CHRIST
(DEEMED TO BE UNIVERSITY)
DELHI-NCR, INDIA

Applied Statistics Using R (MCA232)

Practical 1

BY

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SUBMITTED TO

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Download a data set with at
least 100 entries and a minimum 4 numeric variables.

Load the Dataset

```
> data <- read.csv("HUBC_stock_data.csv")
> data
           X   open   high    low  close adjclose volume ticker
1   03-01-2022  98.40  98.40  98.40  98.40    98.40   1000   HUBC
2   04-01-2022  98.40  98.40  98.40  98.40    98.40      0   HUBC
3   05-01-2022  98.80  99.00  98.70  98.90    98.90  90090   HUBC
4   06-01-2022  99.10  99.10  98.90  99.00    99.00  38390   HUBC
5   07-01-2022  99.00  99.30  98.80  99.20    99.20  54640   HUBC
6   10-01-2022  99.10  99.20  99.00  99.00    99.00  11510   HUBC
7   11-01-2022  99.00  99.20  99.00  99.00    99.00   4920   HUBC
8   12-01-2022  99.00  99.20  99.00  99.20    99.20    110   HUBC
9   13-01-2022  99.20  99.20  99.20  99.20    99.20     60   HUBC
10  14-01-2022  99.10  99.30  99.10  99.20    99.20   5700   HUBC
11  18-01-2022  99.20  99.20  99.20  99.20    99.20      0   HUBC
12  19-01-2022  99.20  99.50  99.20  99.50    99.50  48350   HUBC
13  20-01-2022  99.30  99.30  99.30  99.30    99.30     80   HUBC
14  21-01-2022  99.10  99.15  98.90  98.90    98.90    610   HUBC
15  24-01-2022  99.00  99.10  99.00  99.00    99.00    390   HUBC
16  25-01-2022  99.00  99.00  99.00  99.00    99.00      0   HUBC
17  26-01-2022  99.00  99.00  99.00  99.00    99.00      0   HUBC
18  27-01-2022  99.00  99.10  98.60  98.60    98.60   8800   HUBC
19  28-01-2022  99.00  99.20  99.00  99.20    99.20    680   HUBC
20  31-01-2022  99.20  99.20  99.20  99.20    99.20      0   HUBC
21  01-02-2022  99.20  99.20  99.20  99.20    99.20      0   HUBC
22  02-02-2022  99.00  99.00  99.00  99.00    99.00   3200   HUBC
23  03-02-2022  99.00  99.00  99.00  99.00    99.00      0   HUBC
24  04-02-2022  99.10  99.10  99.10  99.10    99.10   4350   HUBC
25  07-02-2022  99.10  99.10  99.10  99.10    99.10      0   HUBC
26  08-02-2022  99.10  99.10  99.10  99.10    99.10      0   HUBC
27  09-02-2022  99.30  99.40  99.30  99.35    99.35  12130   HUBC
28  10-02-2022  99.30  99.50  99.30  99.50    99.50  17560   HUBC
29  11-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
30  14-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
31  15-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
32  16-02-2022  99.40  99.40  99.40  99.40    99.40  24060   HUBC
33  17-02-2022  99.40  99.40  99.30  99.40    99.40  30080   HUBC
34  18-02-2022  99.40  99.40  99.40  99.40    99.40      0   HUBC
35  22-02-2022  99.50  99.50  99.50  99.50    99.50   1050   HUBC
36  23-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
37  24-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
38  25-02-2022  99.50  99.50  99.50  99.50    99.50      0   HUBC
39  28-02-2022  99.60  99.60  99.60  99.60    99.60     90   HUBC
40  01-03-2022  99.60  99.80  99.60  99.80    99.80  23110   HUBC
41  02-03-2022  99.80  99.80  99.80  99.80    99.80     20   HUBC
42  03-03-2022  99.80  99.80  99.80  99.80    99.80     50   HUBC
43  04-03-2022  99.80  99.80  99.80  99.80    99.80      0   HUBC
44  07-03-2022  99.80  99.80  99.80  99.80    99.80      0   HUBC
45  08-03-2022  99.80  99.80  99.80  99.80    99.80   1760   HUBC
46  09-03-2022  99.80  99.80  99.80  99.80    99.80      0   HUBC
47  10-03-2022  99.80  99.80  99.80  99.80    99.80      0   HUBC
48  11-03-2022  99.50  99.80  99.50  99.80    99.80   7670   HUBC
49  14-03-2022  99.90 100.00  99.80 100.00   100.00   9260   HUBC
50  15-03-2022 100.00 100.00 100.00 100.00   100.00    450   HUBC
51  16-03-2022 100.00 100.00 100.00 100.00   100.00      0   HUBC
52  17-03-2022 100.00 100.00 100.00 100.00   100.00     80   HUBC
53  18-03-2022 100.00 100.10 100.00 100.10   100.10     50   HUBC
54  21-03-2022 100.10 100.10 100.10 100.10   100.10      0   HUBC
55  22-03-2022 100.10 100.10 100.10 100.10   100.10      0   HUBC
56  23-03-2022 100.70 100.70 100.00 100.30   100.30 117280   HUBC
57  24-03-2022 100.50 100.50  99.70 100.00   100.00  64730   HUBC
58  25-03-2022  99.89 100.10  99.70  99.80    99.80   2910   HUBC
59  28-03-2022  99.80 100.00  99.70  99.70    99.70  10680   HUBC
```

```
60  29-03-2022  99.86 100.40  99.70  99.90    99.90  29020   HUBC
61  30-03-2022  99.70  99.80  99.70  99.70    99.70    660   HUBC
62  31-03-2022  99.80 100.02  99.80  99.80    99.80    470   HUBC
63  01-04-2022  99.80 100.25  99.70 100.25   100.25   3870   HUBC
64  04-04-2022 100.02 100.10  99.95 100.10   100.10    600   HUBC
65  05-04-2022 100.10 100.15 100.05 100.10   100.10   1470   HUBC
66  06-04-2022 100.20 100.20  99.90  99.90    99.90   8130   HUBC
67  07-04-2022  99.91 100.22  99.91 100.18   100.18     60   HUBC
68  08-04-2022  99.90  99.90  99.90  99.90    99.90    180   HUBC
69  11-04-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
70  12-04-2022  99.90  99.90  99.90  99.90    99.90    130   HUBC
71  13-04-2022 100.00 100.00 100.00 100.00   100.00    130   HUBC
72  14-04-2022 100.00 100.15 100.00 100.15   100.15     20   HUBC
73  18-04-2022 100.15 100.15 100.15 100.15   100.15      0   HUBC
74  19-04-2022 100.30 100.30 100.10 100.30   100.30   2280   HUBC
75  20-04-2022 100.49 100.60 100.10 100.10   100.10   1670   HUBC
76  21-04-2022 100.50 100.50 100.50 100.50   100.50    180   HUBC
77  22-04-2022 100.50 100.50 100.50 100.50   100.50      0   HUBC
78  25-04-2022 100.20 100.20 100.10 100.20   100.20   7410   HUBC
79  26-04-2022 100.20 100.20 100.20 100.20   100.20     20   HUBC
80  27-04-2022 100.20 100.20 100.20 100.20   100.20      0   HUBC
81  28-04-2022 100.30 100.30 100.20 100.20   100.20    650   HUBC
82  29-04-2022 100.20 100.20 100.20 100.20   100.20      0   HUBC
83  02-05-2022 100.20 100.30 100.20 100.20   100.20    340   HUBC
84  03-05-2022 100.20 100.20 100.20 100.20   100.20   1350   HUBC
85  04-05-2022 100.62 100.62 100.62 100.62   100.62     20   HUBC
86  05-05-2022 100.20 100.30 100.20 100.30   100.30   1770   HUBC
87  06-05-2022 100.20 100.20 100.20 100.20   100.20     90   HUBC
88  09-05-2022 100.20 100.20 100.20 100.20   100.20     90   HUBC
89  10-05-2022 100.10 100.10 100.10 100.10   100.10   2980   HUBC
90  11-05-2022 100.35 100.35 100.10 100.10   100.10    200   HUBC
91  12-05-2022 100.00 100.30 100.00 100.30   100.30   1020   HUBC
92  13-05-2022  99.90  99.90  99.90  99.90    99.90     40   HUBC
93  16-05-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
94  17-05-2022 100.49 100.49 100.49 100.49   100.49     30   HUBC
95  18-05-2022 100.60 100.60 100.00 100.00   100.00     70   HUBC
96  19-05-2022  99.90  99.90  99.90  99.90    99.90     60   HUBC
97  20-05-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
98  23-05-2022  99.90  99.90  99.90  99.90    99.90     60   HUBC
99  24-05-2022  99.90  99.90  99.90  99.90    99.90     60   HUBC
100 25-05-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
101 26-05-2022  99.90  99.90  99.90  99.90    99.90     30   HUBC
102 27-05-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
103 31-05-2022  99.90  99.90  99.90  99.90    99.90     20   HUBC
104 01-06-2022 100.00 100.00 100.00 100.00   100.00     30   HUBC
105 02-06-2022 100.10 100.20  99.90 100.20   100.20   6880   HUBC
106 03-06-2022 100.00 100.20 100.00 100.20   100.20  11170   HUBC
107 06-06-2022 100.25 100.25 100.10 100.10   100.10    320   HUBC
108 07-06-2022 100.10 100.28 100.10 100.28   100.28   5140   HUBC
109 08-06-2022 100.30 100.30 100.20 100.20   100.20    130   HUBC
110 09-06-2022 100.20 100.20 100.20 100.20   100.20      0   HUBC
111 10-06-2022 100.20 100.20 100.20 100.20   100.20     40   HUBC
112 13-06-2022 100.40 100.40 100.15 100.20   100.20   5920   HUBC
113 14-06-2022 100.20 100.20  99.90  99.90    99.90   5500   HUBC
114 15-06-2022  99.90  99.90  99.90  99.90    99.90      0   HUBC
115 16-06-2022 100.00 100.30  99.90  99.90    99.90  21110   HUBC
116 17-06-2022 100.05 100.05 100.05 100.05   100.05     20   HUBC
117 21-06-2022 100.00 100.10 100.00 100.10   100.10    130   HUBC
118 22-06-2022 100.10 100.10 100.10 100.10   100.10      0   HUBC
119 23-06-2022 100.05 100.20  99.95 100.00   100.00   5130   HUBC
120 24-06-2022 100.10 100.15 100.10 100.15   100.15    140   HUBC
121 27-06-2022 100.15 100.15 100.15 100.15   100.15      0   HUBC
122 28-06-2022 100.15 100.15 100.15 100.15   100.15      0   HUBC
123 29-06-2022 100.15 100.15 100.15 100.15   100.15      0   HUBC
124 30-06-2022 100.60 100.60 100.60 100.60   100.60     20   HUBC
125 01-07-2022 100.60 100.60 100.60 100.60   100.60      0   HUBC
 [ reached 'max' / getOption("max.print") -- omitted 494 rows ]
> str(data)
'data.frame':  619 obs. of  8 variables:
```

```
 $ X       : chr  "03-01-2022" "04-01-2022" "05-01-2022" "06-01-2022" ...
 $ open    : num  98.4 98.4 98.8 99.1 99 ...
 $ high    : num  98.4 98.4 99 99.1 99.3 ...
 $ low     : num  98.4 98.4 98.7 98.9 98.8 ...
 $ close   : num  98.4 98.4 98.9 99 99.2 ...
 $ adjclose: num  98.4 98.4 98.9 99 99.2 ...
 $ volume  : int  1000 0 90090 38390 54640 11510 4920 110 60 5700 ...
 $ ticker  : chr  "HUBC" "HUBC" "HUBC" "HUBC" ...
> head(data)
           X open high  low close adjclose volume ticker
1 03-01-2022 98.4 98.4 98.4  98.4     98.4   1000   HUBC
2 04-01-2022 98.4 98.4 98.4  98.4     98.4      0   HUBC
3 05-01-2022 98.8 99.0 98.7  98.9     98.9  90090   HUBC
4 06-01-2022 99.1 99.1 98.9  99.0     99.0  38390   HUBC
5 07-01-2022 99.0 99.3 98.8  99.2     99.2  54640   HUBC
6 10-01-2022 99.1 99.2 99.0  99.0     99.0  11510   HUBC
```

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1. Draw

the histogram, pie chart, box plot for any three variables and interpret them.

Draw Histogram, Pie Chart, and Box Plot

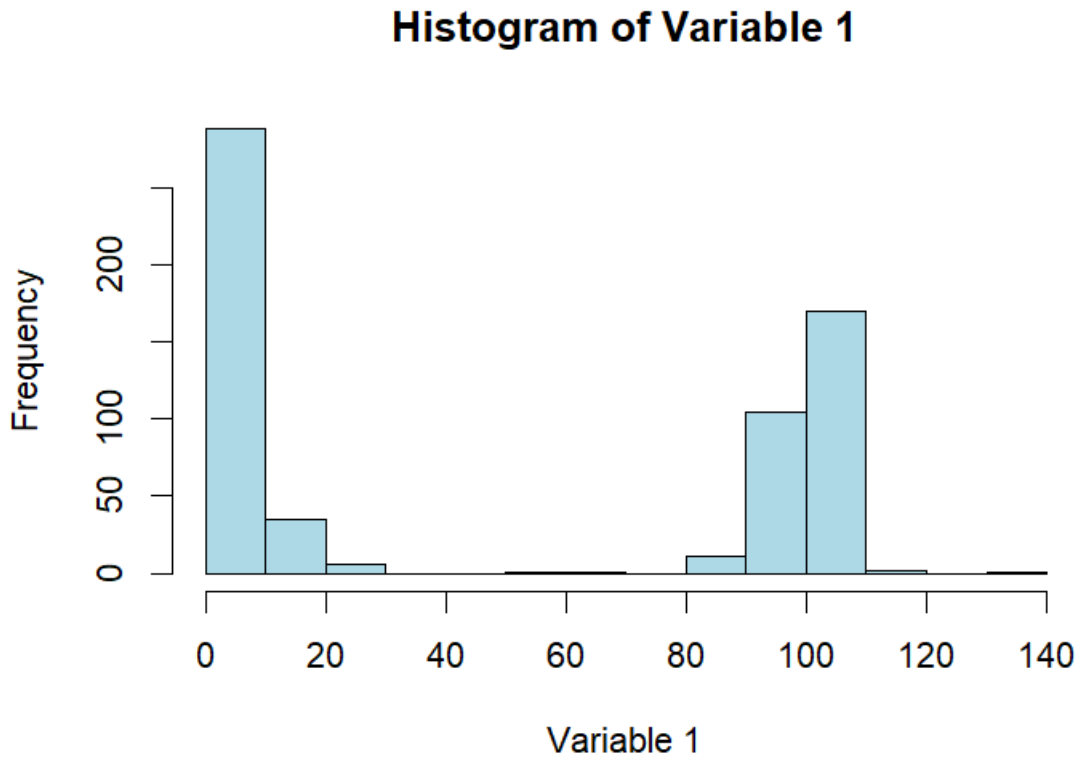
Install ggplot2 if not already installed

install.packages("ggplot2")

Install ggplot2 if not already installed

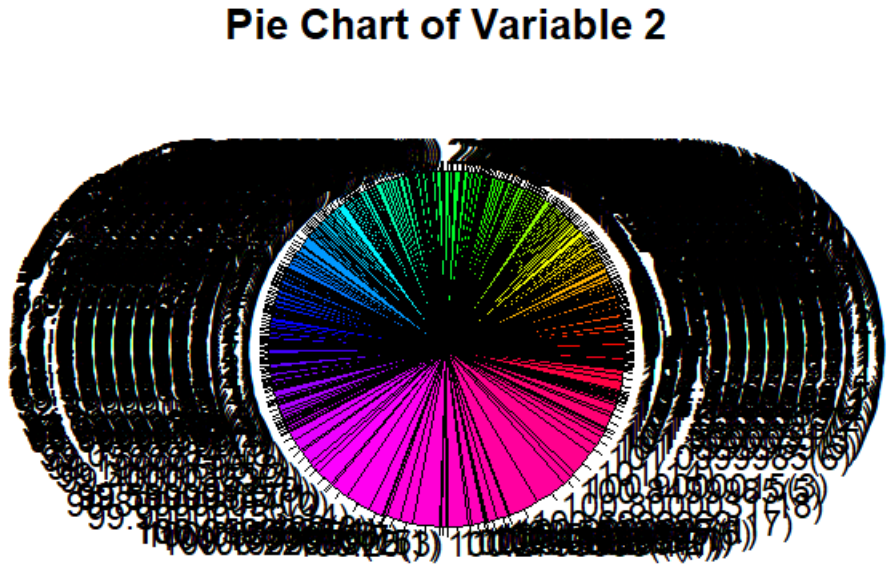
Histogram

```
> hist(data$open,
+      main = "Histogram of Variable 1",
+      xlab = "Variable 1",
+      col = "lightblue",
+      border = "black")
```



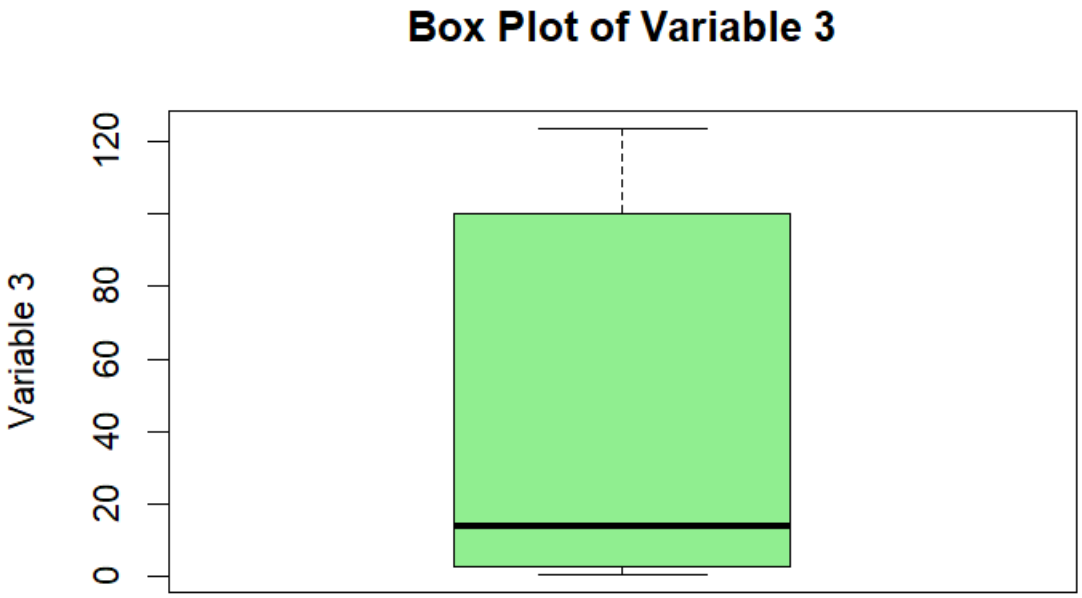
Pie Chart

```
> table_var2 <- table(data$high)
> pie(table_var2,
+     main = "Pie Chart of Variable 2",
+     col = rainbow(length(table_var2)),
+     labels = paste(names(table_var2), "(", table_var2, ")", sep = ""))
```



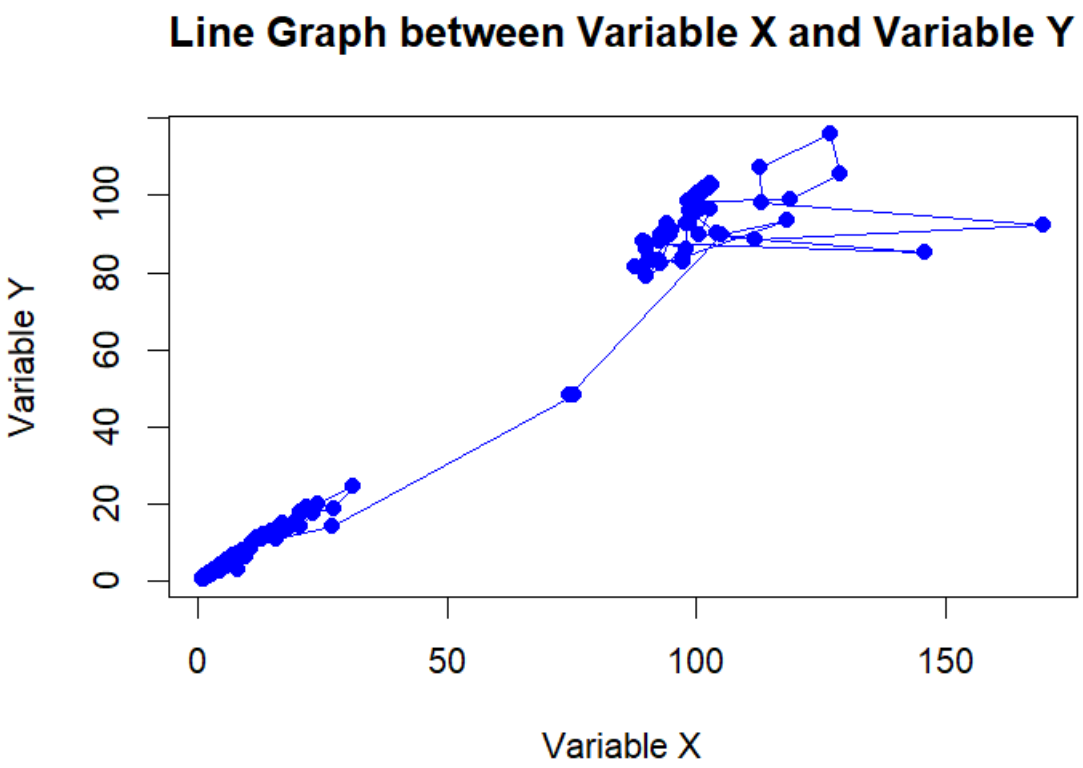
BOX Plot

```
> boxplot(data$adjclose,
+         main = "Box Plot of Variable 3",
+         ylab = "Variable 3",
+         col = "lightgreen")
```



Line Graph between Two Variables

```
> plot(data$high, data$low,
+      main = "Line Graph between Variable X and Variable Y",
+      type = "o",
+      lty = 1,
+      pch = 19,
+      col = "blue",
+      xlab = "Variable X",
+      ylab = "Variable Y")
```



3. Find
the summary of at least 3 numeric variables.

Summary of Three Numeric Variables

```
> summary(data$open)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   0.73    2.85   14.40   49.06  100.20  132.70
> summary(data$high)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  0.749   2.900  15.600  49.789 100.265 169.800
> summary(data$adjclose)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  0.719   2.665  13.900  48.949 100.200 123.600
```

4. Find
the following for any one of the variable

(1) 2, 4 and 6 decile.

(2) 5, 75, and 85
percentile

(3) All the quartiles

Calculate Deciles, Percentiles, and Quartiles

Deciles

```
> deciles <- quantile(data$open, probs = c(0.2, 0.4, 0.6))
> print(deciles)
   20%    40%    60%
 2.206  5.820 99.000
```

Percentiles

```
> percentiles <- quantile(data$open, probs = c(0.05, 0.75, 0.85))
> print(percentiles)
       5%       75%       85%

  0.9093 100.2000 100.8000
```

Quartiles

```
> quartiles <- quantile(data$open, probs = c(0.25, 0.5, 0.75))
> print(quartiles)
   25%    50%    75%

  2.85  14.40 100.20
```

Analysis Report

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1. Description of the Dataset

The dataset used for this analysis contains stock market data for a company, with variables such as open, high, low, and adjclose. These variables represent the opening price, highest price, lowest price, and adjusted closing price of the stock on specific days. The data consists of numeric variables that help analyze stock trends over time.

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2. Aim/Objective

The objective of this analysis is to:

1. Visualize the data using histograms, pie charts, box plots, and line graphs.
2. Summarize key numeric variables to understand the distribution and trends in the dataset.
3. Compute statistical measures such as deciles, percentiles, and quartiles for one variable.
4. Interpret the findings to derive insights into stock market behavior.

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3. Results and Visualizations

3.1 Histogram

- **Code Used:**

```
hist(data$open,
    main = "Histogram of Variable 1",
    xlab = "Variable 1",
    col = "lightblue",
    border = "black")
```

- **Result:** The histogram shows the frequency distribution of the stock's opening prices (open). The majority of the values are clustered in the lower price range, indicating the stock's opening prices are typically low.

3.2 Pie Chart

- **Code Used:**

```
table_var2 <- table(data$high)
pie(table_var2,
   main = "Pie Chart of Variable 2",
   col = rainbow(length(table_var2)),
   labels = paste(names(table_var2), "(", table_var2, ")", sep = ""))
```

- **Result:** The pie chart represents the distribution of the stock's highest prices (high). Each segment corresponds to the frequency of specific high values in the dataset. The larger segments signify prices that occurred more frequently.

3.3 Box Plot

- **Code Used:**

```
boxplot(data$adjclose,
      main = "Box Plot of Variable 3",
      ylab = "Variable 3",
      col = "lightgreen")
```

- **Result:** The box plot highlights the distribution of the stock's adjusted closing prices (adjclose). It identifies potential outliers, the median value, and the interquartile range. Most adjusted closing prices are concentrated in the lower range.

3.4 Line Graph

- **Code Used:**

```
plot(data$high, data$low,
    main = "Line Graph between Variable X and Variable Y",
    type = "o",
    lty = 1,
    pch = 19,
    col = "blue",
    xlab = "Variable X",
    ylab = "Variable Y")
```

- **Result:** The line graph illustrates the relationship between the stock's highest (high) and lowest (low) prices. The trend shows how fluctuations in the stock's highest prices correlate with its lowest prices over time.

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4. Summary of Variables

- **Summary of open:**

```
   Min.  1st Qu.  Median   Mean  3rd Qu.   Max.
   0.73   2.85    14.40   49.06  100.20   132.70
```

- **Summary of high:**

```
   Min.  1st Qu.  Median   Mean  3rd Qu.   Max.
   0.749  2.900  15.600  49.789 100.265 169.800
```

- **Summary of adjclose:**

```
   Min.  1st Qu.  Median   Mean  3rd Qu.   Max.
   0.719  2.665  13.900  48.949 100.200 123.600
```

---

5. Statistical Measures

- **Deciles (for open):**

```
   20%    40%    60%
 2.206  5.820  99.000
```

- **Percentiles (for open):**

```
   5%      75%      85%
```

0.9093 100.2000 100.8000

- **Quartiles (for open):**

25% 50% 75%

2.85 14.40 100.20

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6. Interpretation

1. **Histogram Interpretation:** The histogram shows that the opening prices of the stock are skewed towards the lower end, with only a few occurrences of higher prices.
2. **Pie Chart Interpretation:** The pie chart reveals which stock's highest prices occurred most frequently, indicating the stock's popular trading ranges.
3. **Box Plot Interpretation:** The box plot identifies outliers and suggests that the adjusted closing prices are mostly concentrated below the median, reflecting a potentially undervalued stock.
4. **Line Graph Interpretation:** The line graph demonstrates a positive correlation between the stock's highest and lowest prices. When the highest prices increase, the lowest prices tend to increase as well.
5. **Statistical Measures Interpretation:** The deciles, percentiles, and quartiles provide insights into the distribution of the stock's opening prices. For example, 20% of the stock's opening prices are below 2.206, while 75% of the prices are below 100.200.

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7. Conclusion

This analysis provides a comprehensive understanding of the stock's price distribution and trends. The visualizations and statistical measures show that the stock has frequent low prices, but there are outliers at the higher end. These insights can help traders and investors in making informed decisions.