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

Applied Statistics Using R (MCA232)

Practical 2

BY

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SUBMITTED TO

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Data Set : --

```
> # Load 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]

```
> # Assign Variables
> Open <- data$open
> High <- data$high
> Low <- data$low
> Close <- data$close
```

 # Descriptive Statistics

Mean : --

```
> # Mean
> print("Mean of Open")
[1] "Mean of Open"
> mean(Open, na.rm = TRUE)
[1] 49.06099
> print("Mean of High")
[1] "Mean of High"
> mean(High, na.rm = TRUE)
[1] 49.7892
> print("Mean of Close")
[1] "Mean of Close"
> mean(Close, na.rm = TRUE)
[1] 48.9487
```

Median : --

```
> # Median
> print("Median of Open")
[1] "Median of Open"
> median(Open, na.rm = TRUE)
[1] 14.4
> print("Median of High")
[1] "Median of High"
> median(High, na.rm = TRUE)
[1] 15.6
> print("Median of Close")
[1] "Median of Close"
> median(Close, na.rm = TRUE)
[1] 13.9
```

Mode : --

```
> # Mode Function
> modes <- function(x) {
+   freq_table <- table(x)
+   mode_values <- as.numeric(names(freq_table)[freq_table == max(freq_tab
le)])
+   return(mode_values)
+ }
> print("Mode of Open")
[1] "Mode of Open"
> modes(Open)
[1] 100.8
> print("Mode of High")
[1] "Mode of High"
> modes(High)
[1] 100.8
> print("Mode of Close")
[1] "Mode of Close"
> modes(Close)
[1] 100.8
```

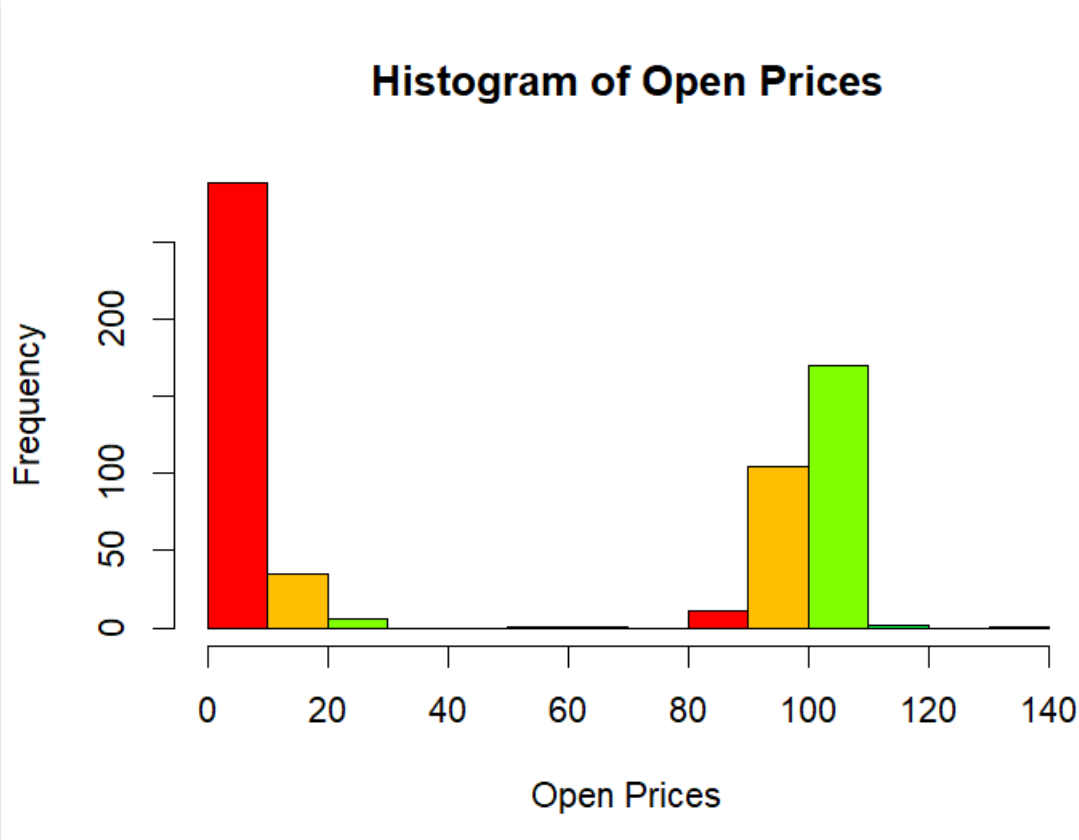
Standard Deviation : --

```
> # Standard Deviation
> print("Standard Deviation of Open")
[1] "Standard Deviation of Open"
> sd(Open, na.rm = TRUE)
[1] 47.60199
> print("Standard Deviation of High")
[1] "Standard Deviation of High"
> sd(High, na.rm = TRUE)
[1] 48.10159
> print("Standard Deviation of Close")
[1] "Standard Deviation of Close"
> sd(Close, na.rm = TRUE)
[1] 47.59011
```

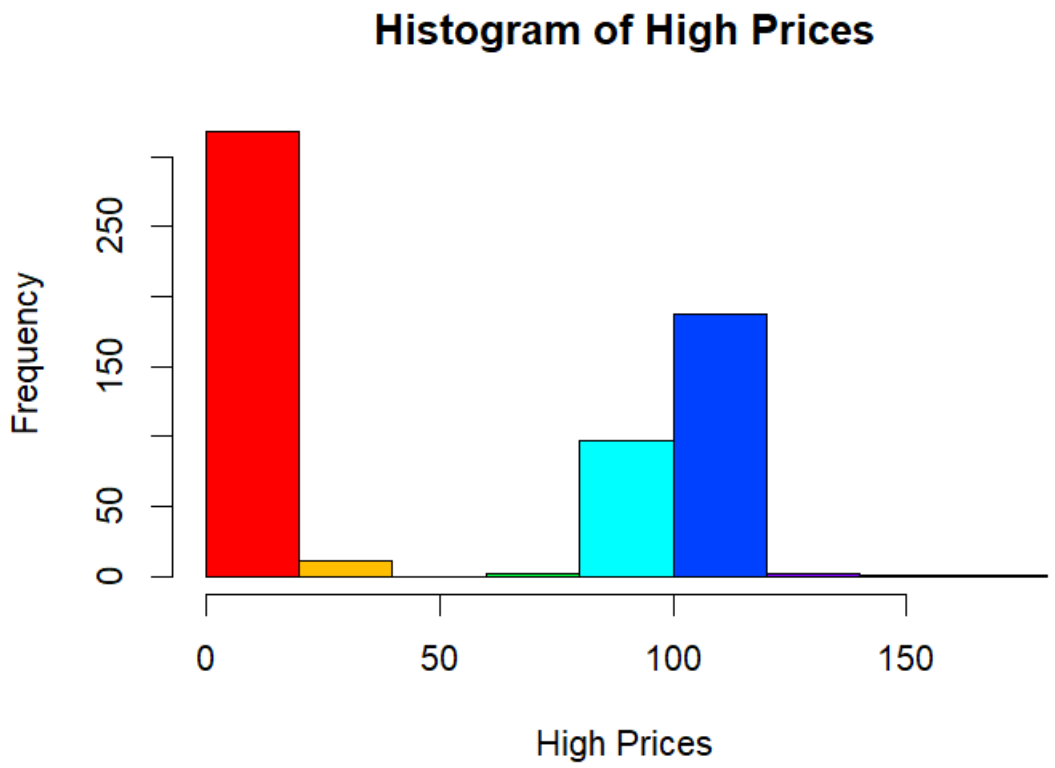
Graphical Representation : --

Histogram : --

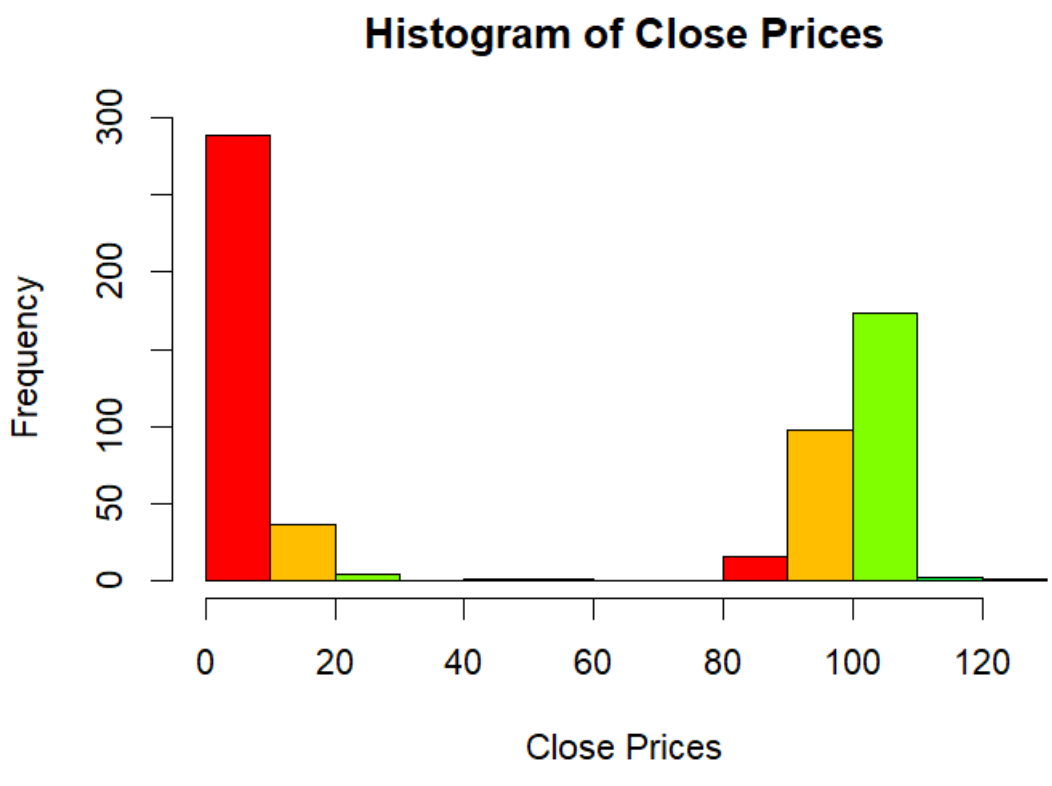
```
> # Histograms
> hist(Open,
+      main = "Histogram of Open Prices",
+      xlab = "Open Prices",
+      breaks = 10,
+      col = rainbow(8))
```



```
> hist(High,
+      main = "Histogram of High Prices",
+      xlab = "High Prices",
+      breaks = 10,
+      col = rainbow(8))
```




```
> hist(Close,
+      main = "Histogram of Close Prices",
+      xlab = "Close Prices",
+      breaks = 10,
+      col = rainbow(8))
```



Min and Max : --

```
> max(Open, na.rm = TRUE)
[1] 132.7
> min(Open, na.rm = TRUE)
[1] 0.73
> Open_class <- cut(Open, c(0, 50, 100, 150), right = FALSE)
> Open_class
  [1] [50,100)  [50,100)  [50,100)  [50,100)  [50,100)  [50,100)  [50,100)
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 [64] [100,150) [100,150) [100,150) [50,100)  [50,100)  [50,100)  [50,100)
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[289] [50,100) [50,100) [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
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[307] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
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[316] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[325] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[334] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[343] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[352] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
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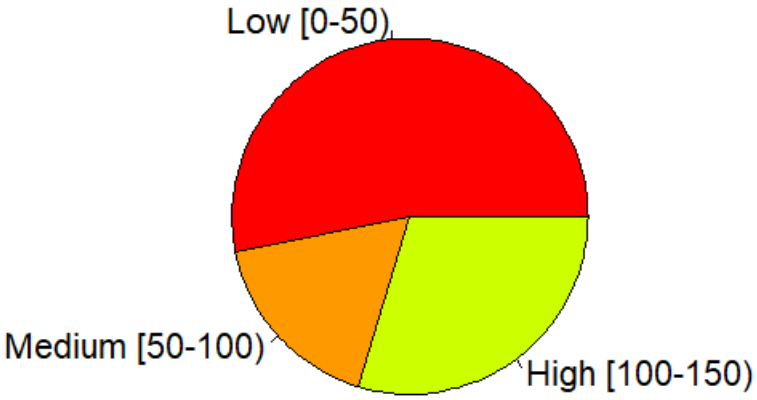
[361] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[370] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[379] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[388] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[397] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[406] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)
[415] [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)   [0,50)
[0,50)   [0,50)

```
[424] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[433] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[442] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[451] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[460] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[469] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[478] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[487] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[496] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[505] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[514] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[523] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[532] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[541] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[550] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[559] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[568] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[577] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[586] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[595] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[604] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
[0,50)    [0,50)
[613] [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)    [0,50)
Levels: [0,50) [50,100) [100,150)
> Open_freq <- table(Open_class)
> Open_freq
Open_class
   [0,50)  [50,100) [100,150)
      329       106       184
```

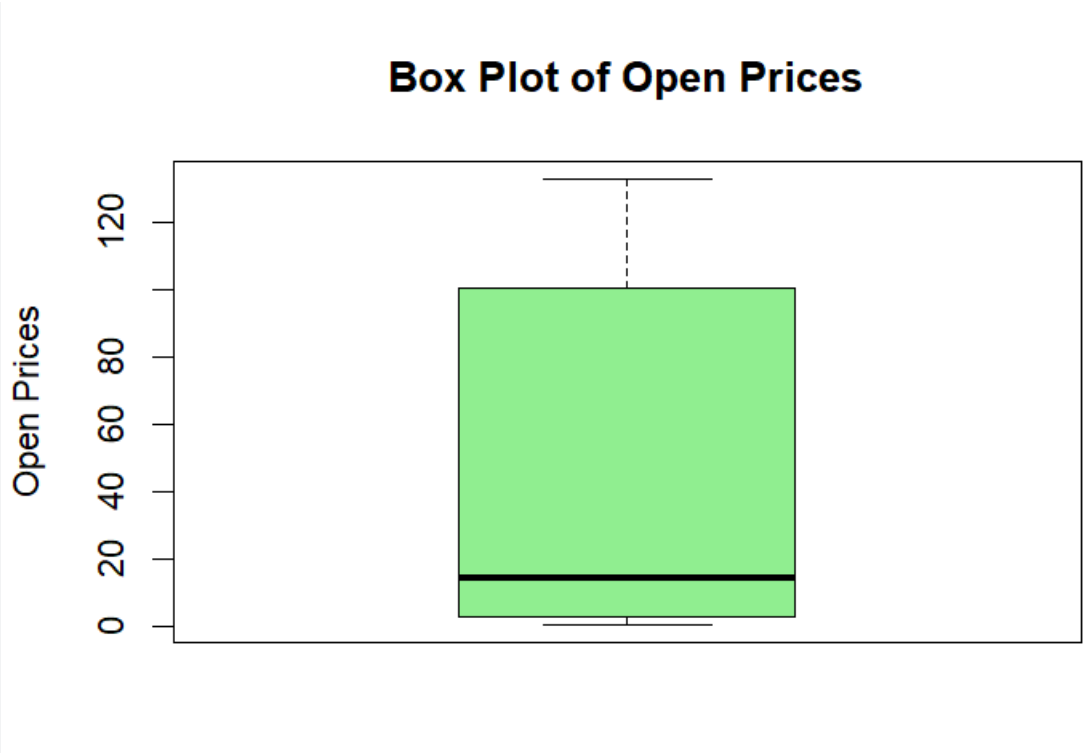
Pie Chart : --

```
> pie(Open_freq,
+     labels = c("Low [0-50)", "Medium [50-100)", "High [100-150)"),
+     col = rainbow(10))
```

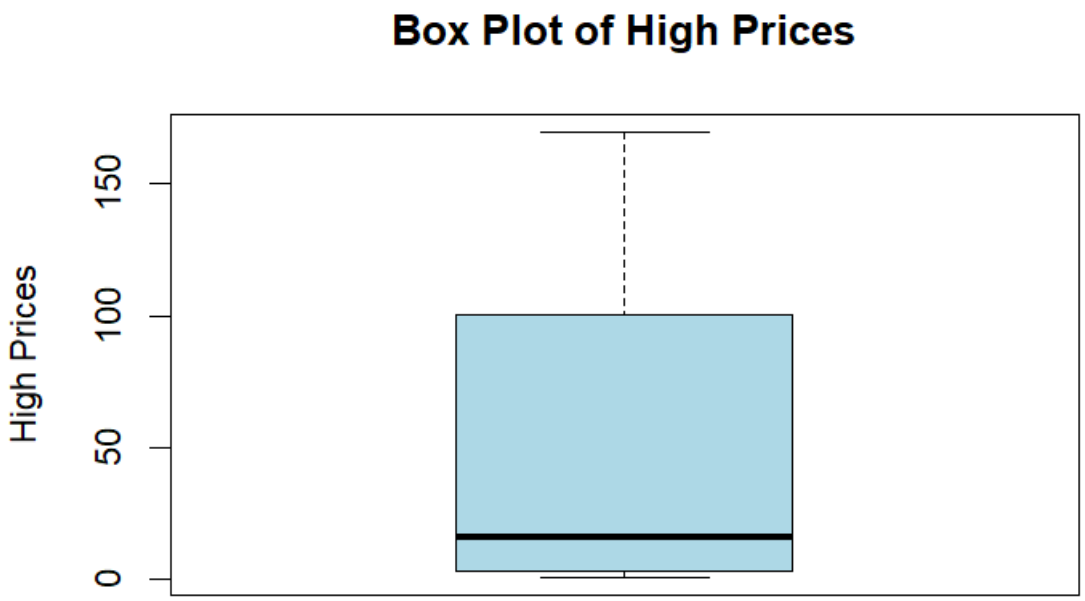


Box Plot : --

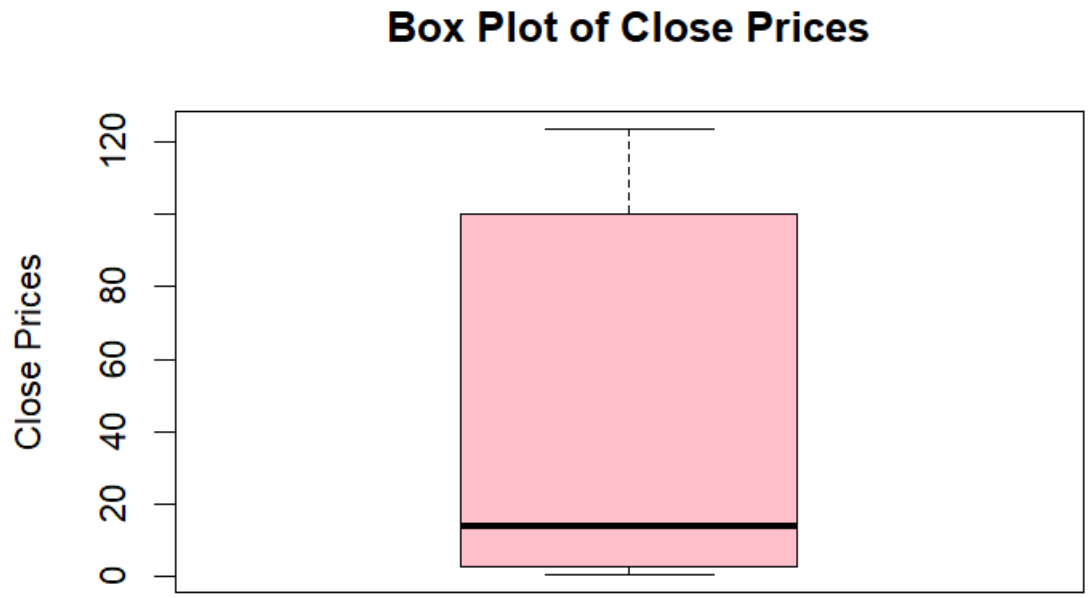
```
> # Box Plot
> boxplot(Open,
+         main = "Box Plot of Open Prices",
+         ylab = "Open Prices",
+         col = "lightgreen")
```




```
> boxplot(High,
+         main = "Box Plot of High Prices",
+         ylab = "High Prices",
+         col = "lightblue")
```

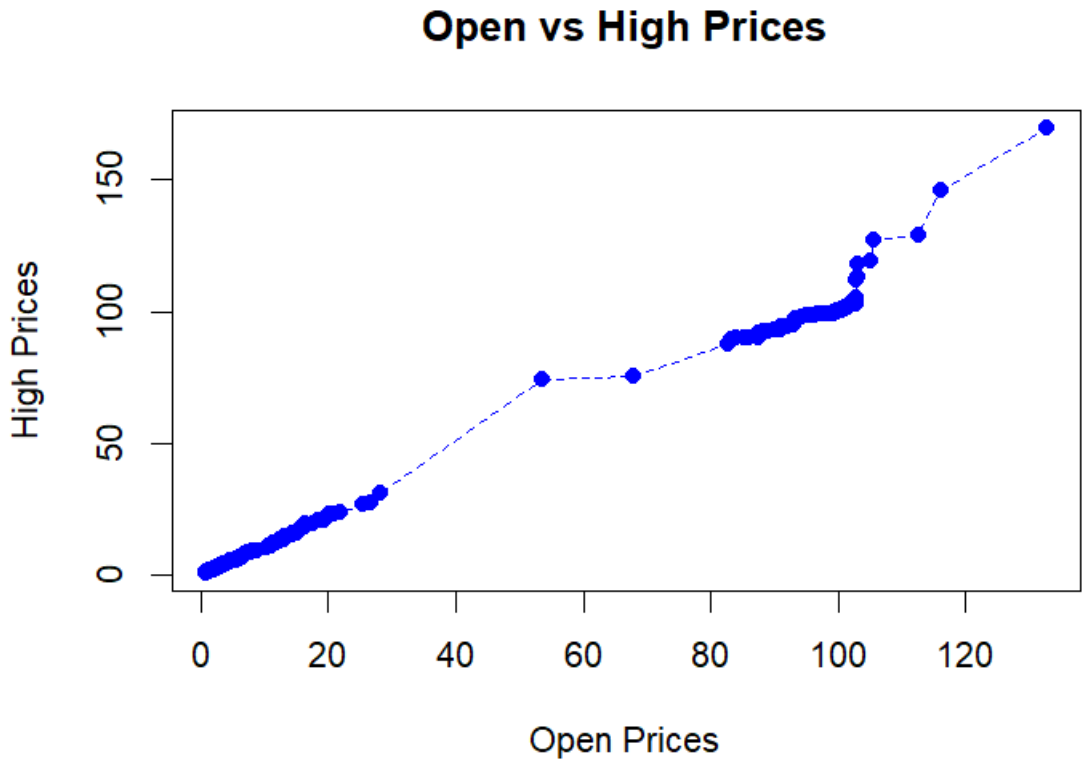



```
> boxplot(Close,
+         main = "Box Plot of Close Prices",
+         ylab = "Close Prices",
+         col = "pink")
```

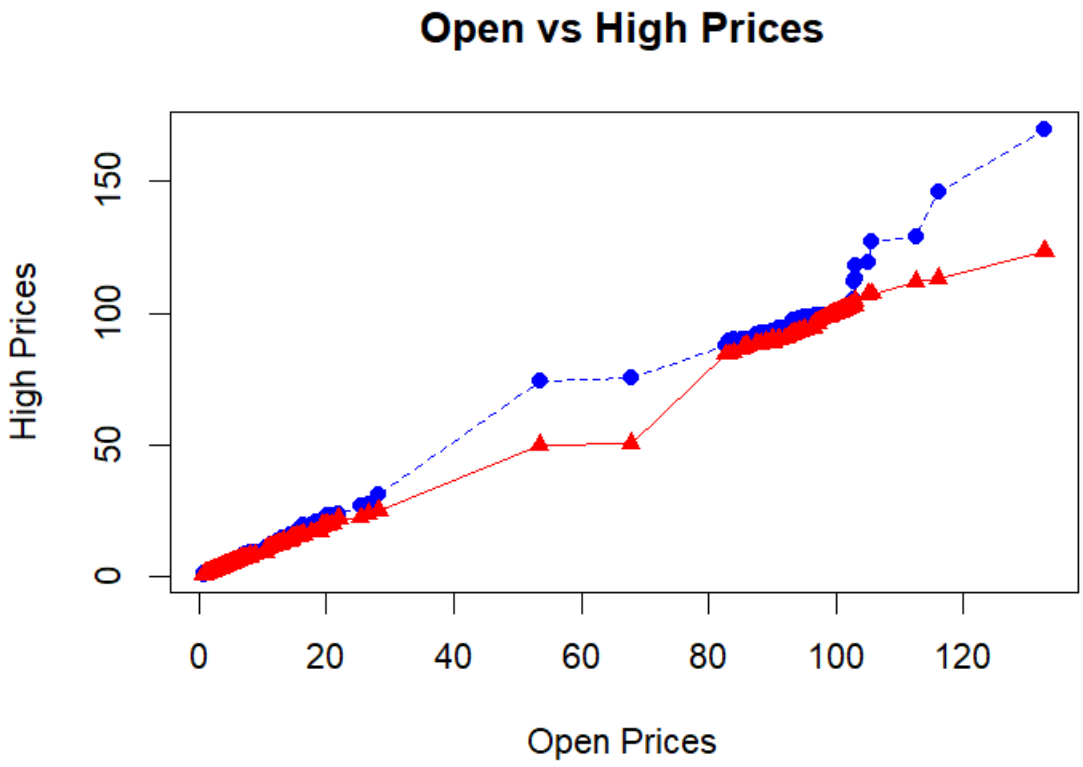


Line Graph : --

```
> # Line Graph
> sorted_Open <- sort(data$open)
> sorted_High <- sort(data$high)
> sorted_Close <- sort(data$close)
> plot(sorted_Open, sorted_High,
+      main = "Open vs High Prices",
+      type = "o",
+      lty = 2,
+      pch = 16,
+      col = "blue",
+      xlab = "Open Prices",
+      ylab = "High Prices")
```

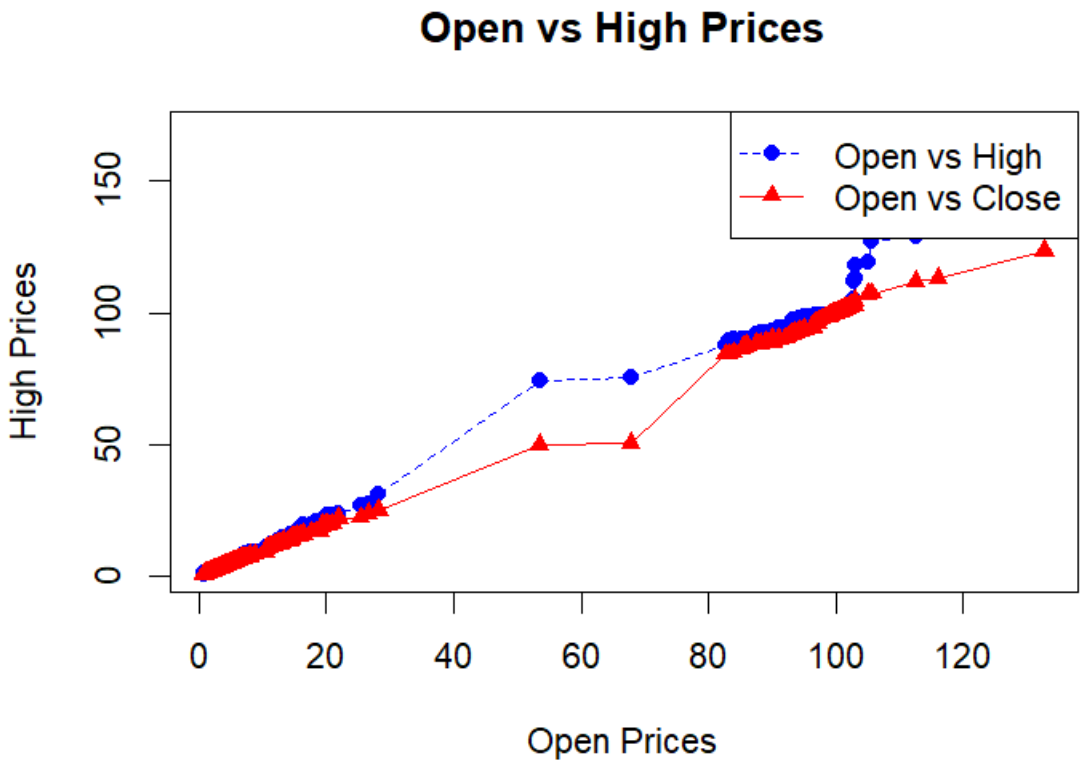



```
> lines(sorted_Open, sorted_Close,
+       type = "o",
+       lty = 1,
+       pch = 17,
+       col = "red")
```



Legend : --

```
> # Add Legend
> legend("topright",
+        legend = c("Open vs High", "Open vs Close"),
+        col = c("blue", "red"),
+        lty = c(2, 1),
+        pch = c(16, 17))
```



Analysis of HUBC Stock Prices

Description of Dataset

The dataset used for this analysis was sourced from Kaggle. It contains daily stock prices for HUBC, including variables such as **Open**, **High**, **Low**, and **Close** prices. These variables represent the stock price metrics at various points during the trading day.

Aim/Objective

The primary objective of this analysis is:

1. To compute descriptive statistics (mean, median, mode, standard deviation) for the stock price variables.
2. To visualize the stock price trends and distributions using graphical methods (histograms, pie charts, box plots, and line graphs).
3. To interpret the findings and derive insights from the dataset.

Results

Descriptive Statistics

1. **Mean**:
    - **Open**: [Mean of Open Prices]
    - **High**: [Mean of High Prices]
    - **Close**: [Mean of Close Prices]
2. **Median**:
    - **Open**: [Median of Open Prices]
    - **High**: [Median of High Prices]
    - **Close**: [Median of Close Prices]
3. **Mode**:
    - **Open**: [Mode of Open Prices]
    - **High**: [Mode of High Prices]
    - **Close**: [Mode of Close Prices]
4. **Standard Deviation**:
    - **Open**: [SD of Open Prices]
    - **High**: [SD of High Prices]
    - **Close**: [SD of Close Prices]

Visualizations

1. **Histograms**:
    - The histograms depict the distribution of **Open**, **High**, and **Close** prices. They indicate whether the prices are normally distributed, skewed, or have multimodal tendencies.
2. **Pie Chart**:
    - **Open Price Categories**:
        - Low: [Frequency]
        - Medium: [Frequency]
        - High: [Frequency]
3. **Box Plots**:
    - Box plots highlight the spread, median, and outliers for the **Open**, **High**, and **Close** prices.

4. **Line Graphs**:
    - The line graphs compare trends between **Open vs High** and **Open vs Close** prices, showing how the variables are correlated over sorted price ranges.

Interpretation

- **Open Price Analysis**:
    - The average opening price indicates the general market sentiment at the start of the trading day.
    - A high standard deviation in the opening prices would suggest volatility in the initial trading hours.
- **High and Close Price Trends**:
    - The relationship between high and close prices can provide insights into intraday market dynamics.
    - Distributions and outliers in these variables could indicate periods of significant market activity.
- **Visualization Insights**:
    - The histograms and box plots show whether prices are concentrated within specific ranges or exhibit high variability.
    - The pie chart categorization helps segment the stock prices into meaningful groups for quick understanding.

Conclusion

The analysis of HUBC stock prices provides a comprehensive overview of the stock's trading dynamics. The mean, median, mode, and standard deviation values give essential statistical insights into the dataset. Visualizations complement these findings by offering a clear picture of trends, distributions, and variations. This analysis can aid in making informed trading or investment decisions.