

An Empirical Study on Risk and Return Analysis of Mining Sector

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ABSTRACT

In investment decision, risk and return analysis plays a key role in evaluation of any assets. The present paper investigates the study on relationship between risk and return of selected companies of Mining industry. Mining industry is considered to be one of the fastest growing sectors in any developing and even in a developed country. In such a scenario, analyzing stocks from the Mining sector requires utmost caution and understanding. The study calculated security return, Market return, Beta, Standard deviation, Correlation Coefficient, Skewness and Kurtosis. The required data is collected from www.bseindia.com. The sample size for this study consists of 6 public limited mining companies that are listed on BSE from 2011 to 2016. The SENSEX is used as market proxy. The descriptive statistics are being used to examine the relationship between the security return and market return. Findings suggest that there is a positive relationship between the security return and market return and the beta are unstable during the study period.

Keywords: Risk and return, Mining Sector. BSE, SENSEX, Beta.

INTRODUCTION:

The investment theory provides a normative approach to investors to assess the risk factor while investing. It is mainly because of the assumption that investors are risk-averse. The investors are very cautious in investing their wealth in risky assets. In the era of information technology, the economy and capital markets of all countries are integrated at an unprecedented pace. The information among the market participants is faster than ever and the market participants are more informative than before. The investment must be considered in light of their impact on the risk and return of the assets. It is assumed that higher the risk, higher the returns and lower the risk, lower the returns. However, a general understanding of this phenomenon is not sufficient to make appropriate decisions relating to investments. A more quantifiable analysis is required to understand the investment. This study reported a statistically significant positive relationship between risk and returns, both at the individual security level and at the portfolio level, confirming the theoretical predictions and empirical findings on this issue in developed markets.

Investment in stock market is characterized by return and risk. The return may be in the form of yield or capital appreciation. Risk is the uncertainty of a future outcome. The return to be generated in future period is known as the expected return. The actual return over some past period is known as the realized return. The realized return on an asset may vary from expected return. Volatility may be described as the range of movement from the expected level of return. The more a stock fluctuates, the more volatile the stock is. This is because of the fact that the wide price variations create more uncertainty of an eventual outcome. Risk measurement and analysis has been a critical issue for any investment decision because risk can be transferred but cannot be eliminated from the system. The estimation of risk is the key to any investment decisions.

LITERATURE REVIEW:

Levitz (1974) examined the beta stability between single stock and portfolio and the results found that the beta is stable in portfolio and highly unstable in individual. Theobald (1981) demonstrated that the stability of beta was function of time period utilized for estimation of beta. He is also showed that the steadiness would however not upturn indefinitely with length of estimation period. Bowman (1980) explained the risk and return relationship he predicted that risky projects and investment would need to offer higher earnings than other projects to be attractive. As per his analysis, measure of hazard in one period of time and execution in another, his investigation recommended that low execution promoted hazard going out on limb taking did not influence on future performance. Tversky and Kahneman (1986) revealed that the view of hypothesis clamps that the hazard tendency of who is taking the decisions is affected by predictable execution results but most of the peoples are risk averse and when views are positive (expected gains) and chance looking for when views are adverse (expected losses). These contentions were moved to situational framing where high presentation is related with hazard aversion and low presentation with hazard looking for conduct. Bromilay (1991) analyzed the negative risk and return relationship arises in corporate sector. This article shows that the managers behavioral study in the underachieving and organizations decide to take hazardous action to escalate the returns this implies that decisions behaviors of an individual aggregate into structural result effect found that greater the risk causes poor performance. Das (2008) used a time frame from February 1999 to September 2007 to examine the stability of beta. Sample of 60 stocks which are listed in NSE are considered in the study. The results show that 85% of the stocks had a stable beta in one method (regression using time as variable) and 65% for the stocks had a stable beta when using the second method (regression using dummy variable). Campbell and Vuolteenaho (2004) examined the beta with two classifications of good beta and bad beta. This type of classification will capture the discount-rate and cash-flow, respectively. They suggest that growth and large stocks have good betas with low risk (generate high average returns) and small stocks have bad betas with high risk and low average returns. . Soumya Guhadeb & Sagarika Misra (2011) found that there was a signal of instability of betas particularly in shorter period of time and the instability was condensed when the beta estimation period is increased. In adding to that extreme beta showed the higher stability than the intermediate range of betas Ye, Y.P. (2017) examined the stability of beta by using data from Weekly China's stock return. The mean value, maximum value and minimum value of beta coefficients which regressed by different length of time. The t test is used for statistical significance. It was found that china, beta risk is much higher in the Small and Medium Enterprise Board than in the Main-board market, and it is higher in the Main-board market in SZ than in the Main-board market

STATEMENT OF THE STUDY:

Mining industries plays a significant role in supporting a monetary development and its value replicating about the lessons that have been learnt from the worldwide money related emergency. Mining and financial services sector funds have proved to be more volatile than the pure diversified equity funds which make some of them a high risk proposition. Investing on mining industry is more risky decision because all minerals have been extracted from natural environment so for the concern of protecting the environment it's difficult to get a license from the ministry of mines and state government therefore, we can found very limited mining companies in India listed in NSE and BSE. The mining industry under the control of state government and ministry of mines it is adversely used as the tool to control the external problems because of this there is a high instability in share prices that reduces the real investor's interest. Therefore this study is structure to analyze "Risk and Return of the selected shares in the mining industry", in a particular period of time.

OBJECTIVE OF THE STUDY:

The following are the objectives of the study.

1. To determine the relationship between the security return and market return
2. To examine the stability of beta for the selected mining companies
3. To examine the Correlation Coefficient of mining stocks with SENSEX

SCOPE OF THE STUDY:

The study is restricted to mining industry. The 6 public Limited State owned mining companies are considered for the time period from 2011 to 2016.

SAMPLING:

The risk and return is examined by using monthly closing data of top listed 6 public limited mining companies. The SENSEX is taken as market proxy. S&P SENSEX signifies the key market capitalization on BSE. There are more than 10 mining companies listed in NSE and BSE, in that 6 top mining public limited companies which are listed in BSE are selected based judgmental sampling method.

The list of sample companies are given bellow.

1. Coal India Limited
2. National Mineral Development Corporation Limited
3. Vedanta Resource Limited
4. Gujarat Mineral Development Corporation Limited
5. Orissa Mineral Development Corporation Limited
6. Manganese Ore India Limited

DATA AND METHODOLOGY:

Data:

The current study is mainly based on the secondary data. The monthly closing prices of sample companies are considered in the study. The closing prices of S&P SENSEX are considered as market Proxy. The data is collected from www.bse.com for the time period January 2011 to December 2016.

Sl.NO.	Name of the companies	From	To
1	Coal India Ltd	1-1-2011	31-12-2016
2	NMDC Ltd	1-1-2011	31-12-2016
3	Vedanta Ltd	1-1-2011	31-12-2016
4	GMDC Ltd	1-1-2011	31-12-2016
5	OMDC Ltd	1-1-2011	31-12-2016
6	MOIL	1-1-2011	31-12-2016
7	S&P Sensex 100 (Market Proxy)	1-1-2011	31-12-2016

METHODOLOGY:

The monthly ending price for each month is to be taken and each of the securities rate of monthly return is calculated by using the following formulas:

Security Return:

$$R_i = \left(\frac{P_1 - P_0}{P_0} \right) * 100$$

Where

R_i = monthly rate of return of stock

P_1 = monthly closing price of the security

P_0 = previous month closing price of the security

The market rate of monthly return is calculated by using following formula:

Market Return:

$$R_m = \left(\frac{B_t - B_{t-1}}{B_{t-1}} \right) * 100$$

Where

R_m = Return on market security

B_t = market current month price at the time period t, and

B_{t-1} = market previous month price

Beta is a statistical term used to evaluating the market risk. It is to be calculated by using the following relationship:

$$\beta = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$$

Where

Y = dependent variable of security returns

X = independent variable of market returns

Correlation of Coefficient is to be measure to know the linear relationship between 2 variables by using the following formula:

$$\text{Correlation Coefficient} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2(y-\bar{y})^2}}$$

Standard Deviation is to be measure to know the variability of observation around the mean by using the formula:

$$SD = \frac{\sqrt{\sum(x-\bar{x})^2}}{n}$$

Skewness is a term in statistics used to define asymmetry from the normal distribution in a set of statistical data.

$$\text{Skewness} = \frac{n}{(n-1)(n-2)} \sum\left(\frac{xi-\bar{x}}{s}\right)$$

Kurtosis is a statistical measure that is used to define the distribution, or skewness, of observed data around the mean.

$$\text{Kurtosis} = \left\{ \frac{n(n+1)}{(n-1)(n-2)(n-3)} \sum\left(\frac{xi-\bar{x}}{s}\right)^4 \right\}$$

RESULTS AND DISCUSSION:

The results of the study are discussed in this section. From the table 1, it is clear that during the year 2011 average monthly return on Coal India Ltd stock was -0.17 and Market has provided return of -2.28 (annualized -27.36) with the beta value of 0.32 annually. In the year 2012 monthly return on security is 1.50 provide a positive return (annualized 18%) and market also provide a positive return that is 2.33 (annualized 27.96%) with the beta value of 0.69 annually. In the year 2013 return on security was -1.36 (annualized 16.32%) and market return is 0.56 (annualized 6.72%), with the beta value of 1 In the year 2014 Return on security is 2.90 (annualized 34.8%) and market has provided the return of 2.43 (annualized 29.16%) with the annual beta value is 2.09% In the year 2015 security return has provided negative monthly return that is -0.97 (annualized 11.64%) and market return is -0.22 (annualized 2.64%) with the annual beta value of 1.00%. In the year 2016 security return of coal India ltd was provided negative returns -0.68 (annualized 8.16%) and market has provided positive return of 0.40 (annualized 4.8%), with the beta value is 0.18% annually. Coal India Ltd. stocks are positively correlated with the market in every year taken for the study that is from 2011 to 2016.

Table 1 shows Risk and Return analysis of Coal India Limited from 2011 to 2016

Table 1: Risk, Return and Beta of Coal India Ltd

Year	R _i	R _m	β	Correlation Coefficient
2011	-0.1717	-2.2873	0.3207	0.2894
2012	1.5055	2.3343	0.6965	0.7441
2013	-1.3645	0.5663	1.2466	0.6696
2014	2.9040	2.4307	2.0965	0.7455
2015	-0.9702	-0.2219	1.0002	0.4194
2016	-0.6834	0.4084	0.1898	0.2361

Table 2 shows Risk and Return analysis of National Mineral Development Corporation Limited in the year 2011 to 2016

Table 2: Risk, Return and Beta of NMDC Ltd

Year	R _i	R _m	β	Correlation Coefficient
2011	-4.1288	-2.2873	1.0321	0.7624
2012	0.4762	2.3343	0.7642	0.5430
2013	-0.7815	0.5663	0.6501	0.2777
2014	0.5839	2.4307	0.6738	0.2926
2015	-3.7665	-0.2219	0.1240	0.0786
2016	3.2018	0.4084	1.2302	0.5591

In the year 2011 average monthly return of NMDC Limited stock was -4.12 (annualized -49.44%) and market has provided return of -2.28 (annualized -27.36) with the beta value of 1.03% annually. In the year 2012 return on security is 0.47(annualized 5.64) and market return is 2.33 (annualized 27.96) with the beta value of 0.76 annually. In the year 2013 security return of NMDC Ltd is has provided negative return that is -

0.78 (annualized 9.36%) and market return is 0.56 (annualized 6.72%) with the beta value of 0.65 annually. In the year 2014 the return on security is 0.58 (annualized 6.96%) and market return is 2.43 (annualized 29.16%) with the beta value of 0.67 annually. In the year 2015 the return on security is -3.76 (annualized -45.12) and market return is -0.22 (annualized 2.64%) with the beta value of 0.12% annually. In the year 2016 security return of NMDC Ltd is 3.20 (annualized 38.4%) and market return is 0.40 (annualized 4.8%) with the beta value of 1.23% annually. NMDC Ltd stocks are positively correlated with the market in every year that's from 2011 to 2016.

Table 3 Showing Risk and Return analysis of Vedanta Limited for 2011 to 2016

Table 3: Risk, Return and Beta of Vedanta Ltd

Year	R _i	R _m	β	Correlation Coefficient
2011	-5.2449	-2.2873	0.9823	0.6036
2012	2.0433	2.3343	1.4684	0.6987
2013	1.3808	0.5663	0.3511	0.0936
2014	1.4548	2.4307	2.6520	0.6520
2015	-6.0984	-0.2219	0.8567	0.2197
2016	8.4390	0.4084	1.9087	0.6844

Table 3 shows the year wise analysis of risk and return. In the year 2011 average monthly return of Vedanta Limited stock was -5.24 (annualized -62.88%) and market has providing the return of -2.28 (annualized -27.36%) with the beta value of 0.98%. In the year 2012 return on security is 2.04 (annualized 24.48) and market return is 2.33 (annualized 27.96) with the beta value of 1.46% annually. In the year 2013 return on security is 1.38 (annualized 16.56%) and market return is 0.56 (annualized 6.72%) with the annual beta value of 0.35. In the year 2014 return on security is 1.45 (annualized 17.4%) and market return is 2.43 (annualized 29.16%) with the beta value of 2.65% annually. In the year 2015 return on security is -6.09 (annualized 73.08%) and market return is -0.22 (annualized 2.64%) with the beta value of 0.85%. In the year 2016 return on security is 8.43 (annualized 101.1%) and market return is 0.40 (annualized 4.8) with the beta value of 1.90% annually. Vedanta Ltd stocks are positively correlated with the market in every year that is from 2011 to 2016.

Table 4 Showing Risk and Return analysis of Manganese Ore India Limited (MOIL) in the year 2011 to 2016

Table 4: Risk, Return and Beta of MOIL

Year	R _i	R _m	β	Correlation coefficient
2011	-5.4068	-2.2873	0.2974	0.3718
2012	1.5155	2.3343	0.4997	0.3553
2013	-0.5421	0.5663	0.5656	0.3218
2014	2.5474	2.4307	1.7685	0.8473
2015	-3.0965	-0.2219	0.3132	0.1864
2016	5.0877	0.4084	0.6742	0.2932

The results of above table evidence that during the year 2011 average monthly return on security of MOIL Ltd is -5.40 (annualized 64.8%) and market has providing the return of -2.28 (annualized -27.36) with the beta value of 0.29% annually. In the year 2012 return on security of monthly stock is 1.51 (annualized 18.12%) and market return is 2.33 (annualized 27.96%) with the beta value of 0.49% annually. In the year 2013 return on security is -0.54 (annualized 6.48%) and market return is 0.56 (annualized 6.72%) with the beta value of 0.56% annually. In the year 2014 return on security is 2.54 (annualized 30.48%) and market return is 2.43 (annualized 29.16) with the beta value of 1.76% annually. In the year 2015 return on daily stock is -3.09 (annualized 37.08%) and market return is -0.22 (annualized -2.64) with the beta value of 0.31 % annually. In the year 2016 return on security is 5.08 (annualized 60.96%) and market return is 0.40 (annualized 4.8%) with the beta value of 0.67% annually. Manganese Ore India Ltd stocks are positively correlated with the market in every year that is from 2011 to 2016.

Table 5 Showing Risk and Return analysis of Gujarat Mineral Development Corporation Limited (GMDC Ltd) in the year 2011 to 2016

Table 5: Risk, Return and Beta of GMDC Ltd

Year	R _i	R _m	β	Correlation Coefficient
2011	1.5905	-2.2873	0.8073	0.5451
2012	2.5800	2.3343	0.6805	0.5617
2013	-4.0582	0.5663	1.3903	0.4945
2014	1.2740	2.4307	1.8068	0.6664
2015	-3.1309	-0.2219	0.7299	0.2931
2016	2.0612	0.4084	1.9046	0.5413

It is clear from the above table that during the year 2011 the average monthly return of GMDC Ltd was 01.59 (annualized 19.08%) and market has providing the return of -2.28 (annualized -27.36%) with the beta value of 0.80% annually. In the year 2012 return on security is 2.58 (annualized 30.96%) and market return is 2.33 (annualized 27.96) with the beta value of 0.68% annually. In the year 2013 return on security is -4.05 (annualized -48.6) and market return is 0.56 (annualized 6.72%) with the beta value of 1.39% annually. In the year 2014 return on security is 1.27 (annualized 15.24%) and market return is 2.43 (annualized 29.16%) with the beta value of 1.80% annually. In the year 2015 return on security is -3.13 (annualized 37.56%) and market return is -0.22 (annualized -2.64%) with the beta value of 0.72% annually. In the year 2016 return on security is 2.06 (annualized 24.72%) and market return is 0.40 (annualized 4.8) with the beta value of 1.90% annually. GMDC Ltd stocks are positively correlated with the market in every year that is from 2011 to 2016.

Table 6 Showing Risk and Return analysis on Orissa Minerals Development Corporation Limited (OMDC Ltd) in the year 2011 to2016

Table 6: Risk, Return and Beta of OMDC Ltd

Year	R _i	R _m	β	Correlation Coefficient
2011	-4.5484	-2.2873	1.9361	0.8479
2012	-3.5847	2.3343	1.7926	0.2887
2013	-3.4832	0.5663	2.1323	0.7219
2014	4.8280	2.4307	3.6650	0.5072
2015	-2.2967	-0.2219	1.4543	0.3995
2016	1.6730	0.4084	2.2320	0.7173

Evidence from the above table shows that during the year 2011 the average monthly return of OMDC Ltd was -4.54 (annualized -54.48%) and market has providing the return of -2.28 (annualized -27.36%) with the beta value of 1.93 annually. In the year 2012 return on security is -3.58 (annualized -42.96%) and market return is 2.33 (annualized 27.96) with the beta value of 1.79% annually. In the year 2013 return on security is -3.48 (annualized -41.76%) and market return is 0.56 (annualized 6.72%) with the beta value of 2.13% annually. In the year 2014 return on security is 4.82 (annualized 57.84%) and market return is 2.43 (annualized 29.16%) with the beta value of 3.66% annually. In the year 2015 return on security is -2.29 (annualized -27.48%) and market return is -0.22 (annualized -2.64%) with the beta value of 1.45%. In the year 2016 return on security is 1.67 (annualized 20.04 %) and market return is 0.40 (annualized 4.8) with the beta value of 2.23% annually. OMDC Ltd stocks are positively correlated with the market in every year that is from 2011 to 2016.

Table 7 Showing Descriptive Statistics of the monthly return of 6 mining companies during the period of 2011 to 2016

Table 7 Descriptive Statistics of Returns

Company	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
Coal India Ltd	-16.6060	27.2369	0.2033	6.2888	0.5575	2.1208
NMDC Ltd	-21.6107	13.1451	-0.7357	7.1698	0.413	1.4850
Vedanta Ltd	-25.1581	50.9994	0.329	10.5496	1.4948	5.9739
GMDC Ltd	-32.0467	34.7593	0.0527	8.6802	0.2572	2.8778
OMDC Ltd	-90.4109	93.2081	-1.2353	15.0251	0.3084	18.4742
MOIL	-12.7653	33.3875	0.0175	6.8623	1.1617	3.3638

A summary of descriptive statistics of the average monthly return of 6 mining companies are given in table 7. Among the 6 mining companies, 4 firms have been showed as positive mean return for all the months during the course of the study period i.e. Coal India Ltd, Vedanta Ltd, GMDC Ltd, and MOIL Ltd with 0.20, 0.32, 0.05, and 0.017 mean respectively. NMDC Ltd (-0.73), OMDC Ltd (-1.23) companies show negative mean return. Lower standard deviation indicates least volatility in returns and higher standard deviation leads to more volatility. From the table it is clear that OMDC Ltd shows highest standard deviation and Coal India Ltd is the lowest. The skewness of the monthly returns is found to be positive for all 6 mining companies which are selected for the study those are Coal India ltd, NMDC ltd, Vedanta Ltd, GMDC Ltd OMDC Ltd and MOIL, but the high skewed amount indicates that the return distribution of the firms traded in the market is have a greater probability of getting positive return than the lowest. Vedanta Ltd is giving high skewed return distribution where as GMDC Ltd showing lowest among 6 mining companies. Kurtosis of the monthly mean return that 3 companies are showing excessive that is greater than 3 those are Vedanta Ltd, OMDC Ltd and MOIL. This results the presence of leptokurtosis and 3 companies are showing less than 3 those are Coal India Ltd, NMDC Ltd and GMDC Ltd, which shows the presence of platorkurtic.

Table 8 Showing the Stability of Beta for all 6 mining companies from 2011 to 2016

Table 8: Results of Beta from 2011-2016

Company	2011	2012	2013	2014	2015	2016	Mean	SD
Coal India Ltd	0.3207	0.6965	1.2466	2.0965	1.0002	0.1898	0.9250	0.6985
NMDC Ltd	1.0321	0.7642	0.6501	0.6738	0.1240	1.2302	0.7457	0.3789
Vedanta Ltd	0.9823	1.4684	0.3511	2.652	0.8566	1.9086	1.3698	0.8241
GMDC Ltd	0.8072	0.6805	1.3903	1.8068	0.7299	1.9045	1.2199	0.5556
OMDC Ltd	1.9361	1.7926	2.1323	3.6650	1.4543	2.2320	2.2021	0.7673
MOIL	0.2974	0.4997	0.5656	1.7685	0.3132	0.6742	0.6864	0.5498

A steady beta of an organization over a period of time indicates that taken as hint for future market hazard and unsteady beta over a period should be redesigned at regular intervals such that it shows the potential danger of the organization with minimum error. Beta of Coal India Ltd increasing from 2011 to 2014 and it was decreased in the year 2015 and 2016. Beta of NMDC Ltd found to be heavy fluctuating from year by year one year it shows increasing beta and next year it was declined. Beta of Vedanta Ltd, GMDC ltd, is also found to be heavy fluctuation in year by year same as NMDC Ltd. OMDC Ltd and MOIL has increasing from 2011 to 2014 later it was decreased in the year 2015 and again in 2016 beta of 2 companies was increased. As we analyze the above Table No.4.8 the betas of all 6 companies have not been stable for all 6 years, but when we take average beta of 6 years Vedanta Ltd, GMDC Ltd, and OMDC Ltd showing high risk and Coal India Ltd, NMDC Ltd, and MOIL indicating less risk factor.

CONCLUSION:

In this study, the researcher evaluated the relationship between the security return and market return and stability of beta. We have conducted our data analysis by using the statistical techniques i.e., mean, standard deviation, correlation coefficient, and beta statistics. The study revealed that the return of Coal India Ltd is highest (2.90) during the year 2014, lowest (-0.17) during 2011. The market return was positively correlated with security return. The highest (2.09) beta found in the year 2014 and lowest (0.18) in the year 2016. It is also clear that the return of NMDC Ltd is highest (3.20) during the year 2014, lowest (-0.78) during 2013. The market return was positively correlated with security return. The highest (1.23) beta found in the year 2016 and lowest (0.12) in the year 2015. The return of Vedanta Ltd is highest (8.43) during the year 2016, lowest (-5.24) during 2011. The market return was positively correlated with security return. The highest (2.65) beta found in the year 2014 and lowest (0.35) in the year 2013. The return of MOIL Ltd is highest (5.08) during the year 2016, lowest (-0.54) during 2013. The market return was positively correlated with security return. The highest (1.76) beta found in the year 2014 and lowest (0.29) in the year 2011. The return of GMDC Ltd is highest (2.58) during the year 2012, lowest (-3.13) during 2015. The market return was positively correlated with security return. The highest (1.90) beta found in the year 2016 and lowest (0.68) in the year 2012. The return of OMDC Ltd is highest (4.82) during the year 2014, lowest (-2.29) during 2015. The market return was positively correlated with security return. The

highest (3.66) beta found in the year 2014 and lowest (1.45) in the year 2015. The average monthly return from 2011 to 2016 Vedanta Ltd has provided a high positive return among 6 companies that is 0.32 and lowest negative return provided by OMDC Ltd that is -1.23, and Vedanta Ltd showing highest probability of earning positive return in market (1.49), whereas GMDC Ltd showing less probability of earning that is 0.25 among 6 mining companies. The beta of the sample companies are not stable over the years and found heavy fluctuation during the period of study. Thus, while making investment decision, an investor can consider those companies which have high positive influence on the Sensex when the market is favorable.

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