



Portfolio Selection Process through Markowitz Model

KEYWORDS

Portfolio, Markowitz model, beta, covariance

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ABSTRACT As the economy grows, and grows more complex, the financial sector needs to keep pace. In comparison with the developed industrialized countries, the financial sector development of our country is relatively less, and there is a lot of scope for the growth of the financial sector in India. The market capitalization is considerably lower than US and Australian economies. The financial assets in the total assets in India was only 16.7 per cent in 2006-07. The proportion of shares and debentures in total assets declined from 1.7 in 1993-94 to 0.8 per cent in 2006-07. It clearly indicates that investment in financial assets tends to move towards fewer risky portfolios like bank deposits, government bonds and insurance funds. This vividly manifests that the investors tend to be risk averters.

SECURITIES MARKET IN INDIA

In last threedecades, a large number of countries have initiated financial reforms processes to open up their economies and to integrant into the global economy. India is one of the late entrants- the reform process officially started in 1991 only. The Indian stock market is possibly one of the oldest in Asia, but remained at a small scale and was largely outside the global integration process until the date 1980s (Rajan and Zingales,2005). The major stock market in India located in Mumbai (formerly known as Bombay) has always played a dominant role in the equity market in India. It has been traditionally governed by broker/owners of stock exchanges (Acharya and Richardson, 2009).Reforms in equity market in India commenced slightly earlier than the overall reforms –in mid -1980s.

MODERN PORTFOLIO THEORY

Markowitz mean-variance portfolio theory is one of the most widely used approaches in portfolio selection. It reflects market condition, which are no longer valid by assigning equal weights to the most recent and most distant observations. To express the dynamic structure of the market, one can use exponentially weighted variances. Exponentially weighted data gives greater weight to the most-recent observations. Thus, current market conditions are taken in to consideration more accurately.

METHODOLOGY

The general objective of the study is to assess the optimality of the portfolios in the Bombay Stock Exchange (BSE). The specific objectives of the study are:

1. To analyze the expected return of different portfolio in the BSE;
2. To assess the risk level of different portfolios;
3. To analyze the optimality of the portfolios in the BSE;

The research methodology followed in the study is exploratory empirical research. Only time series secondary data was used. The data for the study was collected from the BSE website and published data of RBI and SEBI. The data for all the portfolios and the benchmark indexes such as Sensex 30, BSE 500, Midcap index were collected from the BSE archives. The data were collected in three sets such as daily closure index, monthly closure and the annual average. The analysis was done from three dimensions. The data was collected from 2008 to 2012. The analysis of the

collected data has been done within the above conceptual framework. The analysis in the study includes the expected returns from different portfolios and their respective risk levels. The expected return has been computed through the calculation of the average increase in the return and their skewness. The risk level has been analyzed through variances, S.D., covariance and correlation matrix.

PORTFOLIO OPTIMIZATION: ANALYSIS AND INTERPRETATION

Optimum portfolio selection within a capital market is primarily based on the best risk-return trade-off among the industry sectors. Literature suggests that much of the market volatility can be attributed to substantial increase in the sectors specific and sub sector specific risks. Performance of the company influences industry sector returns differently, and changes over time periods.

Expected Risk and Return- Mean, Standard Deviation and Portfolio Choice

Expected risk and returns of portfolio have been analyzed with the help of arithmetic mean, SD and the ratio between this two. The ratio was computed with the help of the formula used by Markowitz:

$$R = (\mu - d) / \sigma$$

Here, μ denotesthe arithmetic mean of the rate of return of the daily data; σ denotes the SD of the set of the data; d refers to the disaster level, which refers to the lowest value of the return; and r is the risk adjusted ratio between the mean and SD of the returns. These three results explicate the relationship between the expected returns and risk of all portfolios including the indices.

Table:-1 Mean, Standard Deviation And their Ratio for the Daily Data From 2008-2012

	Mean	STD	MIN	MAX	R= $(\mu - d) / \sigma$
BSE	-0.02	2.05	-12.28	14.80	5.98
MID CAP	0.0046	1.72	-12.84	10.51	7.47
SMALL CAP	0.0029	1.68	-11.45	8.29	6.82
AUTO	-0.003	1.74	-11.64	10.08	6.69
BANK	0.02	3.3	-14.46	16.07	4.39
BSECD	0.01	2.90	-12.39	11.72	5.93
BSECG	0.0001	2.29	-10.15	17.97	4.43

	Mean	STD	MIN	MAX	R=(μ -d)/ σ
FMCG	0.02	1.38	-8.67	6.70	6.30
IT	0.0046	2.01	-11.24	10.22	5.59
PSU	-0.04	1.71	-11.90	14.14	6.94
METAL	-0.08	2.61	-15.26	13.95	5.82
OIL & GAS	0.0042	2.15	-17.60	16.04	8.19
POWER	-0.09	2.06	-12.81	15.58	6.17

Thus, the table 1 clearly indicates the most preferable shares were the midcap shares in comparison with the others shares in the Sensex and the small cap. The most supportable portfolios Oil & Gas, Auto, FMCG. The returns and risk level support these portfolios. The results tend to discourage the support to portfolio like IT, CG, Metal, bank and MID CAP. Though the last two have high returns, risk level very high. Hence, the portfolio choice ratio indicates resistance of these portfolios.

Table:-2 Mean, Standard Deviation And their Ratio for the Monthly Data From 2008-2012

	Mean	STD	MIN	MAX	R=(μ -d)/ σ
BSE500	-0.30	9.11	-36.88	25.30	4.02
BSE30	-0.17	8.31	-31.22	22.20	3.74
MID CAP	-0.71	10.95	-49.24	31.22	4.43
IT	0.37	8.33	-28.53	16.66	3.47
BANK	-0.16	11.37	-30.89	31.32	2.70
PSU	-0.61	10.44	-36.22	31.03	3.41
FMCG	1.50	5.7	-21.55	15.86	4.04
OIL & GAS	-0.02	9.46	-45.88	21.97	4.85

Table: 3 Correlation Matrix of Daily Data of All The Portfolios And Benchmark Indices

	BSE	MID CAP	SMALL CAP	AUTO	BANK	BSECD	BSECG	FMCG	IT	PSU	METAL	OIL & GAS	POWER
BSE	1												
MID CAP	0.84963	1											
SMALLCAP	0.76948	0.96082	1										
AUTO	0.81014	0.79822	0.74345	1									
BANK	0.91229	0.80628	0.7229	0.74731	1								
BSECD	0.70513	0.80934	0.79654	0.65339	0.65155	1							
BSECG	0.87165	0.83315	0.77214	0.73951	0.81527	0.68714	1						
FMCG	0.67117	0.61128	0.55867	0.56215	0.56543	0.52251	0.53506	1					
IT	0.74251	0.56418	0.51244	0.53827	0.58168	0.50513	0.56262	0.49494	1				
PSU	0.87656	0.88245	0.8294	0.75518	0.83725	0.71532	0.82505	0.59843	0.54952	1			
METAL	0.85697	0.84387	0.79167	0.75309	0.76109	0.69526	0.76497	0.55017	0.58842	0.81873	1		
OIL & GAS	0.885	0.76761	0.69991	0.69031	0.74747	0.6214	0.73587	0.54774	0.58048	0.82621	0.77445	1	
POWER	0.89795	0.87521	0.81223	0.76171	0.82268	0.71673	0.89098	0.60015	0.58406	0.90707	0.81514	0.80905	1

	Mean	STD	MIN	MAX	R=(μ -d)/ σ
POWER	-1.54	10.11	-41.21	28.21	3.92
AUTO	0.95	9.89	-37.79	23.18	3.92
CD	0.05	11.46	-41.35	36.23	3.61
CG	-1.35	11.76	-49.43	35.01	4.09
METAL	-1.55	14.82	-65.97	38.25	4.35
REALITY	-4.38	19.61	-72.99	48.61	3.50

The analysis result of monthly average data shown in the table 2 conform the results of the previous table. The FMCG and AUTO portfolios performed very well, while the MIDCAP and REALITY portfolios showed a very poor performance. The portfolios choice ratio does not substantiate the same. The ratio value is very low in case of IT and BANK. It shows that in case of IT and BANK, the risk level is very high.

Correlation and variance matrices:

The correlation matrix all the portfolios, along with the benchmark indices was computed to understand the relationship between the portfolios. The table 3 shows the correlation matrix of daily return data of all the portfolios. It shows that the BSE Sensex index has a very high positive correlation with all the portfolios. Other benchmark indices also have a high correlation with the most of the portfolios. Only FMCG and IT portfolios have displayed a very low positive correlation in comparison with others. This indicates that these two portfolios are relatively independent of others. MID CAP & SMALL CAP portfolios have high correlation with PSU & POWER portfolios. Since these are largely government- on shares, understandably, there is a high correlation with portfolios.

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Table: 4 Correlation Matrix of Monthly Data of All The Portfolios And Benchmark Indices

	BSE 500	BSE30	MID CAP	IT	BANK	PSU	FMCG	OIL& GAS	POWER	AUTO	CD	CG	METAL	REALITY
BSE500	1													
BSE30	0.99119	1												
MID CAP	0.98065	0.94987	1											
IT	0.63167	0.66314	0.58901	1										
BANK	0.92816	0.91870	0.89611	0.51824	1									
PSU	0.93179	0.91349	0.91286	0.42288	0.88492	1								
FMCG	0.60932	0.62119	0.58458	0.40129	0.49846	0.54955	1							
OIL& GAS	0.90441	0.90184	0.87590	0.46108	0.7848	0.89616	0.49079	1						
POWER	.94366	0.93116	0.92414	0.49803	0.87282	0.96215	0.60459	0.86907	1					
AUTO	0.90323	0.90464	0.88529	0.58576	0.79558	0.83057	0.61381	0.83991	0.84634	1				
CD	0.91198	0.88181	0.92929	0.63397	0.86389	0.81274	0.48764	0.74907	0.83848	0.78783	1			
CG	0.93181	0.91781	0.9292453	0.48394	0.86052	0.89934	0.54307	0.84639	0.93137	0.82254	0.84436	1		
METAL	.92673	0.91404	0.92336	0.64474	0.79873	0.83308	0.52661	0.84865	0.85362	0.83881	.85453	0.85730	1	
REALITY	0.93699	0.90888	0.94631	0.53134	0.87024	0.88798	0.52388	0.83649	0.88810	0.82004	0.88217	0.86696	0.85757	1

Conclusion

The common objective of financial investors is to achieve an optimal risk-return combination. It can be achieved either by maximizing return with an accepted level of risk, or by minimizing risk with an acceptable rate of return. Diversification influences the risk component of the portfolio, in particular. It implies a spread of investments and allows a middle road through the highs and low market performance. In other words, diversification allows an opportunity for investments to grow with minimum volatility. Securities behave differently from one another within the same market based on its own performance, industry/sector conditions, national and international factors and so on.

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