F.R.A Main Project

Stocks Price

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Problem Statement:

The dataset contains 6 years of information (weekly stock information) on the stock prices of 10 different Indian Stocks. Calculate the mean and standard deviation on the stock returns and share insights. You are expected to do the Market Risk Analysis using Python.

Dataset: Market Risk Dataset

Objective:

The objective of this analysis is to conduct market risk analysis on a dataset comprising 6 years of weekly stock information for 10 different Indian stocks. The analysis involves computing the mean and standard deviation of stock returns and extracting insights to assist in investment decision-making.

Import all the necessary and load our data set, CompData-1.xlsx and use the head() function to view the Top 5 data and the tail() function to view the bottom 5 data. Using the shape function, we can determine that there are 314 rows and 11 column and size of dataset is 3454. Find out the characteristics of the column using the info() method. The datatypes for the int64(10), object(1) are present and no null values are present in the dataset.

	Date	Infosys	Indian Hotel	Mahindra & Mahindra	Axis Bank	SAIL	Shree Cement	Sun Pharma	Jindal Steel	Idea Vodafone	Jet Airways
0	31-03-2014	264	69	455	263	68	5543	555	298	83	278
1	07-04-2014	257	68	458	276	70	5728	610	279	84	303
2	14-04-2014	254	68	454	270	68	5649	607	279	83	280
3	21-04-2014	253	68	488	283	68	5692	604	274	83	282
4	28-04-2014	256	65	482	282	63	5582	611	238	79	243

	Date	Infosys	Indian Hotel	Mahindra & Mahindra	Axis Bank	SAIL	Shree Cement	Sun Pharma	Jindal Steel	Idea Vodafone	Jet Airways
309	02-03-2020	729	120	469	658	33	23110	401	146	3	22
310	09-03-2020	634	114	427	569	30	21308	384	121	6	18
311	16-03-2020	577	90	321	428	27	18904	365	105	3	16
312	23-03-2020	644	75	293	360	21	17666	338	89	3	14
313	30-03-2020	633	75	284	379	23	17546	352	82	3	14

Table 1: Dataset Sample

Fixing messy column names (Containing spaces) for ease of use: The dataset have messy column names so rewrite the columns name.

```
Date
Infosys
Indian_Hotel
Mahindra_&_Mahindra
Axis_Bank
SAIL
Shree_Cement
Sun_Pharma
Jindal_Steel
Idea_Vodafone
Jet_Airways
```

Table 2: Columns Name

Checking data types of all columns: There are total 314 rows and 11 columns in the dataset. Out of 58, 1 column is of object type and rest 10 are of integer data type.

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 314 entries, 0 to 313
Data columns (total 11 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   Date                 314 non-null    object
 1   Infosys              314 non-null    int64
 2   Indian_Hotel         314 non-null    int64
 3   Mahindra_&_Mahindra  314 non-null    int64
 4   Axis_Bank            314 non-null    int64
 5   SAIL                 314 non-null    int64
 6   Shree_Cement         314 non-null    int64
 7   Sun_Pharma           314 non-null    int64
 8   Jindal_Steel         314 non-null    int64
 9   Idea_Vodafone        314 non-null    int64
 10  Jet_Airways          314 non-null    int64
dtypes: int64(10), object(1)
memory usage: 27.1+ KB
```

Table 3: Types of variables in the data frame

1: Draw Stock Price Graph (Stock Price vs Time) for any 2 given stocks with inference

Lets us plot & see price trend over time for different companies: Take two company Infosys and Mahindra_&_Mahindra

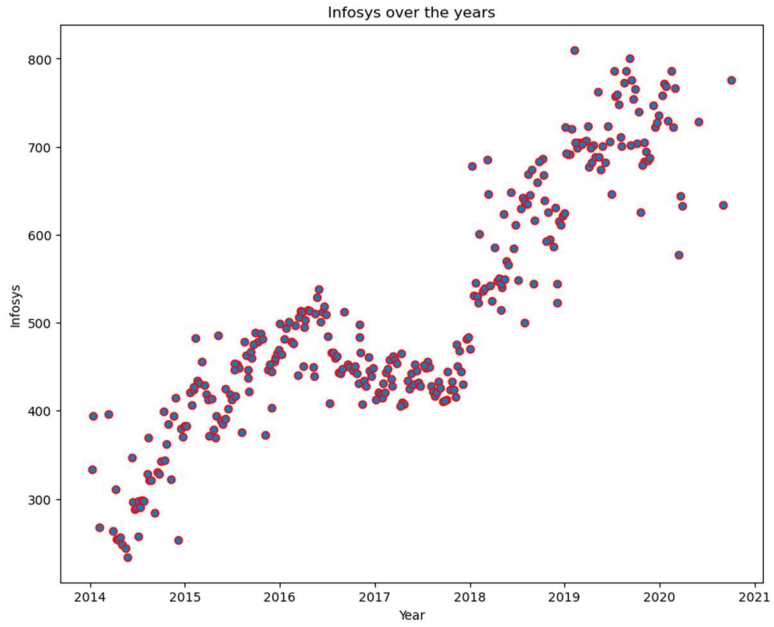

Fig 1: Infosys over the years

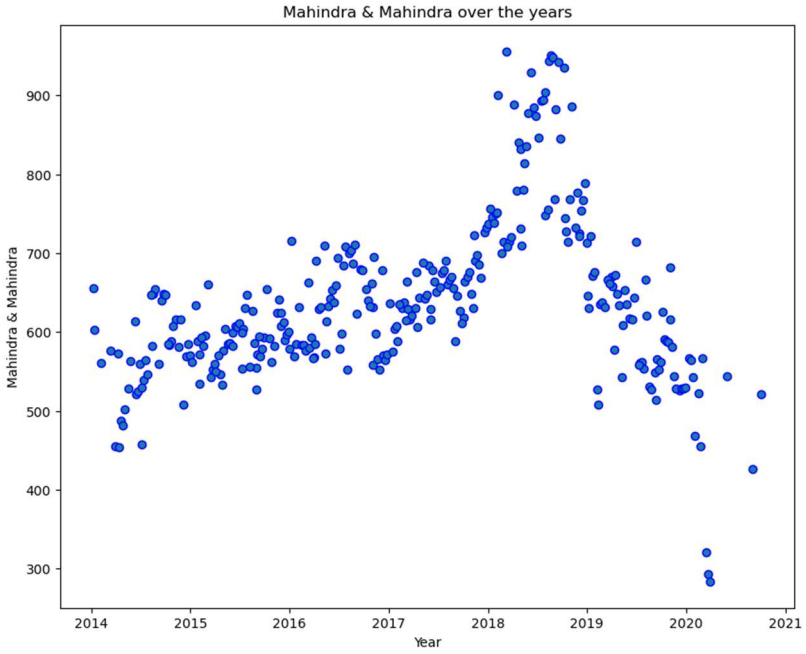

Fig 2: Mahindra & Mahindra over the years

Insights:

- The dataset contains weekly stock prices of 10 different Indian stocks spanning over 6 years. Each row represents a week, and columns represent different stocks along with the date.
- The messy column names were cleaned by replacing spaces with underscores for ease of use.
- Data types were checked and converted appropriately. The 'Date' column was converted to datetime format.
- Indicates the number of data points available for each stock. All stocks have 314 data points, suggesting that there are no missing values.
- Infosys has an average stock price of approximately 511.34.
- Mahindra & Mahindra has an average stock price of around 636.68.
- Infosys has a standard deviation of approximately 135.95, suggesting moderate volatility.
- Shree Cement has a much higher standard deviation of around 4288.28, indicating significant volatility in its stock prices.
- The minimum stock price for Infosys is 234, while the maximum is 810.
- At the 25th percentile, Infosys has a stock price of 424, suggesting that 25% of the observations are below this value.
- At the 75th percentile, Shree Cement has a stock price of 17773.25, indicating that 75% of the observations are below this value.
- Overall, these descriptive statistics offer a comprehensive overview of the central tendency, variability, and distribution of stock prices for each company, which is crucial for market risk analysis and investment decision-making.

2: Calculate Returns for all stocks with inference

Steps for calculating returns from prices: Take logarithms Take differences and drop the Date columns. And create new dataset Stock_prices_new.

	Infosys	Indian_Hotel	Mahindra_&_Mahindra	Axis_Bank	SAIL	Shree_Cement	Sun_Pharma	Jindal_Steel	Idea_Vodafone	Jet_Airways
0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
1	-0.026873	-0.014599	0.006572	0.048247	0.028988	0.032831	0.094491	-0.065882	0.011976	0.086112
2	-0.011742	0.000000	-0.008772	-0.021979	-0.028988	-0.013888	-0.004930	0.000000	-0.011976	-0.078943
3	-0.003945	0.000000	0.072218	0.047025	0.000000	0.007583	-0.004955	-0.018084	0.000000	0.007117
4	0.011788	-0.045120	-0.012371	-0.003540	-0.076373	-0.019515	0.011523	-0.140857	-0.049393	-0.148846

Table 4: Dataset New Sample

Checking data types of all columns: There are total 314 rows and 10 columns in the dataset. All column are float data type.

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 314 entries, 0 to 313
Data columns (total 10 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   Infosys              313 non-null    float64
 1   Indian_Hotel         313 non-null    float64
 2   Mahindra_&_Mahindra  313 non-null    float64
 3   Axis_Bank            313 non-null    float64
 4   SAIL                 313 non-null    float64
 5   Shree_Cement         313 non-null    float64
 6   Sun_Pharma           313 non-null    float64
 7   Jindal_Steel         313 non-null    float64
 8   Idea_Vodafone        313 non-null    float64
 9   Jet_Airways          313 non-null    float64
dtypes: float64(10)
memory usage: 24.7 KB
```

Table 5: Types of variables in the New data frame

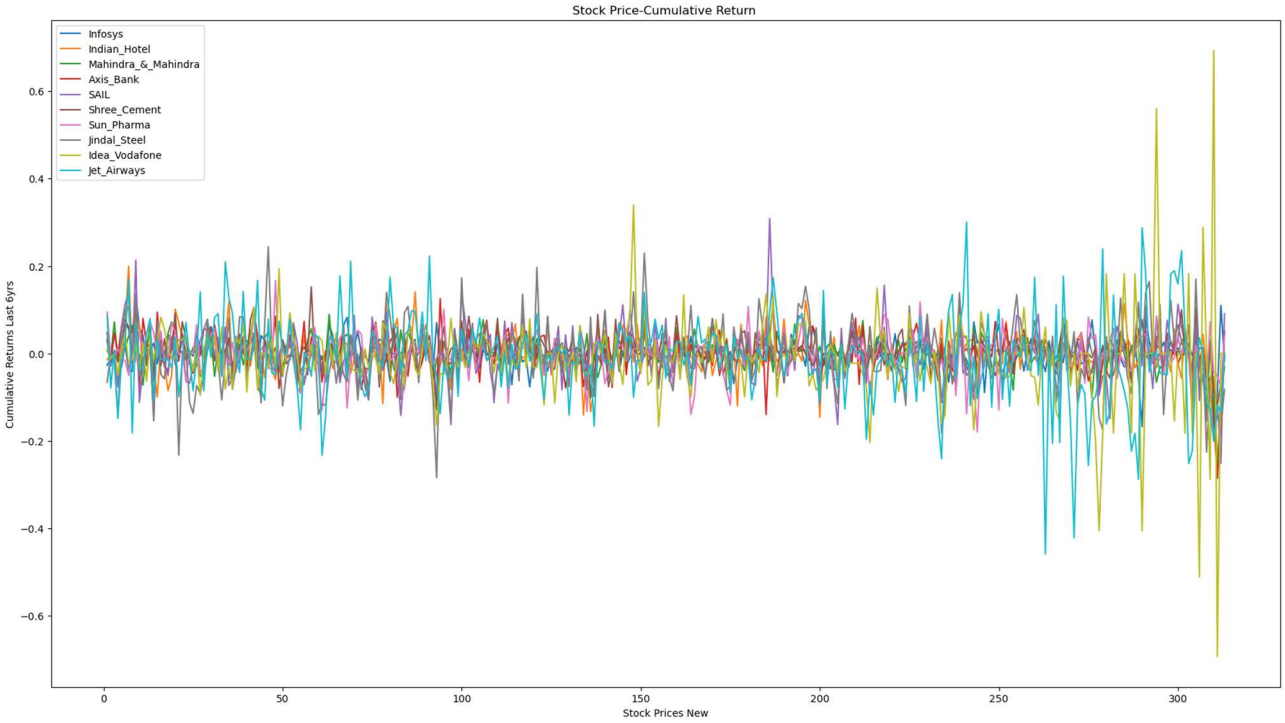

Fig 3: Stock Price-Cumulative Return

Insights:

- The resulting dataframe, Stock_prices_new, contains the calculated returns for each stock. It has 314 rows and 10 columns, indicating the weekly returns for each stock over the past 6 years. The data types for all columns are float64, representing numerical values.
- However, there are some missing values in the dataframe, as indicated by the non-null count being less than the total number of rows (314). These missing values may need to be addressed depending on the specific requirements of the analysis.
- Lastly, a plot is generated to visualize the cumulative returns for all stocks over the past 6 years. This plot provides an overview of how cumulative returns have evolved over time for each stock.

3: Calculate Stock Means and Standard Deviation for all stocks with inference

- We now look at Means & Standard Deviations of these returns
- **Stock Means:** Average returns that the stock is making on a week to week basis
- **Stock Standard Deviation:** It is a measure of volatility meaning the more a stock's returns vary from the s tock's average return, the more volatile the stock

```
Infosys                 0.002794
Indian_Hotel            0.000266
Mahindra_&_Mahindra    -0.001506
Axis_Bank               0.001167
SAIL                   -0.003463
Shree_Cement            0.003681
Sun_Pharma             -0.001455
Jindal_Steel           -0.004123
Idea_Vodafone          -0.010608
Jet_Airways            -0.009548
dtype: float64
```

Table 6: Stock Prices Means

```
Infosys                 0.035070
Indian_Hotel            0.047131
Mahindra_&_Mahindra     0.040169
Axis_Bank               0.045828
SAIL                    0.062188
Shree_Cement            0.039917
Sun_Pharma              0.045033
Jindal_Steel            0.075108
Idea_Vodafone           0.104315
Jet_Airways             0.097972
dtype: float64
```

Table 7: Stock Standard Deviation

Standard Deviation renamed as Volatility and checking the values in descending order first by Average, followed by Volatility: Calculating Stock Mean as Average

	Average	Volatility
Shree_Cement	0.003681	0.039917
Infosys	0.002794	0.035070
Axis_Bank	0.001167	0.045828
Indian_Hotel	0.000266	0.047131
Sun_Pharma	-0.001455	0.045033
Mahindra_&_Mahindra	-0.001506	0.040169
SAIL	-0.003463	0.062188
Jindal_Steel	-0.004123	0.075108
Jet_Airways	-0.009548	0.097972
Idea_Vodafone	-0.010608	0.104315

Table 8: Stock Average

	Average	Volatility
Idea_Vodafone	-0.010608	0.104315
Jet_Airways	-0.009548	0.097972
Jindal_Steel	-0.004123	0.075108
SAIL	-0.003463	0.062188
Indian_Hotel	0.000266	0.047131
Axis_Bank	0.001167	0.045828
Sun_Pharma	-0.001455	0.045033
Mahindra_&_Mahindra	-0.001506	0.040169
Shree_Cement	0.003681	0.039917
Infosys	0.002794	0.035070

Table 9: Stock Volatility

Insights:

- Infosys has the highest stock means 0.002794 and Jet_Airways has the lowest stock means -0.009548
- Idea_Vodafone has the highest stock standard deviation 0.104315 and Infosys has the lowest stock standard deviation 0.035070
- Shree_Cement has the highest average return of 0.003681 and Idea_Vodafone has the lowest average return of -0.010608.
- Idea_Vodafone has the highest volatility of 0.104315 and Infosys has the lowest volatility of 0.035070.

4: Draw a plot of Stock Means vs Standard Deviation and state your inference

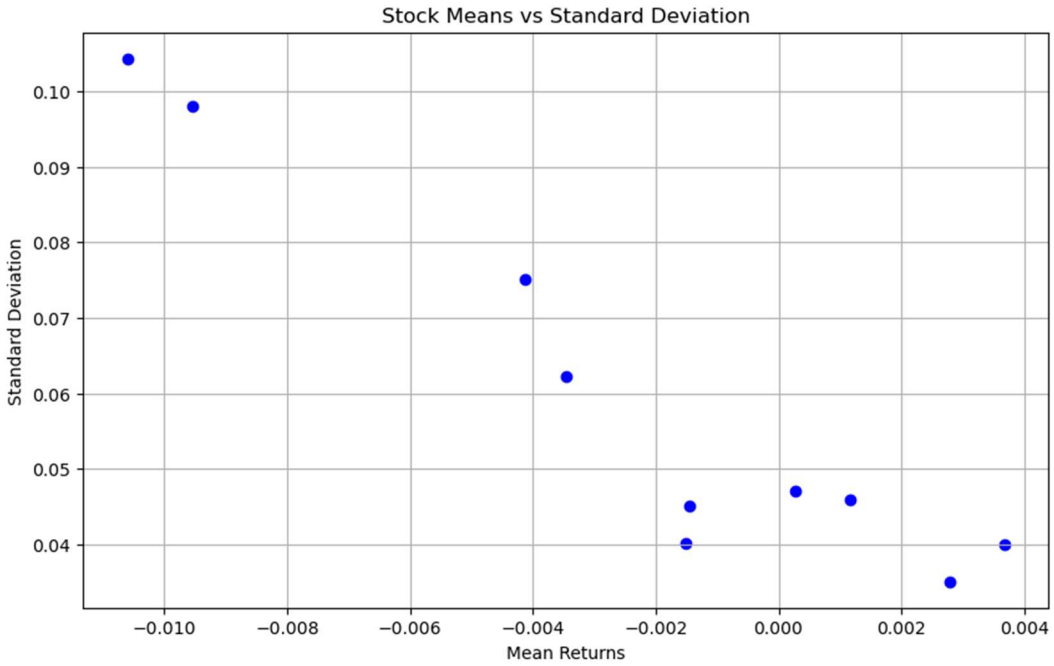

Fig 4: Stock Means vs Standard Deviation

Insights:

- Stocks on the left side show high volatility and low returns.
- Stocks on the bottom right show low volatility with high returns.
- This plot helps find a balance between risk and reward when investing in different companies.

5: Conclusions and Recommendations

- The dataset encompasses weekly stock prices for 10 Indian stocks over a 6-year span.
- Column names were cleaned for improved usability, and appropriate data type conversions were performed.
- Descriptive statistics provided valuable insights into the central tendencies, variabilities, and distributions of stock prices for each company.
- Variations in average stock prices and volatility levels were observed across companies, crucial for assessing market risk and forming investment strategies.
- Visualizations were created to depict the price trends over time for selected stocks, such as Infosys and Mahindra & Mahindra.
- These visualizations offer qualitative assessments of price movements and potential trends in stock prices.
- Returns were computed for all stocks using logarithmic transformations and differencing techniques.
- A plot illustrating cumulative returns over the 6-year period was generated, providing an overview of stock performance.
- Mean returns and standard deviations (volatility) were calculated to evaluate average returns and risk levels for each stock.
- Companies like Shree Cement demonstrated relatively high average returns with moderate volatility, while Idea Vodafone exhibited high volatility and low returns.
- A scatter plot depicting the relationship between stock means and standard deviations was generated.
- This plot facilitates the identification of stocks with desirable risk-return profiles, balancing volatility with potential returns.
- In summary, this analysis furnishes valuable insights for investors to comprehend the risks associated with different stocks and make well-informed investment decisions. It is advisable to conduct further analysis on individual stocks based on specific investment objectives and risk tolerances. Additionally, regular monitoring and adjustment of investment portfolios are recommended to adapt to evolving market conditions.