PROJECT-1

Analysis Of Mutual Funds

IME611A

Platform Used - Python
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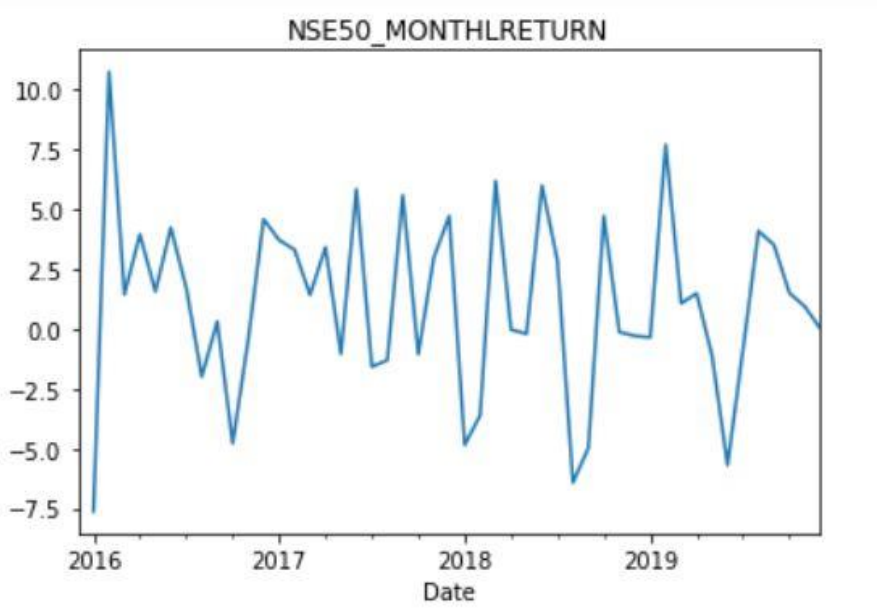
Methodology

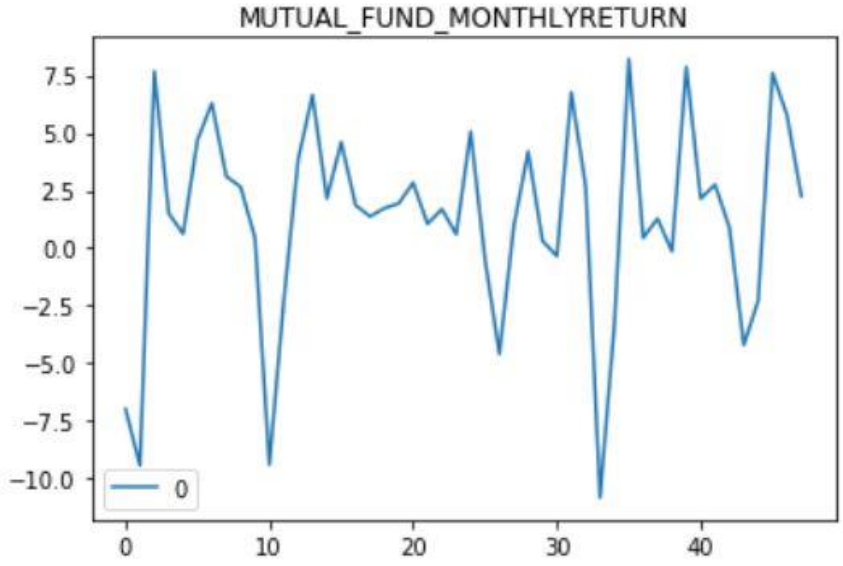
In this project I use python (Jupyter Notebook) programming language for comparing the performance of 3 mutual funds (Canara Robeco Equity Diversified Fund, DSP Equity Fund - Regular Plan, ICICI Prudential Focused Equity Fund - Direct Plan). I extracted 4 year daily data (1-1-2016 to 1-1-2020) of each stocks of mutual funds from yahoo finance. I obtained the min variance portfolio and optimal risky portfolio from a set of 5000 different portfolios. I also calculated coefficients of Fama French Factor Model and jenson's alpha (i.e intercept) by linear regression of mutual fund monthly return data with Risk premium (Rm-Rf),SMB,HML (which I take from IIMA data). I also find the accuracy of our linear regression model. Finally I compare the Mutual Fund with NIFTY50 by plotting their monthly return, their standard deviation, their Beta market and yearly return bar chart.

Comparing Mutual Fund with NIFTY50

1) Canara Robeco Equity Diversified Fund –

- **Monthly Return Graph** between Canara Robeco Fund and NIFTY50 is –





Graph of NSE50 monthly return shows a good fluctuation as compared to Canara Robeco fund except few months where there is a high jump and fall in return(approx.-15%) in Canara Robeco fund. In year 2017 mutual fund return is stagnant there is very small change in return.

- **Beta Market**:

  NIFTY50 Beta ≈ 1 (generally we assume beta of index is equal to1).

  Canara Robeco Beta = 0.66 (From python code)

  This mutual fund beta is less than 1 and a beta of less than 1 means it tends to be less volatile than the market.

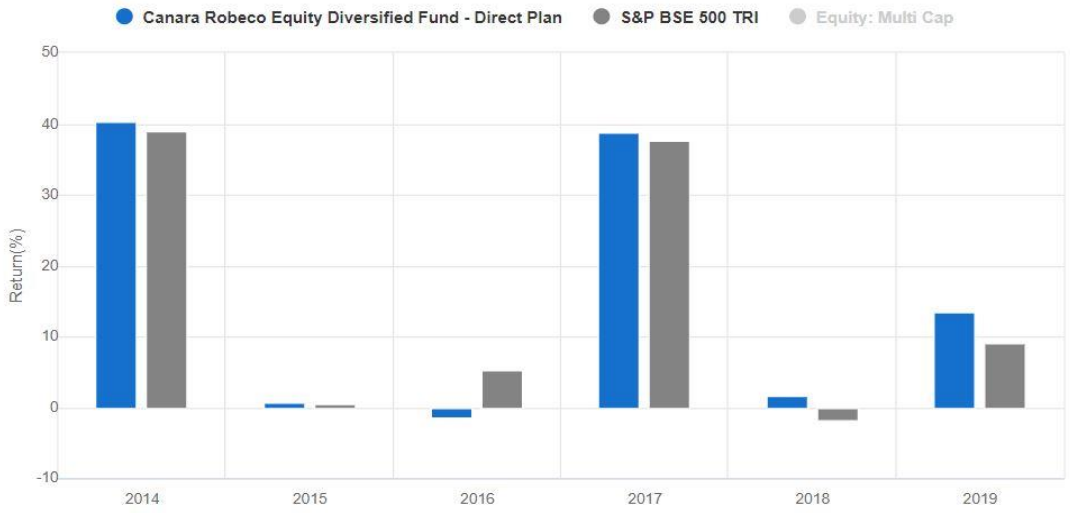
	NIFTY50	Canara Robeco
Beta Market	1	0.66

- **Standard Deviation –**

  This is a logarithmic monthly return standard deviation. Nifty50 is more volatile than Canara Robeco mutual fund.

	NIFTY50	Canara Robeco
STD	0.037951	0.008429

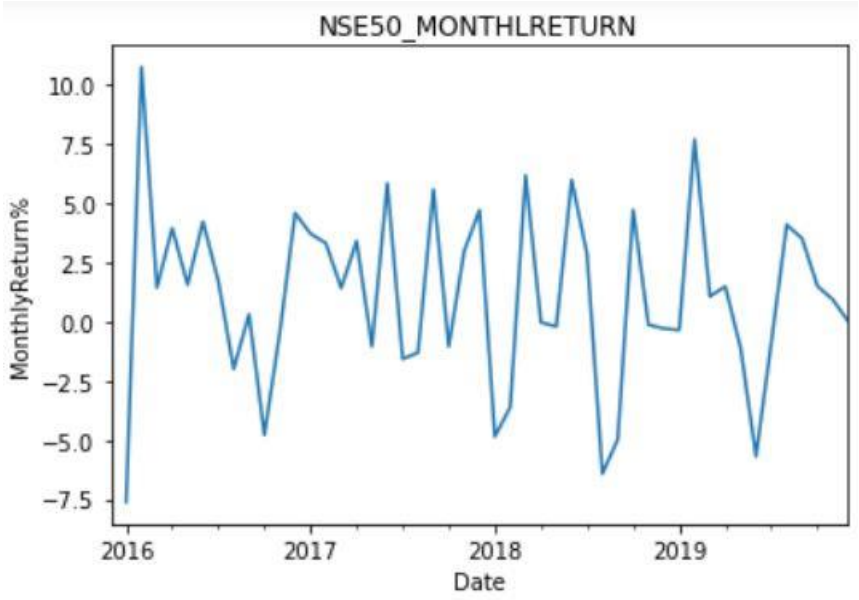
- **Yearly Return Comparision(Bar Chart) –**
  Following bar chart from value research online website showing comparison between mutual fund and S&P BSE500:

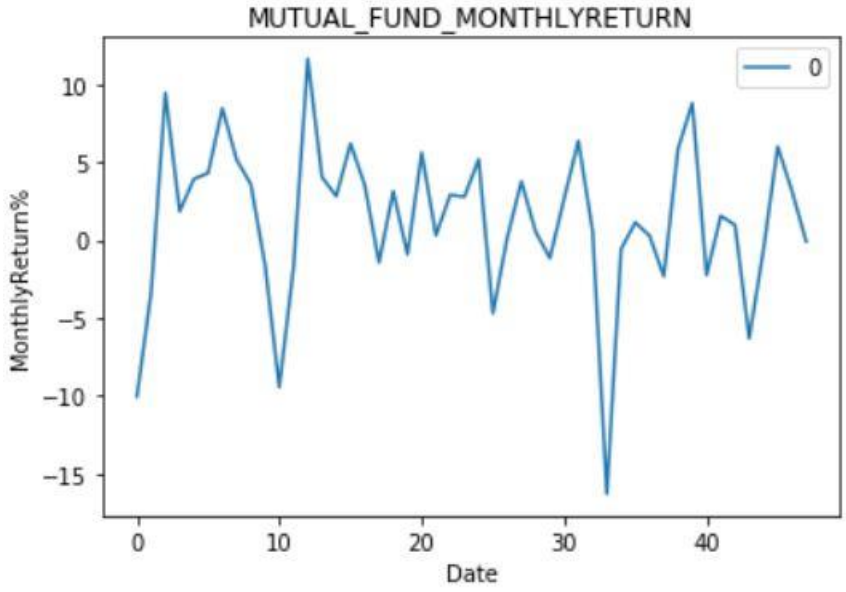


2) DSP Equity Fund Regular Plan Growth –

- **Monthly Return Graph** between DSP Equity Fund and NIFTY50 is –
  From graph we see that graph of monthly return of mutual fund in the year 2017 and 2018 is between -3% to 5%.
  Both the graph shows similar trend as many of the stocks of DSP fund is from nifty50, there is a one

difference that gain or loss in monthly return of NIFTY50 is more as compared to DSP fund.





- **Beta Market**:

  NIFTY50 Beta ≈ 1 (generally we assume beta of index is equal to1).

  DSP Equity Fund Beta = 0.867 (From python code)

This mutual fund beta is less than 1 and a beta of less than 1 means it tends to be less volatile than the market.

	NIFTY50	DSP FUND
Beta Market	1	0.867

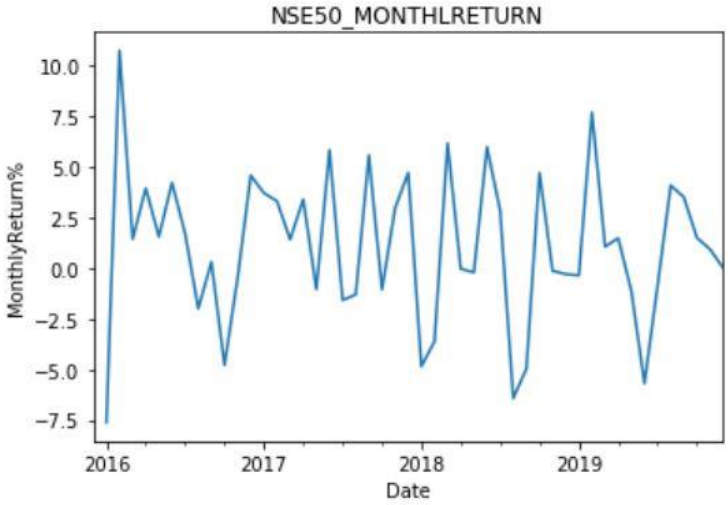
- **Standard Deviation –**
  This is a logarithmic monthly return standard deviation. of Nifty50 is more volatile than DSP Fund .

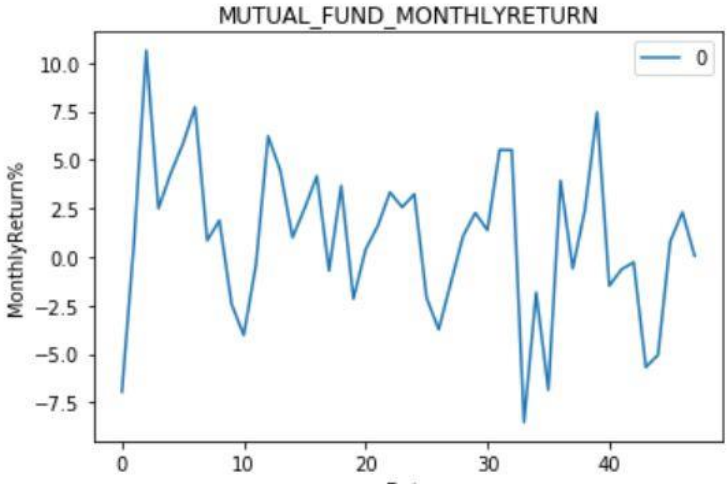
	NIFTY50	DSP FUND
STD	0.037951	0.008963

3) ICICI Prudential Focused Equity Fund –

- **Monthly Return Graph** between ICICI Pru. Fund and NIFTY50 is –
  From graph the monthly expected return over a period of 4 years is always less than 5% except few 3-4 months.

We can also conclude that volatility of fund is less than nifty50 because it fluctuate less as compared to nifty50.





- **Beta Market**:

  NIFTY50 Beta ≈ 1 (generally we assume beta of index is equal to1).

  ICICI Pru. Beta = 0.485 (From python code)

  This mutual fund beta is less than 1 and a beta of less than 1 means it tends to be less volatile than the market.

	NIFTY50	ICICI Pru.
Beta Market	1	0.485

- **Standard Deviation –**

  This is a logarithmic monthly return standard deviation. of Nifty50 is more volatile than ICICI Pru mutual fund.

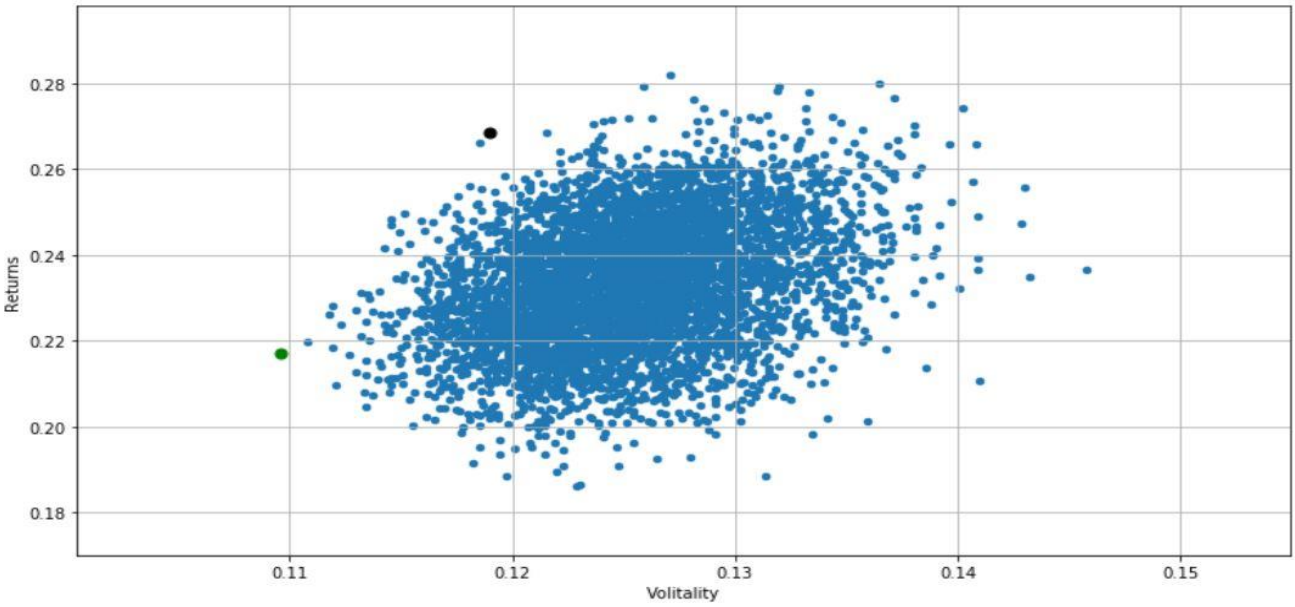
	NIFTY50	ICICI Pru.
STD	0.037951	0.008092

Mean Variance Optimization

Approach:-

First I calculate annual expected return of each stock in the mutual fund (shown in code), then I calculate covariance matrix of the daily data return data (which I later multiply with sqrt(238) to convert it into annual standard deviation because there are approx. 238 trading days in a year) after this I create 5000 different portfolios by randomly giving weights to each asset. I plotted graph between annual expected return vs annual std. of all the portfolios then from these portfolios I point out one having minimum volatility with min. variance portfolio and one having highest reward to risk ratio (i.e. Sharpe Ratio) with optimal risky portfolio. I also plotted capital allocation line (CAL). I compare weights of optimal risky portfolio with mutual funds actual weights.

1.) Canara Robeco Equity Diversified Fund –



- It can be visualize our efficient frontier curve from the graph i.e. curved part from green point to till above max. return point.
- I drop the Dmart stock data (Avenue Supermarkets) from my file as it is newly register in market having approx. 60% data NAN value.
- Green Point in the graph showing the minimum variance portfolio with expected annual return of 21.71% and 10.9% annual volatility. Weights are

shown in python code. One having less volatile is having greater weight.

- Black point in the graph showing the optimal risky p ortfolio i.e. having highest reward to risk ratio (Max. Sharpe Ratio). Ex. Annual return is 26.85% with 11. 90% annual volitality. Weights are shown-

Actual weights & ORP weights of Canara Robeco Mutual Fund –

Sector	% Assets	Weights of optimal risky portfolio
HDFC Bank	6.96	5.77
Reliance Industries	6.56	10.46
ICICI Bank	5.99	0.41
Infosys	4.76	0.11
HDFC	3.75	1.14
Bharti Airtel	3.50	0.08
Hindustan Unilever	2.78	6.8
Divi's Laboratories	2.71	0.74
Tata Consultancy Services	2.52	5.56
Kotak Mahindra Bank	2.32	3.59
Abbott India	2.32	8.62
Axis Bank	2.18	4.98
Atul	2.02	7.16
Asian Paints	1.96	0.66
Avenue Supermarts	1.94	-
Ipca Laboratories	1.89	3.78
Maruti Suzuki India	1.87	0.01
Bajaj Finance	1.75	6.93
Alkem Laboratories	1.75	10.17
Ultratech Cement	1.69	0.7

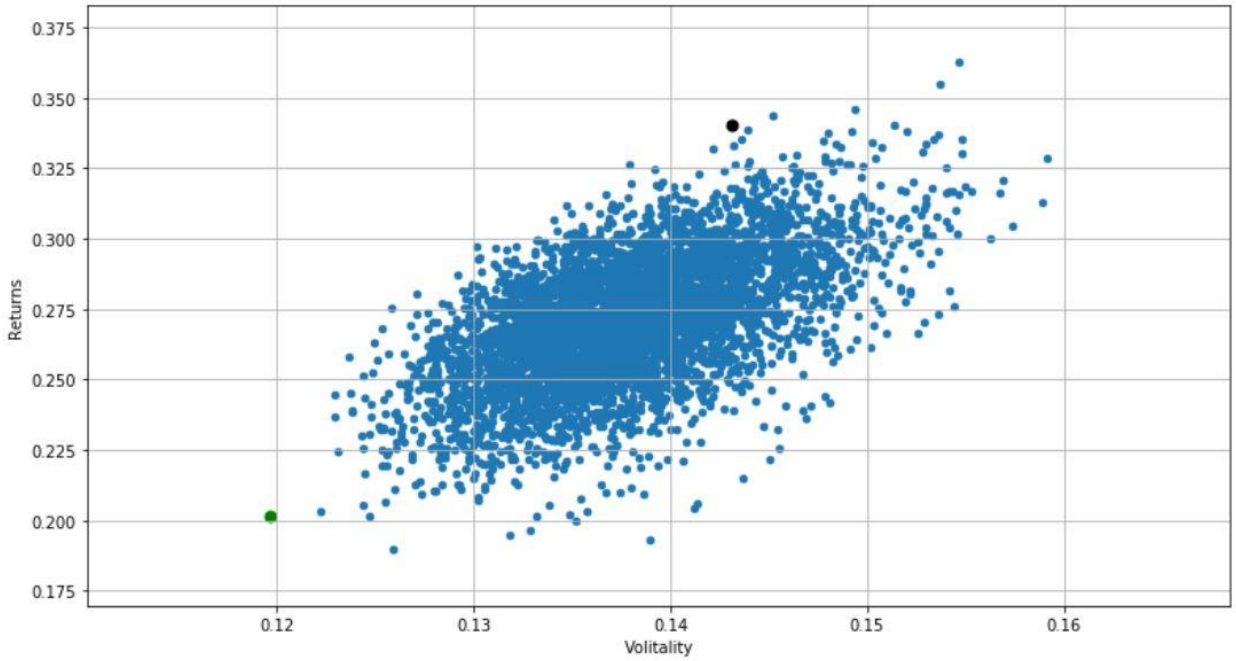
Sector	% Assets	Weights of optimal risky portfolio
Larsen & Toubro	1.63	6.4
Honeywell Automation	1.53	4.1
Britannia Inds.	1.49	2.05
Balkrishna Industries	1.47	8.63
Voltas	1.37	0.79

- Max. Sharpe Ratio = 1.84 (From Code)

- Comparing weights one thing we can notice it that t hose companies like (Hindustan uniliver, TCS, Abbot t India, Atul, IPCA, Alkem , Balkrishna Industries, L&T) are growing very fast in past few year therefore in our optimal portfolio their weights are more as com pared to actual mutual fund weights.

- As our mutual fund is less volatile compared to mar ket that why weights to high std. stocks are less eg. Pharma sector IPCA and Alkem have less weights as compared to optimal risky portfolio.

2.) DSP Equity Fund Regular Plan Growth -



- It can be visualize our efficient frontier curve from the graph i.e. curved part from green point to till above max. return point.
- I drop the ICICI Lombard General Insurance Company Limited, HDFC Life Insurance, DMART stock data (Avenue Supermarkets) from my file as it is newly register in market having approx. 50% data with NAN value.
- Green Point in the graph showing the minimum variance portfolio with expected annual return of 20.16% and 11.96% annual volatility. Weights are shown in python code. One having less volatile is having greater weight.

- Black point in the graph showing the optimal risky portfolio i.e. having highest reward to risk ratio (Max. Sharpe Ratio). Ex. Annual return is 34.01% with 14.31% annual volitality. Weights are shown-

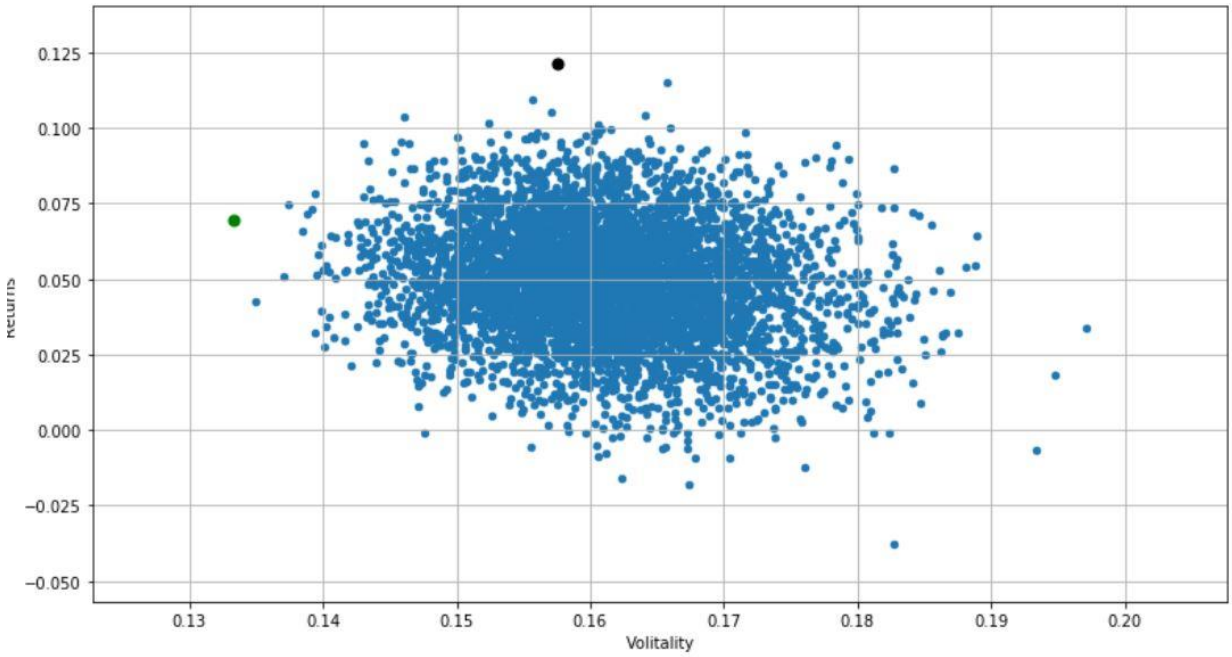
Actual weights & ORP weights of DSP Equity Fund –

Sector	% Assets	Weights Optimal Risky Portfolio
HDFC Bank	6.80	8.80
ICICI Bank	6.15	7.15
Bharti Airtel	5.85	4.81
Ultratech Cement	4.08	0.65
Bajaj Finance	3.70	10.69
Coromandel International	3.10	4.39
Bajaj Finserv	2.52	5.28
Tata Consultancy Services	2.51	2.08
Muthoot Finance	2.35	2.70
Kotak Mahindra Bank	2.35	6.24
Avenue Supermarts	2.28	-
Shree Cement	2.26	3.90
Britannia Inds.	2.25	5.99
Divi's Laboratories	2.09	0.42
Dr. Reddy's Lab	2.07	2.06
V-Mart Retail	1.99	5.75
Godrej Properties	1.86	8.02
Alkem Laboratories	1.79	6.60
Bajaj Auto	1.78	0.90
Axis Bank	1.74	0.62
ICICI Lombard General Insurance Company	1.69	-
Asian Paints	1.69	3.40

Sector	% Assets	Weights Optimal Risky Portfolio
Atul	1.67	0.72
HDFC Life Insurance	1.61	-
Indraprastha Gas	1.49	8.56

- Max. Sharpe Ratio = 2.03 (from code)
- Bajaj Finance and Bajaj Finserv have high weights as compared to actual weight, Their performance is inc reases drastically in the past 1-2 years.
- Indraprastha Gas weights is very high as compared t o actual weights.
- Newly register emerging companies like DMART (Av enue Supermarket), ICICILGCI, HDFC LI are added in actual portfolio of DSP fund later.

3.) ICICI Prudential Focused Equity Fund –



- Green Point in the graph showing the minimum varia nce portfolio with expected annual return of 6.96% a nd 13.33% annual volatility. Weights are shown in pyt hon code.
- Black point in the graph showing the optimal risky por tfolio i.e. having highest reward to risk ratio (Max. Sha rpe Ratio). Ex. Annual return is 12.11% with 15.90% a nnual volatility. Weights are shown-

Actual weights & ORP weights of ICICI Pru. Mutual Fund –

Sector	%Assets	Weight optimal risky porfolio
Sun Pharmaceutical Inds.	9.58	2.46
Bharti Airtel	8.58	2.10
Infosys	8.17	3.72
NTPC	8.10	10.50
Mahindra & Mahindra	6.40	2.90
ITC	6.07	.64
HCL Technologies	5.53	7.25
GAIL	5.38	3.87
Indian Oil Corp.	4.05	6.58
Hindustan Zinc	3.37	11.26
Max Financial Services	3.37	2.65
Gujarat Pipavav Port	3.18	1.07
Wipro	3.18	8.10
Amara Raja Batteries	3.01	3.36
Exide Industries	2.48	6.80
Grasim Industries	2.22	1.62
Tata Steel	2.10	4.5
LIC Housing Fin.	1.79	.85

Sector	%Assets	Weight optimal risky porfolio
Bank of Baroda	1.73	2.70
Vedanta	1.41	10.10
Sun TV Network	1.20	5.8
BHEL	0.79	0.73
Vodafone Idea	0.22	0.25

- Max. Sharpe Ratio = 0.4517
- Mainly consists of government functioned companies (eg. GAIL, IOC, HisdutanZinc, BHEL, NTPC) therefore having less return as compared to other funds.
- Many of the stocks are not included in NIFTY50 currently.

Fama French 3 Factor model

Approach –

First I calculate the monthly return of mutual fund then I apply l inear regression model on my data where independent variable is our risk premium, SMB, HML and dependent variable is our m onthly return of mutual fund. I found coefficient of each factor and intercept which is known as jenson's alpha. I also find resre ssion model score to check the accuracy of our model.

1.) Canara Robeco Equity Diversified Fund –

- Coefficients of fama french factors are:-
  The Coefficient of **SMB** is 0.0064
  The Coefficient of **HML** is -0.1533
  The Coefficient of **Rm-Rf** is 0.6605
- A **negative** coefficient for the HML factor would **indicate** that the excess return is due to the fund's low book-to-market equity value.
- Excess return of portfolio compared to return that is obtained by fama French factor model is jenson's alpha.
  Value of Jenson's Alpha = 1.395

2.) DSP Equity Fund –

- Coefficients of fama french factors are:-

The Coefficient of **SMB** is -0.0906

The Coefficient of **HML** is -0.2113

The Coefficient of **Rm-Rf** is 0.8604

- A **negative** coefficient for the **SMB** factor would **indicate** that the excess return is in part, due to the size of the fund.
- Value of Jenson's Alpha = 1.0834
- Regression Model Score = 57.26%

3) ICICI Prudential Focused Equity Fund -

- Coefficients of fama french factors are:-

The Coefficient of **SMB** is -0.1542

The Coefficient of **HML** is -0.1897

The Coefficient of **Rm-Rf** is 0.4857

- A **negative** coefficient for the **SMB** factor would **indicate** that the excess return is in part, due to the size of the fund.
- Value of Jenson's Alpha = 0.6609
- Regression Model Score = 28.34% (Very low)

Final Note

We can compare our three mutual funds with max. sharpe ratio, returns and volatility at min. variance portfolio, using fama French coefficients and excess return that is obtain by regression i.e. intercept i.e. Jenson's alpha. All these things are shown above in he report. Sharpe ratio also includes unsystematic risk but jenson alpha do not, so it is a good practice to first compare sharpe ratio for performance then comparing excess return i.e. Jenson's alpha.

PDF of Python Code and ipynb file attached with this file.

THE END