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HIGHER MOMENTS AND BETA ASYMMETRY- EVIDENCE FROM INDIAN STOCK MARKET

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ABSTRACT

This paper aims at analyzing the role of higher moments (coskewness and cokurtosis) in examining the beta asymmetry while pricing risky assets in the Indian Stock Market. To examine the impact of coskewness and cokurtosis in explaining asymmetric market risk, a time period of around 108 months from April 2006 to March 2015 has been considered. The 12 sectors (namely, Auto, Banking, FMCG, Consumer Durables, Capital Goods, Oil and Gas, IT, Telecom, Realty, HealthCare, Metals and Power) constitute the total population of the study. The S&P BSE 500 index, is taken as a proxy for market portfolio. The results of the study show that the inclusion of systematic skewness and systematic kurtosis in conditional beta estimation model display better explanatory power for equityreturn variations but are not able to fully explain the beta asymmetry.

Introduction

The two of the main assumptions of the traditional Capital Asset Pricing Model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966) are firstly, the normality of security returns and secondly, the utility function of the investor being quadratic. The normal distribution is said to be symmetric if the likelihood of any positive deviation over the mean is equivalent to that of a negative appropriation of a similar size. Thus the traditional CAPM model assures that the standard deviationis only the proper measure of risk .Further the quadratic utility function exhibits that risk aversion increases with increase in wealth. This is in contrast to the reasonable assumption of decrease in risk aversion with increase in wealth. The non-normal distribution and/or the utility function of investor being non- quadratic, then the assumption that the mean and variance of the security returns are only the determinants of investor's choice cannot be justified. It has been empirically verified long back that stock returns do not follow normal distribution.Ariditti(1967), Mandelbrot (1963), Fama(1965),Mandelbrot and Taylor(1967),Taylor (2005) and Chung et al (2006) are some studies that document the non-normality of asset returns.

Many studies have questioned the assumption of beta symmetry and examined the relationship between beta and market returns in bull and bear market conditions.Most of these studies argue that the main reason for the weak unconditional relationship between beta and return is that the theoretical framework of traditional unconditional CAPM is based on the expected returns whereas in practice realized returns are used for empirically verifying the unconditional relationship between beta and return. Furthermore, the beta symmetry assumption has been cross examined by these studies but the results are mixed and inconclusive.Fabozzi and Francis (1977) in their study test the differential effect of beta for the two different market conditions i.e. the bull and bear market for 700 NYSE stocks. They formulated a modified single index market model, taking into consideration the dummy variable to test whether beta coefficient differs over bull and bear markets. In the model the dummy variable assumed the value of unity in bull markets and zero for the bear market. A significant coefficient on the binary variable reflects the existence of asymmetric beta in bull and bear market conditions. Using this model, they found the beta to be symmetric in bull and bear market conditions. In their study the few securities which had significant differential coefficient reflecting the dual beta were scrutinized to find the common cause. They mentioned the insignificant R2 for the single index model or association of securities with a

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particular industry as some of the reasons for significant coefficient on their binary variable, but no commonality could be found. The test was replicated using three alternative bull and bear market conditions and concluded with the same results for all these definitions.Pettengill et al. (1995), by using the conditional two moment CAPM observed that there is a significant positive (negative) relationship between beta and security returns during rising (declining) market. However, their study does not report beta asymmetry during bull and bear market.

Some research has been done in the emerging economies also but that too with mixed results. Javid and Ahmad (2011) in their study for a sample of 50 stocks traded in Karachi Stock Exchange for Pakistani Stock Market found asymmetric response of beta to bullish and bearish market conditions by applying the dual beta CAPM. In the Indian context Bhaduri and Durai (2006) studied 78 highly liquid stocks in BSE 100 Index to test the stability of beta in bull and bear market conditions. The results showed symmetry in beta in both bull and bear market, in all competing definitions of market conditions. Deb and Misra (2011) in their study for 410 companies found some evidence of instability of betas. The cause of instability or variation in beta is still to be investigated. Chaudhary (2017) tested the symmetry of beta over bull and bear market for the twelve sectoral indices of Bombay Stock Exchange. The results showed beta asymmetry over bull and bear market in case of nine sectors out of twelve.

Taking into consideration the asymmetric variation in market risk between bull and bear market states, there are two divergent views documented in literature. One in which the studies have proved that higher moments clubbed with dual beta market model display better explanatory power for return variation with prevalence of beta asymmetry. Another set of studies state that higher moments explain away beta asymmetry.

Rubinstein (1973) argued that all moments in distribution of returns are significant for investors given that their utility function is other than quadratic and asset returns are non-normally distributed.According to Kraus and Litzenberger (1976), if an investor's utility function is non-quadratic and exhibits non-increasing absolute risk aversion, the investor will prefer positive skewness to negative skewness in the distribution of stock returns. According to Kimbal (1993) and Dittmar (2002), if the utility function of an investor exhibits decreasing absolute prudence, the investor will not prefer kurtosis in the distribution of stock returns. Since the presence of skewness and excess kurtosis in the distribution of stock returns affect the investor, they must be included while determining the price of the stock. As investors dislike negative skewness and excess kurtosis, the investors must be compensated in form of higher expected returns for the presence negative skewness and large kurtosis in the distribution of stock returns. On the other hand, as investors like positive skewness and low excess kurtosis (less than 3),they will be willing to forego some returns for the same variance if the stock returns show the presence of positive skewness and low excess kurtosis. Thus, if the distribution function of stock returns is asymmetric, the traditional CAPM should be extended by incorporating co-skewness and co-kurtosis (in addition to co-variance) in pricing the stocks.

The study by Teplova and Shutova (2011) incorporated the first four moments for explaining variations in security returns for the Russian Market. Their study compared the performance of unconditional higher moment CAPM with the conditional higher moment CAPM and found that performance of conditional higher moment CAPM is better than the unconditional modelThe study by Galagedera and Maharaj (2004) reports that for Australian market, there exist a direct relationship between beta and returns and between cokurtosis and returns during the rising market and an inverse relationship between beta and return and cokurtosis and return during the declining market. Their results does not support the validity of unconditional higher moments CAPM The study by Javid and Ahmad (2008) reports that coskewness significantly explains the variations in security returns whereas beta and cokurtosis are not highly significant determinants of security returns for the Karachi Stock Exchange. Doan, Lin and Chng (2014) use the dual beta model with systematic higher moments and with Carhart (1997) factors to test if they are important in capturing the asymmetric behavior of beta risk during different market conditions. They find that higher moments are important in capturing beta asymmetry in Australian stock returns.Furthermore, the studies by Harvey andSiddique (2000) and Chen et al. (2001), show that conditional skewness explains some variations in security returns.

In relation to asymmetric beta behavior, this study aims at conducting an empirical analysis to examine if higher moments such as systematic skewness

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and systematic kurtosis can explain the beta asymmetry across bull and bear market states in the twelve prominent sectors of the Indian Economy. These sectoral indices are Auto, Banking, Fast Moving Consumer Goods (FMCG), Consumer Durables, Capital Goods, Oil & Gas, Information Technology (IT), Telecom, Realty, Health-Care, Metals and Power. This study has an important contribution to make to the existing literature as there is dearth of empirical study on the higher moments CAPM in the Indian context.Furthermore, the study may also be of relevance for the Indian investors to price the higher moments while designing their equity portfolio.The results of the study will help analysing the role of higher moments in capturing additional variations in beta risk.

The paper is organized as follows: Section 2 explains the Data and Methodology used in the study. Section 3 presents the Results and Analysis and the final section Concludes.

Data and Methodology

The data for this study spans over 108 months ranging from April 2006 to March 2015.The sample selected for the study includes twelve Bombay Stock Exchange(BSE) sectoral indices (namely, Auto, Banking, FMCG, Consumer Durables, Capital Goods, Oil and Gas, IT, Telecom, Realty, HealthCare, Metals and Power). These sectoral indices reflect the performance of the specific sector. As these indices present a picture of the independent sector, so taking all these indices together reflect the position of the economy. The Bombay Stock Exchange (BSE), established in 1875, is Asia's first and fastest stock exchange. BSE is also the first listed stock exchange of India.The S&P BSE 500 index constituting the top 500 companies listed at BSE ltd is taken as a proxy for market portfolio. The index covers all the major industries in the Indian Economyand is considered to be a broad representation of Indian Market. Monthly sectoral indices return are calculated as follow:

$$\hat{R}_{it} = \ln\left(\frac{P_{it}}{P_{i,t-1}}\right)$$

Where,

R_{it} =Return on Sectoral Index i

P_{it}= Value of the Sector alI nexi at the end of the montht

P_{it-1} =Value of the sector alIndexat the end of the montht-1"

Similarly the monthly return for the market portfolio i.e. BSE500 Index is calculated as follows:

$$\hat{R}_{mt} = \ln\left(\frac{P_{mt}}{P_{m,t-1}}\right)$$

Where,

R_{mt} = Monthly return on the market portfolio

P_{mt}= Value of the S&P BSE 500 Index at the end of the month t.

$P_{m,t-1}$= Value of the S&P BSE 500 Indexat the end of the month t-1.

The required data of all the sectoral indices and market index has been obtained from BSE website.

The 91 days Treasury bill rate has been taken as a proxy for the risk free rate of return. The data for the 91 days Treasury bill has been taken from the official website of Reserve Bank of India (RBI). To measure the effect of co-skewness and co-kurtosis of a sector on the expected return of the sector, average monthly returns on twelve sector and BSE-500 index from April 2006 to March 2015 have been used.

To test the explanatory power of coskewness and cokurtosis against the dual beta, three alternative models are proposed.

$$R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \lambda_i R_{mt}^2 + \mu_t$$

$$R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \delta_i R_{mt}^3 + \mu_t$$

$$R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \lambda_i R_{mt}^2 + \delta_i R_{mt}^3 + \mu_t$$

Where,

R_{it}denotes the monthly excess returns for the ith sector in the tth month;

R_{mt}represents the monthly excess return of BSE 500 Index;

$a_i$is the regression intercept and ß_i is the slope i.e. the beta of the i th sector respectively

D is the dummy variable which assumes the value of 1 in bear market and 0 in the bull market. The coefficient ß_(2i)measures the differential effect of the bear market condition over the bull market for the ith sector. As per the equations the beta of the ith sector over the bull market is equal to ß_1iand the beta of the ith sector over the bear market is equal to ß_1i+ß_(2i).

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?_iandd_i are measures of co-skewness (systematic skewness) and co-kurtosis (systematic kurtosis) respectively. Co-skewness measures the sensitivity of excess returns of asset i to the squared excess returns of the market portfolio. Similarly co-kurtosis measures the sensitivity of excess return of asset i to the cubed excess returns of the market portfolio.

The months of positive (negative) excess market returns are classified as up (down) markets. This is in agreement with one of the alternative definition of bull and bear market as proposed by Fabozzi and Francis (1977).

Results & Analysis

Table 1 presents the descriptive statistics of all the twelve sectoral indices and the market index. The mean, standard deviation, skewness and excess kurtosis of all the indices, as well as Jarque-Bera normality test statistics have been reported. As shown in table 1 the returns of all indices are asymmetric and leptokurtic. Ten portfolios out of twelve show the presence of negative skewness in their returns and the remaining two exhibit positive skewness. The mean coefficient of skewness for S&P BSE 500 Index has come out to be -0.6069. The excess kurtosis of all the indices are positive including BSE-500 which shows that returns of all indices are leptokurtic. The Jarque-Bera test of normality for the indices show that out of twelve indices, the returns of eleven indices exhibit significant non-normality at 1% level and one index is significantly non-normal at 5% level. The BSE-500 index also show significant non-normality at 1% level.

Table 1 Descriptive Statistics and Normality Test

Indices	Mean	Median	Skewness	Excess Kurtosis	Count	JB Test	P value
BSE-Auto	0.0060	0.0128	-0.4865	2.5469	108	33.4494	0.0000
BSE-Bankex	0.0069	0.0052	0.0478	1.5031	108	10.2076	0.0061
BSE-Capital Goods	0.0011	0.0007	-0.0300	3.0789	108	42.6735	0.0000
BSE-consumer durables	0.0050	0.0144	-0.2440	3.8708	108	68.4946	0.0000
BSE-FMCG	0.0058	0.0074	-0.7493	2.9795	108	50.0544	0.0000
BSE-Healthcare	0.0080	0.0172	-1.4567	4.4271	108	126.3915	0.0000
BSE-IT	0.0038	0.0118	-0.5289	0.8392	108	8.2038	0.0165
BSE-Metal	-0.0053	-0.0150	-0.2883	3.2408	108	48.7575	0.0000
BSE-Oil & Gas	0.0000	0.0018	-0.6025	3.4420	108	59.8479	0.0000
Bse-Power	-0.0052	-0.0035	-0.0738	2.6698	108	32.1727	0.0000
Bse-Realty	-0.0089	-0.0207	0.2082	1.7298	108	14.2455	0.0008
BSE-Telecom	-0.0033	-0.0011	-0.8120	1.9437	108	28.8672	0.0000
BSE-500	0.0024	0.0033	-0.6069	3.5470	108	63.2444	0.0000

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Chaudhary (2017) examines whether beta are symmetric over bull and bear market in the twelve prominent sectors of the Indian Economy. The empirical model used in the study to check beta symmetry is given below in equation

$$R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt)}\,D + \mu_t$$

If the ß_(2i) will be significantly different than zero, then it reflects the existence of dual beta. The findings of the study (Table 2) state that beta coefficient is not symmetric over bull and bear market in case of nine sectors out of twelve.

Table 2

Regression Analysis Results $R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt)}\,D + \mu_t$

Sectors	α	β_{1i}	β_{2i}	Adjusted R^2
BSE-Auto	0.006866 (1.202926)	0.85621 (8.895464)*	0.108146 (0.739731)	0.7541
BSE-Bankex	-0.0082 (-1.38247)	1.411372 (14.10989)*	-0.43629 (-2.87165)*	0.8239
BSE-Capital Goods	-0.00745 (-1.16095)	1.352693 (12.50223)*	-0.1964 (-1.19512)	0.8172
BSE-Consumer Durables	0.00523 (0.723358)	1.116091 (9.152706)*	0.108426 (0.585411)	0.7588
BSE-FMCG	0.019007 (3.057395)*	0.120893 (1.153111)	0.505464 (3.174232)*	0.3671
BSE-Healthcare	0.021661 (3.711509)*	0.288179 (2.927868)*	0.535879 (3.584536)*	0.568
BSE-IT	0.012676 (1.377533)	0.327114 (2.10794)*	0.362544 (1.538142)	0.2856
BSE-Metal	-0.01658 (-2.16138)*	1.595243 (12.33384)*	-0.27866 (-1.41846)	0.8077
BSE-Oil & Gas	-0.00664 (-1.21826)	1.045553 (11.36877)*	-0.15551 (-1.11325)	0.7863
BSE-Power	-0.01352 (-2.47966)*	1.2233 (13.30035)*	-0.19958 (-1.42862)	0.8321
BSE-Realty	-0.0348 (-2.76506)*	2.299413 (10.83307)*	-0.76191 (-2.36328)*	0.7279
BSE-Telecom	-0.00713 (-0.79623)	0.899263 (5.95245)*	-0.06222 (-0.27114)	0.5222

Source- Chaudhary (2017)
Note Figures in ( ) indicate the value of t-statistics
*Significant at 1% level

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The current study is the extended form of Chaudhary (2017) work. In the light of asymmetric variations in market risk between bull and bear markets, the objective of this study is to find out whether the systematic higher moments are important in capturing asymmetric variations in equity returns. The models specified in the data & methodology section 2 have been tested for the twelve sectoral indices of BSE and have been shown in the table 3-5.

The results show that estimating dual beta model with systematic higher moments improves the explanatory power of the model. Specifically, it is

Table 3

Regression Analysis Results $R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \lambda_i R_{mt}^2 + \mu_t$

	α	β_{1i}	β_{2i}	λ	Adjusted R^2
	0.0069	0.8548	0.1111	0.0065	
BSE-Auto	(0.9407)	(4.8231)*	(0.3183)	(0.0094)	0.7517
	0.0001	1.1428	0.1365	1.2480	
BSE-Bankex	(0.0129)	(6.2972)*	(0.3817)	(1.7657)***	0.8273
	-0.0069	1.3343	-0.1571	0.0856	
BSE-Capital Goods	(-0.8333)	(6.6977)*	(-0.4003)	(0.1104)	0.8155
	0.0193	0.6604	1.0804	2.1177	
BSE-consumer durables	(2.1362)**	(3.0279)*	(2.5140)**	(2.4930)**	0.7702
	0.0089	0.4477	-0.1916	-1.5188	
BSE-FMCG	(1.1362)	(2.3660)**	(-0.5140)	(-2.0610)**	0.3861
	0.0197	0.3504	0.4032	-0.2890	
BSE-Healthcare	(2.6304)*	(1.9348)***	(1.1301)	(-0.4098)	0.5646
	0.0247	-0.0624	1.1934	1.8101	
BSE-IT	(2.1138)**	(-0.2211)	(2.1471)**	(1.6477)	0.2971
	-0.0247	1.8580	-0.8392	-1.2212	
BSE-Metal	(-2.5233)**	(7.8675)*	(-1.8034)***	(-1.3278)	0.8092
	-0.0198	1.4717	-1.0644	-1.9803	
BSE-Oil & Gas	(-2.9536)*	(9.0935)*	(-3.3381)*	(-3.1420)*	0.8029
	-0.0198	1.4253	-0.6304	-0.9387	
Bse-Power	(-2.8439)*	(8.4989)*	(-1.9079)***	(-1.4372)	0.8338
	-0.0442	2.6039	-1.4113	-1.4150	
Bse-Realty	(-2.7409)*	(6.6901)*	(-1.8404)***	(-0.9335)	0.7275
	-0.0152	1.1605	-0.6195	-1.2142	
BSE-Telecom	(-1.3270)	(4.1973)*	(-1.1372)	(-1.1276)	0.5235

Note Figures in ( ) indicate the value of t-statistics

*Significant at 1% level

**Significant at 5% level

***Significant at 10% level

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observed that the beta asymmetry is not absorbed by the higher moments.

The results of the table 3 shows that after introduction of coskewness with dual beta, the explanatory power of the model has improved in case of eight sectors out of twelve.

If the t-value of the regression coefficient of any explanatory variable is greater than one, it means that by including that explanatory variable in the regression model, the value of adjusted R^2 increases and thus it increases the explanatory power of the model. Thus, if the t-value of the regression coefficient of any independent variable in the regression model comes out to be greater than one, that independent variable should be retained in the model as it increases the explanatory power of the model.

Furthermore, the coskewness is not able to fully explain the beta asymmetry. It has just been a good candidate for explaining asymmetry in market risk only for BSE-Bankex, BSE-FMCG and BSE-Capital Goods.

The results of the table 4 show that after introduction of cokurtosis with the dual beta, the explanatory power of the model has improved in case of five sectors out of twelve. Furthermore, the coskurtosis is not able to explain the beta asymmetry.

Table 4

Regression Analysis Results $R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \delta R_{mt}^3 + \mu_t$

	α	β_{1i}	β_{2i}	δ	Adjusted R^2
	0.0067	0.8426	0.0971	0.5127	
BSE-Auto	(1.1712)	(8.1359)*	(0.6476)	(0.3646)	0.7520
	-0.0074	1.4922	-0.3704	-3.0525	
BSE-Bankex	(-1.2617)	(14.1545)*	(-2.4273)**	(-2.1328)**	0.8296
	-0.0079	1.3102	-0.2310	1.6045	
BSE-Capital Goods	(-1.2260)	(11.3029)*	(-1.3771)	(1.0195)	0.8173
	0.0049	1.0800	0.0789	1.3652	
BSE-consumer durables	(0.6696)	(8.2486)*	(0.4166)	(0.7681)	0.7579
	0.0192	0.1418	0.5225	-0.7903	
BSE-FMCG	(3.0742)*	(1.2579)	(3.2022)*	(-0.5164)	0.3626
	0.0214	0.2579	0.5112	1.1444	
BSE-Healthcare	(3.6443)*	(2.4408)**	(3.3426)*	(0.7978)	0.5665
	0.0135	0.4031	0.4245	-2.8709	
BSE-IT	(1.4629)	(2.4313)**	(1.7691)***	(-1.2755)	0.2898
	-0.0174	1.5171	-0.3424	2.9524	
BSE-Metal	(-2.2764)**	(11.0238)*	(-1.7190)***	(1.5802)	0.8105
	-0.0071	1.0035	-0.1898	1.5885	
BSE-Oil & Gas	(-1.2966)	(10.2028)*	(-1.3333)	(1.1896)	0.7871
	-0.0136	1.2186	-0.2034	0.1760	
Bse-Power	(-2.4713)**	(12.3066)*	(-1.4190)	(0.1309)	0.8305
	-0.0346	2.3163	-0.7481	-0.6384	
Bse-Realty	(-2.7328)*	(10.1372)*	(-2.2620)**	(-0.2058)	0.7254
	-0.0066	0.9473	-0.0230	-1.8162	
BSE-Telecom	(-0.7388)	(5.8429)*	(-0.0980)	(-0.8251)	0.5208

Note Figures in ( ) indicate the value of t-statistics

*Significant at 1% level **Significant at 5% level ***Significant at 10% level

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The results of table 5 show that introduction of both coskewness and cokurtosis with dual beta, the explanatory power of the model has improved in case of ten sectors out of twelve.

Table 5

Regression Analysis Results $R_{it} = \alpha_i + \beta_{1i}(R_{mt}) + \beta_{2i}\,(R_{mt})\,D + \lambda_i R_{mt}^2 + \delta R_{mt}^3 + \mu_t$

	α	β_{1i}	β_{2i}	λ	δ	Adjusted R^2
	0.0072	0.8277	0.1267	0.0660	0.5427	
BSE-Auto	(0.9666)	(4.3066)*	(0.3588)	(0.0928)	(0.3744)	0.7496
	-0.0011	1.2737	0.0615	0.9616	-2.6149	
BSE-Bankex	(-0.1474)	(6.5675)*	(0.1726)	(1.3400)	(-1.7878)***	0.8309
	-0.0061	1.2477	-0.1075	0.2751	1.7297	
BSE-Capital Goods	(-0.7348)	(5.8040)*	(-0.2722)	(0.3458)	(1.0668)	0.8158
	0.0204	0.5378	1.1507	2.3861	2.4511	
BSE-consumer durables	(2.2613)**	(2.2934)**	(2.6707)*	(2.7503)*	(1.3860)	0.7722
	0.0082	0.5257	-0.2363	-1.6896	-1.5592	
BSE-FMCG	(1.0410)	(2.5731)**	(-0.6296)	(-2.2351)**	(-1.0119)	0.3862
	0.0202	0.2970	0.4338	-0.1723	1.0660	
BSE-Healthcare	(2.6784)*	(1.5154)	(1.2045)	(-0.2375)	(0.7211)	0.5625
	0.0237	0.0454	1.1316	1.5742	-2.1545	
BSE-IT	(2.0200)**	(0.1491)	(2.0206)**	(1.3959)	(-0.9373)	0.2963
	-0.0235	1.7318	-0.7668	-0.9449	2.5224	
BSE-Metal	(-2.4039)**	(6.8147)*	(-1.6423)	(-1.0050)	(1.3160)	0.8105
	-0.0195	1.4355	-1.0437	-1.9011	0.7233	
BSE-Oil & Gas	(-2.8827)*	(8.1863)*	(-3.2394)*	(-2.9302)*	(0.5469)	0.8016
	-0.0199	1.4385	-0.6380	-0.9676	-0.2644	
Bse-Power	(-2.8366)*	(7.9067)*	(-1.9085)***	(-1.4375)	(-0.1927)	0.8323
	-0.0448	2.6714	-1.4500	-1.5628	-1.3496	
Bse-Realty	(-2.7571)*	(6.3310)*	(-1.8703)***	(-1.0010)	(-0.4241)	0.7254
	-0.0163	1.2853*	-0.6910	-1.4873	-2.4930	
BSE-Telecom	(-1.4225)	(4.3095)	(-1.2610)	(-1.3478)	(-1.1083)	0.8309

Note Figures in ( ) indicate the value of t-statistics

*Significant at 1% level   **Significant at 5% level   ***Significant at 10% level

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Taken together, the results suggest that inclusion of systematic skewness and systematic kurtosis in conditional beta estimation model display better explanatory power for equity return variations but are not able to fully explain the beta asymmetry. These findings are in contradiction to Doan, Lin and Chng (2014), who report that higher moments explain beta asymmetry. To test for beta asymmetry across bull and bear market states, the Bhardwaj and Brooks (1993) dual beta model has been used in their study. They have related the highest 25% of the market return distribution with the bull market and the lowest 25% of the market distribution with the bear market. The middle 50% of market return distribution is reflected as neutral market i.e. neither bull and bear market. In the current study one of the alternative definition of bull and bear market as proposed by Fabozzi and Francis (1977) has been used. This can be one of the reason of the contradiction as the explanatory power of the model is sensitive to how bull and bear market states are estimated.

Conclusion

This fact is well documented in literature that stock returns are non-normally distributed (Arditti,1967) Furthermore, as the CAPM is tested on the realized returns rather than expected returns, the conditional relationship between beta and realized returns come out to be significant. Taking the clue from both the points mentioned above, an asset pricing model incorporating higher moments seems to be the next rational step to include non-normality of stock-returns during both bull and bear states. In relation to asymmetric beta behavior, this study aims at conducting an empirical analysis to examine if higher moments can explain the beta asymmetry across bull and bear market states in the twelve prominent sectors of the Indian Economy. The results show that both higher moments i.e. systematic skewness and systematic kurtosis under conditional beta estimation model display better explanatory power for equity return variation but are not able to explain beta asymmetry. Furthermore, it is interesting to note that systematic skewness plays a more prominent role. The future scope of the study includes the importance of conditional skewness and conditional kurtosis in explaining stock returns.

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