

FRA PROJECT

Project 2

DSBA

BUSINESS REPORT



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Problem 1

Problem statement:

The objective of this analysis is to conduct Market Risk Analysis on a portfolio of Indian stocks using Python. It uses historical stock price data to understand market volatility and riskiness. Using statistical measures like mean and standard deviation, investors gain a deeper understanding of individual stocks' performance and portfolio variability.

Through this analysis, investors can aim to achieve the following objectives:

- **Risk Assessment:** Analyze the historical volatility of individual stocks and the overall portfolio.
- **Portfolio Optimization:** Use Market Risk Analysis insights to enhance risk-adjusted returns.
- **Performance Evaluation:** Assess portfolio management strategies' effectiveness in mitigating market risk.
- **Portfolio Performance Monitoring:** Monitor portfolio performance over time and adjust as market conditions and risk preferences change.

Context

Investors face market risk, arising from asset price fluctuations due to economic events, geopolitical developments, and investor sentiment changes. Understanding and analyzing this risk is crucial for informed decision-making and optimizing investment strategies.

Data Description

The dataset contains weekly stock price data for 5 Indian stocks over an 8-year period. The dataset enables us to analyze the historical performance of individual stocks and the overall market dynamics.

Data Overview

Read the data as an appropriate time series data

Data is loaded into dataframe using pandas library and first 5 were printed.

	Date	ITC Limited	Bharti Airtel	Tata Motors	DLF Limited	Yes Bank
0	28-03-2016	217	316	386	114	173
1	04-04-2016	218	302	386	121	171
2	11-04-2016	215	308	374	120	171
3	18-04-2016	223	320	408	122	172
4	25-04-2016	214	319	418	122	175

Table 1 –Dataset – Rows of Data

The dataset has weekly stock prices for the 5 stocks

Check the structure of the data

The number of rows (observations) is 418

The number of columns (variables) is 6

Check the Datatypes:

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 418 entries, 0 to 417
Data columns (total 6 columns):
#   Column          Non-Null Count  Dtype
---  ---
0   Date             418 non-null   object
1   ITC_Limited      418 non-null   int64
2   Bharti_Airtel    418 non-null   int64
3   Tata_Motors      418 non-null   int64
4   DLF_Limited      418 non-null   int64
5   Yes_Bank         418 non-null   int64
dtypes: int64(5), object(1)
memory usage: 19.7+ KB
```

Table 2 –Dataset– Info

There are 5 int datatypes. Additionally, there is 1 Object datatype i.e Date.

Check for and treat (if needed) missing values –

There are no null values in the dataset.

Statistical Summary:

	ITC_Limited	Bharti_Airtel	Tata_Motors	DLF_Limited	Yes_Bank
count	418.000000	418.000000	418.000000	418.000000	418.000000
mean	278.964115	528.260766	368.617225	276.827751	124.442584
std	75.114405	226.507879	182.024419	156.280781	130.090884
min	156.000000	261.000000	65.000000	110.000000	11.000000
25%	224.250000	334.000000	186.000000	166.250000	16.000000
50%	265.500000	478.000000	399.500000	213.000000	30.000000
75%	304.000000	706.750000	466.000000	360.500000	249.750000
max	493.000000	1236.000000	1035.000000	928.000000	397.000000

Table 3– Summary Stats

Perform EDA :

Stock Price Graph (Stock Price vs Time) :

ITC Limited:

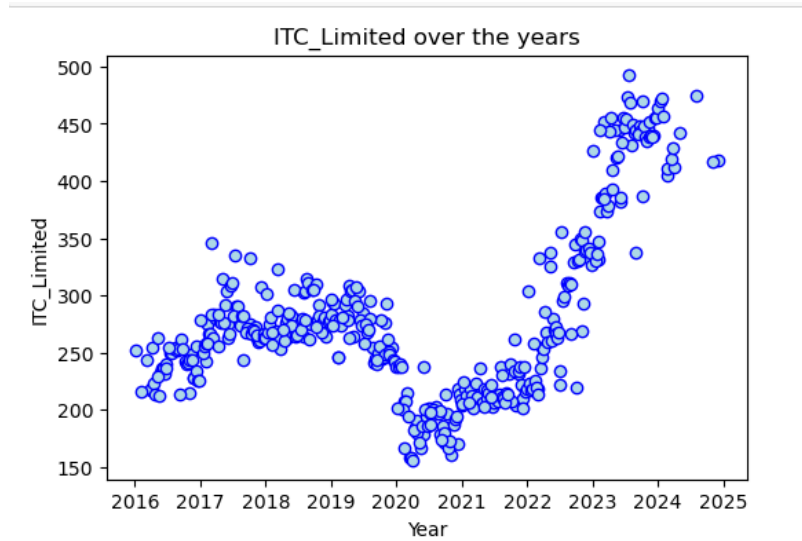


Fig 1 ITC Limited

Bharti Airtel:

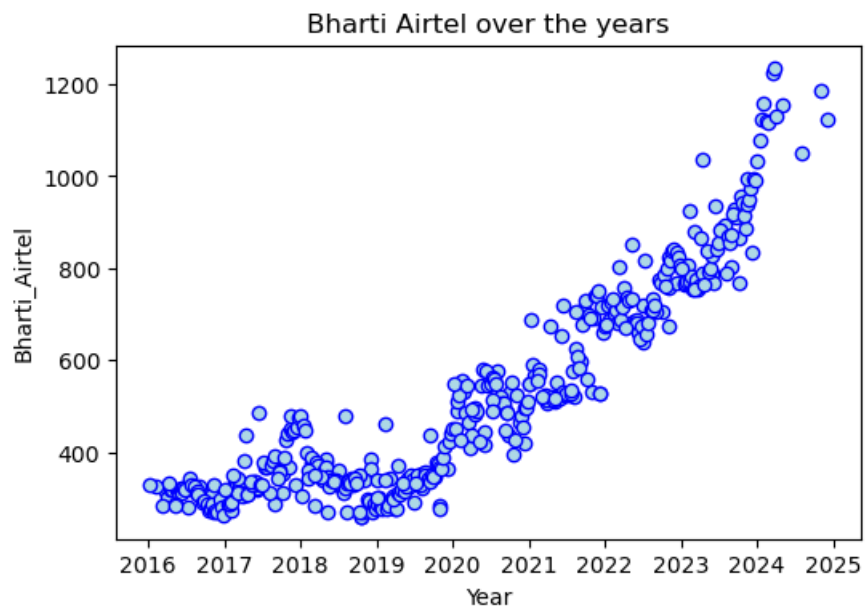


Fig 2 Bharti Airtel

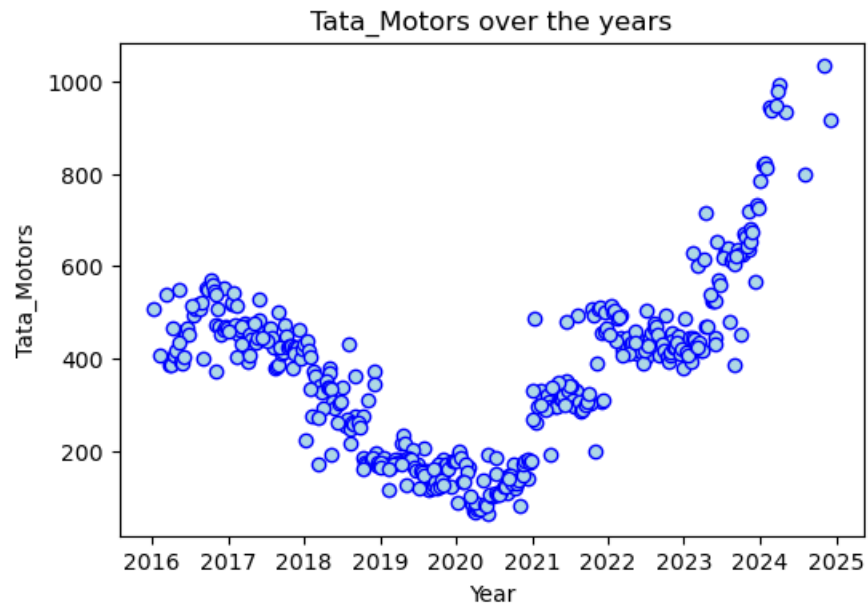
Tata Motors:

Fig.3 Tata Motors

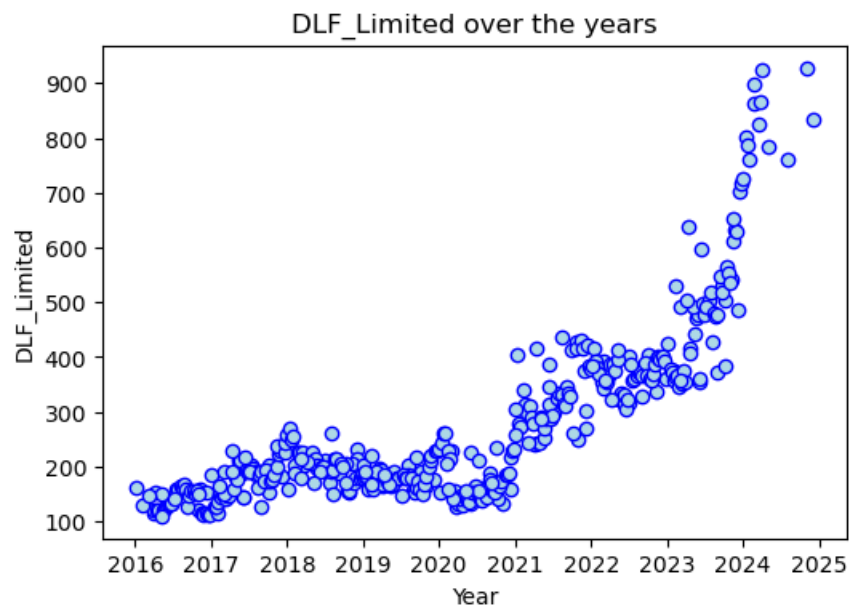
DLF Limited:

Fig.4 DLF Limited

Yes_Bank:

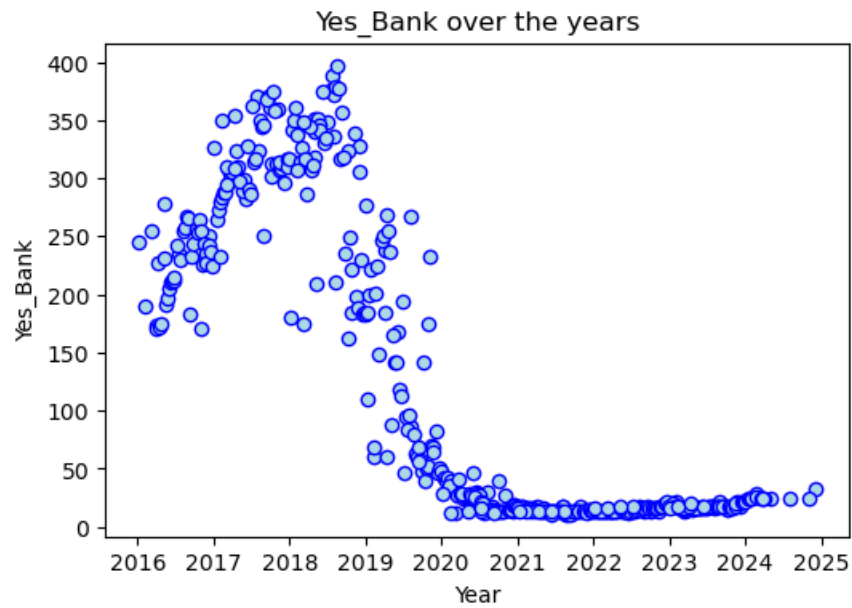


Fig.5 Yes_Bank

Calculate Returns for all stocks:

Returns: The log returns formula is used to calculate the continuous compounding return of an investment over a period.

	ITC_Limited	Bharti_Airtel	Tata_Motors	DLF_Limited	Yes_Bank
0	NaN	NaN	NaN	NaN	NaN
1	0.004598	-0.045315	0.000000	0.059592	-0.011628
2	-0.013857	0.019673	-0.031582	-0.008299	0.000000
3	0.036534	0.038221	0.087011	0.016529	0.005831
4	-0.041196	-0.003130	0.024214	0.000000	0.017291

Table 4 - returns

Calculate the Mean and Standard Deviation for the returns of all stocks :

Mean and Standard Deviation (Volatility):

	Average	Volatility
ITC_Limited	0.00163444	0.0359038
Bharti_Airtel	0.00327073	0.0387279
Tata_Motors	0.00223433	0.0604845
DLF_Limited	0.00486256	0.0577847
Yes_Bank	-0.00473678	0.0938788

Table 5 - Mean and Standard Deviation

Draw a plot of Mean vs Standard Deviation for all stock returns

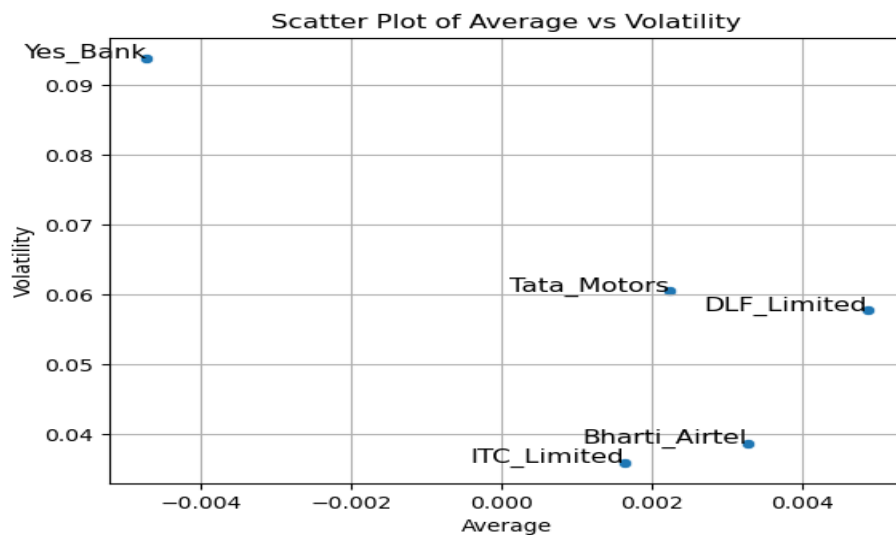


Fig 6: Mean vs Standard Deviation

Key meaningful observations :

- ITC Limited:**
Steady Performer: ITC Limited has the lowest volatility (0.0359038) among the stocks, indicating it is a relatively stable investment with minimal fluctuations. Its average return (0.00163444) is modest but positive, making it suitable for risk-averse investors seeking stability.
- DLF Limited:**
High Return, High Risk: DLF Limited offers the highest average return (0.00486256) but also has significant volatility (0.0577847). This stock is appealing for investors willing to accept higher risk for the potential of higher returns.
- Yes Bank:**
High Risk, Negative Return: Yes Bank has the highest volatility (0.0938788) and a negative average return (-0.00473678). This indicates both high risk and poor performance, making it the least attractive option for investors, particularly those looking for stable or positive returns.

Actionable Insights & Recommendations

ITC Limited:

- **Insight:** ITC Limited demonstrates low volatility (0.0359) with a modest positive average return (0.0016).
- **Recommendation:** Consider ITC Limited for a conservative investment portfolio aiming for stability and minimal risk. It's a good candidate for investors seeking consistent performance without significant price fluctuations.

Bharti Airtel:

- **Insight:** Bharti Airtel has moderate volatility (0.0387) and a decent average return (0.0033).
- **Recommendation:** Bharti Airtel can be included in a balanced portfolio. It offers a good trade-off between risk and return, suitable for investors looking for moderate growth with manageable risk.

Tata Motors:

- **Insight:** Tata Motors shows higher volatility (0.0605) with a moderate average return (0.0022).
- **Recommendation:** Suitable for a moderately aggressive portfolio. Investors should be prepared for price fluctuations but can expect reasonable returns. It's ideal for those willing to accept higher risk for potential growth.

DLF Limited:

- **Insight:** DLF Limited offers the highest average return (0.0049) but comes with higher volatility (0.0578).
- **Recommendation:** Suitable for aggressive investors who are willing to accept higher risk in pursuit of higher returns. Allocate a portion of the portfolio to DLF Limited to balance potential high returns with diversified risk.

Yes Bank:

- **Insight:** Yes Bank shows the highest volatility (0.0939) and a negative average return (-0.0047), indicating high risk and poor performance.
- **Recommendation:** Avoid or minimize exposure to Yes Bank in your portfolio. This stock is not suitable for risk-averse investors and could negatively impact overall portfolio performance. For those who currently hold Yes Bank, consider re-evaluating the position and potentially reallocating to more stable or better-performing assets.

Conclusion:

- Ensure a well-diversified portfolio to balance risk and return. Including a mix of low-risk, moderate-return stocks like ITC Limited, moderate-risk, decent-return stocks like Bharti Airtel, and higher-risk, high-return stocks like DLF Limited can optimize portfolio performance.
- Regularly monitor the volatility and performance of individual stocks. Adjust portfolio allocations based on changes in stock performance and market conditions to maintain a balanced risk profile.