

# Stability of Sector wise Beta: Case Study of India

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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 nature and degree of risk varies from industry to industry. The risk can be categorized into two parts ; unique risk and market risk. Beta is used by all categories of investors for measurement of market risk of individual companies, portfolios and sectors. The objective of this paper is to analyze the changing risk profile and stability of beta for different sectors of the Indian economy over last one decade. The period covered for this study is 2003-2012. The sector wise indices from Bombay Stock Exchange of India are used for the purpose of analysis. The sectors which have been considered for the study are auto (BSEAUTO), banking (BSEBANK), capital goods (BSECG), consumer durables (BSECD), FMCG(BSEFMCG), healthcare (BSEHC), Information Technology (BSEIT), metal (BSEMET), oil and gas (BSEOIL), power (BSEPOWER) and reality sector(BSREAL).The beta and R square values clearly indicate that or selected sectors show that FMCG, healthcare and IT are the most defensive sectors whereas reality, metal and IT are the most volatile sectors.

**Keywords:** Risk, beta, sectors of Indian economy

## INTRODUCTION

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. The existing literature classifies the risk in two categories, market and unique risk. Sharpe (1964) examined the linear relationship between the expected return and market risk and postulated the famous Capital Asset Pricing Model (CAPM). Capital asset pricing model (CAPM) has given the concept of beta which even after so many criticisms is considered as an authentic measurement of market risk by the existing literature. During the past four decades, CAPM (Capital Asset Pricing Model) has been studied in great depth and is used as the standard risk-return model by various researchers and academicians. The basic premise of CAPM is that the stocks with a higher beta should yield higher returns for the investors. One of the conditions stipulated in the model is that the said return should be higher than the return of the risk-free asset. But, if the market return falls short of the risk free rate, then stocks with higher betas yield lower returns for the investors.

Indian stock markets witnessed a dramatic change in risk return profile of stocks of different sectors of Indian economy due to series of reforms and volatile economic cycles. That attracted the interest of scholars to study the changing risk return profile of various sectors of emerging economies like India. Since 1970, there has been a large collection of research examining the market risk with the help of beta. Beta estimation is soul of financial management because entire analysis of cost of equity is based on concept of beta. Even in corporate finance the practitioners and researchers use beta for capital budgeting and valuation process. Many studies were conducted globally for analyzing the behavior and stability of beta, but, most of these research works are clustered around the highly-developed markets and there are very few studies documented this behavior in Indian context.

This study is an attempt to examine the behavior and stability of beta across selected sectors in Indian market. The paper is divided into four main areas. Section II briefly discusses the literature review. Section III explains the data & methodology. The results are dealt with in Section IV. The paper ends with some brief concluding remarks in Section V.

## **REVIEW OF LITERATURE**

The review of literature documents that many studies were conducted for analyzing the beta of individual firms and sectors. Levy (1971) and Levitz (1974) in a study examined the stability of individual as well as portfolio betas and found that portfolio betas are more stable than individual betas. In a similar type of studies Blume (1971) and Altman (1974) found that the stability of portfolio beta is much more than individual stock beta. In another study found the similar results. Baesel (1974) examined the period during which the beta is stable and he found that as the interval of analysis increases the stability of beta increases. He also found that stability of beta depends upon the stock market conditions. Jagannathan and Wang (1996) found that market conditions affect the leverage profile of the firms hence the beta and that's why beta is not stable over the period of time. Vipul (1999) analyzed the stability of beta with respect to size and liquidity of the firm and he found that the nature and stability of beta varies across various size and liquidity. Chawla (2004) investigated the stability of beta and he found that hypothesis of having stable beta is rejected. McNulty et al (2002) analyzed the problems of using historical beta for estimating cost of capital. He found that as the beta is not stable than prospective beta is used for the purpose than using historical beta. Lewellen and Nagel (2003) in a study found that the volatility and causes of volatility affects the leverage of the firm and that ultimately affect the behavior of beta . Haddad (2007) examined the nature and steadiness of systematic risk in Egyptian stock markets. The study found that the nature and direction of systematic risk also varies over the period of time. Kanti Ray (2012) in a study examined the stability of beta of thirty stocks using dummy variables and the Chow test. The findings of the study were inconclusive and only nine out of thirty stocks were found stable during the period of analysis.

## **DATA AND METHODOLOGY**

The risk and returns based on market related information has been analyzed using the monthly returns based on different BSE sectoral indices available for different sectors of the Indian economy. The return and risk based on broad stock market index BSE 500 has been taken as the measurement of market return and market risk, respectively. BSE 500 represents nearly 93% of the total market capitalization on BSE. This means that BSE 500 ideally represent the total market and hence has been taken as a proxy for market portfolio. The sectors which have been considered for the present study are auto (BSEAUTO), banking (BSEBANK), capital goods (BSECG), consumer durables (BSECD), FMCG(BSEFMCG), healthcare (BSEHC), Information Technology (BSEIT), metal

(BSEMET), oil and gas (BSEOIL), power (BSEPOWER) and reality sector (BSERREAL). The risk and returns based on accounting information has been analyzed using data on total sales, total PBIT, total PBT and total assets of different firms included in respective sectoral indices. To analyze risk and returns of different sectors of the Indian economy, a time period of ten years from 2003 to 2012 has been chosen. The data used for study is extracted from CMIE database Prowess. The sample covers all the sectoral market indices maintained by BSE. BSE is one of the leading stock exchanges of India. The stable data for power sector and reality sector is available only since 2007 and 2008 respectively.

## METHODOLOGY

The basic framework of this study is risk return relationship analysis of equities of selected sectors of Indian economy. For the qualitative investigation, the study used the empirical evidences from literature review the stability of beta. All variables are transformed into natural logs. The return is calculated as follows:

$$R_i = \ln(P_2) - \ln(P_1) \dots\dots\dots(i)$$

Beta is used for analyzing the market risk of the selected sector. Beta is calculated by using following relationship.

$$R_i = a + \beta_i R_m \dots\dots\dots(ii)$$

Where

$R_i$  = expected return of selected sector

$R_m$  = expected return of market (BSE 500)

$\beta_i$  = Market sensitivity of selected sector (Beta)

## RESULTS AND ANALYSIS

The objective of this paper is to analyze risk and returns profiles and beta stability of different sectors (on the basis of sector wise indices on Bombay stock exchange) listed on Bombay stock exchange. The sectors and the descriptive statistics which have been considered for the present study are listed in Table 1.

**Table 1 Risk and Return Statistics of Monthly Data of Selected Sectors**

## (2003 To 2012)

	Mean	Maximum	Minimum	Std. Dev.	Coff. of Variation	Skewness	Kurtosis
SENSEX	0.01	0.25	-0.27	0.09	6.92	-0.64	4.59
BSE500	0.01	0.29	-0.32	0.10	7.78	-0.73	5.09
BSEAUTO	0.01	0.28	-0.31	0.10	6.94	-0.52	5.09
BSEBANK*	0.02	0.37	-0.27	0.12	6.58	-0.12	4.29
BSECD	0.01	0.45	-0.35	0.13	9.82	-0.24	5.61
BSECG	0.01	0.41	-0.41	0.12	8.13	-0.27	6.45
BSEFMCG	0.01	0.19	-0.20	0.07	5.23	-0.73	4.98
BSEHC	0.01	0.14	-0.28	0.08	6.98	-1.39	5.75
BSEIT	0.01	0.19	-0.25	0.09	10.22	-0.54	3.52
BSEMET	0.02	0.46	-0.52	0.15	9.76	-0.60	5.13
BSEOIL	0.02	0.25	-0.38	0.10	6.87	-0.89	5.58
BSEPOWER**	0.01	0.31	-0.36	0.11	9.06	-0.56	5.56
BSEREAL***	0.02	0.58	-0.57	0.21	13.58	-0.02	3.63

\*Data available since 2002

\*\*Data available since 2005

\*\*\* Data available since 2006

Table 1 shows the ex-post returns and risk computed for the different sectors of the Indian economy. Standard deviation and coefficient of variation of the rate of return has been considered as the measurement of total sectoral risk as shown in Table 1. The results show that both the returns and risk of the heavy engineering sector and metal sector respectively are the largest. The FMCG and healthcare sectors are having the least risk but surprisingly not the lowest returns, showing the strength of FMCG sector specially. Metal sector is indicating low returns but very high risk. Table 1, clearly indicate that in last ten years the best performing sectors are heavy engineering, Oil and Gas, Consumer durables, FMCG, Auto and Banks. Even the risk return profile of these sectors was even better than the market benchmarks BSE 500. On the other hand Metal sector was the worst performer. The data also suggests that the Health care and IT sector were also among the poor performers.

The total risk of any sector can be divided into two components: systematic risk (Market risk) and unsystematic risk (sector specific risk). The systematic risk of the sector is explained by macroeconomic factors whereas sector-specific risk is explained by factors specific to that sector. Beta which shows the sensitivity of the sectoral return to the market return is considered as the measurement of market return. The value of beta for different sectors computed from the regression

model (Equation ii) has been shown in Table 2. Break-up of total variance (calculated on the basis of characteristic line).

**Table 2 Alpha, Beta and R<sup>2</sup> for Selected Sectors (Benchmark BSE 500)**

	Alpha	Beta	R <sup>2</sup>
BSEAUTO	0.79%	0.91	0.76
BSEBANK	1.00%	0.99	0.76
BSECD	0.05%	1.18	0.74
BSECG	1.04%	1.11	0.84
BSEFMCG	0.06%	0.48	0.40
BSEHC	0.10%	0.67	0.66
BSEIT	-0.78%	0.85	0.44
BSEMET	0.35%	1.37	0.80
BSEOIL	0.51%	0.95	0.75
BSEPOWR	0.14%	1.15	0.86
BSEREAL	-1.08%	2.25	0.70

In Table 2, the anticipated values of beta for selected sectors show that FMCG, healthcare and IT are the most defensive (least risky) sectors whereas metal and IT are the most volatile sectors. Metal and capital goods sectors have the maximum market risk of running a business whereas FMCG, healthcare and IT are the least volatile sectors. The market risk of other sectors, namely, auto and oil and are having below market risk (Beta less than 1) while sectors like banks and consumer durables have above market risk (beta greater than 1). The alpha value of different sectors give a surprise and that is the performance of FMCG sector. This sector is often known as defensive sector but during last ten years in term of performance this sector outperformed the other sectors. The alpha value of this sector is significantly higher than other sectors.

**Table 3 Break Up of Total Risk into Systematic and Unsystematic Risk**

	SR	USR
BSEAUTO	74.81%	25.19%
BSEBANK	71.51%	28.49%
BSECD	73.12%	26.88%
BSECG	82.36%	17.64%
BSEFMCG	39.54%	60.46%
BSEHC	64.52%	35.48%

GFJMR	Vol. 5	July-December, 2012
BSEIT	43.66%	56.34%
BSEMET	79.04%	20.96%
BSEOIL	74.03%	25.97%
BSEPOWR	91.99%	8.01%
BSERREAL	84.21%	15.79%

When the study analyzed the percentage of total risk for different sectors we found that on an average approximately 65% of the total risk is explained by market related factors and rest 35% by sector specific factors. But this percentage varies from sector to sector. For sectors like capital goods, banks, consumer durables and power the proportion of market risk is 75-80% and sector specific risk is hardly 20-25%. On the other hand for the sectors like FMCG and IT the proportion of market risk is 40-45% only. For metal sector this component is even less than 30% over last ten years. If beta (measurement of market risk) of any sector has been stable over time it means that the current beta can be taken as an indicator of the future market risk of the sector. If beta has not been stable over time it should be updated at frequent intervals such that it captures the future market risk of the sector with minimum error. To analyze whether beta for different sectors of the Indian economy has been stable over time, the estimated values of betas for different sectors from 2003 to 2012 have been shown in Table 4. The results of Table 5 show that betas for different sectors of the Indian economy have not been stable over time. The betas of some sectors have increased over time while for some other sectors they have declined over time. The sectors for which the market risk has increased over time are banks, oil and gas and metal. For example, the beta of banking sector has increased from 0.57 in 2003 to 1.04 in 2012. The sectors, the market risk of which has declined over time are auto, consumer durables, IT and power. The IT sector has witnessed maximum decline in the market risk. The beta of the IT sector has declined from 2.12 in 2003 to 0.44 in 2007 and then marginally increased to 0.73 in 2012. The sectors for which beta is constant over last ten years are capital goods (on an average near to 1.00) and health care (near to 0.7). Thus, the analysis shows that betas for all the sectors have not been stable over time, i.e. betas of all the sectors should be updated at frequent intervals such that it is able to capture the market risk of the sector in the future precisely.

**Table 4 Stability of Beta (2003-2012)**

Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean	SD	Coff. Of Variation
BSEAUTO	0.96	1.33	0.84	0.74	0.92	0.82	0.56	0.77	0.74	0.87	0.86	0.20	0.23
BSEBANK	NA	0.57	0.6	1.2	1.17	0.7	1.02	0.95	1.28	1.04	0.85	0.27	0.31
BSECD	1.34	1.04	1.05	1.04	0.98	0.79	0.85	1.09	1.16	0.65	1.00	0.20	0.20
BSECG	0.94	1.01	0.73	1.02	1.02	1.11	1	1	1.16	0.97	1.00	0.11	0.11
BSEFMCG	0.26	0.87	0.75	0.58	0.68	0.97	0.47	0.49	0.05	0.64	0.57	0.30	0.53
BSEHC	0.47	0.64	0.68	0.65	1.03	0.81	0.6	0.69	0.46	0.69	0.67	0.16	0.24
BSEIT	2.12	1.03	1.03	0.39	0.74	0.54	0.44	0.46	0.47	0.73	0.80	0.52	0.66
BSEMET	0.95	1.26	1.14	1.21	1.3	1.3	1.31	1.34	1.28	1.48	1.26	0.14	0.11
BSEOIL	0.55	1.06	1.08	1.1	0.8	0.76	0.94	0.94	0.82	0.63	0.87	0.19	0.22
BSEPOWR	NA	NA	NA	NA	1.04	1.06	1.11	1	0.84	0.77	0.58	0.13	0.23
BSERREAL	NA	NA	NA	NA	NA	1.01	1.82	1.74	2.09	1.38	0.80	0.42	0.52

## FINDINGS AND CONCLUSIONS

The aim of this paper was to analyze the changing risk and returns profile for different sectors of the Indian economy over last one decade by analyzing the stability of beta. The main sectors which have been sampled for the study were FMCG; healthcare; IT; metal; oil and gas; technology; auto; banking; capital goods; consumer durables and reality sector. The beta and R square values clearly indicate that or selected sectors show that FMCG, healthcare and IT are the most defensive (least risky) sectors whereas reality, metal and IT are the most volatile sectors. That is, metal and capital goods sectors have the maximum market risk of running a business whereas FMCG, healthcare and IT are the least volatile sectors. The market risk of other sectors, namely, auto and oil and are moderately low while sectors like banks and consumer durables have moderately high market risk. The findings of this study are very interesting for FMCG sector. This sector is often known as defensive sector but during last ten years in term of performance this sector outperformed the other sectors. The FMCG companies were best in terms of their risk return profile during last ten years. Sectoral risk and returns have been analyzed using both the accounting and market based information. When we analyze the percentage of total risk for different sectors of the Indian economy, which is explained by macroeconomic factors, we find that the proportion of market risk in total risk varies from sector to sector. For sectors like capital goods, banks, consumer durables and power the proportion of market risk is high and the sectors like FMCG, IT and metal the proportion of market risk is comparatively lower over last ten years. The analysis of volatility of beta on the



basis of coefficient of variation suggests that volatility is maximum for IT sector and minimum for metals and consumer durables in the given period.

The results further show that beta for different sectors have not been stable over time. The beta of some sectors has increased over time while that of some other sectors has declined over time. The sectors for which the beta has increased over time are banks, oil and gas and metal. The sectors, the beta of which has declined over time are auto, consumer durables, IT and power. The IT sector has witnessed maximum decline in the value of beta. The study suggested that the beta values are not stable over a period of time so one must be very careful while measuring risk with the help of beta and in order to minimize the error one should keep on updating the beta for the purpose of doing analysis and estimating cost of equity and capital.