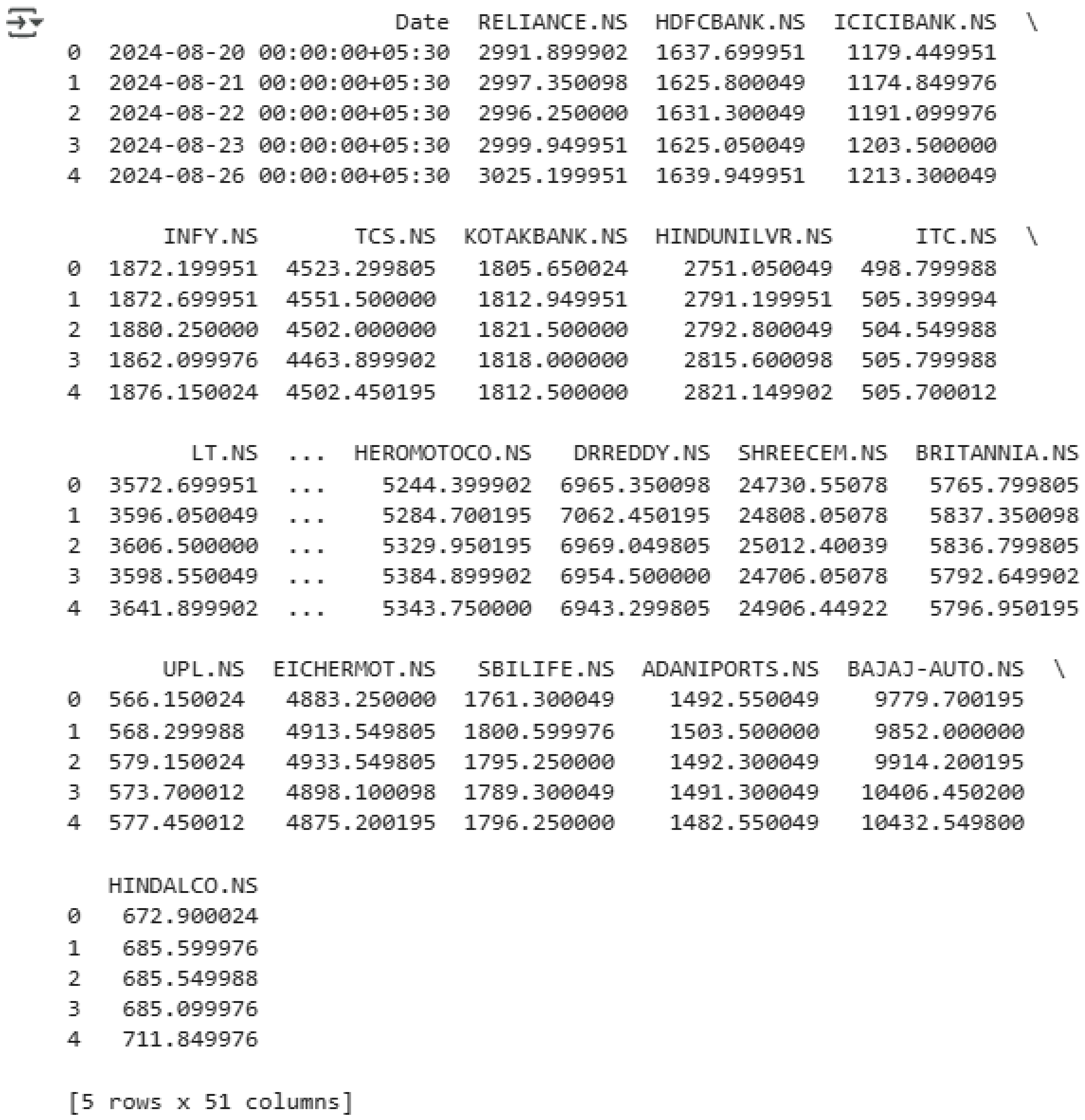
Mutual-fund-investment-plan-analysis

#Read the dataset

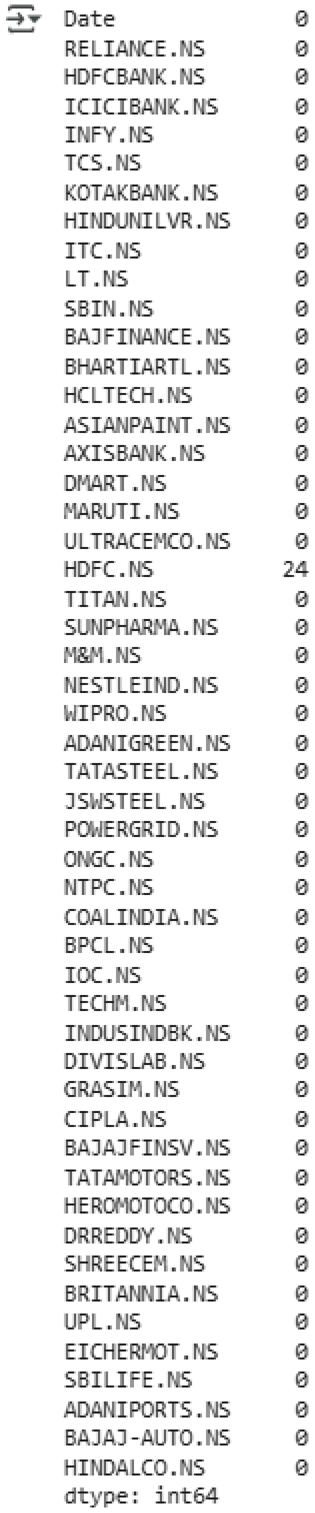
```
import pandas as pd

data = pd.read_csv('/content/nifty50_closing_prices.csv')
print(data.head())
```



```
                        Date  RELIANCE.NS  HDFCBANK.NS  ICICIBANK.NS  \
0  2024-08-20 00:00:00+05:30  2991.899902  1637.699951   1179.449951
1  2024-08-21 00:00:00+05:30  2997.350098  1625.800049   1174.849976
2  2024-08-22 00:00:00+05:30  2996.250000  1631.300049   1191.099976
3  2024-08-23 00:00:00+05:30  2999.949951  1625.050049   1203.500000
4  2024-08-26 00:00:00+05:30  3025.199951  1639.949951   1213.300049

       INFY.NS       TCS.NS  KOTAKBANK.NS  HINDUNILVR.NS      ITC.NS  \
0  1872.199951  4523.299805   1805.650024    2751.050049  498.799988
1  1872.699951  4551.500000   1812.949951    2791.199951  505.399994
2  1880.250000  4502.000000   1821.500000    2792.800049  504.549988
3  1862.099976  4463.899902   1818.000000    2815.600098  505.799988
4  1876.150024  4502.450195   1812.500000    2821.149902  505.700012

         LT.NS  ...  HEROMOTOCO.NS  DRREDDY.NS  SHREECEM.NS  BRITANNIA.NS
0  3572.699951  ...    5244.399902  6965.350098  24730.55078   5765.799805
1  3596.050049  ...    5284.700195  7062.450195  24808.05078   5837.350098
2  3606.500000  ...    5329.950195  6969.049805  25012.40039   5836.799805
3  3598.550049  ...    5384.899902  6954.500000  24706.05078   5792.649902
4  3641.899902  ...    5343.750000  6943.299805  24906.44922   5796.950195

       UPL.NS  EICHERMOT.NS   SBILIFE.NS  ADANIPORTS.NS  BAJAJ-AUTO.NS  \
0  566.150024   4883.250000  1761.300049    1492.550049    9779.700195
1  568.299988   4913.549805  1800.599976    1503.500000    9852.000000
2  579.150024   4933.549805  1795.250000    1492.300049    9914.200195
3  573.700012   4898.100098  1789.300049    1491.300049   10406.450200
4  577.450012   4875.200195  1796.250000    1482.550049   10432.549800

   HINDALCO.NS
0   672.900024
1   685.599976
2   685.549988
3   685.099976
4   711.849976

[5 rows x 51 columns]
```

Before moving forward,I’ll convert the data column into a datetime data type & check whether this data has any null values or not:

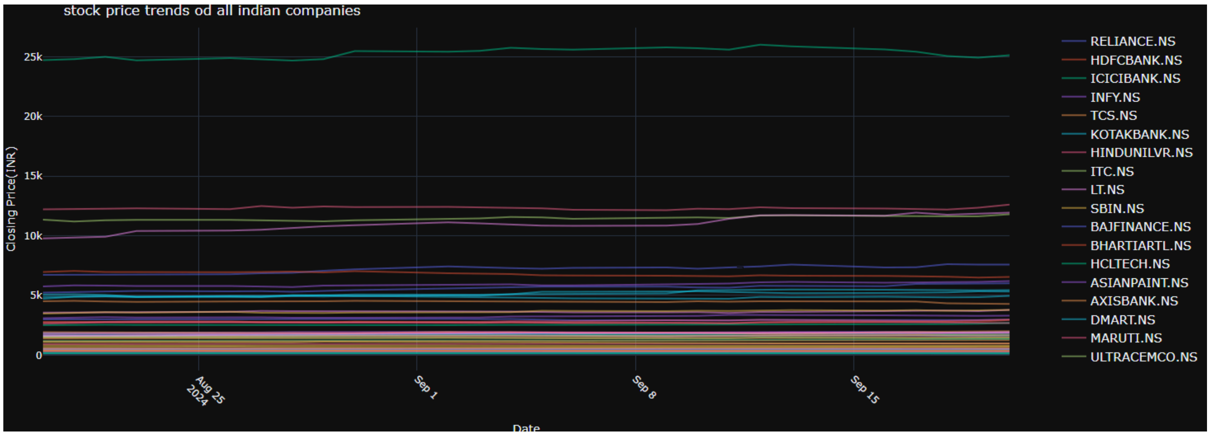
```
data['Date']= pd.to_datetime(data['Date'])
print(data.isnull().sum())
```



```
Date              0
RELIANCE.NS       0
HDFCBANK.NS       0
ICICIBANK.NS      0
INFY.NS           0
TCS.NS            0
KOTAKBANK.NS      0
HINDUNILVR.NS     0
ITC.NS            0
LT.NS             0
SBIN.NS           0
BAJFINANCE.NS     0
BHARTIARTL.NS     0
HCLTECH.NS        0
ASIANPAINT.NS     0
AXISBANK.NS       0
DMART.NS          0
MARUTI.NS         0
ULTRACEMCO.NS     0
HDFC.NS          24
TITAN.NS          0
SUNPHARMA.NS      0
M&M.NS            0
NESTLEIND.NS      0
WIPRO.NS          0
ADANIGREEN.NS     0
TATASTEEL.NS      0
JSWSTEEL.NS       0
POWERGRID.NS      0
ONGC.NS           0
NTPC.NS           0
COALINDIA.NS      0
BPCL.NS           0
IOC.NS            0
TECHM.NS          0
INDUSINDBK.NS     0
DIVISLAB.NS       0
GRASIM.NS         0
CIPLA.NS          0
BAJAJFINSV.NS     0
TATAMOTORS.NS     0
HEROMOTOCO.NS     0
DRREDDY.NS        0
SHREECEM.NS       0
BRITANNIA.NS      0
UPL.NS            0
EICHERMOT.NS      0
SBILIFE.NS        0
ADANIPORTS.NS     0
BAJAJ-AUTO.NS     0
HINDALCO.NS       0
dtype: int64
```

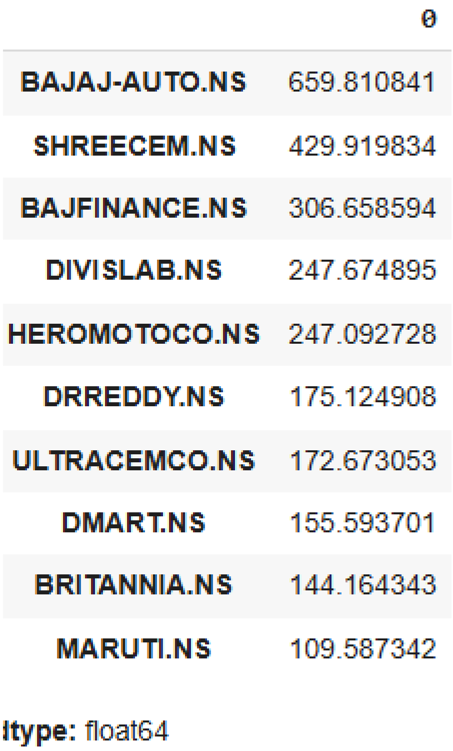
There are 24 null values in the closing prices of HDFC.Let's fill in these null values and look at the stock price trends of all the companies in the data:

```
data.fillna(method='ffill',inplace=True)
from re import template
import plotly.graph_objs as go
import plotly.express as px

fig = go.Figure()

for company in data.columns[1:]:
  fig.add_trace(go.Scatter(x=data['Date'],y=data[company],
                          mode='lines',
                          name=company,
                          opacity=0.5))

fig.update_layout(
    title='stock price trends od all indian companies',
    xaxis_title='Date',
    yaxis_title='Closing Price(INR)',
    xaxis=dict(tickangle=45),
    legend=dict(x=1.05,
                y=1,
                traceorder="normal",
                font=dict(size=15),
                orientation="v"),
    margin=dict(l=0,r=0,t=30,b=0),
    hovermode='x',
    template='plotly_dark'

)
fig.show()
```



Let’s look at the companies with the highest risks for investing:

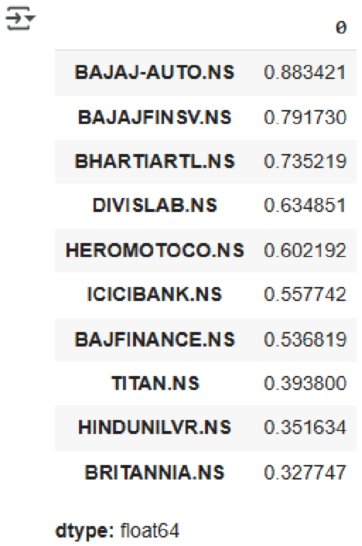
```
all_companies = data.columns[1:]

volatility_all_companies = data[ all_companies].std()

volatility_all_companies.sort_values(ascending=False).head(10)
```



```
                         0
BAJAJ-AUTO.NS   659.810841
SHREECEM.NS     429.919834
BAJFINANCE.NS   306.658594
DIVISLAB.NS     247.674895
HEROMOTOCO.NS   247.092728
DRREDDY.NS      175.124908
ULTRACEMCO.NS   172.673053
DMART.NS        155.593701
BRITANNIA.NS    144.164343
MARUTI.NS       109.587342

ltype: float64
```

Now, let’s look at the companies with the highest growth rate for investing:

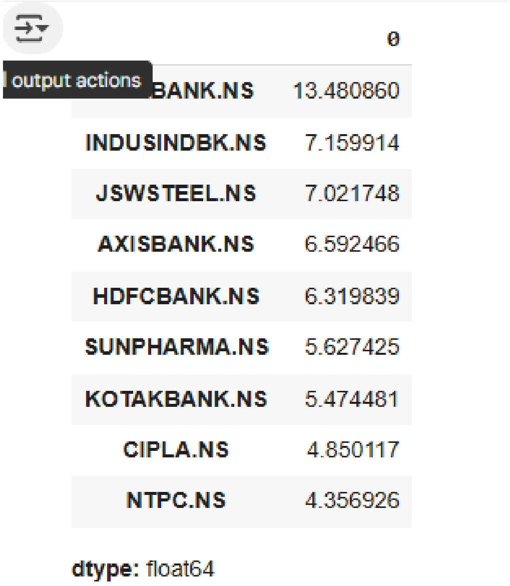
```
growth_all_companies = data[all_companies].pct_change(fill_method=None) * 100

average_growth_all_companies = growth_all_companies.mean()

average_growth_all_companies.sort_values(ascending=False).head(10)
```



```
                       0
BAJAJ-AUTO.NS   0.883421
BAJAJFINSV.NS   0.791730
BHARTIARTL.NS   0.735219
  DIVISLAB.NS   0.634851
HEROMOTOCO.NS   0.602192
 ICICIBANK.NS   0.557742
BAJFINANCE.NS   0.536819
     TITAN.NS   0.393800
HINDUNILVR.NS   0.351634
 BRITANNIA.NS   0.327747

dtype: float64
```

Creating a Mutual Fund Plan Based on High ROI and Low Risk:

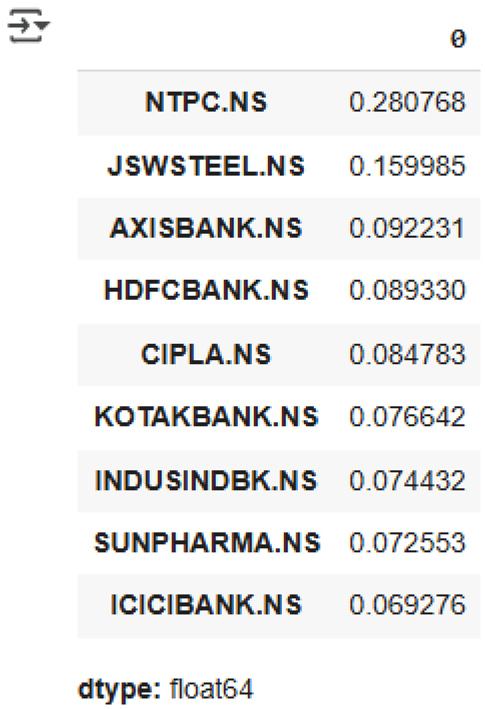
```
roi_threshold = roi_all_companies.median()
volatility_threshold = volatility_all_companies.median()

selected_companies = roi_all_companies[(roi_all_companies > roi_threshold)&
(volatility_all_companies < volatility_threshold)]
selected_companies.sort_values(ascending=False)
```



```
                              0
        BANK.NS       13.480860
  INDUSINDBK.NS        7.159914
    JSWSTEEL.NS        7.021748
    AXISBANK.NS        6.592466
    HDFCBANK.NS        6.319839
   SUNPHARMA.NS        5.627425
   KOTAKBANK.NS        5.474481
       CIPLA.NS        4.850117
        NTPC.NS        4.356926

dtype: float64
```

To balance the investment between these companies, we can use an **inverse volatility ratio** for allocation. Companies with lower volatility will get a higher weight. Let’s calculate the weight for each company:

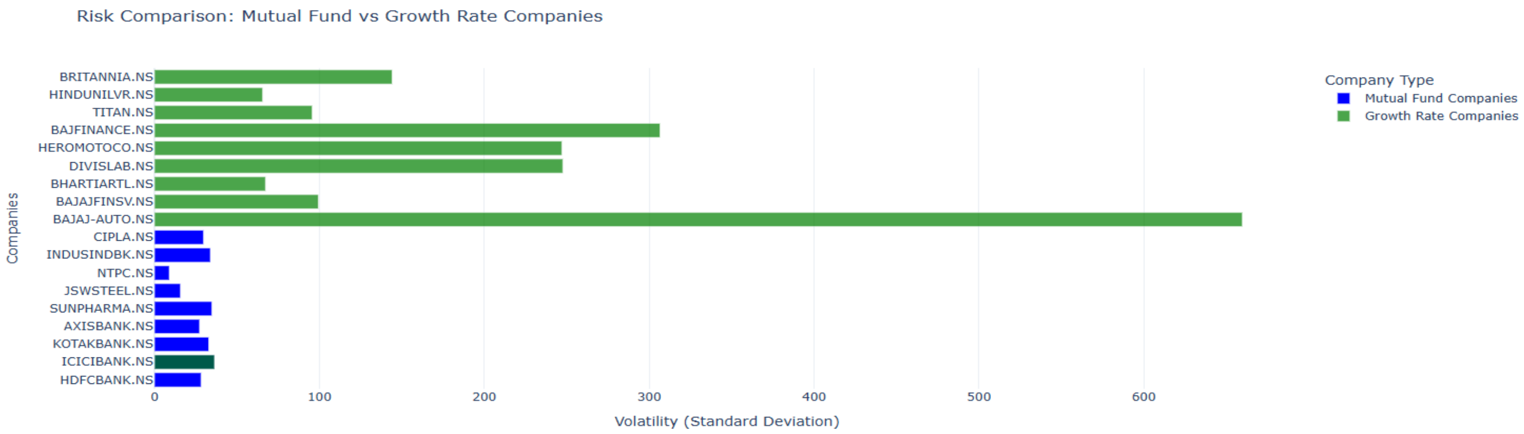
```
selected_volatility = volatility_all_companies[selected_companies.index]
inverse_volatility = 1 / selected_volatility

investment_ratios = inverse_volatility / inverse_volatility.sum()

investment_ratios.sort_values(ascending=False)
```



```
                     0
NTPC.NS         0.280768
JSWSTEEL.NS     0.159985
AXISBANK.NS     0.092231
HDFCBANK.NS     0.089330
CIPLA.NS        0.084783
KOTAKBANK.NS    0.076642
INDUSINDBK.NS   0.074432
SUNPHARMA.NS    0.072553
ICICIBANK.NS    0.069276

dtype: float64
```

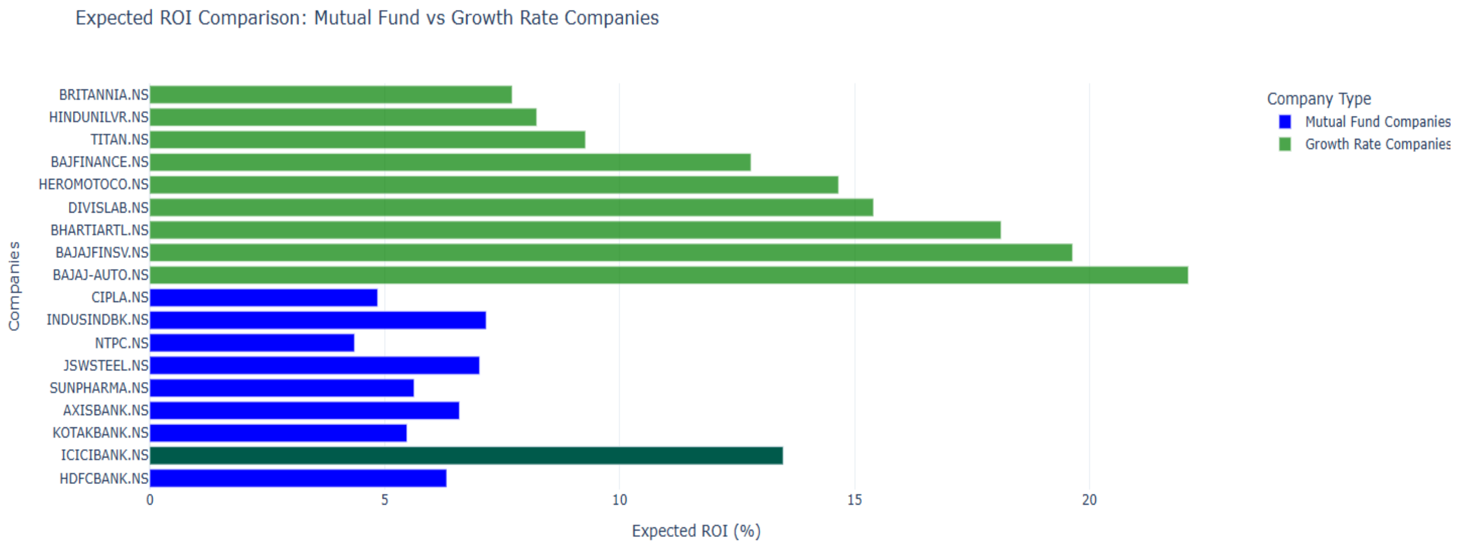
Analysing Our Mutual Fund Plan:

```
top_growth_companies =
average_growth_all_companies.sort_values(ascending=False).head(10)
risk_growth_rate_companies = volatility_all_companies[top_growth_companies.index]
risk_mutual_fund_companies = volatility_all_companies[selected_companies.index]

fig = go.Figure()

fig.add_trace(go.Bar(
    y=risk_mutual_fund_companies.index,
    x=risk_mutual_fund_companies,
    orientation='h',  # Horizontal bar
    name='Mutual Fund Companies',
    marker=dict(color='blue')
))

fig.add_trace(go.Bar(
    y=risk_growth_rate_companies.index,
    x=risk_growth_rate_companies,
    orientation='h',
    name='Growth Rate Companies',
    marker=dict(color='green'),
    opacity=0.7
))

fig.update_layout(
    title='Risk Comparison: Mutual Fund vs Growth Rate Companies',
    xaxis_title='Volatility (Standard Deviation)',
    yaxis_title='Companies',
    barmode='overlay',
    legend=dict(title='Company Type'),
    template='plotly_white'
)

fig.show()
```



Now, let’s compare the ROI of both the groups as well:

```
expected_roi_mutual_fund = roi_all_companies[selected_companies.index]

expected_roi_growth_companies = roi_all_companies[top_growth_companies.index]

fig = go.Figure()

fig.add_trace(go.Bar(
    y=expected_roi_mutual_fund.index,
    x=expected_roi_mutual_fund,
    orientation='h',
    name='Mutual Fund Companies',
    marker=dict(color='blue')
))

fig.add_trace(go.Bar(
    y=expected_roi_growth_companies.index,
    x=expected_roi_growth_companies,
    orientation='h',
    name='Growth Rate Companies',
    marker=dict(color='green'),
    opacity=0.7
))

fig.update_layout(
    title='Expected ROI Comparison: Mutual Fund vs Growth Rate Companies',
    xaxis_title='Expected ROI (%)',
    yaxis_title='Companies',
    barmode='overlay',
    legend=dict(title='Company Type'),
    template='plotly_white'
)

fig.show()
```



The comparison between the **risk (volatility)** and **expected ROI** for mutual fund companies (in blue) and growth rate companies (in green) shows a clear trade-off. **Mutual fund companies** offer lower volatility, meaning they are less risky, but also provide lower expected returns. In contrast, **growth rate companies** demonstrate higher volatility, indicating more risk, but they offer much higher potential returns, especially companies like **Bajaj Auto** and **Bajaj Finserv**. This highlights a common investment dilemma: lower risk comes with a lower reward, while higher risk could yield higher returns.

For **long-term investments**, the goal is typically to find companies that offer a **balance of stable returns and manageable risk**. The companies in our mutual fund exhibit **low volatility**, meaning they are less risky, and their **moderate returns** make them solid choices for **long-term, stable growth**. They are well-suited for conservative investors who want steady returns without significant fluctuations in value.

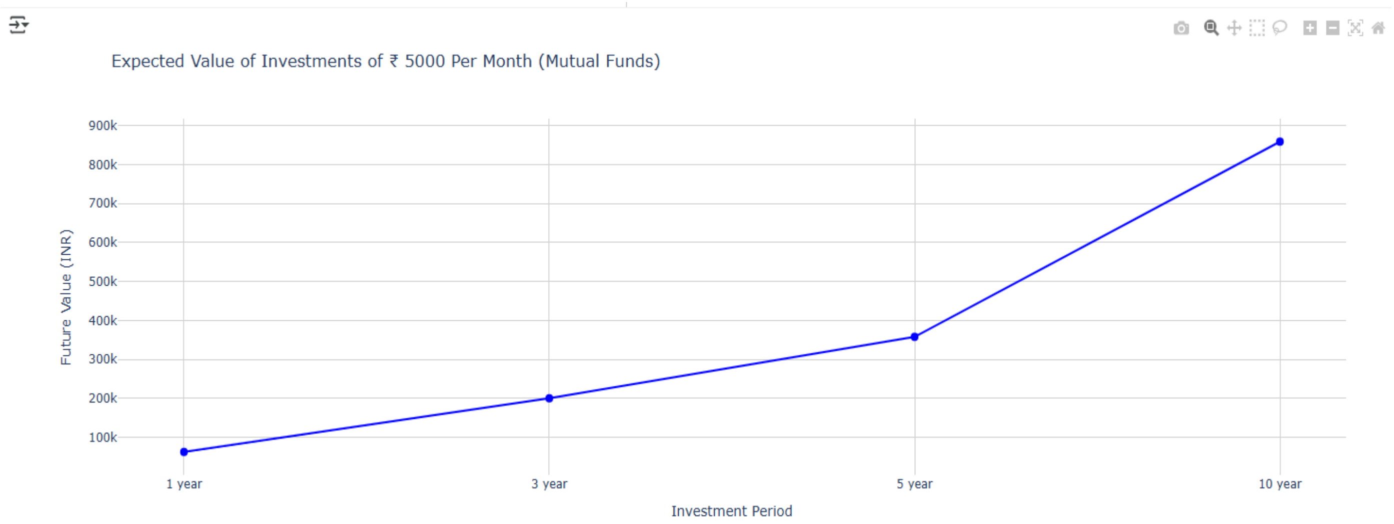
Calculating Expected Returns:

Now, let’s calculate the expected returns a person will get from our mutual fund if he/she invests ₹5000 every month.

To calculate the expected value a person will accumulate over **1 year**, **3 years**, **5 years**, and **10 years** through the mutual fund plan, we can follow these steps:

1. Assume the person is investing **5000 rupees every month**.
2. Use the **expected ROI** from the mutual fund companies to simulate the growth over time.
3. Compute the compounded value of the investments for each period (1y, 3y, 5y, and 10y).
4. Visualize the accumulated value over these periods.

```
import numpy as np

monthly_investment = 5000  # Monthly investment in INR
years = [1, 3, 5, 10]  # Investment periods (in years)
n = 12  # Number of times interest is compounded per year (monthly)

avg_roi = expected_roi_mutual_fund.mean() / 100  # Convert to decimal

def future_value(P, r, n, t):
   return P * (((1 + r/n)**(n*t) - 1) / (r/n)) * (1 + r/n)

future_values = [future_value(monthly_investment, avg_roi, n, t) for t in years]

fig = go.Figure()

fig.add_trace(go.Scatter(
   x=[str(year) + " year" for year in years],
   y=future_values,
   mode='lines+markers',
   line=dict(color='blue'),
   marker=dict(size=8),
   name='Future Value'
))

fig.update_layout(
   title="Expected Value of Investments of ₹ 5000 Per Month (Mutual Funds)",
   xaxis_title="Investment Period",
   yaxis_title="Future Value (INR)",
   xaxis=dict(showgrid=True, gridcolor='lightgrey'),
   yaxis=dict(showgrid=True, gridcolor='lightgrey'),
   template="plotly_white",
   hovermode='x'
)

fig.show()
```



After **1 year**, the accumulated value is around ₹62,000, and by **5 years**, it grows to over ₹300,000. The long-term benefit is evident, with the investment growing to nearly ₹860,000 over **10 years**, which emphasises the value of consistent investing and compounding over time for long-term investors.

Summary:

So, this is how a mutual fund plan is designed by investment companies for long-term investors. Mutual funds are investment plans that pool money from multiple investors to purchase a diversified portfolio of stocks, bonds, and other securities, managed by professional fund managers.