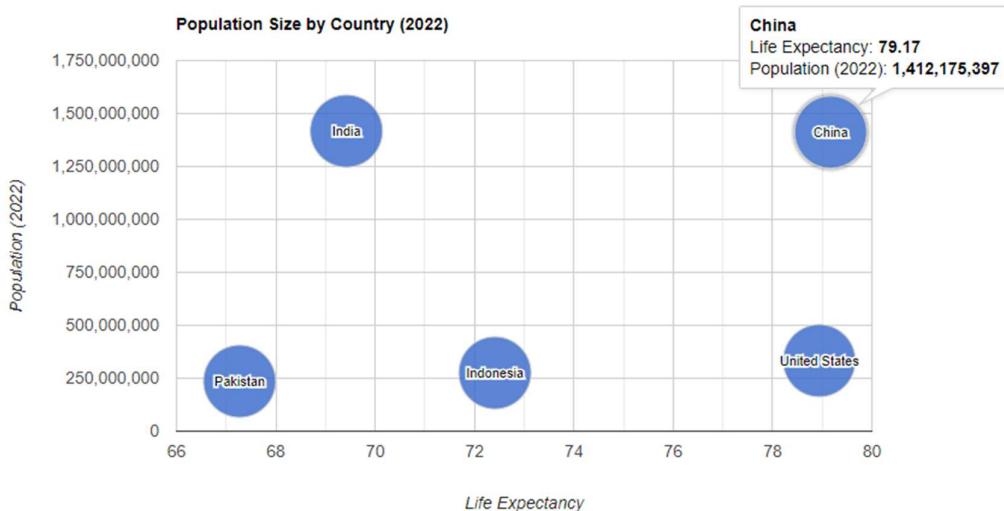


# Business Analytics Project Using Excel, Python,Html,JS

- a Create a dataset for a bubble chart, Geo Chart, line chart including at least five countries and their respective population.
- b. Use the Google Charts library to implement the HTML and JavaScript code for the mentioned charts.

## 1 Bubble Chart:

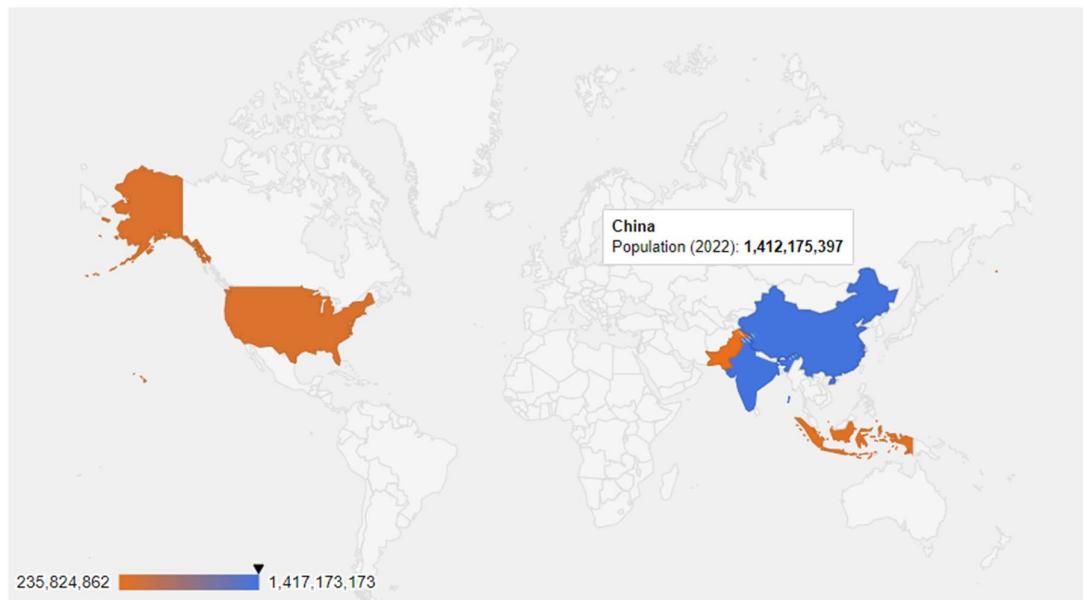
```
↳ bubble.html ✘ ↳ geo.html  ↳ line.html
↳ bubble.html > Ⓜ html > Ⓜ body
1   <!DOCTYPE html>
2   <html lang="en">
3   <head>
4       <meta charset="UTF-8">
5       <meta name="viewport" content="width=device-width, initial-scale=1.0">
6       <title>Bubble Chart Example</title>
7       <script type="text/javascript" src="https://www.gstatic.com/charts/loader.js"></script>
8       <script type="text/javascript">
9           google.charts.load('current', {'packages':['corechart']});
10          google.charts.setOnLoadCallback(drawBubbleChart);
11
12      function drawBubbleChart() {
13          var bubbleData = google.visualization.arrayToDataTable([
14              ['Country', 'Life Expectancy', 'Population (2022)'],
15              ['China', 79.17, 1412175397],
16              ['India', 69.42, 1417173173],
17              ['United States', 78.94, 332948600],
18              ['Indonesia', 72.41, 275501339],
19              ['Pakistan', 67.27, 235824862],
20          ]);
21
22          var bubbleOptions = {
23              title: 'Population Size by Country (2022)',
24              hAxis: {title: 'Life Expectancy'},
25              vAxis: {title: 'Population (2022)'},
26              bubble: {textStyle: {fontSize: 11}}
27          };
28
29          var bubbleChart = new google.visualization.BubbleChart(document.getElementById('bubble_chart'));
30          bubbleChart.draw(bubbleData, bubbleOptions);
31      }
32  </script>
33  </head>
34  <body>
35      <div id="bubble_chart" style="width: 900px; height: 500px;"></div>
36  </body>
37  </html>
38
```



### Geo Chart :

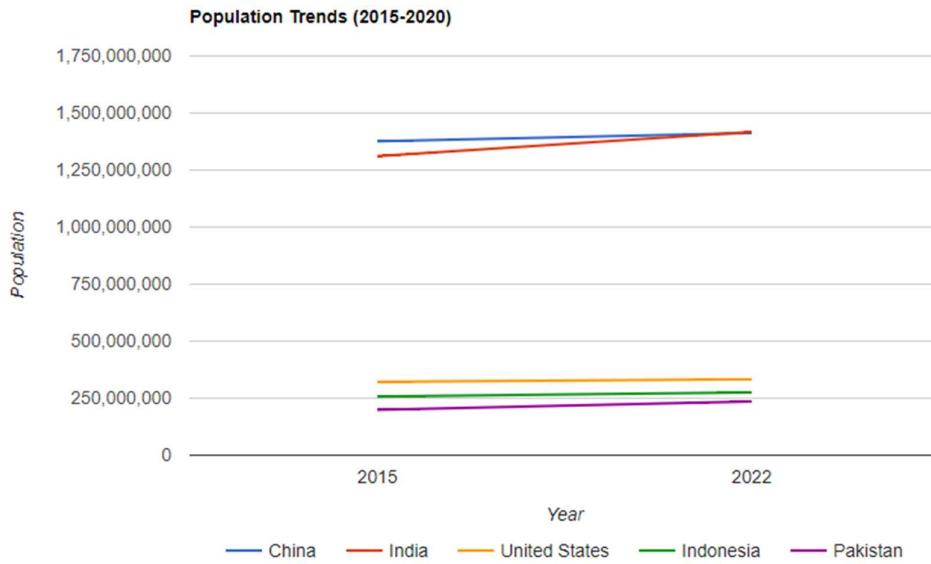
```
geo.html  geo.html  line.html

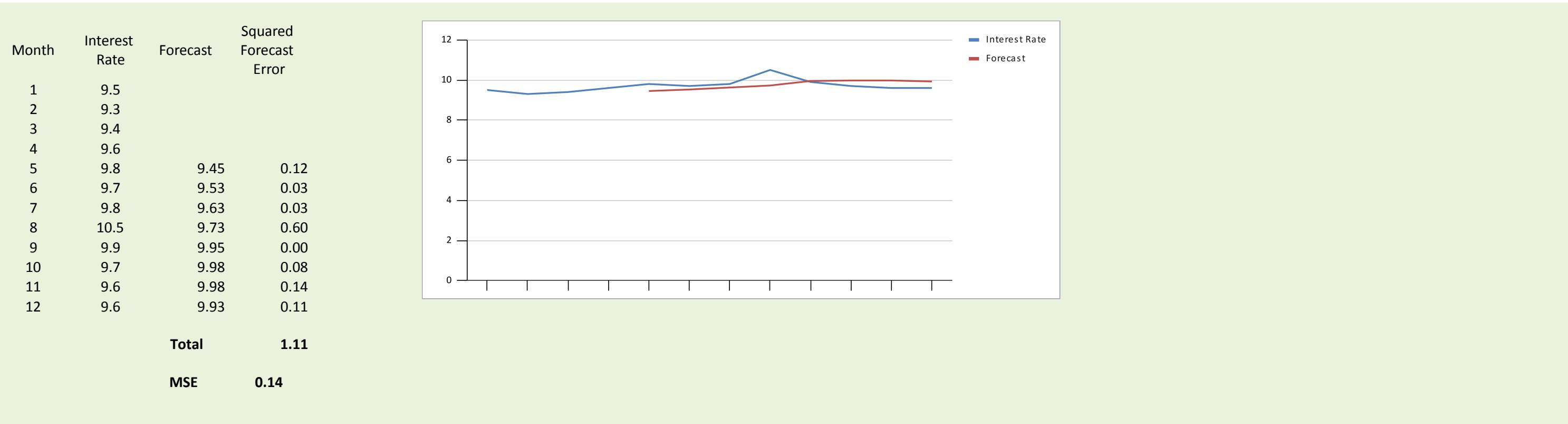
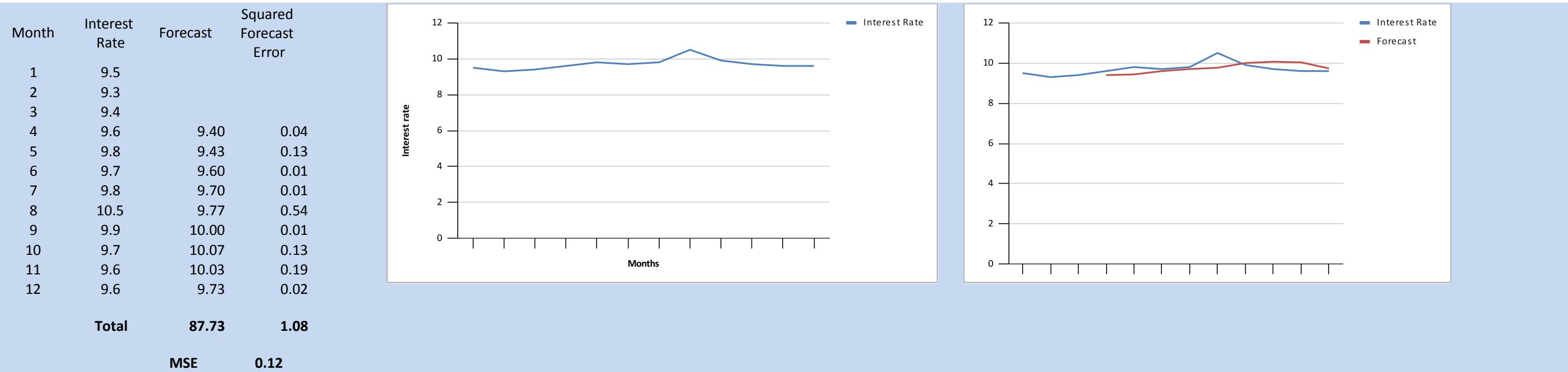
geo.html > html > body
1  <!DOCTYPE html>
2  <html lang="en">
3  <head>
4      <meta charset="UTF-8">
5      <meta name="viewport" content="width=device-width, initial-scale=1.0">
6      <title>Geo Chart Example</title>
7      <script type="text/javascript" src="https://www.gstatic.com/charts/loader.js"></script>
8      <script type="text/javascript">
9          google.charts.load('current', {'packages':['geochart']});
10         google.charts.setOnLoadCallback(drawGeoChart);
11
12         function drawGeoChart() {
13             var data = google.visualization.arrayToDataTable([
14                 ['Country', 'Population (2022)'],
15                 ['China', 1412175397],
16                 ['India', 1417173173],
17                 ['United States', 332948600],
18                 ['Indonesia', 275501339],
19                 ['Pakistan', 235824862],
20             ]);
21
22             var options = {
23                 region: 'world',
24                 colorAxis: {colors: ['#e7711c', '#4374e0']},
25                 backgroundColor: '#f0f0f0'
26             };
27
28             var chart = new google.visualization.GeoChart(document.getElementById('geo_chart'));
29             chart.draw(data, options);
30         }
31     </script>
32 </head>
33 <body>
34     <div id="geo_chart" style="width: 900px; height: 500px;"></div>
35 </body>
36 </html>
37
```



### Line Chart :

```
↳ bubble.html  ↳ geo.html  ↳ line.html X
  ◊ line.html > Ⓜ html > Ⓜ body
1   <!DOCTYPE html>
2   <html lang="en">
3   <head>
4     <meta charset="UTF-8">
5     <meta name="viewport" content="width=device-width, initial-scale=1.0">
6     <title>Line Chart Example</title>
7     <script type="text/javascript" src="https://www.gstatic.com/charts/loader.js"></script>
8     <script type="text/javascript">
9       google.charts.load('current', {'packages':['corechart']});
10      google.charts.setOnLoadCallback(drawLineChart);
11
12      function drawLineChart() {
13        var data = google.visualization.arrayToDataTable([
14          ['Year', 'China', 'India', 'United States', 'Indonesia', 'Pakistan'],
15          ['2015', 1376048943, 1311050527, 321773631, 257563815, 199085847],
16          ['2022', 1412175397, 1417173173, 332948600, 275501339, 235824862]
17        ]);
18
19        var options = {
20          title: 'Population Trends (2015-2020)',
21          curveType: 'function',
22          legend: { position: 'bottom' },
23          hAxis: {title: 'Year'},
24          vAxis: {title: 'Population'}
25        };
26
27
28        var chart = new google.visualization.LineChart(document.getElementById('line_chart'));
29        chart.draw(data, options);
30      }
31    </script>
32  </head>
33  <body>
34    <div id="line_chart" style="width: 900px; height: 500px;"></div>
35  </body>
36  </html>
37
```





1. As we can see the Interest rate pattern hike start from the month of 7 and reach the top in 8th month then starts to decline.

2.The MSE is the measure of error, the model is better the smaller it is.  
The moving average with k = 3 had MSE = 0.12 and with depth k = 4, MSE = 0.14

Moving average with 3 previous values has lower MSE, which is better as compare to 4.

3. The moving average forecast model with depth of 3 works better of this data it will be used as a forecast for the next time point.

In this moving average the forecast in time i is the average of the last three time series values before time i.

13th month forecast is the average of the 10th-12th month values, that are 9.7,9.6,9.6

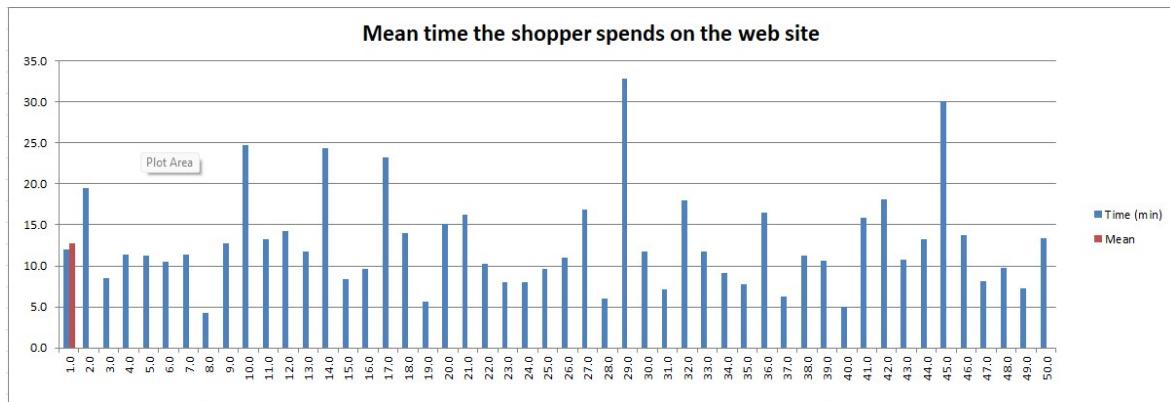
$$F_{13} = 9.7 + 9.6 + 9.6 / 3 = 9.633$$

**13th forecast      9.633**

**a. Graphical and numerical summaries for the amount of time the shopper spends on the web site, the number of pages viewed, and the mean amount spent per transaction. Write notes on what you learn about Company's online shoppers from these numerical summaries:**

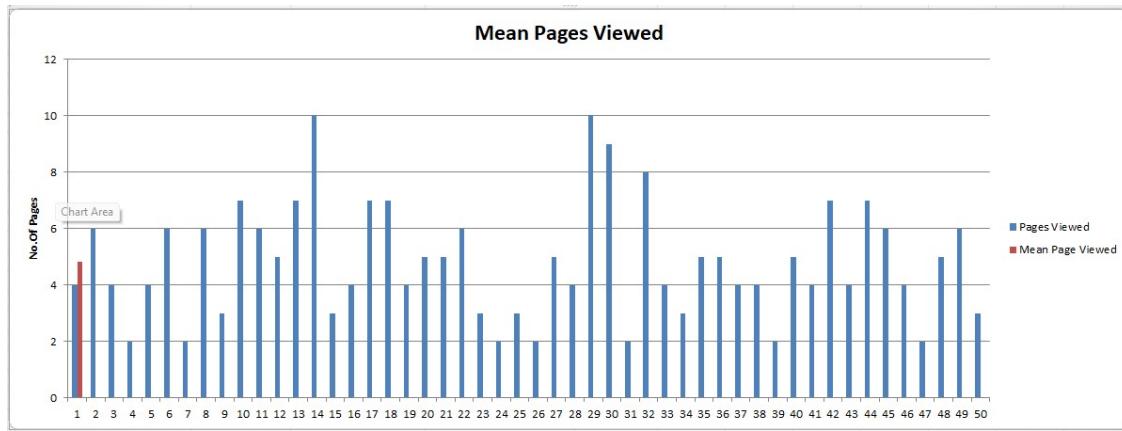
	Time	Page Viewed	Amount
Mean	12.8	4.8	68.1
Median	11.4	4.5	62.2
Standard Deviation	6.00	2.02	32.02
Minimum	4.3	2.0	17.8
Maximum	32.90	10.00	158.51
Sum	640.5	241.0	3406.4

#### **1. Time Spent on the Website:**



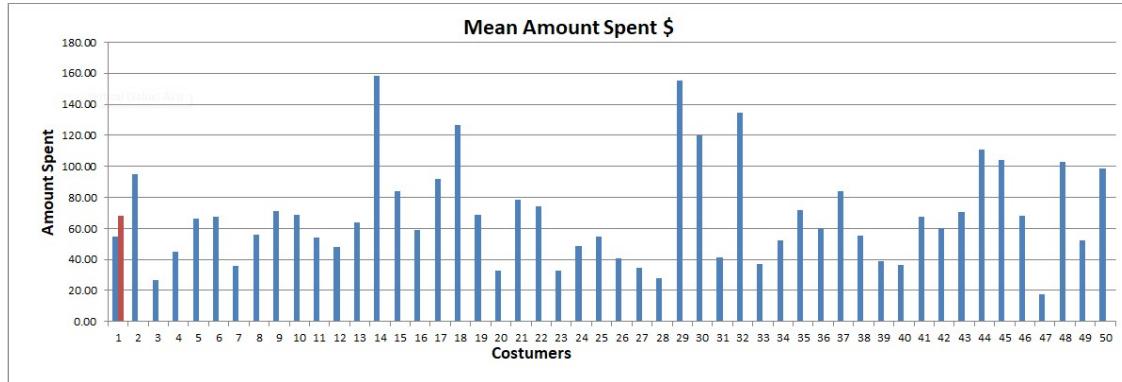
- On average, customers spend approximately 12.8 minutes on the website.
- The median time spent is slightly lower (11.4 minutes), indicating that there might be some variation in the time spent.
- The standard deviation of 6.00 minutes suggests that there is moderate variability in the time customers spend on the website.

#### **2. Number of Pages Viewed:**



- On average, customers view around 4.8 pages during their visit.
- The median number of pages viewed is 4.5, which is close to the mean, indicating a somewhat symmetric distribution.
- The standard deviation of 2.02 pages suggests that there is relatively low variability in the number of pages viewed.

### 3. Mean Amount Spent per Transaction:



- The average amount spent per transaction is approximately \$68.1, which provides insight into the typical purchase value.
- The median amount spent per transaction is slightly lower at \$62.2, suggesting that there may be some high-value transactions that are affecting the mean.
- The standard deviation of \$32.02 is relatively high, indicating that there is a wide range of transaction amounts, with some customers spending significantly more or less than the average.

**b. Summarize the frequency, the total dollars spent, and the mean amount spent per transaction for each day of week. Discuss the**

**observations that you have learned about Company's business based on the day of the week?**

Day of Week	Frequency	Total Amount	Avg. Amount
Sunday	5	218.15	43.63
Monday	9	813.38	90.38
Tuesday	7	414.86	59.27
Wednesday	6	341.82	59.27
Thursday	5	294.03	56.97
Friday	11	945.43	58.81
Saturday	7	378.74	85.95
<b>Total</b>	<b>50</b>	<b>3406.41</b>	<b>54.11</b>

**Sunday:**

- Frequency: 5 transactions
- Total Dollars Spent: \$218.15
- Mean Amount Spent: \$43.63

**Monday:**

- Frequency: 9 transactions
- Total Dollars Spent: \$813.38
- Mean Amount Spent: \$90.38

**Tuesday:**

- Frequency: 7 transactions
- Total Dollars Spent: \$414.86
- Mean Amount Spent: \$59.27

**Wednesday:**

- Frequency: 6 transactions
- Total Dollars Spent: \$341.82
- Mean Amount Spent: \$56.97

**Thursday:**

- Frequency: 5 transactions
- Total Dollars Spent: \$294.03
- Mean Amount Spent: \$56.97

**Friday:**

- Frequency: 11 transactions
- Total Dollars Spent: \$945.43
- Mean Amount Spent: \$58.81

**Saturday:**

- Frequency: 7 transactions
- Total Dollars Spent: \$378.74
- Mean Amount Spent: \$85.95

1. **Peak Sales Days:** Friday and Monday have the highest transaction frequency, suggesting they are the busiest days for online sales.
2. **Monday Spending:** Monday has both a high frequency and the highest total dollars spent per transaction, indicating customers tend to spend more at the beginning of the week.
3. **Weekend Strength:** Saturday and Sunday show relatively high mean amounts spent per transaction, implying that weekends are strong for online sales, with customers making larger purchases.
4. **Midweek Moderation:** Wednesday and Thursday have lower mean amounts spent per transaction, suggesting moderate sales during the middle of the week.
5. **Overall Mean:** The overall mean amount spent per transaction across all days is \$54.11.

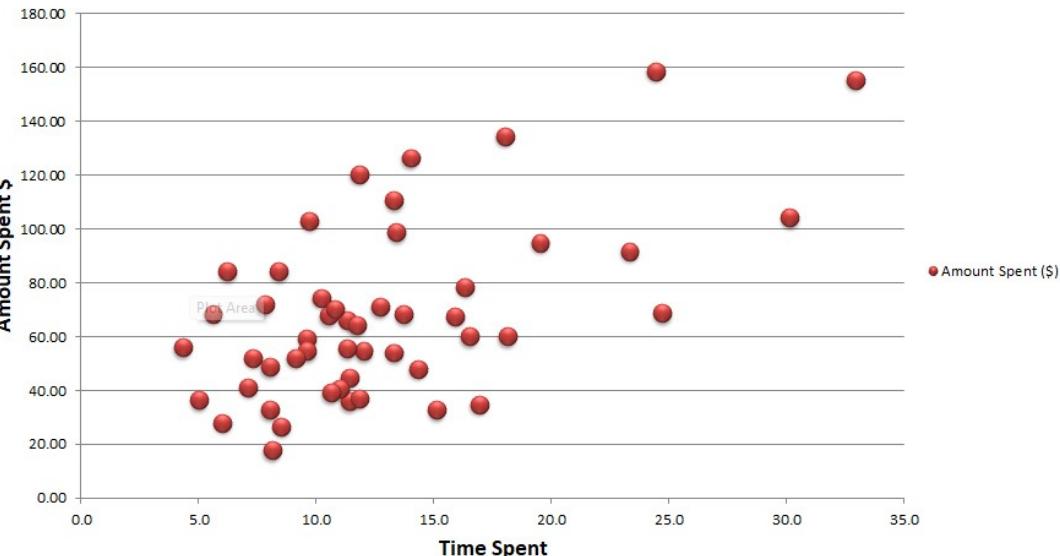
**c. Summarize the frequency, the total dollars spent, and the mean amount spent per transaction for each type of browser. Discuss the observations that you learned about Company's business based on the type of browser?**

Browser	Frequency	Total Amount	Avg. Amount
Chrome	27.00	1656.81	61.36
Firefox	16.00	1228.21	76.76
Other	7.00	521.39	74.48
<b>Total</b>	<b>50.00</b>	<b>3406.41</b>	<b>68.13</b>

- **Chrome:**
    - Frequency: 27 transactions
    - Total Dollars Spent: \$1,656.81
    - Mean Amount Spent per Transaction: \$61.36
  - **Firefox:**
    - Frequency: 16 transactions
    - Total Dollars Spent: \$1,228.21
    - Mean Amount Spent per Transaction: \$76.76
  - **Other:**
    - Frequency: 7 transactions
    - Total Dollars Spent: \$521.39
    - Mean Amount Spent per Transaction: \$74.48
- Firefox users have the highest mean amount spent per transaction, followed by Chrome and Other browser users.
- While Chrome has the highest frequency, Firefox users spend more per transaction on average.
- The total dollars spent by all customers across browsers amount to \$3,406.41, with an overall mean spending of \$68.13 per transaction

**d. Compute the sample correlation coefficient to explore the relationship between the time spent on the web site and the dollar**

**amount spent. Discuss your findings. Also find the average amount spent by 50 customers for purchase.**



The sample correlation coefficient of approximately 0.5800 indicates a moderate positive linear relationship between the time spent on the website and the dollar amount spent by customers. This means that, on average, as the time spent on the website increases, the dollar amount spent by customers tends to increase as well.

***Average Amount Spent by 50 Customers for Purchase: \$68.13***

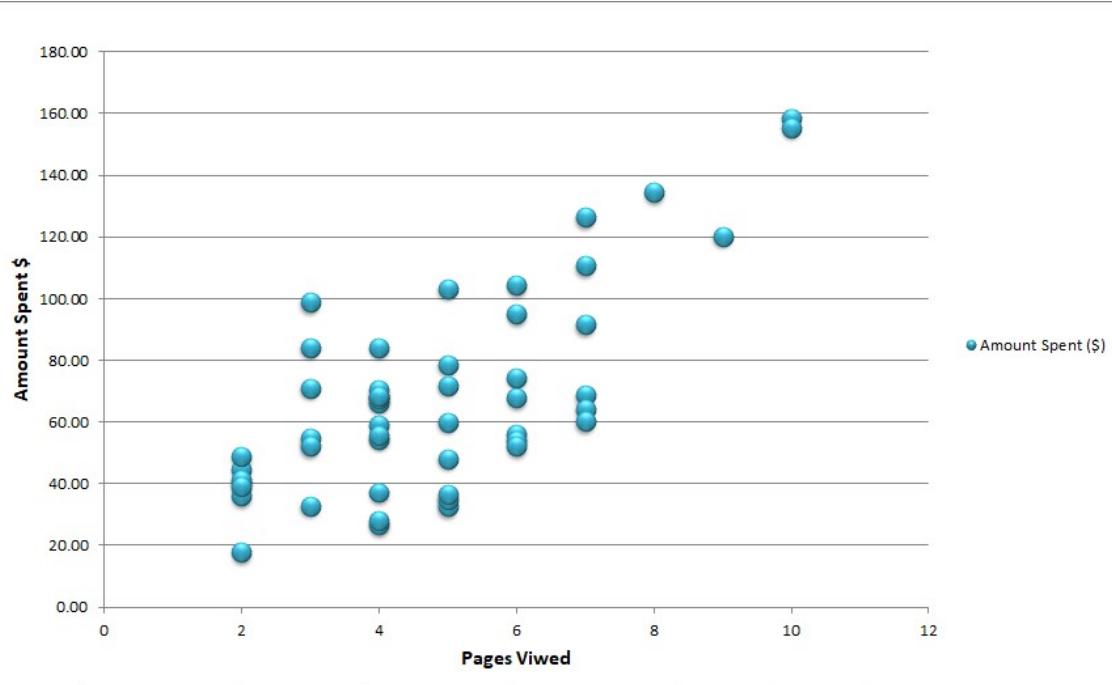
- *The average amount spent by 50 customers for purchase is \$68.13. This represents the mean amount spent per transaction across all 50 customers in the dataset.*

The moderate positive correlation ( $r = 0.5800$ ) indicates that there is a discernible relationship between time spent on the website and the amount spent. However, it's important to note that correlation does not imply causation. While customers who spend more time on the website tend to spend more, other factors may also influence their spending.

To leverage this finding, the company might consider strategies to engage customers and keep them on the website for longer periods, such as enhancing user experience, providing relevant content, or offering personalized recommendations.

**e. Compute the sample correlation coefficient to explore the relationship between the number of web pages viewed and the amount spent. Discuss your findings.**

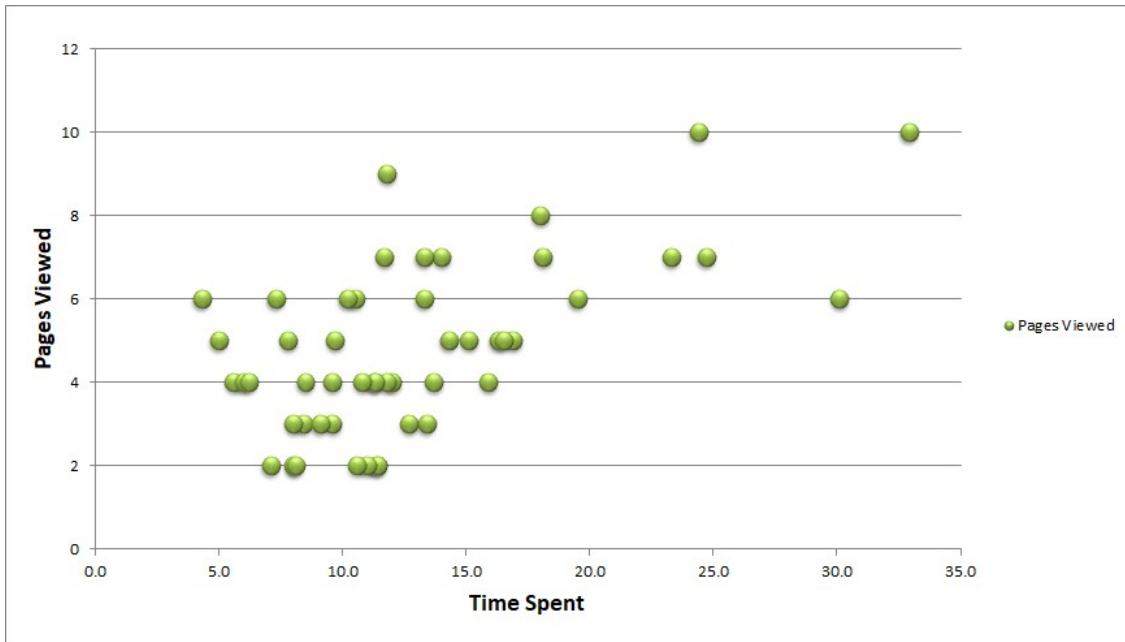
*A scatter diagram showing the relationship between the number of pages viewed and the amount spent follows:*



*The sample correlation coefficient between these two variables is .724. The scatter diagram and the sample correlation coefficient indicate a positive relationship between time spent on the website and the number of pages viewed. Thus, the sample data support the conclusion that customers who view more website pages spend more*

**f. Compute the sample correlation coefficient to explore the relationship between the time spent on the web site and the number of pages viewed. Discuss your findings.**

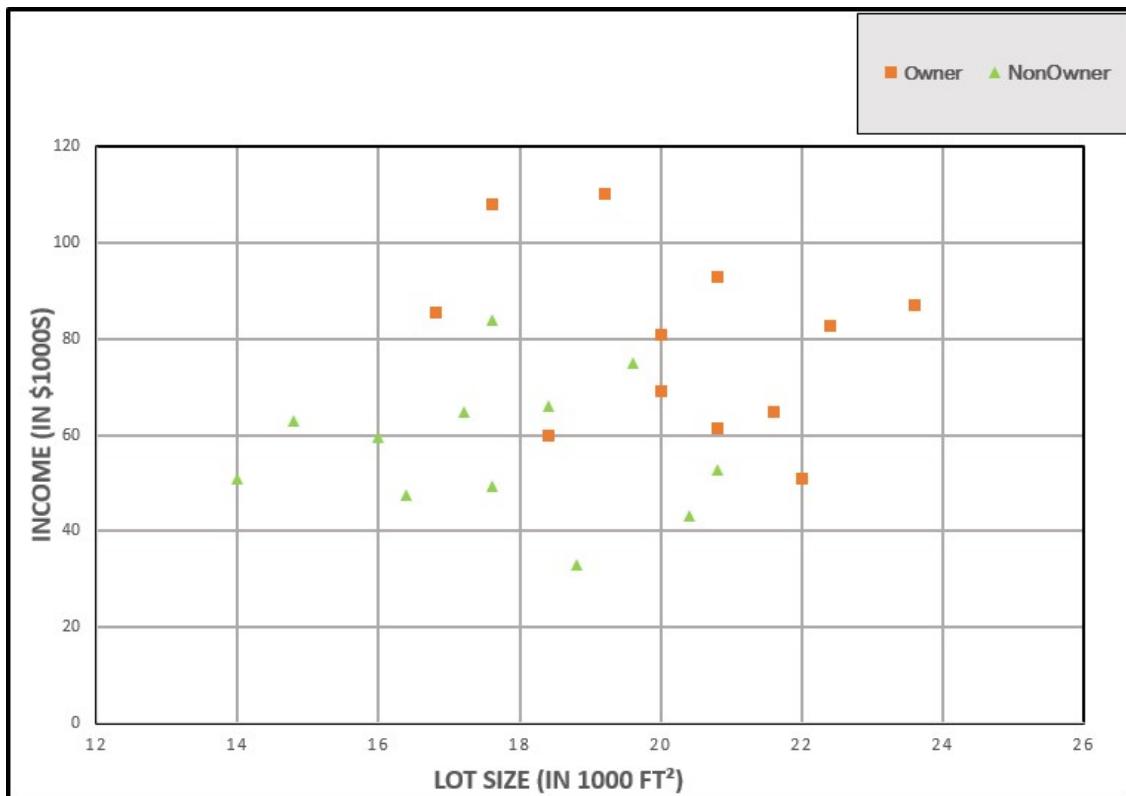
*A scatter diagram showing the relationship between the time spent on the web site and the number of pages viewed follows:*



*In summary, the moderate positive correlation between time spent on the website and the number of pages viewed highlights the importance of engaging content and user experience in encouraging customers to explore more pages. This insight can guide content and marketing strategies to enhance customer engagement and satisfaction on the website.*

1. Identifying projects on the efficient frontier means finding projects that offer good returns for the level of risk they have. In the bubble chart, look for projects in the top-right corner with high returns and moderate risk.

However, to confirm which projects are on the efficient frontier, you typically need to do financial calculations. It's not easy to tell just by looking at the chart. Additional analysis is usually required to pinpoint these projects.



2. Laptop Sales at a London Computer Chain: LaptopSalesJanuary2008.csv file contains data for all sales of laptops at a computer chain in London in January 2008. This is a subset of the full dataset that includes data for the entire year. Attempt the following:

- Create a bar chart, showing the average retail price by store.



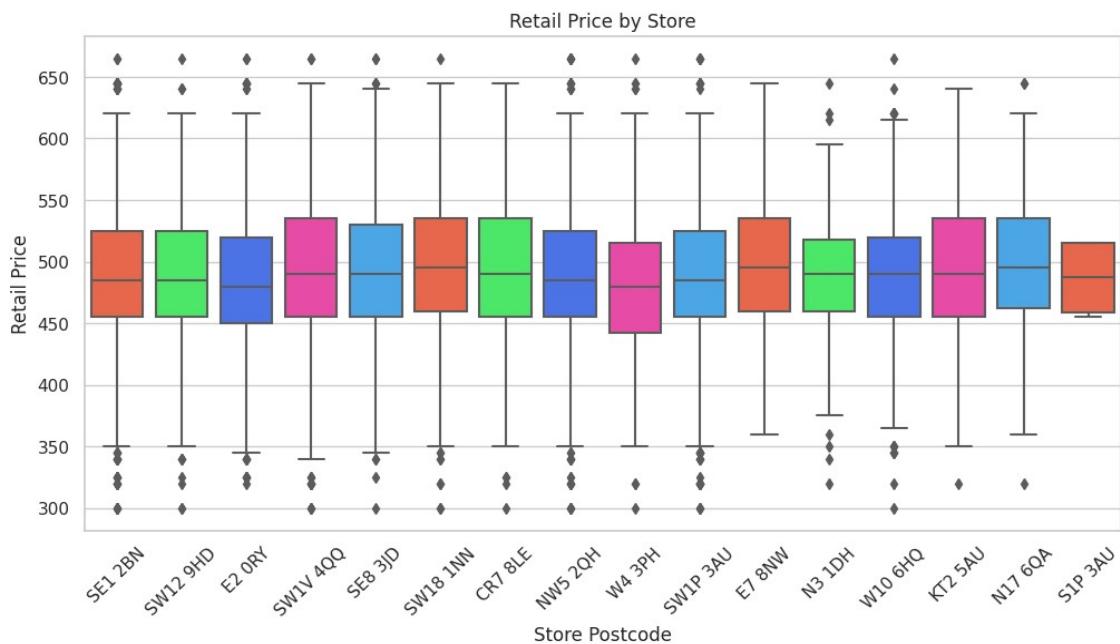
- Which store has the highest average

**The store with the highest average retail price is N17 6QA with an average of \$494.63**

- Which has the lowest?

**The store with the lowest average retail price is W4 3PH with an average of \$481.01**

- Create side-by-side boxplots of retail price by store.



3.The file Mutual Funds contains a data set with information for 45 mutual funds that are part of the Morningstar Funds 500. The data set includes the following five variables: Fund Type: The type of fund, labeled DE (Domestic Equity), IE (International Equity), and FI (Fixed Income) Net Asset Value (\$): The closing price per share Five-Year Average Return (%): The average annual return for the fund over the past five years Expense Ratio (%): The percentage of assets deducted each fiscal year for fund expenses Morningstar Rank: The risk adjusted star rating for each fund; Morningstar ranks go from a low of 1 Star to a high of 5 Stars.

a. Prepare a PivotTable that gives the frequency count of the data by Fund Type (rows) and the five-year average annual return (columns). Use classes of 0–9.99, 10–19.99, 20–29.99, 30–39.99, 40–49.99, and 50–59.99 for the Five-Year Average Return (%). b. What conclusions can you draw about the fund type and the average return over the past five years? (Mutual Fund data)

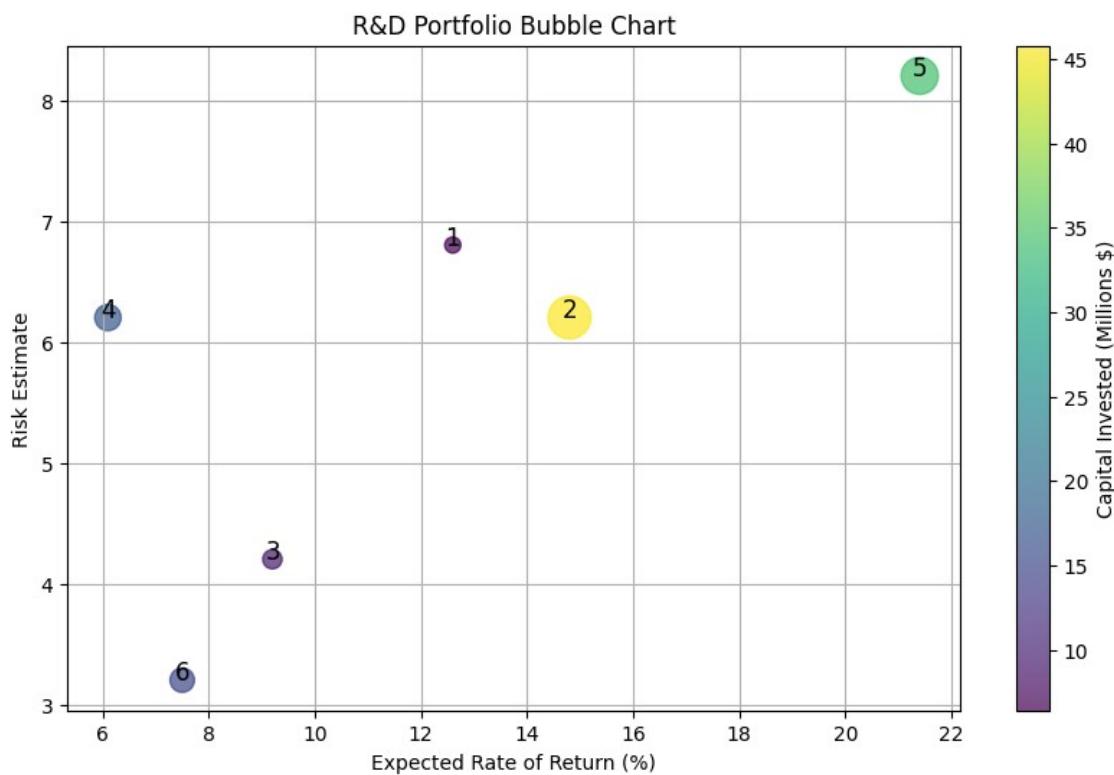
Pivot\_Table:-

Fund Type	0-9.99	10-19.99	20-29.99	30-39.99	40-49.99	50-59.99
<b>DE</b>	1	25	1	0	0	0
<b>FI</b>	9	1	0	0	0	0
<b>IE</b>	0	2	3	2	0	1

- "DE" Funds: These funds have a wide distribution of average returns, ranging from the 0-9.99% category to the 10-19.99% category. The highest frequency of "DE" funds falls in the 10-19.99% range, suggesting that many domestic equity funds fall within this performance range.
- "FI" Funds: Fixed income funds ("FI") primarily fall in the 0-9.99% range, with a few exceptions in the 10-19.99% range. This indicates that fixed income funds generally have lower average returns compared to equity funds.
- "IE" Funds: International equity funds ("IE") have a more diverse distribution of average returns, spread across multiple categories. This suggests that the performance of international equity funds varies widely.

- Domestic equity funds ("DE") with higher average returns may come with higher risk, while fixed income funds ("FI") with lower average returns may offer more stability.
- Investors seeking a diversified portfolio may consider a mix of fund types. Domestic equity funds ("DE") offer potential for higher returns, while fixed income funds ("FI") may provide stability and income. International equity funds ("IE") offer diversification into global markets.

**4.a. Create a bubble chart in which the expected rate of return is along the horizontal axis, the risk estimate is on the vertical axis, and the size of the bubbles represents the amount of capital invested. Format this chart for best presentation by adding axis labels and labeling each bubble with the project number**



b. The efficient frontier of R&D projects represents the set of projects that have the highest expected rate of return for a given level of risk. In other words, any project that has a smaller expected rate of return for an equivalent, or higher, risk estimate cannot be on the efficient frontier. From the bubble chart in part a, which projects appear to be located on the efficient frontier? (Ajax data)

*Identifying projects on the efficient frontier means finding projects that offer good returns for the level of risk they have. In the bubble chart, look for projects in the top-right corner with high returns and moderate risk.*

*However, to confirm which projects are on the efficient frontier, you typically need to do financial calculations. It's not easy to tell just by looking at the chart. Additional analysis is usually required to pinpoint these projects.*