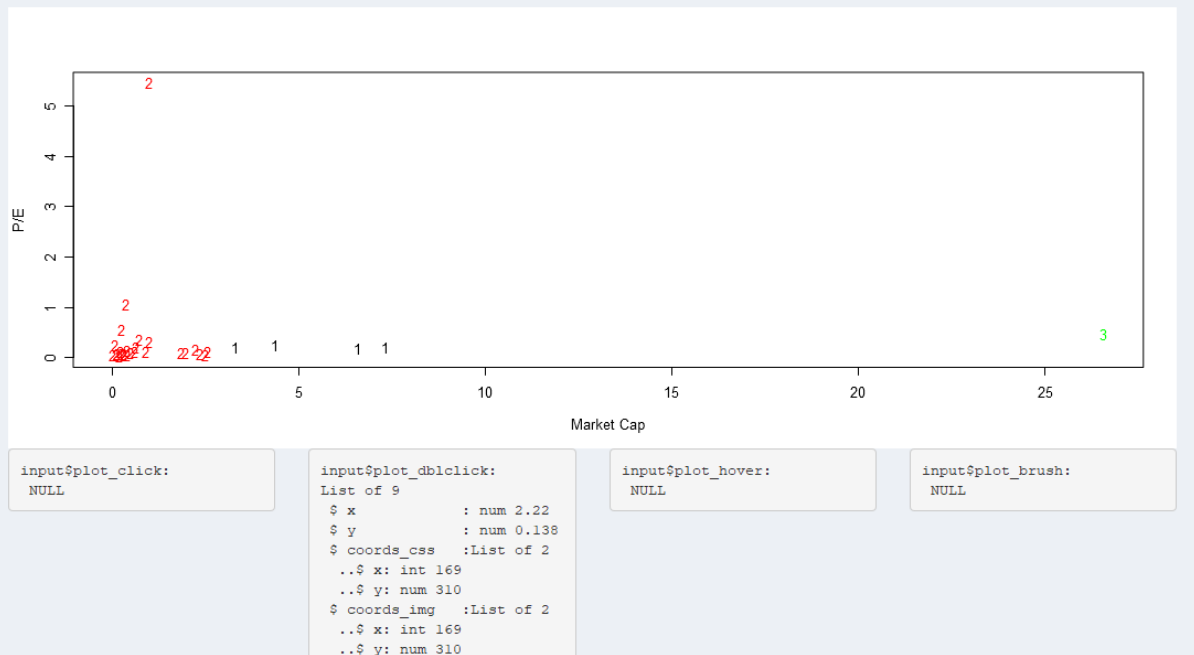


Figure 8: K-means cluster map of all the stocks in Finco's database

The plot above shows all the industries clustered by P/E ratio and Market cap. The clustering was carried out using K-means clustering algorithm. It shows the industry of similar nature grouped together in clusters named – '1','2','3'. Industries in Cluster 2 are of small P/E ratio and Small market cap. Industries in Cluster 1 are mid-cap industries. Industries in Cluster 3 are large-cap industries.

The above set of plots and table gives the user an overall idea of the industry characteristics. Based on these the user can make the selection in the next tab.

Display user selected data:

This tab allows the user to display of plots based on the curated selection of industries. It shows two plots – The cluster plots of the selected industries and the barplot of the risk. The cluster

Scatterplot of all industries by Market Cap and P/E

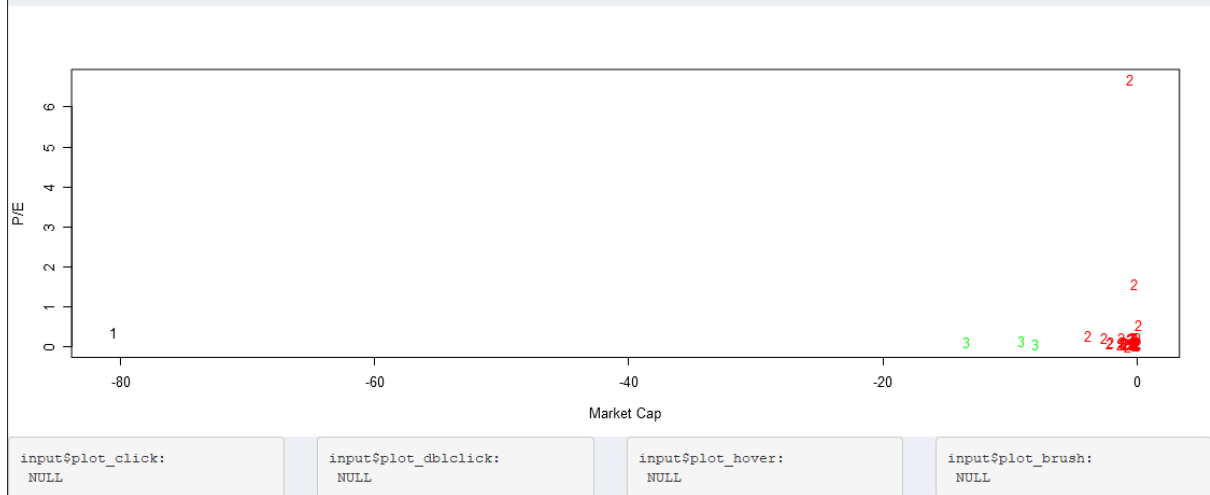


Figure 10 below shows how the user selection are grouped. The bar plot as shown in Figure 11 of the risk the risk ratings of the industries.

Create

Read initial data

Display user selected data

Update

Delete

Select Industries

IndustryName

ElectronicsAutomotiveChemicalFinancialEnergy

Select

Show10entries

Search:

stockid	Industry	Market Cap	P/E	Dividend Yield	Price Movers: 1 Week	Price Movers: 4 Week	Current Year change	Next Year change	Projected Earnings Growth (1 Yr)	Projected Earnings Growth (3-5 Yrs)	
32	4323	Energy	537839	22.02	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
45	4610	Automotive	89519	10.07	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
12	1430	Financial	61006	17.52	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
2	1040	Electronics	53663	7.23	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
11	1410	Financial	26475	47.99	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
20	4121	Financial	17808	37.56	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
43	4570	Financial	17088	1236	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
31	4322	Chemical	14750	15.01	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
21	4123	Electronics	14135	19.58	0.09	0.04	0.11	0.05	1.6	-0.65	0.1
17	4052	Financial	8859	6.63	0.09	0.04	0.11	0.05	1.6	-0.65	0.1

Figure 9: Data table of user selected industries.

Scatterplot of all industries by Market Cap and P/E

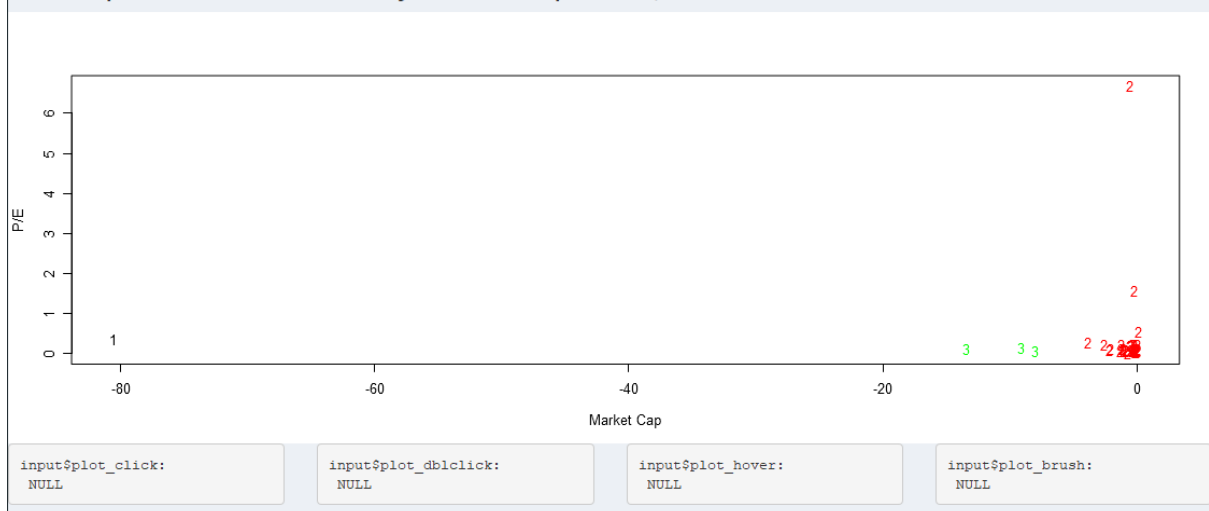


Figure 10: K-means cluster map of user selected industries

Barplot of industry risk

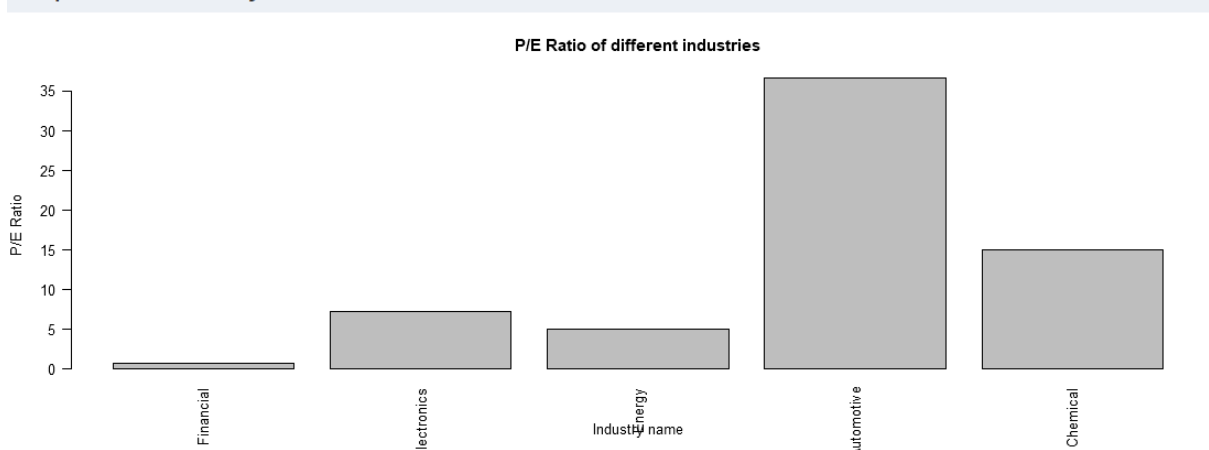


Figure 11: Barplot of the risk of the selected industries

Update Tab:

This tab was used to update customer information that is their last name. This functionality can be extended to updating industries, stocks, other customer information or other metrics. The example in the Figure 12 shows that the last name of the customer Jimi Hendrix, whose last name was when modified to Halo shows in the updated table.

Portfolio Management

Create
Read initial data
Display user selected data
Update
Delete

Page for Update

UID: 222

Surname: Halo

Update

Customer table after updation

Show 10 entries

Search:

UID	FirstName	Surname	age	job	marital	education	
111	222	Jimi	Halo	27	Guitarist	Single	Unknwon

Showing 111 to 111 of 111 entries

Previous 1 ... 8 9 10 11 12 Next

Figure 12: Update customer information tab

Delete Tab:

This was similar to the update tab and was used to delete customer information that is their last name. This functionality can be extended to updating industries, stocks, other customer information or other metrics. The example shown in the

Read initial data
Display user selected data
Update
Delete

Customer table after deletion

UID: 222

Delete

Show 10 entries

Search:

UID	FirstName	Surname	age	job	marital	education	
101	103	Robert	Martin	52	blue-collar	married	primary
102	104	Jennifer	Jones	59	blue-collar	married	primary
103	105	Daniel	Martinez	27	technician	single	tertiary
104	106	John	Thomas	44	blue-collar	married	secondary
105	107	John	Martin	47	technician	married	tertiary
106	108	Richard	Miller	34	admin.	married	secondary
107	109	Michael	White	59	retired	single	secondary
108	290	Jon	Doe	55	Service	married	tertiary
109	101	James	Smith	58	management	married	tertiary
110	567	James	Smith	58	management	married	tertiary

Showing 101 to 110 of 110 entries

Previous 1 ... 7 8 9 10 11 Next

Figure 13 shows that the user id 222 who was added in the

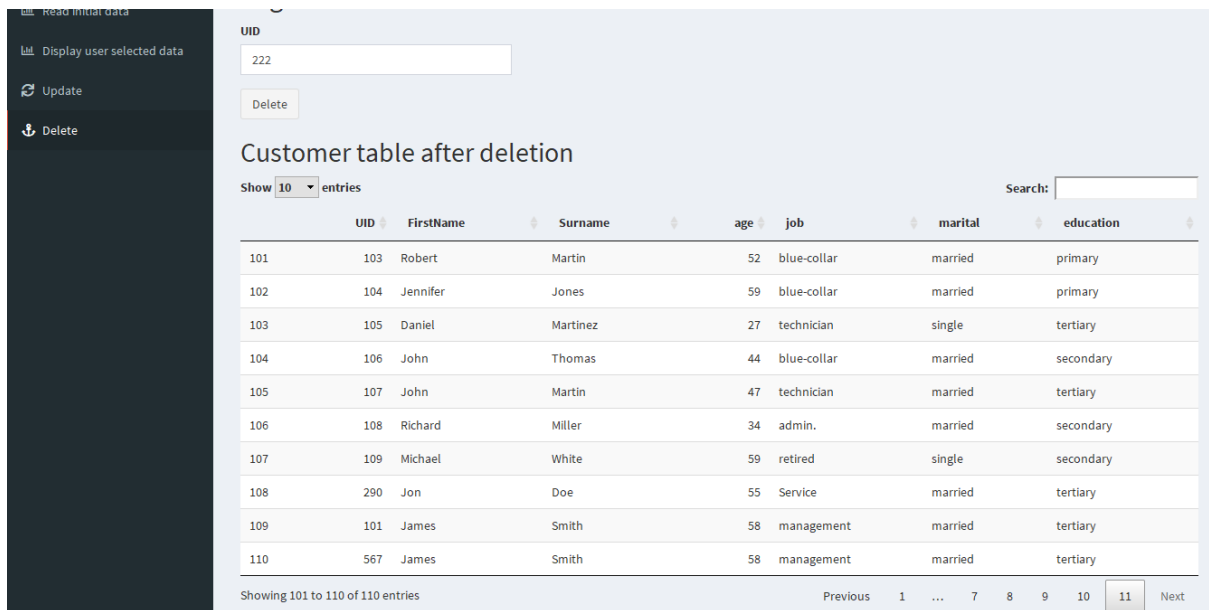


Figure 13: Delete customer tab

Then we connected all of this to the server to output the data.

1. R code for shiny application
2. Final ERD as a PDF with relationships names shown (in text) clearly.
3. Presentation used during the demo
4. Report (single space, 12 point font size, approximately 3 pages. You can add more pages if you really have a need for it.)
 1. Start with the **updated** proposal to give an overview of your project. Make sure you talk about the scope and goals of the project.
 2. A brief discussion about your conceptual design (E-R diagram) and logical design (transformation from E-R diagrams and tables, normalization): In this part, you should *discuss* why you have such an E-R diagram design, how you transformed your E-R diagram to tables, how you normalized your tables. Please make sure that you do not simply attach your E-R diagram and table list here.
 3. Briefly describe how you designed Shiny user interface (layout) and user workflow
 4. In the appendix
 1. Write down all the relationships in words
 2. Screenshots of application to explain #3 above.