Project Name:

Portfolio Analysis of Nifty stocks under multiple scenarios & Sharpe-Ratio comparison for various investors under SIP v/s one-time scheme

Presenter Name:

Kartik Chhabra; 2K20/EMBA/19

12th May'2022
Under the guidance of
Mr. Chandan Sharma

Description

Portfolio Analysis on Nifty stocks

Compare return using Mean-Variance Portfolio technique

DELHI SCHOOL OF MANAGEMENT

Delhi Technological University

Bawana Road, Delhi – 110042

End-Term Project

EMBA 2020-2022 (Major Project)

Executive MBA

Delhi Technological University

(Formerly Delhi College of Engineering)

Bawana Road, Delhi-110042

<u>CANDIDATE DECLARATION</u>

I, Kartik Chhabra 2K20/EMBA/019, Executive MBA student, hereby declare that the project dissertation titled *"Portfolio Analysis of Nifty stocks under multiple scenarios & Sharpe-Ratio comparison for various investors under SIP v/s one-time scheme"*, which is submitted to Delhi School of Management, DTU, Delhi is original and not copied from any source without proper citation. This work has not previously formed the basis for the award of any Degree, Diploma Associateship, Fellowship or other similar title or recognition.

Place: Delhi
Date: 10th May' 2022

Name: Kartik Chhabra

Executive MBA

Delhi Technological University

(Formerly Delhi College of Engineering)

Bawana Road, Delhi-110042

<u>CERTIFICATE</u>

I hereby certify that the Project Dissertation titled *Portfolio Analysis of Nifty stocks under multiple scenarios & Sharpe-Ratio comparison for various investors under SIP v/s one-time scheme"* which is submitted by Kartik Chhabra (2K20/EMBA/019), student of Executive MBA, Delhi Technological University, Delhi in partial fulfillment of the requirement for the award of the degree of Master of Business Administration, is a record of the project work carried out by the student under my supervision. To the best of my knowledge this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere

Place: Delhi
Date: 10th May' 2022

Supervisor Name: Chandan Sharma

Contents

Executive Summary

The purpose of this research paper is to study the importance of Mean Variance portfolio as an investor.

As an investor the goal is to maximize the return while maintaining minimum risk. MVPT helps an investor in achieving the same.

Data from Nifty stocks is gathered from past 5 – 6 years to determine the risk and return characteristics using R software.

Return from each stock is then calculated over 1 year to determine the mean expected return and then make informed decision about stock selection. The return is calculated nder various scenarios, which include one-time investment, systematic investment, and SIP over a certain date.

Return from each scenario is then compared to determine the best strategy which will help investor to increase their portfolio value.

Mean-Variance portfolio technique is then used to determine various investment scenarios and weightage which needs to be put under each stock. Once that is done the same is compared with equal investment strategy to determine the effectiveness of MVPT.

Return is then compared over systematic investment strategy for number of investors based on their stock selection and conclusion is made about effectiveness of building investment strategy.

Chapter 1: Stock History for Nifty50 – Background

Stock index is an index that is used as a reference for stock market. It helps in comparing current market price levels with past prices to calculate market performance. Price of index is calculated by computing the process of selected stock.

There are couple of key indices used in Indian financial market – BSE Sensex and Nifty50. NIFTY 50 is a benchmark index that denotes the weighted average of 50 of the largest Indian companies by market capitalization listed on the National Stock Exchange.

List of Stocks:

Stock	Market Capitalization (in Cr.)
RELIANCE INDUSTRIES LIMITED (XNSE:RELIANCE)	₹ 1,609,460
TATA CONSULTANCY SERVICES LIMITED (XNSE:TCS)	₹ 1,275,008
HDFC BANK LIMITED (XNSE:HDFCBANK)	₹ 825,548
INFOSYS LIMITED (XNSE:INFY)	₹ 708,920
HINDUSTAN UNILEVER LIMITED (XNSE:HINDUNILVR)	₹ 548,653
ICICI BANK LIMITED (XNSE:ICICIBANK)	₹ 501,236
HOUSING DEVELOPMENT FINANCE CORPORATION LIMITED (XNSE:HDFC)	₹ 496,260
Bharti Airtel Limited (XNSE:BHARTIARTL)	₹ 479,653
State Bank of India (XNSE:SBIN)	₹ 419,903
BAJAJ FINANCE LIMITED (XNSE:BAJFINANCE)	₹ 410,157
KOTAK MAHINDRA BANK LIMITED (XNSE:KOTAKBANK)	₹ 390,022
WIPRO LIMITED (XNSE:WIPRO)	₹ 339,539
ASIAN PAINTS LIMITED (XNSE:ASIANPAINT)	₹ 301,415
HCL TECHNOLOGIES LIMITED (XNSE:HCLTECH)	₹ 301,230
ITC LIMITED (XNSE:ITC)	₹ 276,021
Bajaj Finserv Limited (XNSE:BAJAJFINSV)	₹ 265,131
LARSEN AND TOUBRO LIMITED (XNSE:LT)	₹ 249,802
MARUTI SUZUKI INDIA LIMITED (XNSE:MARUTI)	₹ 216,607
ULTRATECH CEMENT LIMITED (XNSE:ULTRACEMCO)	₹ 213,321
TITAN COMPANY LIMITED (XNSE:TITAN)	₹ 203,507
Axis Bank Limited (XNSE:AXISBANK)	₹ 202,972
NESTLE INDIA LIMITED (XNSE:NESTLEIND)	₹ 185,333
OIL AND NATURAL GAS CORPORATION LIMITED (XNSE:ONGC)	₹ 185,056
SUN PHARMACEUTICAL INDUSTRIES LIMITED (XNSE:SUNPHARMA)	₹ 184,101
TATA MOTORS LIMITED (XNSE:TATAMOTORS)	₹ 165,864
JSW Steel Limited (XNSE:JSWSTEEL)	₹ 151,393

TECH MAHINDRA LIMITED (XNSE:TECHM)	₹	148,190
ADANI PORTS AND SPECIAL ECONOMIC ZONE LIMITED (XNSE:ADANIPORTS)	₹	146,424
POWER GRID CORPORATION OF INDIA LIMITED (XNSE:POWERGRID)	₹	140,904
HDFC LIFE INSURANCE COMPANY LIMITED (XNSE:HDFCLIFE)	₹	135,767
TATA STEEL LIMITED (XNSE:TATASTEEL)	₹	133,899
DIVI'S LABORATORIES LIMITED (XNSE:DIVISLAB)	₹	131,083
NTPC LIMITED (XNSE:NTPC)	₹	124,942
INDIAN OIL CORPORATION LIMITED (XNSE:IOC)	₹	113,864
SBI LIFE INSURANCE COMPANY LIMITED (XNSE:SBILIFE)	₹	113,065
GRASIM INDUSTRIES LTD (XNSE:GRASIM)	₹	110,962
MAHINDRA AND MAHINDRA LIMITED (XNSE:M&M)	₹	101,947
BAJAJ AUTO LIMITED. (XNSE:BAJAJ-AUTO)	₹	96,492
COAL INDIA LTD (XNSE:COALINDIA)	₹	96,077
SHREE CEMENT LIMITED (XNSE:SHREECEM)	₹	93,614
HINDALCO INDUSTRIES LIMITED (XNSE:HINDALCO)	₹	93,434
BRITANNIA INDUSTRIES LTD (XNSE:BRITANNIA)	₹	85,636
BHARAT PETROLEUM CORPORATION LIMITED (XNSE:BPCL)	₹	81,491
DR.REDDY'S LABORATORIES LTD (XNSE:DRREDDY)	₹	78,824
CIPLA LIMITED (XNSE:CIPLA)	₹	77,992
TATA CONSUMER PRODUCTS LIMITED (XNSE:TATACONSUM)	₹	70,655
INDUSIND BANK LTD. (XNSE:INDUSINDBK)	₹	69,817
EICHER MOTORS LIMITED (XNSE:EICHERMOT)	₹	66,546
UPL LIMITED (XNSE:UPL)	₹	53,774
Hero MotoCorp Limited (XNSE:HEROMOTOCO)	₹	50,539

Gathering historical data

Financial market is all about finding return on the stock to analyze historical returns on various investments. To perform this analysis we need historical data for the assets.

There are many data providers, some are free most are paid. Here we will use the data from NSE website and pull the same using STOCKHISTORY function in excel. Time period used for analysis is from 1st January 2021 to 31st October 2021. Stock price on 15th November 2021 is used to calculate the return earned on the stock.

1. Download prices (Closing Price)
2. Make investment based on certain rules
3. Calculate return earned using XIRR approach

Once this is done, data is further gathered for selected stocks from 1st January 2022 to 30th April 2022. This is done to study the investment done by each individual and how that investment would have looked different under Sharpe- Ratio portfolio building technique.

Process Methodology

Investment period used is 1st January 2021 – 31st October 2021. It is assumed that an investor is investing 100,000 INR in each of the share on daily basis. Based on closing price, particular number of shares will get allotted to the portfolio of the stock. There are 205 trading days and hence an investor has invested 20,500,000 INR in each of the stock

At end of period, sum of shares is taken to understand how many stocks are being held as of 15th November 2021. Closing price on 15th November is used to calculate the value of overall portfolio.

Attached is how calculation is performed for a sample stock:

Stock	ADANIPORTS	Return	Invested?	# shares	Amount
1/1/2021 ₹	503.9		Y	198.5	-100,000.0
1/4/2021 ₹	498.9	-0.98%	Y	200.4	-100,000.0
1/5/2021 ₹	499.5	0.11%	Y	200.2	-100,000.0
1/6/2021 ₹	496.8	-0.53%	Y	201.3	-100,000.0
1/7/2021 ₹	513.9	3.43%	Y	194.6	-100,000.0
1/8/2021 ₹	517.0	0.61%	Y	193.4	-100,000.0
1/11/2021 ₹	508.4	-1.67%	Y	196.7	-100,000.0

....

Stock	ADANIPORTS	Return	Invested?	# shares	Amount
10/20/2021 ₹	794.9	0.33%	Y	125.8	-100,000.0
10/21/2021 ₹	779.4	-1.96%	Y	128.3	-100,000.0
10/22/2021 ₹	761.8	-2.25%	Y	131.3	-100,000.0
10/25/2021 ₹	752.1	-1.28%	Y	133.0	-100,000.0
10/26/2021 ₹	749.9	-0.29%	Y	133.4	-100,000.0
10/27/2021 ₹	745.9	-0.54%	Y	134.1	-100,000.0
10/28/2021 ₹	688.1	-7.74%	Y	145.3	-100,000.0
10/29/2021 ₹	693.0	0.71%	Y	144.3	-100,000.0
11/15/2021			205.00	30,917.44	23,181,897.9
Amt Invested -->				20,500,000	
Return -->					30.39%

XIRR approach for return calculation:

It is an approach which is used to calculate investment return where there are multiple transaction at different point of time.

Stock	CMP (in Rs.)	SP on 1st Jan	No. of Days	No. of Shares	Amount Invested	Current Value	Return
TATAMOTORS	₹ 505.45	₹ 186.50	205	67,990	20,500,000	34,365,693	189.41%
BAJAJFINSV	₹ 18,130.50	₹ 8,870.45	205	1,787	20,500,000	32,391,730	157.90%
TITAN	₹ 2,539.40	₹ 1,558.60	205	12,587	20,500,000	31,963,737	151.25%
TECHM	₹ 1,579.15	₹ 977.95	205	19,129	20,500,000	30,207,484	124.66%
ONGC	₹ 157.80	₹ 93.20	205	184,779	20,500,000	29,158,129	109.32%
GRASIM	₹ 1,855.85	₹ 933.40	205	15,266	20,500,000	28,330,917	97.53%
SBIN	₹ 506.55	₹ 279.40	205	54,235	20,500,000	27,472,751	85.58%
LT	₹ 1,947.05	₹ 1,297.00	205	14,062	20,500,000	27,380,165	84.31%
BHARTIARTL	₹ 737.55	₹ 515.15	205	36,953	20,500,000	27,254,549	82.59%
BAJFINANCE	₹ 7,534.25	₹ 5,280.15	205	3,610	20,500,000	27,200,469	81.85%
WIPRO	₹ 658.90	₹ 388.10	205	41,263	20,500,000	27,187,909	81.68%
IOC	₹ 132.85	₹ 91.50	205	203,286	20,500,000	27,006,570	79.22%
TATASTEEL	₹ 1,245.45	₹ 643.10	205	21,488	20,500,000	26,762,345	75.92%
HINDALCO	₹ 455.90	₹ 238.35	205	58,152	20,500,000	26,511,331	72.55%
NTPC	₹ 137.15	₹ 99.05	205	189,926	20,500,000	26,048,314	66.40%
INFY	₹ 1,787.15	₹ 1,260.45	205	14,537	20,500,000	25,980,680	65.51%
TATACONSUM	₹ 852.55	₹ 601.50	205	30,443	20,500,000	25,953,939	65.16%
ICICIBANK	₹ 773.30	₹ 527.50	205	33,426	20,500,000	25,848,231	63.78%
RELIANCE	₹ 2,577.80	₹ 1,987.50	205	10,013	20,500,000	25,811,585	63.30%
ULTRACEMCO	₹ 8,050.80	₹ 5,290.80	205	3,165	20,500,000	25,477,266	58.95%
SUNPHARMA	₹ 810.70	₹ 596.25	205	31,411	20,500,000	25,465,041	58.79%
DIVISLAB	₹ 4,907.65	₹ 3,849.05	205	5,088	20,500,000	24,969,155	52.43%
UPL LIMITED	₹ 784.05	₹ 469.30	205	31,693	20,500,000	24,848,748	50.90%
JSWSTEEL	₹ 661.50	₹ 389.70	205	37,477	20,500,000	24,790,843	50.17%
M&M	₹ 928.40	₹ 732.45	205	26,669	20,500,000	24,759,850	49.78%
SBILIFE	₹ 1,159.90	₹ 895.40	205	21,310	20,500,000	24,717,873	49.25%
HDFC	₹ 3,000.85	₹ 2,568.75	205	8,199	20,500,000	24,604,980	47.83%
KOTAKBANK	₹ 2,097.30	₹ 1,994.05	205	11,689	20,500,000	24,515,773	46.71%
HCLTECH	₹ 1,170.85	₹ 950.50	205	20,858	20,500,000	24,422,041	45.54%
ASIANPAINT	₹ 3,168.70	₹ 2,775.55	205	7,617	20,500,000	24,137,464	42.00%
ITC	₹ 238.10	₹ 213.85	205	100,296	20,500,000	23,880,581	38.84%
POWERGRID	₹ 188.30	₹ 142.13	205	126,626	20,500,000	23,843,708	38.39%
NESTLEIND	₹ 19,476.60	₹ 18,450.70	205	1,202	20,500,000	23,401,775	33.03%
COALINDIA	₹ 159.75	₹ 135.35	205	146,394	20,500,000	23,386,409	32.84%
ADANIPORTS	₹ 749.80	₹ 503.85	205	30,917	20,500,000	23,181,898	30.39%
TCS	₹ 3,553.30	₹ 2,928.25	205	6,518	20,500,000	23,158,942	30.11%
CIPLA	₹ 938.15	₹ 826.60	205	24,069	20,500,000	22,580,776	23.29%
SHREECEM	₹ 29,077.20	₹ 23,950.30	205	774	20,500,000	22,519,075	22.57%
MARUTI	₹ 7,503.10	₹ 7,691.30	205	2,996	20,500,000	22,476,999	22.08%
BRITANNIA	₹ 3,742.60	₹ 3,567.80	205	5,936	20,500,000	22,215,217	19.05%
INDUSINDBK	₹ 1,041.50	₹ 900.15	205	21,312	20,500,000	22,196,036	18.83%
HDFCBANK	₹ 1,557.25	₹ 1,425.05	205	14,226	20,500,000	22,154,083	18.35%
HDFCLIFE	₹ 714.60	₹ 678.40	205	30,951	20,500,000	22,117,414	17.93%
HDFCLIFE	₹ 714.60	₹ 678.40	205	30,951	20,500,000	22,117,414	17.93%
EICHERMOT	₹ 2,684.35	₹ 2,542.70	205	8,086	20,500,000	21,705,514	13.25%
HINDUNILVR	₹ 2,424.75	₹ 2,387.55	205	8,894	20,500,000	21,565,539	11.68%
AXISBANK	₹ 733.25	₹ 623.80	205	29,239	20,500,000	21,439,779	10.27%
DRREDDY	₹ 4,873.65	₹ 5,241.35	205	4,379	20,500,000	21,339,926	9.16%
BPCL	₹ 426.35	₹ 381.95	205	48,762	20,500,000	20,789,735	3.12%
BAJAJ-AUTO	₹ 3,601.15	₹ 3,481.25	205	5,569	20,500,000	20,053,184	-4.74%
HEROMOTOCO	₹ 2,693.25	₹ 3,102.65	205	7,274	20,500,000	19,589,419	-9.55%
				Amount Invested -->	1,025,000,000	1,249,141,571	54.58%
				Overall Return -->	22%		

According to the approach of making daily investment in Nifty50 stocks based on an equal weightage criterion, it is seen that an investor would have earned an average XIRR of 54.58% on the investment.

Now in real life, it is not possible for an investor to make daily investments and hence there is an *alternative strategy* which is considered.

The strategy involves making a one-time investment of INR 20,500,000 on 1ˢᵗ January 2021 in each of the stock and holding the security till 15ᵗʰ Nov'2021.

Return is then calculated and compared to understand how this strategy would have compared to daily investment.

It is however observed that 36 stocks out of 50 have given higher return if an investor would have made daily investment than one-time investment.

Stock	CMP (in Rs.)	SP on 1st Jan	No. of Days	No. of Shares	Amount Invested	Current Value	Return
TATAMOTORS	₹ 505.45	₹ 186.50	1	109,920	20,500,000	55,558,847	214.05%
BAJAJFINSV	₹ 18,130.50	₹ 8,870.45	1	2,311	20,500,000	41,900,383	127.17%
GRASIM	₹ 1,855.85	₹ 933.40	1	21,963	20,500,000	40,759,508	120.08%
TATASTEEL	₹ 1,245.45	₹ 643.10	1	31,877	20,500,000	39,701,019	113.54%
HINDALCO	₹ 455.90	₹ 238.35	1	86,008	20,500,000	39,211,034	110.51%
SBIN	₹ 506.55	₹ 279.40	1	73,372	20,500,000	37,166,339	97.96%
WIPRO	₹ 658.90	₹ 388.10	1	52,821	20,500,000	34,804,045	83.59%
JSWSTEEL	₹ 661.50	₹ 389.70	1	52,605	20,500,000	34,797,921	83.55%
ONGC	₹ 157.80	₹ 93.20	1	219,957	20,500,000	34,709,227	83.02%
UPL LIMITED	₹ 784.05	₹ 469.30	1	43,682	20,500,000	34,248,935	80.23%
TITAN	₹ 2,539.40	₹ 1,558.60	1	13,153	20,500,000	33,400,295	75.12%
TECHM	₹ 1,579.15	₹ 977.95	1	20,962	20,500,000	33,102,485	73.33%
ULTRACEMCO	₹ 8,050.80	₹ 5,290.80	1	3,875	20,500,000	31,194,035	61.91%
LT	₹ 1,947.05	₹ 1,297.00	1	15,806	20,500,000	30,774,499	59.41%
ADANIPORTS	₹ 749.80	₹ 503.85	1	40,687	20,500,000	30,506,897	57.82%
ICICIBANK	₹ 773.30	₹ 527.50	1	38,863	20,500,000	30,052,417	55.12%
IOC	₹ 132.85	₹ 91.50	1	224,044	20,500,000	29,764,208	53.42%
BHARTIARTL	₹ 737.55	₹ 515.15	1	39,794	20,500,000	29,350,238	50.97%
BAJFINANCE	₹ 7,534.25	₹ 5,280.15	1	3,882	20,500,000	29,251,465	50.39%
INFY	₹ 1,787.15	₹ 1,260.45	1	16,264	20,500,000	29,066,266	49.30%
TATACONSUM	₹ 852.55	₹ 601.50	1	34,081	20,500,000	29,056,151	49.24%
NTPC	₹ 137.15	₹ 99.05	1	206,966	20,500,000	28,385,411	45.29%
SUNPHARMA	₹ 810.70	₹ 596.25	1	34,382	20,500,000	27,873,124	42.28%
POWERGRID	₹ 188.30	₹ 142.13	1	144,239	20,500,000	27,160,246	38.11%
RELIANCE	₹ 2,577.80	₹ 1,987.50	1	10,314	20,500,000	26,588,629	34.78%
SBILIFE	₹ 1,159.90	₹ 895.40	1	22,895	20,500,000	26,555,673	34.59%
DIVISLAB	₹ 4,907.65	₹ 3,849.05	1	5,326	20,500,000	26,138,093	32.16%
M&M	₹ 928.40	₹ 732.45	1	27,988	20,500,000	25,984,299	31.27%
HCLTECH	₹ 1,170.85	₹ 950.50	1	21,568	20,500,000	25,252,420	27.04%
SHREECEM	₹ 29,077.20	₹ 23,950.30	1	856	20,500,000	24,888,315	24.94%
TCS	₹ 3,553.30	₹ 2,928.25	1	7,001	20,500,000	24,875,830	24.87%
COALINDIA	₹ 159.75	₹ 135.35	1	151,459	20,500,000	24,195,604	20.95%
AXISBANK	₹ 733.25	₹ 623.80	1	32,863	20,500,000	24,096,866	20.39%
HDFC	₹ 3,000.85	₹ 2,568.75	1	7,981	20,500,000	23,948,389	19.54%
INDUSINDBK	₹ 1,041.50	₹ 900.15	1	22,774	20,500,000	23,719,102	18.22%
ASIANPAINT	₹ 3,168.70	₹ 2,775.55	1	7,386	20,500,000	23,403,776	16.42%
CIPLA	₹ 938.15	₹ 826.60	1	24,800	20,500,000	23,266,483	15.64%
BPCL	₹ 426.35	₹ 381.95	1	53,672	20,500,000	22,883,034	13.45%
ITC	₹ 238.10	₹ 213.85	1	95,862	20,500,000	22,824,643	13.12%
HDFCBANK	₹ 1,557.25	₹ 1,425.05	1	14,385	20,500,000	22,401,758	10.72%
EICHERMOT	₹ 2,684.35	₹ 2,542.70	1	8,062	20,500,000	21,642,024	6.42%
NESTLEIND	₹ 19,476.60	₹ 18,450.70	1	1,111	20,500,000	21,639,846	6.41%
NESTLEIND	₹ 19,476.60	₹ 18,450.70	1	1,111	20,500,000	21,639,846	6.41%
HDFCLIFE	₹ 714.60	₹ 678.40	1	30,218	20,500,000	21,593,897	6.15%
KOTAKBANK	₹ 2,097.30	₹ 1,994.05	1	10,281	20,500,000	21,561,470	5.97%
BRITANNIA	₹ 3,742.60	₹ 3,567.80	1	5,746	20,500,000	21,504,372	5.64%
BAJAJ-AUTO	₹ 3,601.15	₹ 3,481.25	1	5,889	20,500,000	21,206,054	3.96%
HINDUNILVR	₹ 2,424.75	₹ 2,387.55	1	8,586	20,500,000	20,819,407	1.79%
MARUTI	₹ 7,503.10	₹ 7,691.30	1	2,665	20,500,000	19,998,381	-2.80%
DRREDDY	₹ 4,873.65	₹ 5,241.35	1	3,911	20,500,000	19,061,850	-8.01%
HEROMOTOCO	₹ 2,693.25	₹ 3,102.65	1	6,607	20,500,000	17,794,990	-14.99%
			Amount Invested -->		1,025,000,000	1,409,640,202	44.88%
					Overall Return -->	38%	

Conclusion

Now, it is seen that both the strategies have given positive return and any strategy could have been chosen.

When 2 strategies are compared it is seen that one-time investment has given the best return at an aggregate level

Strategy	Amount Invested	Portfolio Value	Overall Return	XIRR
One-Time	1,025,000,000	1,409,640,202	37.5%	44.9%
Daily	1,025,000,000	1,249,141,571	21.9%	54.6%

However, when XIRR is calculated strategy with Daily investment has shown much higher return. It thus helps to reach to a conclusion that daily investment is proved to give higher return adjusted for the time. XIRR for these 2 strategies is done using simple average from 50 stocks to get an overall understanding of the return.

Chapter 2: Systematic Investment Planning (SIP)

Now as an investor it is not possible to determine entry points, thus a rationale investor would prefer to make a systematic investment into each of the stock with a specified amount of INR 2,000,000 for each of the next 10 months, starting in January.

The purpose of this research paper is to understand if one investment style is better than the other.

Now SIP is a type of investment where an investor makes an investment on particular day of the month.

For research, there are 6 various scenarios used to determine the return from each of the scenario.

- 1st of every month
- 5th of every month
- 10th of every month
- 15th of every month
- 20th of every month
- 25th of every month

An investor will be purchasing shares of same amount and total number of shares are then accumulated at end of the research period. These number of shares are then used to determine the accumulated value.

#	Stock	CMP (in Rs.)	One-Time Investment SP on 1st Jan	Return	ALL DAYS Return	1st of Month Return	5th of Month Return	10th of Month Return	15th of Month Return	20th of Month Return	25th of Month Return
1	ADANIPORTS	₹ 749.80	₹ 503.85	57.82%	30.39%	22.39%	17.99%	17.59%	15.10%	16.00%	18.79%
2	ASIANPAINT	₹ 3,168.70	₹ 2,775.55	16.42%	42.00%	29.57%	30.62%	27.40%	30.32%	28.61%	34.21%
3	AXISBANK	₹ 733.25	₹ 623.80	20.39%	10.27%	2.89%	-0.20%	0.48%	-3.48%	2.02%	-2.71%
4	BAJAJ-AUTO	₹ 3,601.15	₹ 3,481.25	3.96%	-4.74%	-13.92%	-14.23%	-12.99%	-12.47%	-13.20%	-15.94%
5	BAJAJFINSV	₹ 18,130.50	₹ 8,870.45	127.17%	157.90%	138.36%	142.26%	141.19%	143.74%	150.48%	145.68%
6	BAJFINANCE	₹ 7,534.25	₹ 5,280.15	50.39%	81.85%	64.84%	64.70%	69.99%	69.57%	73.97%	73.57%
7	BHARTIARTL	₹ 737.55	₹ 515.15	50.97%	82.59%	69.93%	68.63%	65.20%	63.39%	69.98%	74.25%
8	BPCL	₹ 426.35	₹ 381.95	13.45%	3.12%	-4.51%	-7.68%	-7.95%	-9.92%	-5.63%	-6.23%
9	BRITANNIA	₹ 3,742.60	₹ 3,567.80	5.64%	19.05%	8.42%	6.55%	6.98%	7.18%	6.75%	9.45%
10	CIPLA	₹ 938.15	₹ 826.60	15.64%	23.29%	12.33%	11.55%	8.63%	11.50%	13.28%	12.38%
11	COALINDIA	₹ 159.75	₹ 135.35	20.95%	32.84%	23.34%	18.91%	17.28%	18.51%	27.27%	25.11%
12	DIVISLAB	₹ 4,907.65	₹ 3,849.05	32.16%	52.43%	40.77%	36.24%	35.46%	39.66%	44.92%	46.96%
13	DRREDDY	₹ 4,873.65	₹ 5,241.35	-8.01%	9.16%	-0.73%	-3.51%	-6.34%	-3.09%	-0.11%	-0.27%
14	EICHERMOT	₹ 2,684.35	₹ 2,542.70	6.42%	13.25%	3.92%	0.44%	-0.80%	1.20%	6.09%	5.57%
15	GRASIM	₹ 1,855.85	₹ 933.40	120.08%	97.53%	85.09%	81.72%	79.42%	80.59%	87.41%	86.45%
16	HCLTECH	₹ 1,170.85	₹ 950.50	27.04%	45.54%	35.97%	32.32%	29.74%	29.34%	34.29%	37.14%
17	HDFC	₹ 3,000.85	₹ 2,568.75	19.54%	47.83%	36.55%	34.32%	31.57%	31.19%	38.26%	37.52%
18	HDFCBANK	₹ 1,557.25	₹ 1,425.05	10.72%	18.35%	8.92%	7.66%	8.19%	5.28%	9.10%	6.36%
19	HDFCLIFE	₹ 714.60	₹ 678.40	6.15%	17.93%	6.98%	5.63%	3.52%	5.61%	8.04%	7.84%
20	HEROMOTOCO	₹ 2,693.25	₹ 3,102.65	-14.99%	-9.55%	-17.88%	-19.73%	-20.23%	-20.77%	-18.49%	-18.97%
21	HINDALCO	₹ 455.90	₹ 238.35	110.51%	72.55%	66.33%	61.16%	56.77%	54.89%	63.15%	63.32%
22	HINDUNILVR	₹ 2,424.75	₹ 2,387.55	1.79%	11.68%	1.47%	-0.08%	-0.65%	0.74%	-1.03%	2.29%
23	ICICIBANK	₹ 773.30	₹ 527.50	55.12%	63.78%	51.45%	50.80%	52.41%	47.79%	58.37%	49.47%
24	INDUSINDBK	₹ 1,041.50	₹ 900.15	18.22%	18.83%	10.21%	8.32%	9.20%	4.98%	10.88%	10.09%
25	INFY	₹ 1,787.15	₹ 1,260.45	49.30%	65.51%	55.45%	52.19%	49.87%	49.59%	52.65%	53.55%
26	IOC	₹ 132.85	₹ 91.50	53.42%	79.22%	66.44%	63.95%	66.88%	62.16%	69.84%	72.50%
27	ITC	₹ 238.10	₹ 213.85	13.12%	38.84%	25.41%	24.47%	28.17%	24.09%	24.93%	28.36%
28	JSWSTEEL	₹ 661.50	₹ 389.70	83.55%	50.17%	44.35%	40.92%	35.60%	33.25%	41.53%	40.70%
29	KOTAKBANK	₹ 2,097.30	₹ 1,994.05	5.97%	46.71%	34.79%	30.03%	29.59%	31.98%	37.03%	37.55%
30	LT	₹ 1,947.05	₹ 1,297.00	59.41%	84.31%	69.27%	67.86%	69.29%	66.62%	75.95%	75.67%
31	M&M	₹ 928.40	₹ 732.45	31.27%	49.78%	39.64%	38.50%	33.96%	32.02%	36.36%	38.49%
32	MARUTI	₹ 7,503.10	₹ 7,691.30	-2.80%	22.08%	11.09%	10.03%	8.00%	10.37%	13.08%	12.52%
33	NESTLEIND	₹ 19,476.60	₹ 18,450.70	6.41%	33.03%	20.62%	19.82%	19.09%	20.45%	21.32%	24.26%
34	NTPC	₹ 137.15	₹ 99.05	45.29%	66.40%	54.22%	51.17%	54.11%	50.22%	53.82%	56.16%
35	ONGC	₹ 157.80	₹ 93.20	83.02%	109.32%	96.23%	88.53%	90.35%	90.44%	101.51%	99.64%
36	POWERGRID	₹ 188.30	₹ 142.13	38.11%	38.39%	29.72%	28.33%	28.28%	22.16%	25.74%	27.16%
37	RELIANCE	₹ 2,577.80	₹ 1,987.50	34.78%	63.30%	50.00%	46.30%	51.99%	49.14%	50.61%	54.06%
38	SBILIFE	₹ 1,159.90	₹ 895.40	34.59%	49.25%	38.09%	35.47%	33.79%	36.94%	42.99%	41.47%
39	SBIN	₹ 506.55	₹ 279.40	97.96%	85.58%	76.16%	69.16%	74.72%	66.66%	77.66%	76.59%
40	SHREECEM	₹ 29,077.20	₹ 23,950.30	24.94%	22.57%	12.29%	8.19%	8.27%	9.15%	14.09%	16.42%
41	SUNPHARMA	₹ 810.70	₹ 596.25	42.28%	58.79%	45.01%	42.16%	41.27%	44.11%	50.99%	51.79%
42	TATACONSUM	₹ 852.55	₹ 601.50	49.24%	65.16%	52.25%	52.08%	51.23%	50.61%	50.78%	55.23%
43	TATAMOTORS	₹ 505.45	₹ 186.50	214.05%	189.41%	186.11%	177.66%	171.91%	150.89%	176.96%	176.55%
44	TATASTEEL	₹ 1,245.45	₹ 643.10	113.54%	75.92%	70.28%	63.66%	62.02%	57.45%	70.44%	68.57%
45	TCS	₹ 3,553.30	₹ 2,928.25	24.87%	30.11%	22.07%	17.35%	17.02%	16.79%	18.84%	18.99%
46	TECHM	₹ 1,579.15	₹ 977.95	73.33%	124.66%	111.75%	109.27%	103.05%	106.69%	111.87%	116.17%
47	TITAN	₹ 2,539.40	₹ 1,558.60	75.12%	151.25%	130.34%	128.25%	129.04%	132.77%	141.51%	147.69%
48	ULTRACEMCO	₹ 8,050.80	₹ 5,290.80	61.91%	58.95%	48.00%	42.37%	43.45%	46.49%	49.45%	50.06%
49	UPL LIMITED	₹ 784.05	₹ 469.30	80.23%	50.90%	43.75%	42.48%	40.95%	34.51%	40.41%	37.32%
50	WIPRO	₹ 658.90	₹ 388.10	83.59%	81.68%	76.59%	72.03%	66.70%	65.68%	68.53%	71.30%
51			AVERAGE	44.9%	52.61%	41.99%	39.23%	38.47%	37.54%	42.42%	42.78%

All the scenarios have given positive return with some scenarios giving higher return than other.

Thus, we have split data into various buckets to understand number of shares which have done better at an overall level.

For comparison purpose, investment return from one time investment of 1st January is taken.

Investment Style	No. of stocks
All Days	36
1st	27
5th	24
10th	23
15th	25
20th	28
25th	28

Now, returns from each of the 50 stocks from above investment style is compared with investment on 1st January to understand which approach would have been better – One time v/s SIP.

There are few stocks where one investment style would have been preferred over the another. But at an aggregate level, it is seen that systematic investment has higher number of stocks with greater return as compared to one-time investment.

For instance, 36 stocks have given higher return while investing daily as compared to one-time investment.

Further, on comparing days on which investment is done it is observed that investment on few days is resulting in less return than the other.

From above table, it is seen that investment on 10th of every month is the day where stocks have performed bad. Whereas investment on 20th & 25th have shown higher chances of getting better return.

Chapter 3: Mean- Variance Portfolio Theory

Modern portfolio theory believes that if investors have all the information they need, they will make *rational investment decisions*. Mean-variance analysis is one aspect of that theory. Investors, it is assumed, prefer little risk and large gain. Investors enter into market with the motive to maximize the return while avoiding unnecessary risk.

The **variance** and **expected return** are the two basic components of mean-variance analysis.

A number that reflects how diverse or spread out the numbers in a set is called **variance**. Variance, for example, might reveal how evenly distributed a security's returns are on a daily or weekly basis.

The **expected return** is a probability that expresses the expected return on a security investment. If two securities have the same expected return but one has a smaller variance, the lower variance security is the superior choice.

Similarly, if two securities have nearly identical variance, the one with the larger return is the superior choice.

In current portfolio theory, an investor would select various securities with varying amounts of variance and expected return to invest in. This method aims to differentiate assets, lowering the danger of catastrophic loss in the event of quickly changing market conditions.

Diversification can be achieved by investing in securities with different variances and projected returns. A portfolio with proper diversity is one in which a loss in one security is offset by a gain in another.

Investing Strategies:

Every investor's goal when developing an investment plan is to build a portfolio of stocks that provide the best long-term returns while avoiding excessive risk.

The assumption behind modern portfolio theory, which incorporates mean-variance analysis, is that investors are risk averse. As a result, they concentrate on constructing a portfolio that maximises projected return while minimising risk.

High-return equities come with risk, which investors are aware of. Diversifying the investing portfolio is one way to reduce risk.

Expected Return

Portfolio with maximum efficiency

Rf

Standard Deviation
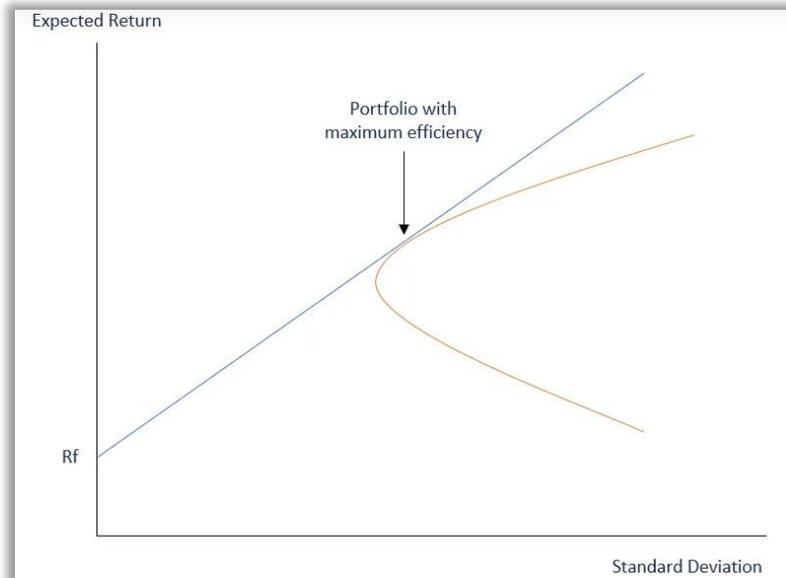
Summary:

• A method used by investors to weigh investment decisions is mean-variance analysis.

• The study aids investors in determining the highest reward for a given level of risk, as well as the lowest risk for a given level of return.

• The variance indicates how far a security's daily or weekly returns are spread out.

• An expected return is a probability that expresses the expected return on a security investment.

• If two securities have the same expected return but one has a smaller variance, choose the one with the lower variance.

• Similarly, if two securities have nearly identical variance, the one with the larger return is preferred.

Efficient Frontier:

An efficient frontier is a set of investment portfolios that are predicted to offer the best returns at a given risk level. If there is no comparable portfolio that gives higher returns for a lower or similar degree of risk, it is said to be efficient. The location of portfolios on the efficient frontier is determined by the risk tolerance of the investor

A curving line represents the efficient frontier. It's because every increase in risk leads to a lower gain in returns. In other words, the marginal return to risk is diminishing, resulting in a curve.
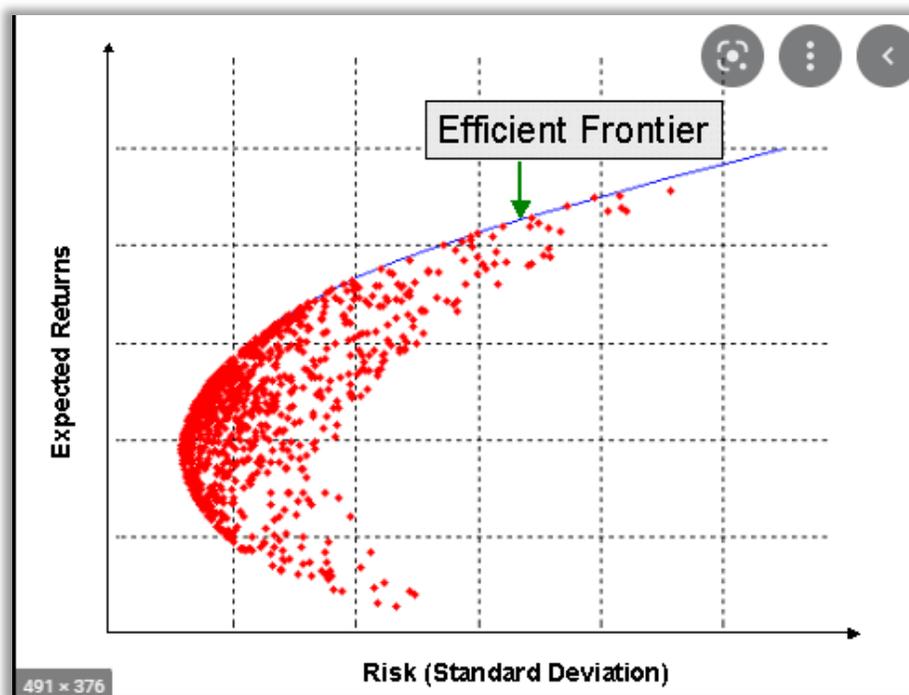
The expected returns of a portfolio and the standard deviation of returns are plotted to depict it. The portfolio's predicted returns are represented on the y-axis. The standard deviation of returns, which is a measure of risk, is labelled on the x-axis.

The portfolio's predicted returns and standard deviation of returns are then put onto the graph. The efficient frontier is used to compare the portfolio. If a portfolio is plotted on the right side of the chart, it implies that the portfolio is at a higher risk level. The portfolio offers minimal returns if it is plotted low on the graph.

The efficient frontier is the cornerstone of current portfolio theory, which describes how investors attempt to construct a portfolio that maximises expected returns given a certain degree of risk. It assists investors in better understanding the risks and returns

in their portfolios, as well as comparing them to the most efficient set of portfolios. Understanding the level of risk associated with each portfolio allows investors to adjust their investing strategy accordingly.

It's worth noting that no single efficient frontier exists for everyone. Each one is unique to each investor because it is based on a variety of parameters, including the quantity of assets in the portfolio, the assets' industry, and the investor's risk tolerance.

Return comparison/ conclusion:

Investment Style	XIRR
One-Time	44.9%
All Days	52.6%
1st	42.0%
5th	39.2%
10th	38.5%
15th	37.5%
20th	42.4%
25th	42.8%

If an investor do systematic investment on 25th of every month then return earned is around 42.8% based on selected time-period.

Whereas if an investor would have made an investment on 15th of every month, then return would have been 37.5% only.

Chapter 4: SITUATION: Real-Life Scenario

An investor now has an interest to increase their wealth by investing in equity market. There is an interest to invest in 5 stocks based on 1st January 2022 share price and understand its return after 4 months' timeframe.

There is a technique which exits in market known as ***Mean-Variance Portfolio Theory*** which helps in deriving efficient frontier.

Mean-variance analysis is the process where weightage is provided to the risk, expressed as variance, against expected return. Investors use mean-variance analysis to make decision of making an investment. Idea of MPT is to help investors weigh how much risk they are willing to take on in exchange for different levels of reward. Mean-variance analysis facilitates investors to find the *biggest reward at a given level of risk* or the *least risk at a given level of return*.
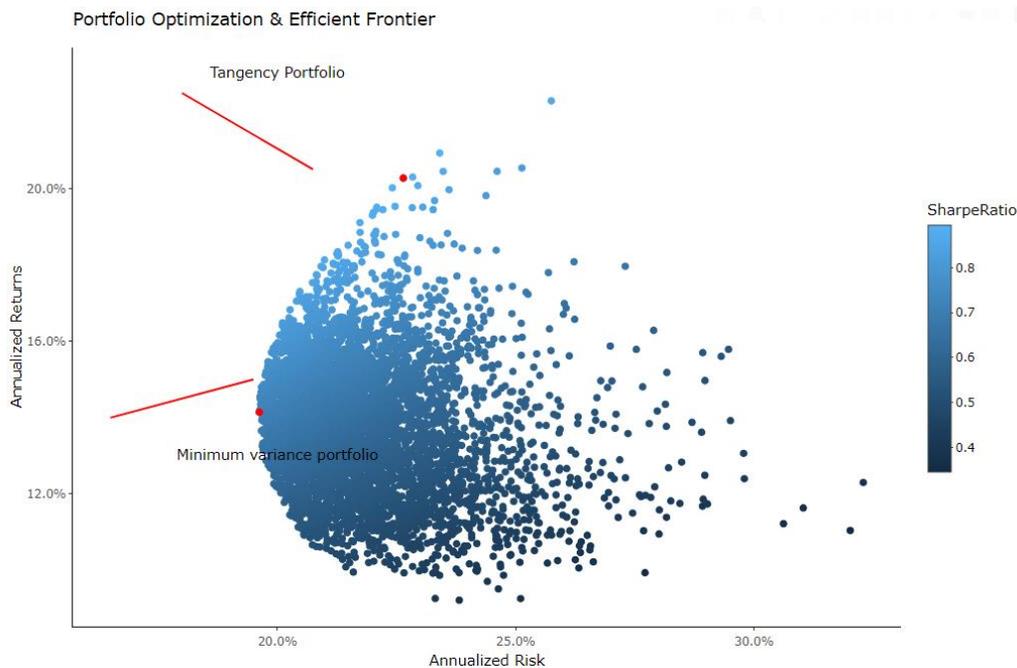
Building Real-Life Scenario

Methodology: 5 of the students were provided with mean return and risk for all 50 stocks, by collecting data from 2015-2021.

Below is list of shares selected by each of the individuals:

Anil K. Dhabade	Nitesh Kumar	Harsha Tyagi	Rohit Ranjan	Shashank Singhal
Bharti Airtel	Adani Ports	Grasim	Britannia	Asian Paint
LT	Bajaj Fin Service	Sun Pharma	Coal India	Hindalco
NTPC	Tata Consumer	Tata Motors	Kotak Bank	M&M
Tata Motors	Techm	TCS	ONGC	SBI
UPL	Wipro	Titan	Reliance	Tata Motors

Stock	Mean Monthly Return
Adani Ports	0.00049
Asian Paint	0.00090
Bajaj Fin Service	0.00147
Bharti Airtel	
Britannia	0.00084
Coal India	-0.00022
Grasim	0.00066
Hindalco	0.00063
Kotak Bank	0.00060
LT	0.00044
M&M	0.00021
NTPC	0.00021
ONGC	-0.00011
Reliance	0.00100
SBI	
Sun Pharma	0.00024
Tata Consumer	0.00003
Tata Motors	0.00097
TCS	-0.00003
Techm	0.00069
Titan	0.00110
UPL	0.00073
Wipro	0.00074

As an investor, they choose to distribute equal amount in each of the shares on a particular date.

For study purpose, t is assumed that each investor is investing 3,000,000 INR either as one-time investment or make equal investment of 1,000,000 INR in each of the next 3 months. The portfolio value is then compared at end of April value to understand the wealth generated by making the investment.

Alternatively, based on MVPT theory weightage is provided on each of these shares and invested in the similar manner.

Based on the stock selection 5000 scenarios will be provided capturing portfolio risk/ return and weightage in each stock.

Investor has option to select any of the weightage portfolio based on their risk-appetite. Study is then performed about how portfolio performs 4 months from the start of their stock selection.

For study purpose only tangency portfolio is considered and compared under various alternatives.

Investment for each of the individual are performed under 14 scenarios each as follows, under equal distribution v/s MVT technique (tangency portfolio scenario – 1 out of 5000).

Scenarios (with equal weightage & Tangency Portfolio weightage):

- Scenario 1: One- time investment on 3rd Jan'2022
- Scenario 2: SIP on 1st of each month
- Scenario 3: SIP on 5th of each month
- Scenario 4: SIP on 10th of each month
- Scenario 5: SIP on 15th of each month
- Scenario 6: SIP on 20th of each month
- Scenario 7: SIP on 25th of each month

Chapter 5: Case Study Results:

Harsha

Shares selected by Harsha are as below.

Harsha Tyagi
Grasim
Sun Pharma
Tata Motors
TCS
Titan

Each of these shares were invested in 14 scenarios.
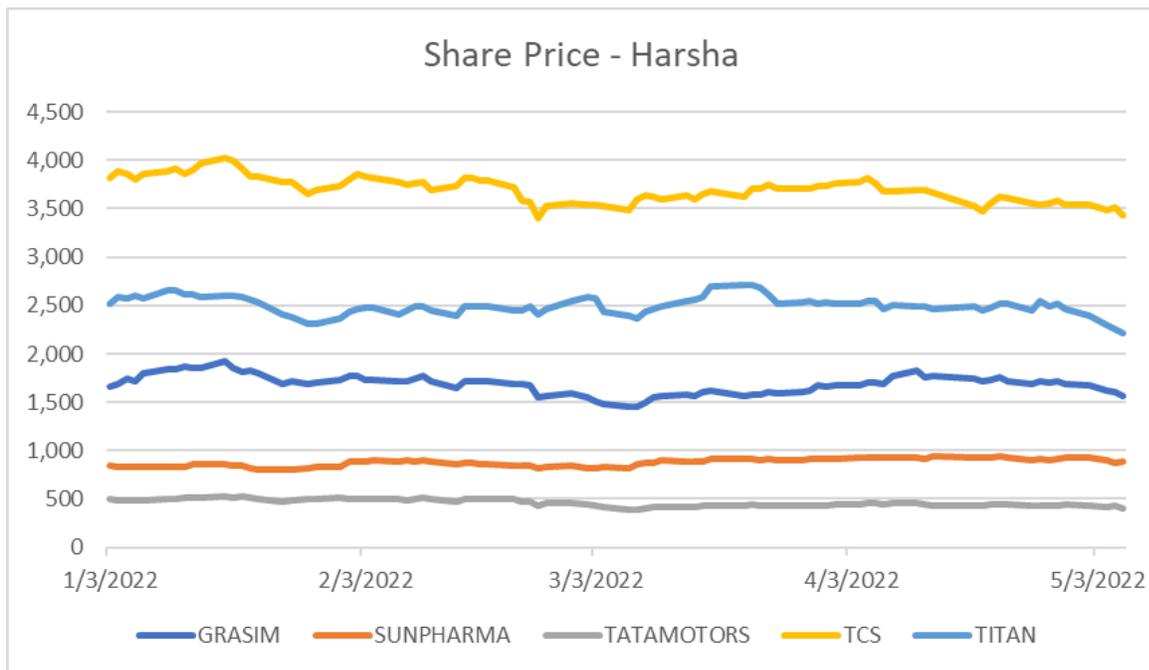
R code was run to determine weightage under each of the scenarios, where return/risk/ sharpe ratio were pulled as follows:

Scenario	GRASIM	SUNPHARMA	TATAMOTORS	TCS	TITAN	Return	Risk	SharpeRatio
1	0.083034	0.247475	0.272789	0.330260	0.066442	0.095063	0.222719	0.426827
2	0.247705	0.336693	0.242594	0.067176	0.105832	0.087393	0.241309	0.362160
3	0.187115	0.307672	0.164993	0.058811	0.281408	0.128761	0.228612	0.563229
4	0.192199	0.338246	0.055873	0.170908	0.242775	0.141166	0.208148	0.678200
5	0.261781	0.255985	0.144165	0.099173	0.238896	0.137331	0.221680	0.619502
6	0.263488	0.190695	0.157534	0.142271	0.246011	0.147891	0.219009	0.675274
7	0.286256	0.347764	0.074395	0.073601	0.217983	0.131674	0.221900	0.593391
8	0.066210	0.292390	0.271620	0.194521	0.175259	0.099180	0.229609	0.431951
9	0.003559	0.200940	0.192521	0.459083	0.143898	0.129628	0.206223	0.628580
10	0.242087	0.245951	0.241106	0.117510	0.153346	0.109788	0.232369	0.472472
11	0.157678	0.142786	0.231399	0.264402	0.203735	0.137874	0.217887	0.632777

	GRASIM	SUNPHARMA	TATAMOTORS	TCS	TITAN	Return	Risk	SharpeRatio
4992	0.184644	0.110782	0.334440	0.330657	0.039477	0.103936	0.237996	0.436714
4993	0.229672	0.068982	0.223929	0.135289	0.342129	0.169086	0.236127	0.716079
4994	0.257385	0.030645	0.251967	0.245654	0.214349	0.155379	0.230625	0.673730
4995	0.306059	0.080212	0.019156	0.387819	0.206754	0.194303	0.196656	0.988035
4996	0.009307	0.131987	0.414821	0.020480	0.423405	0.128397	0.285977	0.448976
4997	0.230067	0.143757	0.128142	0.293643	0.204391	0.158745	0.203073	0.781716
4998	0.184710	0.261860	0.149818	0.096832	0.306780	0.143612	0.222495	0.645462
4999	0.268912	0.233406	0.134478	0.291086	0.072117	0.124591	0.206560	0.603172
5000	0.282516	0.253023	0.055444	0.249082	0.159935	0.147195	0.201336	0.731094
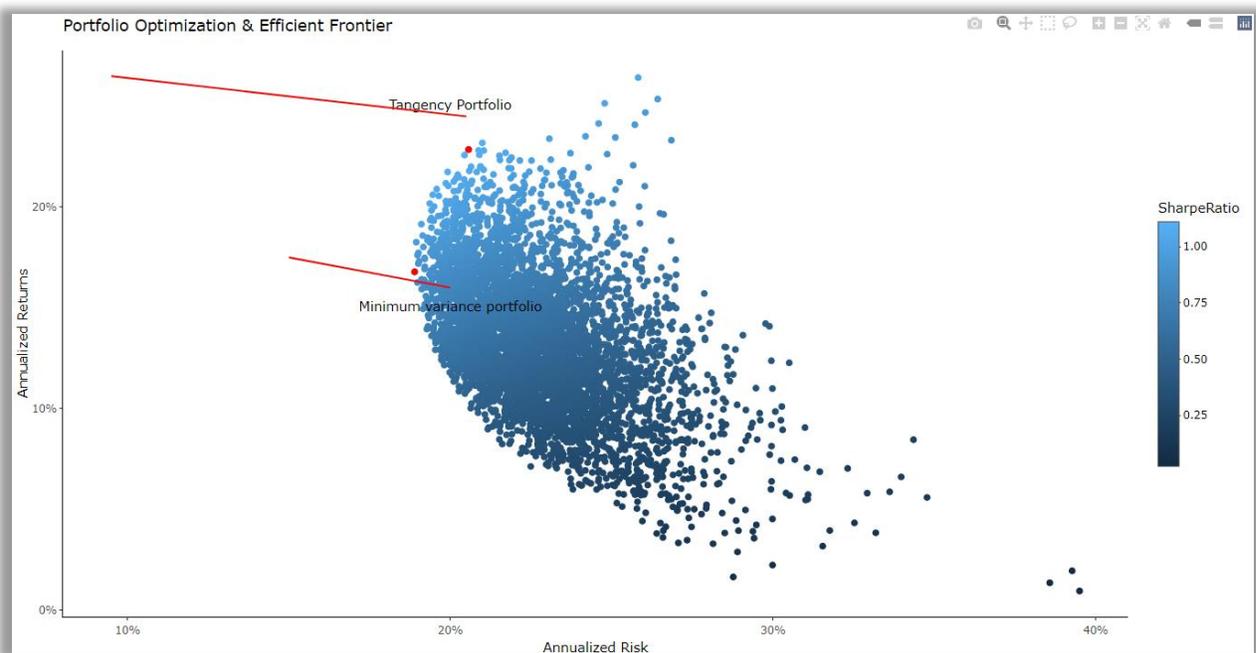
Portfolio Optimization & Efficient Frontier

Based on these scenarios' investment was done only in the tangency portfolio. Below is the weightage under 2 different selected options:

Share	MVPT weightage	Equal weightage	Minimum Variance weightage
GRASIM	0.275	0.200	0.110
SUNPHARMA	0.010	0.200	0.230
TATAMOTORS	0.002	0.200	0.020
TCS	0.334	0.200	0.465

TITAN	0.379	0.200	0.174

	MVPT	Min Var
Return	0.2337	0.1626
Risk	0.2093	0.1895
SharpeRatio	1.1168	0.8578

Below is comparison of Investment value of 3,000,000 made on 3rd January as of 29th April:

Share	MVPT value	Equal weightage value	Min. Var value
GRASIM	840,512	611,086	337,194
SUNPHARMA	33,297	656,328	756,099
TATAMOTORS	5,772	527,653	52,844
TCS	930,642	557,402	1,296,240
TITAN	1,106,420	584,393	508,736
TOTAL	2,916,643	2,936,861	2,951,113

Conclusion:

TataMotors has given lowest value when invested via equal weightage method and SunPharma has given highest value.

MVPT suggested low weightage on TataMotors based on its risk characteristics. It is seen that MVPT has helped to mitigate the low value in and hence portfolio value is covered from the high risk in the share due to low investment in TataMotors.

SunPharma is top performer, however due to MVPT's low weightage total value through MVPT is lower than equal weightage methodology

In addition, on tangency portfolio there is analysis don to capture portfolio value using percentile method.

PERCENTILE	PORTFOLIO VALUE
50%	2,936,599
75%	2,977,376
80%	2,988,761
85%	3,000,775
90%	3,017,381
95%	3,040,354

It is seen that half of the portfolios out of 5,000 would have given portfolio value of over INR 2.94 million which is equivalent to equal weightage method.

MVPT technique has shown high probability of having higher value in most of the scenarios, making this technique a useful technique in portfolio selection process.

As part of next exercise, investment is done on regular basis under 6 different scenarios to understand how MVPT would have looked and if any date is better than other date.

Scenario #	Scenario description	MVPT value	Equal weightage value	Difference
Scenario 2	First day of every month	2,970,675	2,949,111	-21,564
Scenario 3	5th of every month	3,017,228	2,971,207	-46,021
Scenario 4	10th of every month	2,942,239	2,902,049	-40,189
Scenario 5	15th of every month	2,918,395	2,880,264	-38,131
Scenario 6	20th of every month	2,946,876	2,905,467	-41,410
Scenario 7	25th of every month	3,037,388	3,007,189	-30,199

It is observed that single scenario of MVPT (tangency portfolio out of 5,000 scenario) has given comparatively **lower** return due to low weightage in SunPharma. But if selected properly we have observed that more than half of the scenarios have given better return than equal weightage scenario.

Additionally, we do observe portfolio value to be highest if invested on 25th of each month, followed by 5th of each month. Investment done on 15th of each month has led to the lowest portfolio value, followed by 10th of each month.

It helps to conclude that after individual gets their salary credited and making monthly expenses they plan their SIP leading to higher demand of shares pushing the price up and they end up making purchase at higher price.

Next, we are going to investigate other 4 investments to make the conclusion.

Anil

Shares selected by Anil are as below.

| Anil K. Dhabade |
| --- |
| BHARTIARTL |
| LT |
| NTPC |
| TATAMOTORS |
| UPL |

Each of these shares were invested in 14 scenarios.
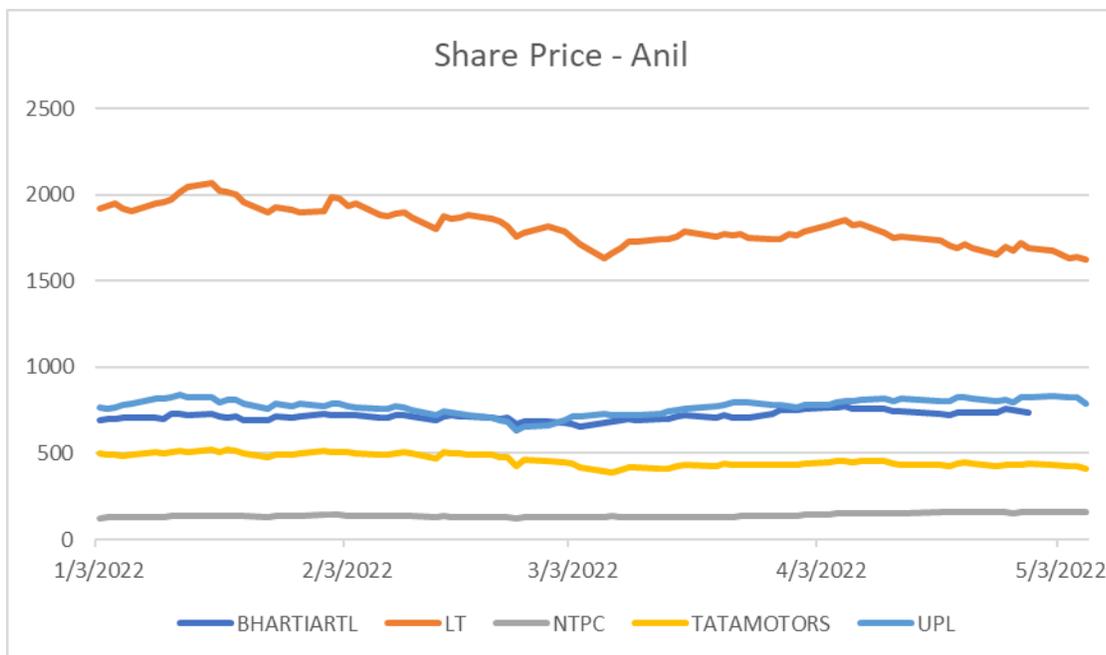
R code was run to determine weightage under each of the scenarios, where return/risk/ sharpe ratio were pulled as follows:

Scenario	BHARTIARTL	LT	NTPC	TATAMOTORS	UPL	Return	Risk	SharpeRa
1	0.187193	0.388302	0.019722	0.154248	0.250535	0.11555	0.24037	0.48070
2	0.275398	0.026230	0.204218	0.299391	0.194763	0.08070	0.25034	0.32235
3	0.004797	0.410418	0.044647	0.294298	0.245839	0.09569	0.26857	0.35630
4	0.188646	0.082579	0.265683	0.091420	0.371672	0.11799	0.23292	0.50658
5	0.387684	0.084939	0.043723	0.111033	0.372621	0.12941	0.24884	0.52005
6	0.292507	0.040600	0.165090	0.370162	0.131640	0.06919	0.26391	0.26217
7	0.084731	0.042606	0.436470	0.384422	0.051772	0.04518	0.26516	0.17040
8	0.199648	0.065761	0.562539	0.079343	0.092709	0.07858	0.21840	0.35979
9	0.237143	0.218672	0.150711	0.269862	0.123612	0.08218	0.24113	0.34081
10	0.417348	0.056578	0.400215	0.068897	0.056962	0.08679	0.22242	0.39021
11	0.344014	0.008541	0.124196	0.308829	0.214420	0.08590	0.25882	0.33188

4990	0.201014	0.155841	0.287379	0.017474	0.338292	0.12358	0.22295	0.55428
4991	0.101003	0.200289	0.259364	0.234949	0.204396	0.08649	0.23706	0.36485
4992	0.081623	0.217487	0.550893	0.132681	0.017316	0.06684	0.22356	0.29897
4993	0.151953	0.290368	0.073265	0.388112	0.096303	0.06998	0.27012	0.25906
4994	0.210107	0.103764	0.247697	0.416349	0.022083	0.05009	0.26939	0.18595
4995	0.247113	0.310343	0.152453	0.068062	0.222029	0.11598	0.22030	0.52645
4996	0.077705	0.196961	0.429547	0.286749	0.009038	0.05437	0.24337	0.22339
4997	0.031525	0.393213	0.056170	0.093668	0.425424	0.13581	0.25657	0.52933
4998	0.282284	0.352689	0.348040	0.013468	0.003519	0.09307	0.21099	0.44108
4999	0.013134	0.363482	0.393462	0.039854	0.190069	0.10216	0.22085	0.46257
5000	0.192860	0.152221	0.243937	0.203731	0.207251	0.09154	0.23050	0.39711
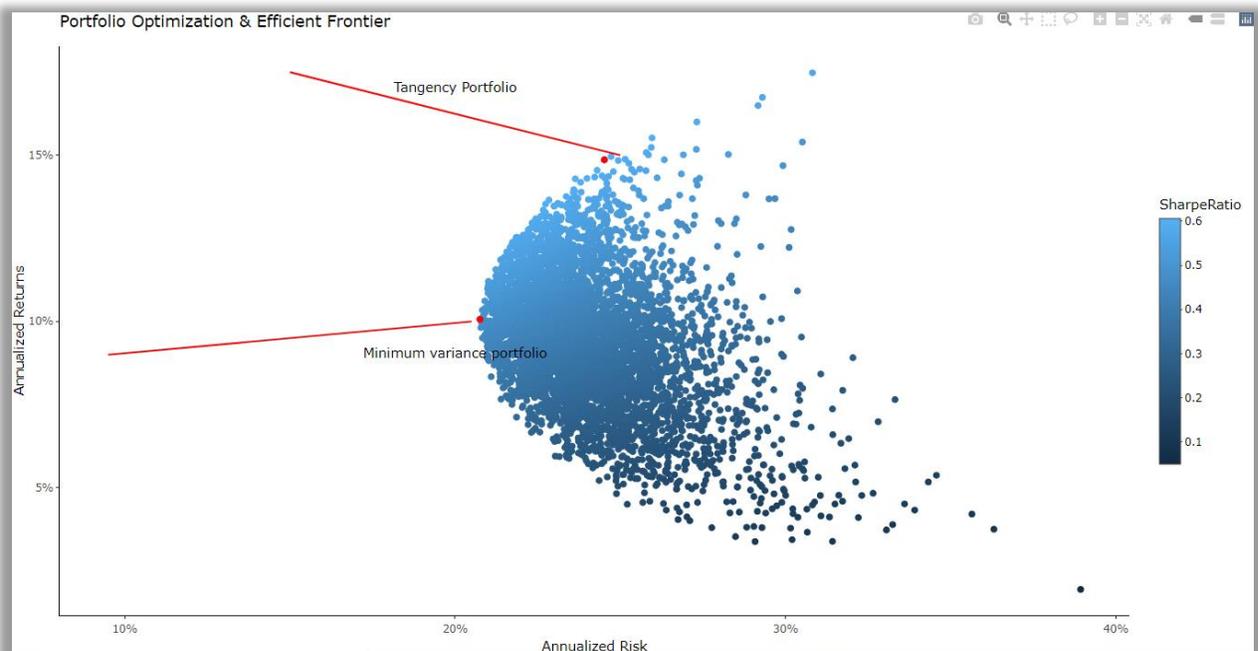
Based on these scenarios' investment was done only in the tangency portfolio. Below is the weightage under 2 different selected options:

Share	MVPT weightage	Equal weightage	Min. Var weightage
BHARTIARTL	0.318	0.200	0.219
LT	0.190	0.200	0.264
NTPC	0.018	0.200	0.384
TATAMOTORS	0.002	0.200	0.022
UPL	0.472	0.200	0.111

	MVPT	Min. Var
Return	0.1541	0.0984
Risk	0.2528	**0.2078**
SharpeRatio	**0.6095**	0.4738

Below is comparison of Investment value of 3,000,000 made on 3rd January as of 29th April:

Share	MVPT value	Equal weightage value	Min. Var. value
BHARTIARTL	1,018,874	641,400	701,415
LT	501,793	528,700	697,101
NTPC	68,598	743,810	1,429,246
TATAMOTORS	5,168	527,653	57,765
UPL	1,524,997	646,087	359,816
TOTAL	3,119,430	3,087,650	3,245,343

Conclusion:

TataMotors has given lowest value when invested via equal weightage method and NTPC has given highest value.

MVPT suggested low weightage on TataMotors based on its risk characteristics. It is seen that MVPT has helped to mitigate the low value in and hence portfolio value is covered from the high risk in the share due to low investment in TataMotors.

NTPC is top performer, however due to MVPT's low weightage total value through MVPT is not as high as could have been than equal weightage methodology.

UPL & Bharti Airtel have shown high value as well and there were higher allocation made in these 2 equity calsses

In addition, on tangency portfolio there is analysis done to capture portfolio value using percentile method.

PERCENTILE	PORTFOLIO VALUE
50%	3,082,919
75%	3,159,327
80%	3,178,073
85%	3,200,661
90%	3,228,585
95%	3,279,970

It is seen that half of the portfolios out of 5,000 would have given portfolio value of over INR 3.08 million which is equivalent to equal weightage method.

MVPT technique has shown high probability of having higher value in most of the scenarios, making this technique a useful technique in portfolio selection process.

As part of next exercise, investment is done on regular basis under 6 different scenarios to understand how MVPT would have looked and if any date is better than other date.

Scenario #	Scenario description	MVPT value	Equal weightage value	Difference
Scenario 2	First day of every month	3,158,802	3,090,277	68,525
Scenario 3	5th of every month	3,133,063	3,122,195	10,869
Scenario 4	10th of every month	3,097,497	3,070,409	27,088
Scenario 5	15th of every month	3,084,126	3,052,014	32,112
Scenario 6	20th of every month	3,109,743	3,071,409	38,334
Scenario 7	25th of every month	3,174,652	3,130,053	44,599

It is observed that single scenario of MVPT (tangency portfolio out of 5,000 scenario) has given comparatively **higher** return due to low weightage in TataMotors. But if selected properly we have observed that more than half of the scenarios have given better return than equal weightage scenario.

Additionally, we do observe portfolio value to be highest if invested on 25th of each month, followed by 5th of each month. Investment done on 15th of each month has led to the lowest portfolio value, followed by 10th of each month.

It helps to conclude that after individual gets their salary credited and making monthly expenses, they plan their SIP leading to higher demand of shares pushing the price up and they end up making purchase at higher price.

Nitesh

Shares selected by Nitesh are as below.

Nitesh Kumar
ADANIPORTS
BAJAJFINSV
TATACONSUM
TECHM
WIPRO

Each of these shares were invested in 14 scenarios.
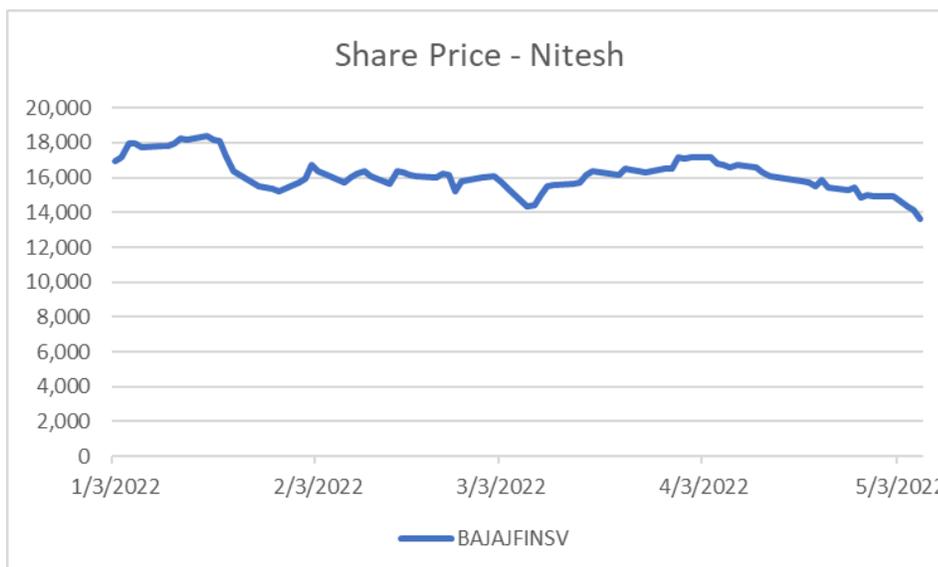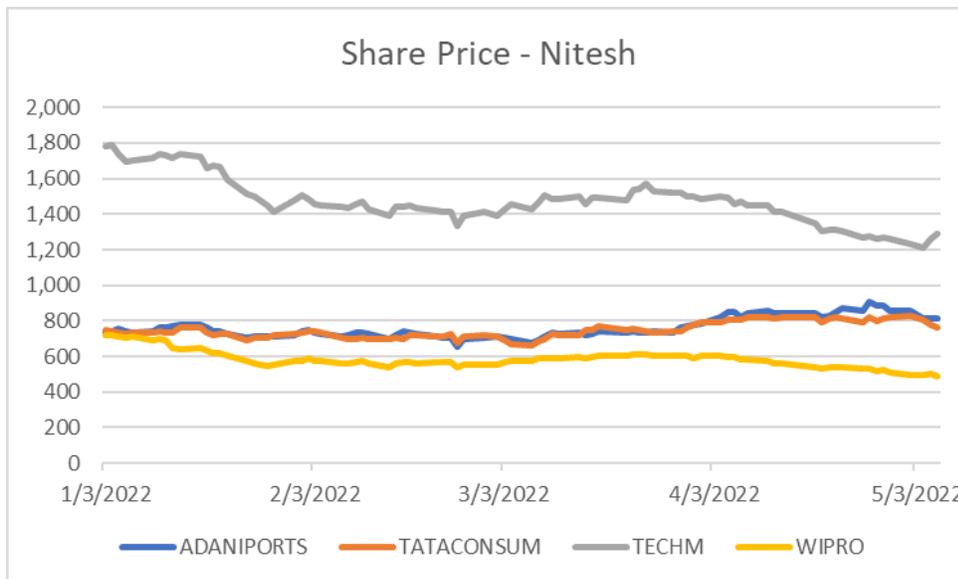
R code was run to determine weightage under each of the scenarios, where return/risk/ sharpe ratio were pulled as follows:

Scenario	ADANIPORTS	BAJAJFINSV	TATACONSUM	TECHM	WIPRO	Return	Risk	SharpeRa
1	0.285591	0.182597	0.204946	0.242147	0.084720	0.234723	0.231288	1.014854
2	0.203629	0.187610	0.143001	0.419681	0.046079	0.234837	0.231930	1.012535
3	0.334914	0.350814	0.126553	0.081250	0.106470	0.266489	0.248881	1.070748
4	0.060497	0.254133	0.364385	0.192242	0.128743	0.281130	0.229785	1.223452
5	0.263009	0.270508	0.026409	0.308159	0.131915	0.242753	0.230666	1.052397
6	0.118081	0.085286	0.229625	0.466786	0.100222	0.223729	0.227999	0.981273
7	0.159235	0.239569	0.156738	0.213847	0.230611	0.254709	0.214646	1.186647
8	0.117652	0.247390	0.299524	0.175374	0.160060	0.270623	0.223695	1.209784
9	0.266240	0.253931	0.180453	0.151020	0.148356	0.252297	0.228853	1.102445
10	0.210748	0.303010	0.086035	0.079446	0.320762	0.262566	0.219710	1.195057
11	0.006912	0.281583	0.161753	0.222260	0.327492	0.276776	0.213120	1.298685
4989	0.194805	0.182722	0.249351	0.223862	0.149260	0.245276	0.221143	1.109125
4990	0.250592	0.279869	0.145227	0.135738	0.188574	0.257258	0.226246	1.137075
4991	0.198548	0.204663	0.185821	0.179982	0.230986	0.246297	0.215223	1.144380
4992	0.388150	0.226480	0.266388	0.029670	0.089312	0.244612	0.253771	0.963909
4993	0.158763	0.107992	0.160642	0.035592	0.537012	0.228427	0.207797	1.099279
4994	0.044413	0.042933	0.255645	0.374358	0.282651	0.223385	0.215937	1.034495
4995	0.278010	0.113879	0.049292	0.319767	0.239052	0.208019	0.220265	0.944402
4996	0.221954	0.208269	0.235842	0.137009	0.196926	0.249534	0.221269	1.127739
4997	0.166575	0.276740	0.109949	0.251177	0.195559	0.258665	0.219305	1.179475
4998	0.203911	0.266341	0.041355	0.260936	0.227457	0.248340	0.219676	1.130480
4999	0.140492	0.215962	0.203196	0.156214	0.284136	0.255100	0.211317	1.207189
5000	0.068117	0.101654	0.350810	0.366420	0.112999	0.241430	0.226722	1.064870
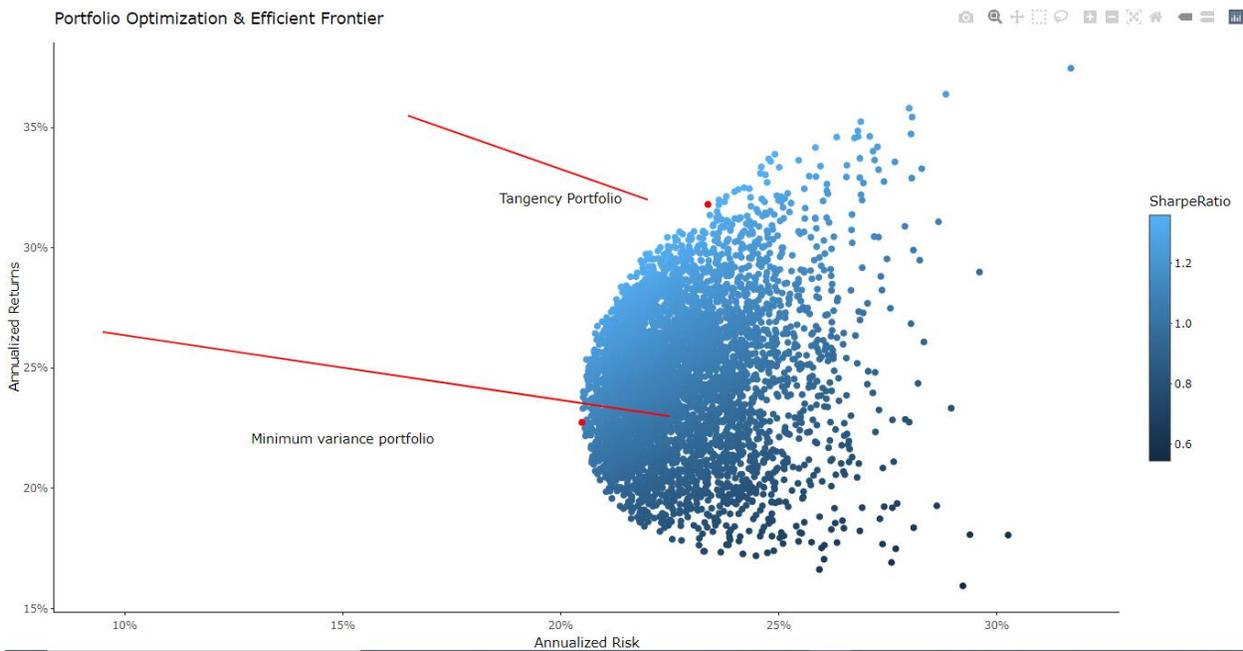
Based on these scenarios' investment was done only in the tangency portfolio. Below is the weightage under 2 different selected options:

Share	MVPT weightage	Equal weightage	Min. Var. weightage
ADANIPORTS	0.010	0.200	0.113
BAJAJFINSV	0.444	0.200	0.081
TATACONSUM	0.151	0.200	0.192
TECHM	0.057	0.200	0.199
WIPRO	0.338	0.200	0.415

	MVPT	Min. Var.
Return	0.3171	0.2253
Risk	0.2316	**0.2051**
SharpeRatio	**1.3690**	1.0986

Below is comparison of Investment value of 3,000,000 made on 3rd January as of 29th April:

Share	MVPT value	Equal weightage value	Min. Var. value
ADANIPORTS	35,046	697,584	392,582
BAJAJFINSV	1,169,145	526,855	212,927
TATACONSUM	497,525	660,762	635,750
TECHM	120,871	423,241	421,280
WIPRO	718,756	424,767	881,631
TOTAL	2,541,344	2,733,209	2,544,170

Conclusion:

Wipro has given lowest value when invested via equal weightage method and Adani Ports has given highest value.

MVPT suggested low weightage on Adani Ports based on its risk characteristics. It is seen that MVPT has not helped to mitigate the high value in and hence portfolio value is lower from the high return in the share due to low investment in AdaniPorts.

AdaniPorts is top performer, however due to MVPT's low weightage total value through MVPT is not as high as could have been than equal weightage methodology.

TataConsumer has shown high value as well and there was higher allocation made in this asset class

In addition, on tangency portfolio there is analysis done to capture portfolio value using percentile method.

PERCENTILE	PORTFOLIO VALUE
50%	2,541,344
75%	2,734,775
80%	2,843,093
85%	2,872,309
90%	2,904,305
95%	2,945,419

It is seen that half of the portfolios out of 5,000 would have given portfolio value of over INR 2.54 million which is less than the equal weightage method.

MVPT technique has shown high probability of having higher value in most of the scenarios, making this technique a useful technique in portfolio selection process.

As part of next exercise, investment is done on regular basis under 6 different scenarios to understand how MVPT would have looked and if any date is better than other date.

Scenario #	Scenario description	MVPT value	Equal weightage value	Difference
Scenario 2	First day of every month	2,750,315	2,920,443	-170,129
Scenario 3	5th of every month	2,824,060	3,002,671	-178,611
Scenario 4	10th of every month	2,735,333	2,913,444	-178,111
Scenario 5	15th of every month	2,731,056	2,904,277	-173,221
Scenario 6	20th of every month	2,763,477	2,940,380	-176,903
Scenario 7	25th of every month	2,854,416	3,017,333	-162,916

It is observed that single scenario of MVPT (tangency portfolio out of 5,000 scenario) has given comparatively **lower** return due to low weightage in AdaniPorts and higher weightage in BajajFinService. But if selected properly we have observed that more than half of the scenarios have given better return than equal weightage scenario.

Additionally, we do observe portfolio value to be highest if invested on 25th of each month, followed by 5th of each month. Investment done on 15th of each month has led to the lowest portfolio value, followed by 10th of each month.

It helps to conclude that after individual gets their salary credited and making monthly expenses, they plan their SIP leading to higher demand of shares pushing the price up and they end up making purchase at higher price.

Rohit

Shares selected by Rohit are as below.

Rohit Ranjan
BHARTIARTL
LT
NTPC
TATAMOTORS
UPL
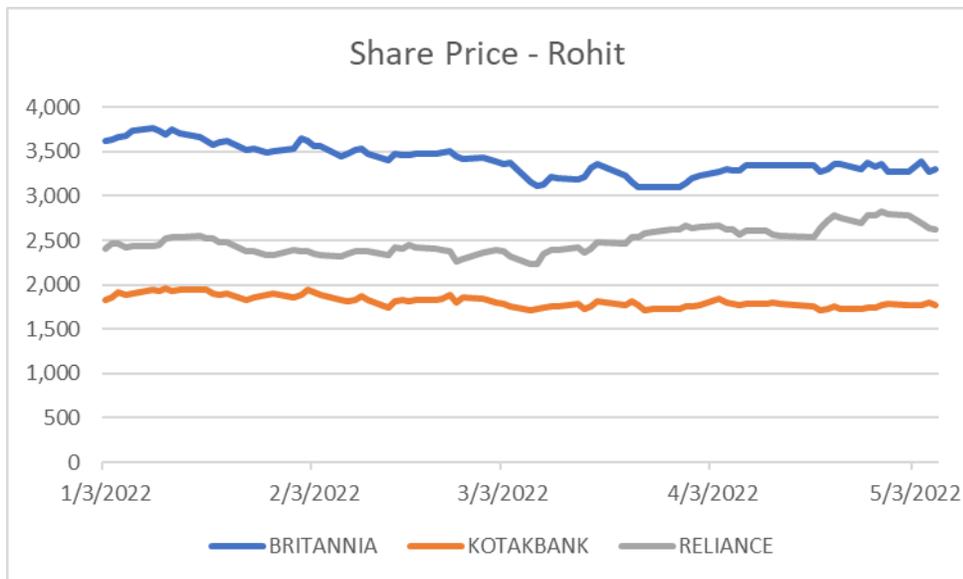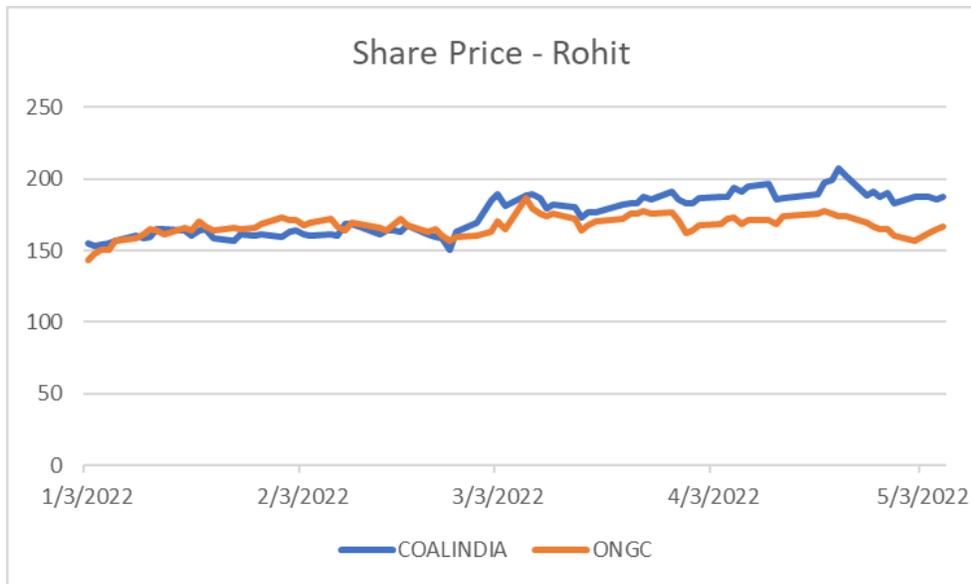
Each of these shares were invested in 14 scenarios.

Share Price - Rohit

COALINDIA — ONGC

R code was run to determine weightage under each of the scenarios, where return/risk/ sharpe ratio were pulled as follows:

Scenario	BRITANNIA	COALINDIA	KOTAKBANK	ONGC	RELIANCE	Return	Risk	SharpeRa
1	0.151005	0.211309	0.146677	0.218113	0.272896	0.111131	0.202466	0.548886
2	0.226410	0.097312	0.068916	0.400479	0.206884	0.099030	0.219276	0.451622
3	0.119733	0.228471	0.249600	0.096662	0.305534	0.132832	0.198507	0.669154
4	0.214298	0.216548	0.237778	0.071113	0.260263	0.142101	0.192267	0.739083
5	0.197291	0.238805	0.199800	0.223298	0.140806	0.092222	0.197329	0.467352
6	0.294396	0.164709	0.216022	0.063127	0.261746	0.161798	0.191683	0.844092
7	0.269529	0.032087	0.218482	0.108058	0.371844	0.195889	0.203816	0.961107
8	0.190901	0.272079	0.334135	0.049456	0.153429	0.119632	0.192225	0.622354
9	0.404064	0.196425	0.139447	0.046437	0.213628	0.159801	0.191325	0.835232
10	0.202533	0.397662	0.265390	0.081853	0.052561	0.074634	0.196120	0.380552
4989	0.289059	0.227728	0.224555	0.186400	0.072259	0.100378	0.192710	0.520878
4990	0.114968	0.274102	0.118537	0.264239	0.228154	0.080681	0.208939	0.386146
4991	0.323039	0.228710	0.214980	0.217295	0.015976	0.090186	0.195801	0.460598
4992	0.137252	0.336931	0.173720	0.266582	0.085516	0.052468	0.207892	0.252380
4993	0.127059	0.168879	0.223431	0.137647	0.342984	0.143342	0.201736	0.710543
4994	0.286023	0.100406	0.232645	0.172451	0.208475	0.147856	0.194405	0.760554
4995	0.062240	0.074792	0.148455	0.346325	0.368188	0.121831	0.224891	0.541732
4996	0.380120	0.029832	0.141493	0.320445	0.128111	0.131796	0.207262	0.635890
4997	0.412536	0.074616	0.203252	0.042980	0.266616	0.196895	0.197055	0.999191
4998	0.080512	0.496595	0.147628	0.075166	0.200099	0.062286	0.209786	0.296902
4999	0.192954	0.276356	0.195468	0.058696	0.276525	0.131059	0.193756	0.676414
5000	0.086562	0.359217	0.375865	0.151014	0.027343	0.059664	0.205036	0.290992
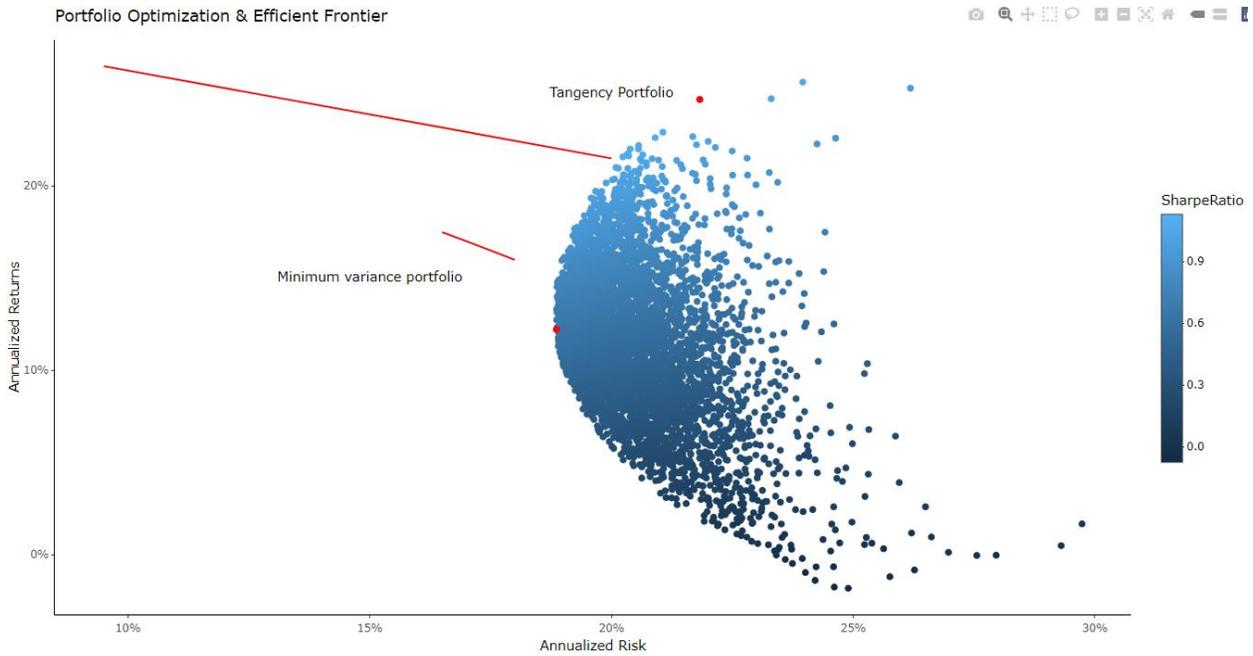
Based on these scenarios' investment was done only in the tangency portfolio. Below is the weightage under 2 different selected options:

Share	MVPT weightage	Equal weightage	Min. Var. weightage
BRITANNIA	0.395	0.200	0.312
COALINDIA	0.021	0.200	0.243
KOTAKBANK	0.015	0.200	0.214
ONGC	0.012	0.200	0.060
RELIANCE	0.558	0.200	0.171

	MVPT	Min. Var.
Return	0.2521	0.1346
Risk	0.2258	**0.1884**
SharpeRatio	**1.1166**	0.7144

Below is comparison of Investment value of 3,000,000 made on 3rd January as of 29th April:

Share	MVPT value	Equal weightage value	Min. Var. value
BRITANNIA	1,073,792	543,890	848,481
COALINDIA	73,786	706,439	859,260
KOTAKBANK	44,464	588,917	628,951
ONGC	38,780	672,981	201,571

RELIANCE	1,941,791	696,445	596,263
TOTAL	**3,172,613**	**3,208,673**	**3,134,527**

Conclusion:

Britannia has given lowest value when invested via equal weightage method and CoalIndia has given highest value.

MVPT suggested low weightage on CoalIndia based on its risk characteristics. It is seen that MVPT has missed to take the opportunity in CoalIndia due to its risk characteristics and hence portfolio value is covered from the high risk in the share due to low investment in CoalIndia.

CoalIndia is top performer followed by Reliance, however due to CoalIndia's low weightage total value through MVPT is not as high as could have been than equal weightage methodology.

Reliance has shown high value as well and there were higher allocation made in this equity share.

In addition, on tangency portfolio there is analysis done to capture portfolio value using percentile method.

PERCENTILE	PORTFOLIO VALUE
50%	3,207,236
75%	3,269,283
80%	3,283,936
85%	3,301,485
90%	3,324,565
95%	3,361,143

It is seen that half of the portfolios out of 5,000 would have given portfolio value of over INR 3.21 million which is higher than equal weightage method.

MVPT technique has shown high probability of having higher value in most of the scenarios, making this technique a useful technique in portfolio selection process.

As part of next exercise, investment is done on regular basis under 6 different scenarios to understand how MVPT would have looked and if any date is better than other date.

Scenario #	Scenario description	MVPT value	Equal weightage value	Difference
Scenario 2	First day of every month	3,191,805	3,104,957	86,849
Scenario 3	5th of every month	3,278,651	3,089,409	189,242

Scenario 4	10th of every month	3,198,601	3,065,471	133,130
Scenario 5	15th of every month	3,185,737	3,088,867	96,870
Scenario 6	20th of every month	3,183,857	3,067,689	116,168
Scenario 7	25th of every month	3,244,567	3,102,489	142,079

It is observed that single scenario of MVPT (tangency portfolio out of 5,000 scenario) has given comparatively **higher** return due to high weightage in Reliance. But if selected properly we have observed that more than half of the scenarios have given better return than equal weightage scenario.

Additionally, we do observe portfolio value to be highest if invested on 5th of each month, followed by 25th of each month. Investment done on 20th of each month has led to the lowest portfolio value, followed by 15th of each month.

It helps to conclude that after individual gets their salary credited and making monthly expenses, they plan their SIP leading to higher demand of shares pushing the price up and they end up making purchase at higher price.

Shashank

Shares selected by Shashank are as below.

Anil K. Dhabade
BHARTIARTL
LT
NTPC
TATAMOTORS
UPL

Each of these shares were invested in 14 scenarios.
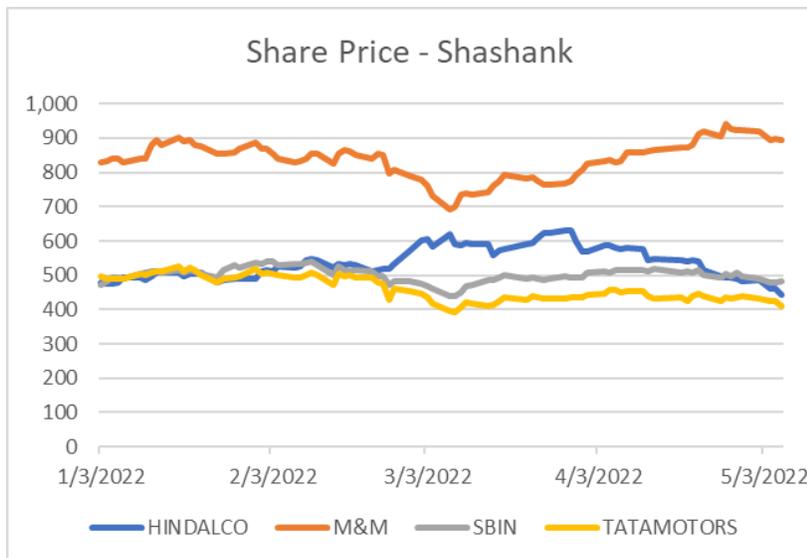
R code was run to determine weightage under each of the scenarios, where return/risk/ sharpe ratio were pulled as follows:

Scenario	ASIANPAINT	HINDALCO	M&M	SBIN	TATAMOTORS	Return	Risk	SharpeRa
1	0.138833	0.136779	0.480500	0.065146	0.178742	0.084260	0.263562	0.319698
2	0.057367	0.043763	0.332405	0.286673	0.279793	0.053816	0.282215	0.190692
3	0.287069	0.303115	0.043900	0.053015	0.312900	0.123518	0.282957	0.436526
4	0.039560	0.366661	0.151765	0.148344	0.293670	0.085530	0.309864	0.276025
5	0.099669	0.045568	0.386319	0.340369	0.128075	0.071768	0.263331	0.272538
6	0.346165	0.105063	0.131017	0.215210	0.202546	0.119884	0.245774	0.487782
7	0.226398	0.100947	0.022089	0.608982	0.041584	0.109953	0.281566	0.390506
8	0.122598	0.266356	0.147386	0.147193	0.316467	0.088078	0.292010	0.301626
9	0.276495	0.056592	0.258808	0.237457	0.170648	0.102930	0.244038	0.421779
10	0.324808	0.151118	0.043663	0.083637	0.396773	0.107414	0.281314	0.381831
11	0.232666	0.075686	0.205510	0.479236	0.006902	0.109390	0.256098	0.427141
4989	0.040252	0.089355	0.171459	0.232120	0.466814	0.043822	0.317928	0.137836
4990	0.239123	0.201138	0.272959	0.270242	0.016538	0.123308	0.245822	0.501617
4991	0.247327	0.120559	0.163462	0.097693	0.370959	0.090802	0.276950	0.327864
4992	0.093247	0.304987	0.141965	0.313108	0.146693	0.099293	0.284675	0.348794
4993	0.305967	0.261248	0.221285	0.131773	0.079727	0.138371	0.245428	0.563795
4994	0.147964	0.358894	0.233804	0.084718	0.174619	0.112541	0.278658	0.403867
4995	0.231023	0.139756	0.216961	0.240768	0.171493	0.104002	0.252099	0.412545
4996	0.382342	0.108751	0.193052	0.132032	0.183823	0.127960	0.238861	0.535708
4997	0.071322	0.292071	0.202186	0.176165	0.258256	0.085344	0.291411	0.292865
4998	0.000662	0.335504	0.079712	0.242785	0.341338	0.072339	0.323719	0.223462
4999	0.228832	0.204931	0.214734	0.155744	0.195759	0.109034	0.257326	0.423721
5000	0.269584	0.166040	0.115801	0.238646	0.209930	0.112016	0.257214	0.435497
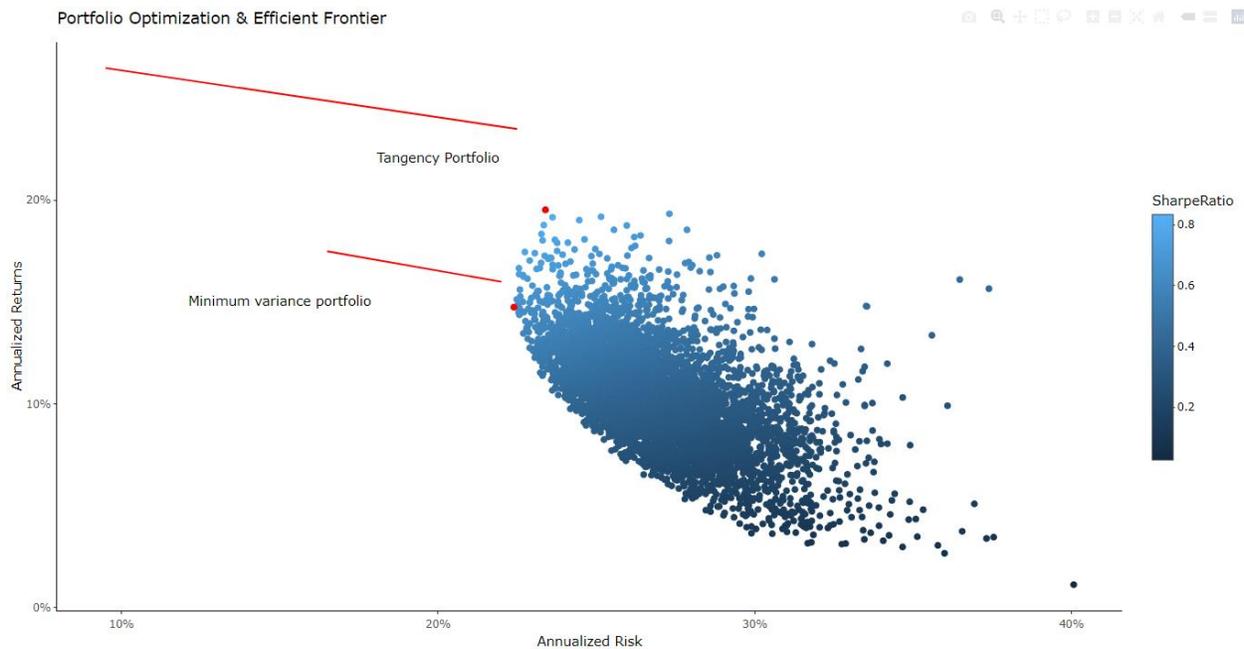
Based on these scenarios' investment was done only in the tangency portfolio. Below is the weightage under 2 different selected options:

Share	MVPT weightage	Equal weightage	Min. Var. weightage
ASIANPAINT	0.704	0.200	0.527
HINDALCO	0.051	0.200	0.074
M&M	0.039	0.200	0.192
SBIN	0.121	0.200	0.131
TATAMOTORS	0.086	0.200	0.076

	MVPT	Min. Var.
Return	0.1922	0.1597
Risk	0.2336	**0.2253**
SharpeRatio	**0.8225**	0.7090

Below is comparison of Investment value of 3,000,000 made on 3rd January as of 29th April:

Share	MVPT value	Equal weightage value	Min. Var. value
ASIANPAINT	1,997,602	567,532	1,496,128
HINDALCO	153,269	605,773	223,533
M&M	129,742	666,739	639,368
SBIN	381,328	632,498	413,524
TATAMOTORS	226,730	527,653	201,589
TOTAL	2,888,671	3,000,195	2,974,143

Conclusion:

TataMotors has given lowest value when invested via equal weightage method and M&M has given highest value.

MVPT suggested low weightage on M&M based on its risk characteristics. It is seen that MVPT has limited the overall increase in portfolio and hence portfolio value is lower from the high risk in the share due to low investment in TataMotors.

M&M is top performer, however due to MVPT's low weightage total value through MVPT is not as high as could have been than equal weightage methodology.

AsianPaint as shown lower value and there was high allocation in this share leading to lower portfolio value as compared to equal weightage technique.

In addition, to tangency portfolio there is analysis done to capture portfolio value using percentile method.

PERCENTILE	PORTFOLIO VALUE
50%	3,000,130
75%	3,045,295
80%	3,055,705
85%	3,069,006
90%	3,086,987
95%	3,111,852

It is seen that half of the portfolios out of 5,000 would have given portfolio value of over INR 3.00 million which is equivalent to equal weightage method.

MVPT technique has shown high probability of having higher value in most of the scenarios, making this technique a useful technique in portfolio selection process.

As part of next exercise, investment is done on regular basis under 6 different scenarios to understand how MVPT would have looked and if any date is better than other date.

Scenario #	Scenario description	MVPT value	Equal weightage value	Difference
Scenario 2	First day of every month	3,001,295	2,979,978	21,317
Scenario 3	5th of every month	3,087,162	3,051,414	35,748
Scenario 4	10th of every month	2,991,463	2,971,294	20,169
Scenario 5	15th of every month	2,992,854	2,952,040	40,814
Scenario 6	20th of every month	2,997,889	2,957,070	40,819
Scenario 7	25th of every month	3,078,870	3,017,654	61,216

It is observed that single scenario of MVPT (tangency portfolio out of 5,000 scenario) has given comparatively **higher** return. But if selected properly we have observed that more than half of the scenarios have given better return than equal weightage scenario.

Additionally, we do observe portfolio value to be highest if invested on 5th of each month, followed by 25th of each month. Investment done on 10th of each month has led to the lowest portfolio value, followed by 15th of each month.

It helps to conclude that after individual gets their salary credited and making monthly expenses, they plan their SIP leading to higher demand of shares pushing the price up and they end up making purchase at higher price.

Chapter 6: Conclusion

- Mean Variance Theory selected with minimum variance has shown better results as compared to doing equal weightage investment
- Investment done on either 25th of month or 5th of month has shown to give better return as compared to other dates
- It is observed that share prices are higher in middle of the month as retail investor uses the disposable income to make investments, making high demand for stocks leading to higher price
- Not all scenarios under the scenario build needs to be used for portfolio building
- If portfolios are selected on efficient frontier they have high probability of maximization of return while maintaining the risk.
- Stocks
-

Chapter 7: Limitations

- Study period is just for 10 months
- Market does not move in a similar fashion
- Current study period is the time when market has given higher than average return and have been in uptrend
- Does not include additional expenses, charges, taxes
- Shares are purchased in non-integer quantity
- Ignores cyclical nature of the industry
- Dividends are ignored
- Return is considered at one point of time
- Reinvestment risk is ignored
- Market volatility is ignored
- Risk from each of the stock is ignored
- Mean-Variance Portfolio theory could be used to determine the weights to be assigned for efficient frontier
- One-time investment date could have been chosen when market was at one of the low levels
- Only Nifty50 stocks are considered
- Individual stock news/ earnings are not considered
- Results would have been very different if selected any different year

Appendix

R Script:

EfficientFrontier_Anil.R   EfficientFrontier_Nitesh.R   EfficientFrontier_Shashank.R   EfficientFrontier_Rohit.R   EfficientFrontier_Harsha.R

Excel file for simple valuation:

Stocks_study_simple.xlsx

Sample calculation for Sharpe ratio and portfolio valuation: