Assignment 5

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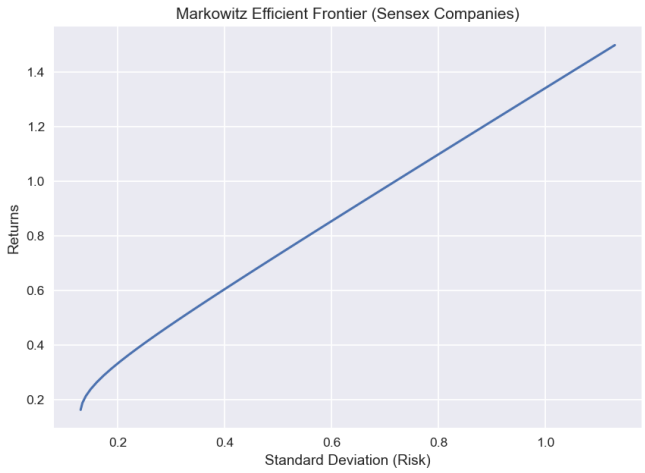
Question 1

Firstly data of 10 indices and 10 non indices stocks is collected for BSE and NSE. CSV file for these data is also attached. For all of them question 3 of last lab is performed.

For 10 SENSEX companies –

a) Below graph is plotted by iterating over the returns and computing the minimum risk we can achieve given the returns. Plot is plotted only for points with returns greater than the returns at the tip of the bullet to achieve the Markowitz efficient frontier.

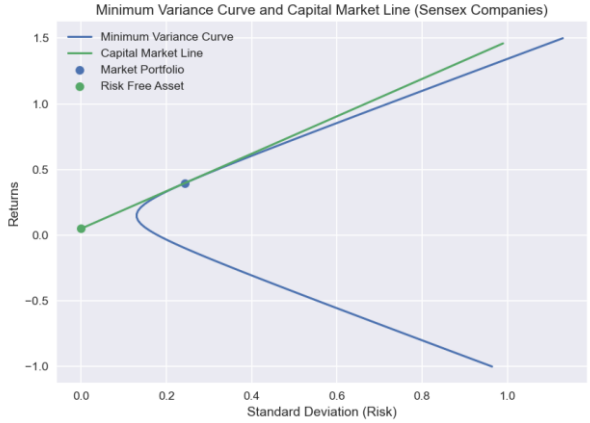


b) Weights on the various companies stocks in the market portfolio are given below -

Market Portfolio has Risk = 0.24278, Return = 0.39591 with following weights on assets -

	Sensex Companies	Weights on their stocks
0	ASIAN_PAINTS	0.389397
1	BHARTI_AIRTEL	-0.479464
2	ICICI_BANK	-0.144865
3	INFOSYS	0.124096
4	MARUTI_SUZUKI	0.582510
5	NESTLE_INDIA	0.195671
6	RELIANCE_INDUSTRIES	0.350152
7	SBI_BANK	-0.152370
8	TATA_STEEL	0.188926
9	WIPRO	-0.054054

c) Plot of minimum variance curve and capital market line is plotted. Market portfolio and risk free asset is also shown.



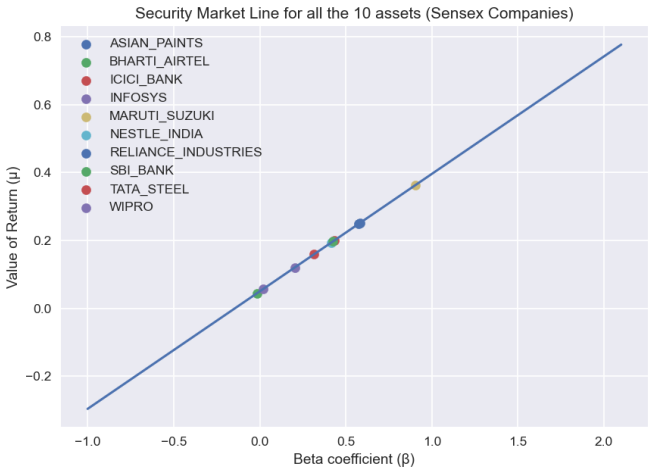
d) Security market line is plotted according to the following equation -

$$E[Rp] = Rf + (\mathrm{E[Rm]} - Rf)*\beta p$$

where Rf is the risk free rate, E[Rm] is expected return of Market portfolio and E[Rp] is the expected return on any arbitrary portfolio.

Beta values according to the CAPM model is computed using the following formula (Obtained by rearranging in the above equation)-

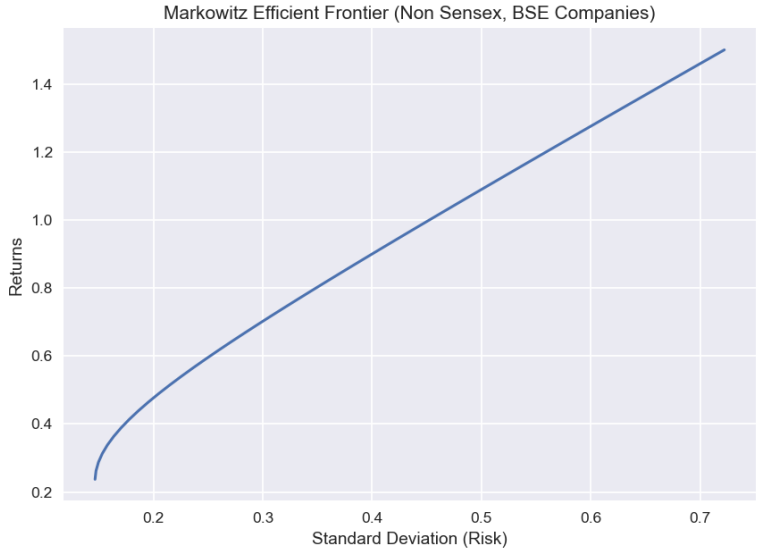
$$\beta p = \frac{E[Rp]-Rf}{E[Rm]-Rf}$$



Similar procedure is performed for all other datas.

For 10 non-SENSEX BSE companies –

a)

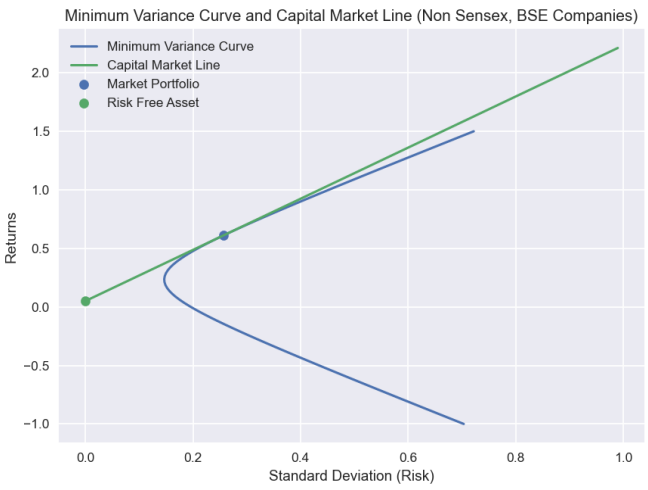


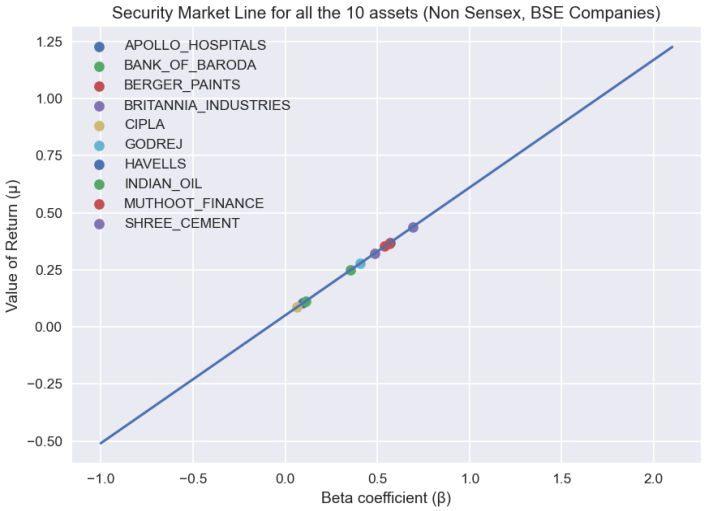
b)

Market Portfolio has Risk = 0.25648, Return = 0.61006 with following weights on assets -

	Non Sensex, BSE Companies	Weights on their stocks
0	APOLLO_HOSPITALS	-0.284294
1	BANK_OF_BARODA	-0.163822
2	BERGER_PAINTS	0.162542
3	BRITANNIA_INDUSTRIES	0.896440
4	CIPLA	-0.350189
5	GODREJ	0.303027
6	HAVELLS	0.255621
7	INDIAN_OIL	0.128488
8	MUTHOOT_FINANCE	0.235196
9	SHREE_CEMENT	-0.183009

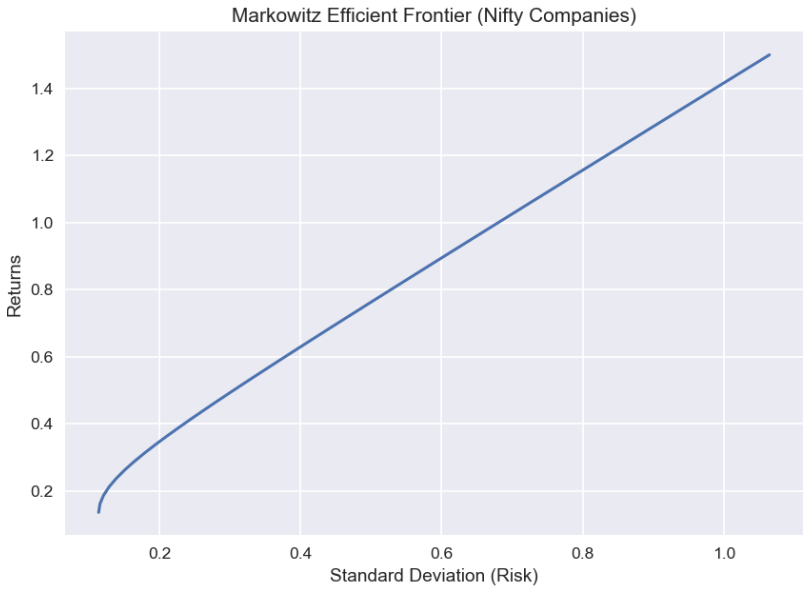
c) d)





For 10 NIFTY companies –

a)

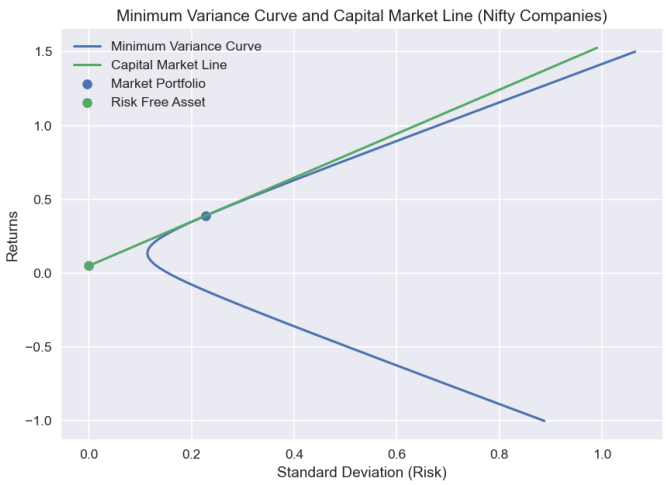


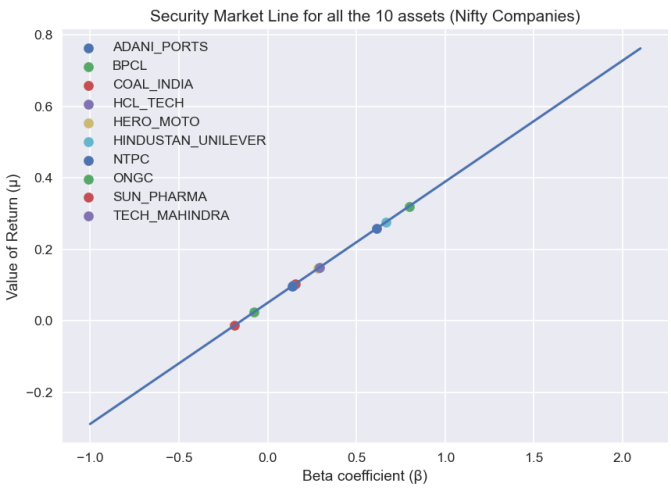
b)

Market Portfolio has Risk = 0.22773, Return = 0.38939 with following weights on assets -

	Nifty Companies	Weights on their stocks
0	ADANI_PORTS	0.141554
1	BPCL	0.465151
2	COAL_INDIA	0.245436
3	HCL_TECH	0.145037
4	HERO_MOTO	-0.171268
5	HINDUSTAN_UNILEVER	0.620637
6	NTPC	0.027981
7	ONGC	-0.651591
8	SUN_PHARMA	-0.028730
9	TECH_MAHINDRA	0.205794

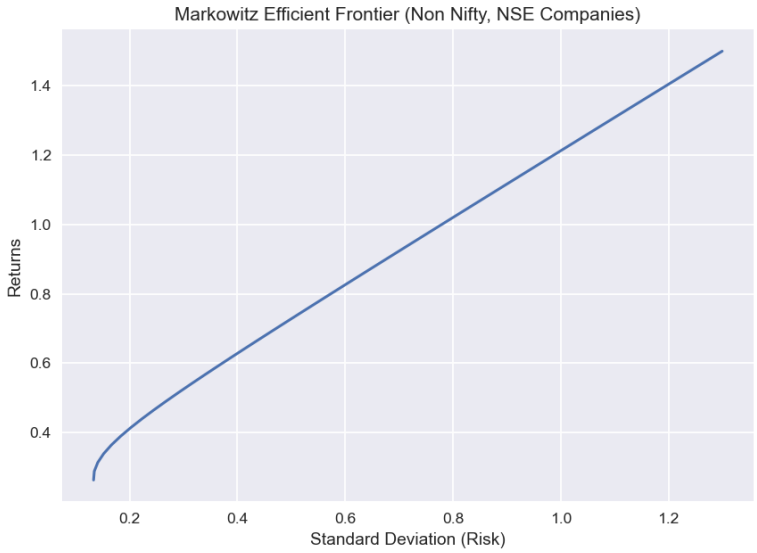
c) d)





For 10 non-NIFTY NSE companies –

a)

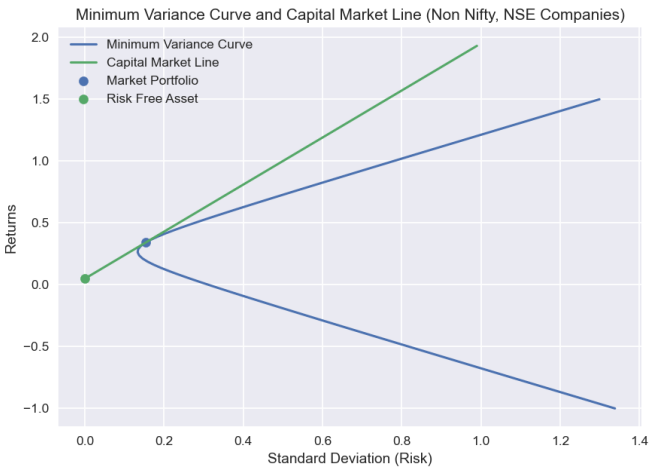


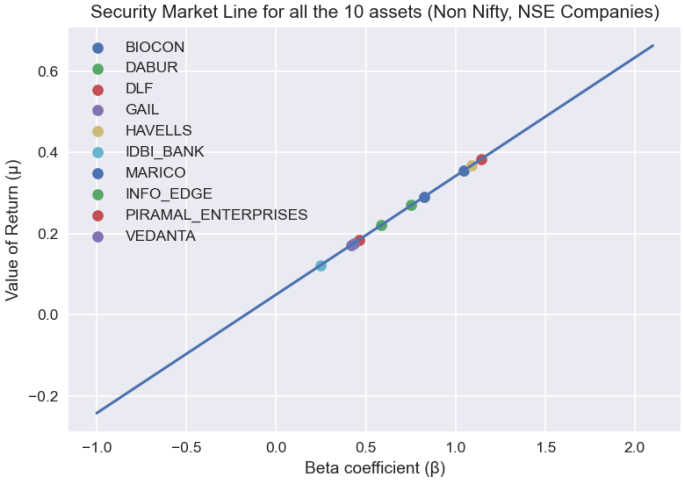
b)

Market Portfolio has Risk = 0.15363, Return = 0.34204 with following weights on assets -

	Non Nifty, NSE Companies	Weights on their stocks
0	BIOCON	0.253044
1	DABUR	0.117105
2	DLF	-0.188852
3	GAIL	-0.084922
4	HAVELLS	0.184183
5	IDBI_BANK	0.062124
6	MARICO	0.472004
7	INFO_EDGE	0.110641
8	PIRAMAL_ENTERPRISES	0.100081
9	VEDANTA	-0.025408

c) d)



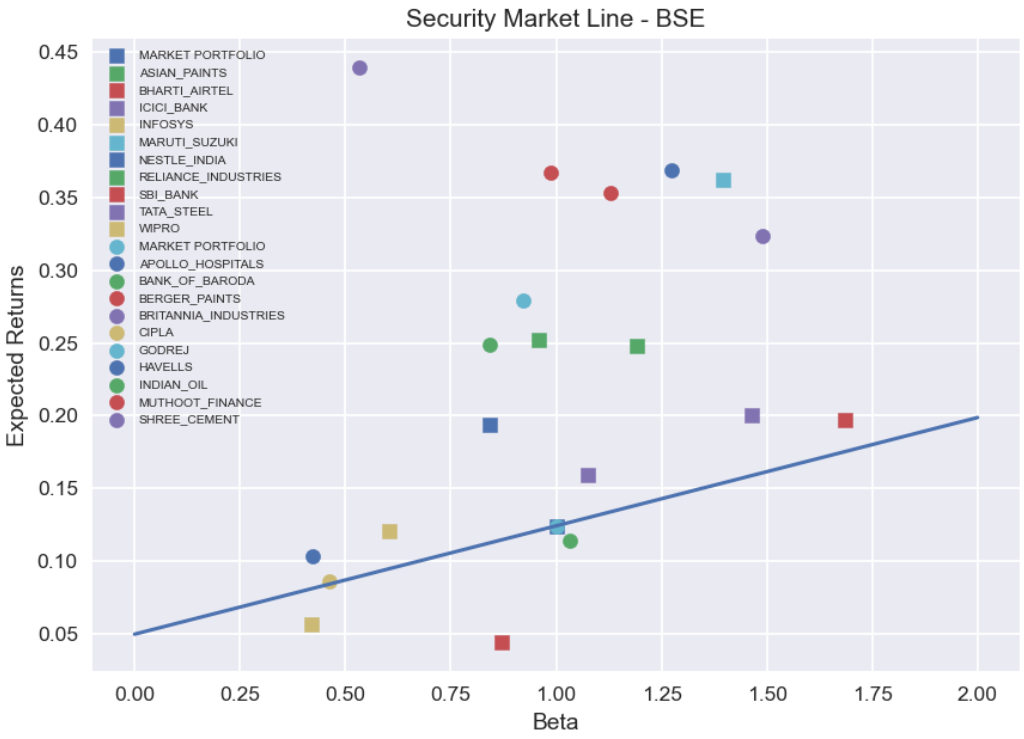


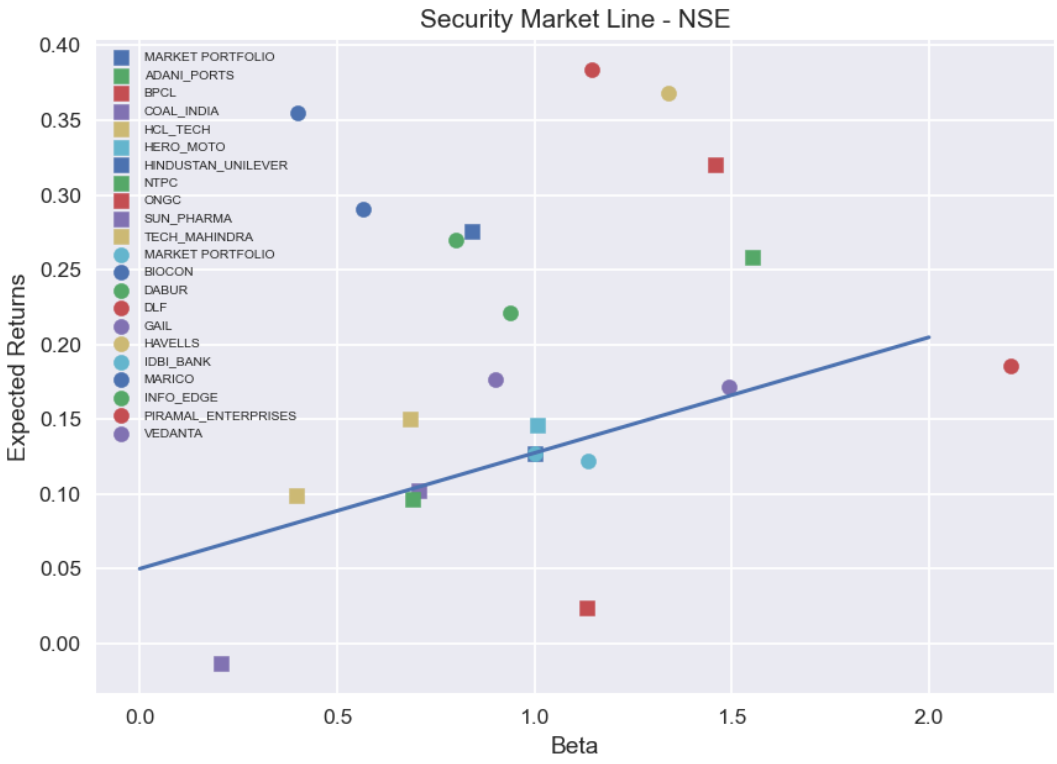
Question 2

- Square dots represent stocks that are included in the indices while circular dots represent stocks that are not included in the indices.
- Security market line is plotted by joining $(0,R_f)$ and $(1,E[R_m])$. Where $E[R_m]$ is the expected return of the market portfolio.
- Beta values of the stocks are calculated by following formula – beta of a portfolio =

$$\frac{covariance\ between\ market\ and\ the\ given\ portfolio}{variance\ of\ market\ portfolio}$$

- Stocks which are above the security market line are considered as undervalued while stocks below the security market line are considered overvalued.
- From the graph we can see that most of the stocks are undervalued according to the CAPM model.





Computed beta values for various data are shown below -

BSE Indices Stocks	Beta
ASIAN_PAINTS	0.959977
BHARTI_AIRTEL	0.871995
ICICI_BANK	1.464665
INFOSYS	0.603411
MARUTI_SUZUKI	1.394688
NESTLE_INDIA	0.842288
RELIANCE_INDUSTRIES	1.192348
SBI_BANK	1.686689
TATA_STEEL	1.073983
WIPRO	0.418408

NSE Indices Stocks	Beta
MARKET PORTFOLIO	1.000000
ADANI_PORTS	1.553770
BPCL	1.459714
COAL_INDIA	0.707130
HCL_TECH	0.397204
HERO_MOTOCORP	1.007812
HINDUSTAN_UNILEVER	0.843052
NTPC	0.690809
ONGC	1.132136
SUN_PHARMA	0.205073
TECH_MAHINDRA	0.684311

BSE Non-Indices Stocks	Beta
APOLLO_HOSPITALS	0.423658
BANK_OF_BARODA	1.031884
BERGER_PAINTS	1.128495
BRITANNIA_INDUSTRIES	0.531937
CIPLA	0.461883
GODREJ	0.922335
HAVELLS	1.275122
INDIAN_OIL	0.842340
MUTHOOT_FINANCE	0.988573
SHREE_CEMENT	1.489839

NSE Non-Indices Stocks	Beta
MARKET PORTFOLIO	1.000000
BIOCON	0.400362
DABUR	0.937285
DLF	2.206476
GAIL	0.901182
HAVELLS	1.339005
IDBI_BANK	1.136379
MARICO	0.567363
INFO_EDGE	0.802243
PIRAMAL_ENTERPRISES	1.146221
VEDANTA	1.493127

Question 3

Data of Beta values of some of the companies are collected and compared with the computed beta values.

COMPANIES	COMPUTED BETA VALUES	ACTUAL BETA VALUES
Adani Ports	1.553770	1.22
BPCL	1.459714	1.11
COAL INDIA	0.707130	0.846
HCL TECHNOLOGIES	0.397204	0.822
HERO MOTOCORP	1.007812	0.811
HINDUSTAN UNILEVER	0.843052	0.329
NTPC	0.690809	0.825
ONGC	1.132136	1.34
SUN PHARMA	0.205073	0.500
TECH MAHINDRA	0.684311	0.968

As can be seen from the above table actual beta valeus and computed beta values are quite close indicating correctness of the analysis.