New-Fangled Multifactor Asset pricing model

Thesis Overview
By

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Abstract

The present study is to evaluate the cross sectional relationship between firm characteristics (size & value) and fundamentals (Profitability, Investment, human capital and others) with risks and expected returns in Indian stock market. The study will consider different horizon of time from previous studies. Further the study will use different breakpoints for Market Capitalisation (Median, Market capitalisation and BSE breakpoints) and Price to Book ratio (Equal weighted and Fama-French Breakpoints) to check the effect on return patterns. The motivation behind using different breakpoints for Market Capitalisation and Price to Book ratio is to check whether results are sensitive to breakpoints or not. This will help analyst and portfolio manager to construct portfolios breakpoints. Study results of average stock patterns, residual graphs, Fama-MacBeth cross sectional test and GRS test will justify the model performance, selection of appropriate factors in the model. Tailed data are important to the investors and OLS is inefficient in tailed analysis. Hence, Quantile regression will be used to analyse tailed distributions. Further study will try to identify the new unidentified factor prevailing in the Indian stock that can explain risk and return relationship better than existing one. Finally a new-fangled asset pricing model will be developed.

Study Objectives

- Test of Multifactor model in emerging markets.
- To identify the unknown factors prevailing in emerging markets that can capture the variance of returns more precisely.
- Finally to developed a new-fangled asset pricing model.

Data

The study employs data of **BSE-500** stocks month end adjusted share prices, market capitalization (MC), price to book ratio (P/B), return on equity(ROE), a measure of profitability (net income is divided by common equity), and total assets (annual growth of total assets is the proxy of investment) from **January, 1999 to April, 2015**. The data are taken from CMIE or Bloomberg database. Beside above data, study also uses BSE-200 index as market proxy. The implicit yields on 91-day treasury bills are used as the proxy of risk-free return and the data sources for market index and risk free return are CMIE Prowess and Reserve Bank of India's website respectively.

Hypothesis

1. H0: There are size and value effects in stock returns
   H1: There are no size and value effects in stock returns
2. H0: There are firm fundamental effects in stock returns
   H1: There are no firm fundamental effects in stock returns
3. H0: Fama-French three factor model is able to explain the average returns on portfolios vis-à-vis one factor CAPM.
   H1: Fama-French three factor model is not able to explain the average returns on portfolios vis-à-vis one factor CAPM.
4. H0: Fama-French Five factor model is able to explain the average returns on portfolios vis-à-vis one factor CAPM and Three factor model.
   H1: Fama-French five factor model is not able to explain the average returns on portfolios vis-à-vis one factor CAPM and three factor model.
5. H0: There is a need for new asset pricing model.
   H1: There is no need of new asset pricing model.

Methodology

Portfolio Construction
Single sort and Double sort techniques
Regressions & Mimicking portfolios
- CAPM
- Fama-French Three factor model
- Fama-French Five Factor model
- Fama-MacBeth Cross sectional regression
- SMB, LMH, RMW, CMA (*Mimicking Portfolios*)

Results

Portfolio returns

Legend:
- 0.06-0.07
- 0.05-0.06
- 0.04-0.05
- 0.03-0.04
- 0.02-0.03
- 0.01-0.02
- 0-0.01
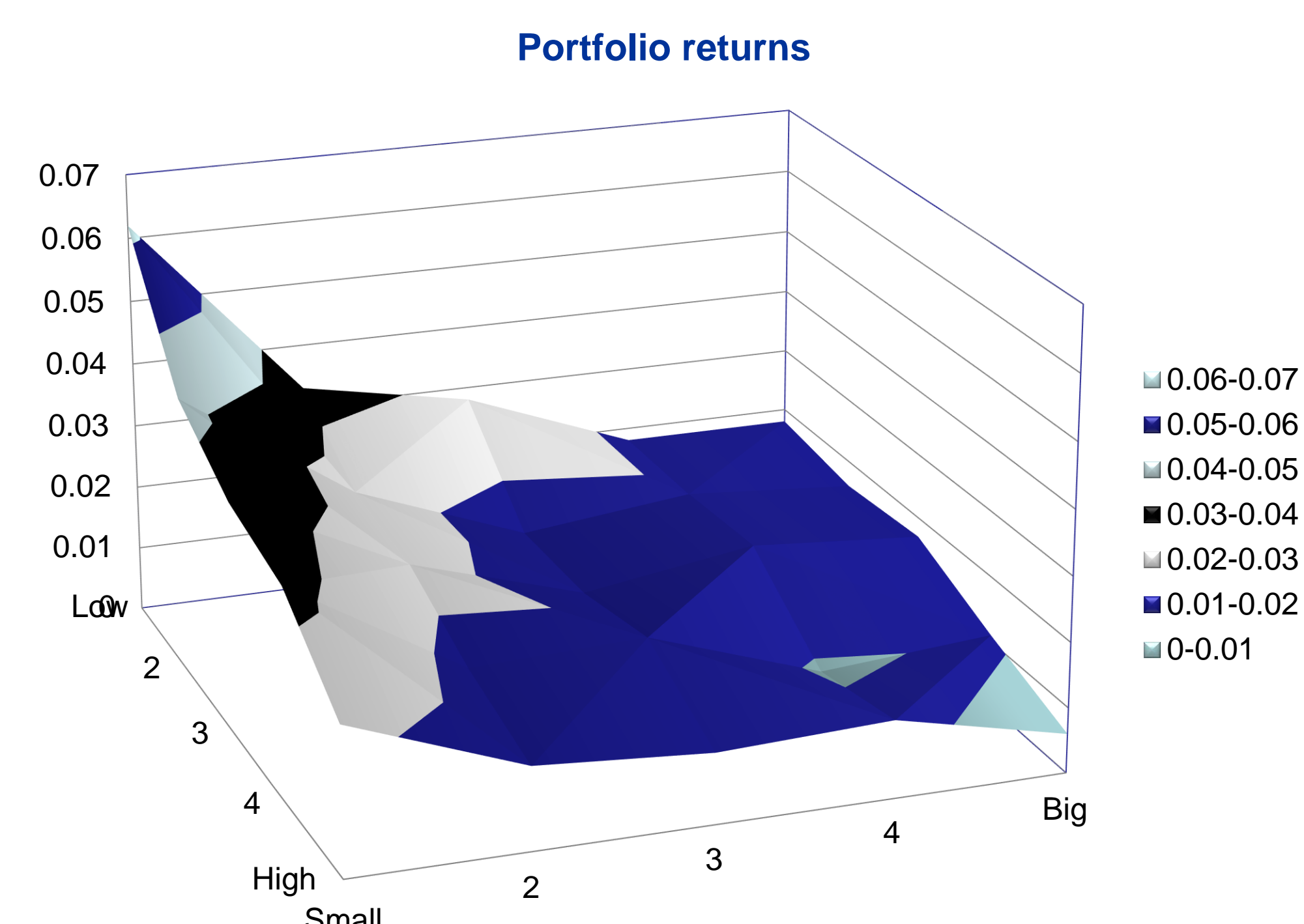
CAPM

	a					b				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.052	0.034	0.028	0.024	0.014	1.182	1.081	0.999	1.046	1.109
2	0.023	0.016	0.014	0.008	0.005	1.227	1.075	1.025	0.898	0.947
3	0.018	0.006	0.005	0.008	0.003	1.183	1.077	1.097	1.093	0.942
4	0.008	0.007	0.009	0.000	0.004	1.155	1.230	1.157	1.032	0.892
Big	0.008	0.007	0.008	0.002	0.000	1.130	1.083	1.052	0.999	0.918

	t(a)					t(b)				
	Low	2	3	4	High	Low	2	3	4	High
Small	5.122	5.700	6.019	5.565	3.199	9.051	14.028	16.700	18.904	19.394
2	3.834	3.550	3.302	1.830	1.680	16.035	18.750	18.054	15.705	21.896
3	3.135	1.425	1.341	2.474	0.046	16.062	18.049	19.876	24.199	0.718
4	1.509	1.590	2.407	0.188	1.501	16.472	20.668	22.672	23.422	22.226
Big	1.488	1.839	2.629	1.177	0.426	15.815	21.452	25.429	32.824	32.217

	R^2				
	Low	2	3	4	High
Small	0.303	0.511	0.597	0.655	0.666
2	0.577	0.651	0.634	0.609	0.718
3	0.578	0.634	0.677	0.756	0.991
4	0.590	0.694	0.732	0.744	0.724
Big	0.570	0.709	0.774	0.851	0.846

FFTF

	a					b				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.006	0.012	0.016	0.017	0.006	1.017	1.007	0.973	1.072	1.133
2	0.009	0.014	0.009	0.007	0.003	1.082	1.001	0.993	0.873	0.973
3	0.013	0.004	0.003	0.005	0.004	1.081	0.990	1.065	1.097	0.943
4	0.010	0.006	0.010	0.002	0.005	1.057	1.149	1.104	1.004	0.906
Big	0.011	0.010	0.014	0.006	0.000	1.000	0.998	1.014	0.982	0.943

	s					l				
	Low	2	3	4	High	Low	2	3	4	High
Small	1.519	0.558	0.316	0.193	0.223	0.561	0.261	0.082	-0.134	-0.129
2	0.293	0.002	0.118	0.023	0.065	0.606	0.328	0.129	0.116	-0.121
3	0.088	0.031	0.039	0.098	0.038	0.440	0.378	0.137	-0.027	-0.003
4	0.087	0.006	0.039	0.048	0.016	0.402	0.360	0.241	0.126	-0.061
Big	0.148	0.130	0.179	0.108	0.011	0.589	0.389	0.185	0.086	-0.106

	t(a)					t(b)				
	Low	2	3	4	High	Low	2	3	4	High
Small	1.196	2.266	3.309	3.688	1.329	16.260	15.411	17.008	19.400	19.957
2	1.860	3.177	2.009	1.732	0.974	17.221	18.130	17.283	16.174	22.123
3	2.241	0.878	0.801	1.312	1.262	15.504	17.628	18.897	23.681	21.174
4	1.781	1.332	2.403	0.537	1.575	15.920	20.236	21.890	22.400	21.895
Big	2.235	2.826	4.344	2.562	0.069	15.995	22.156	25.665	32.491	32.907

	t(s)					t(l)				
	Low	2	3	4	High	Low	2	3	4	High
Small	23.567	8.293	5.368	3.405	3.815	8.174	3.647	1.306	-2.225	-2.085
2	4.531	0.037	2.000	0.430	1.451	8.790	5.419	2.055	1.966	-2.514
3	1.231	0.544	0.686	2.059	0.829	5.751	6.143	2.228	-0.545	-0.073
4	-1.274	0.108	0.767	1.054	0.386	6.077	5.788	4.366	2.573	-1.344
Big	-2.300	2.802	4.400	3.491	0.382	8.591	7.887	4.267	2.595	-3.380

	R^2				
	Low	2	3	4	High
Small	0.851	0.672	0.658	0.680	0.694
2	0.735	0.699	0.651	0.617	0.729
3	0.648	0.698	0.687	0.762	0.719
4	0.658	0.741	0.757	0.754	0.727
Big	0.694	0.785	0.808	0.863	0.856

Residual graphs
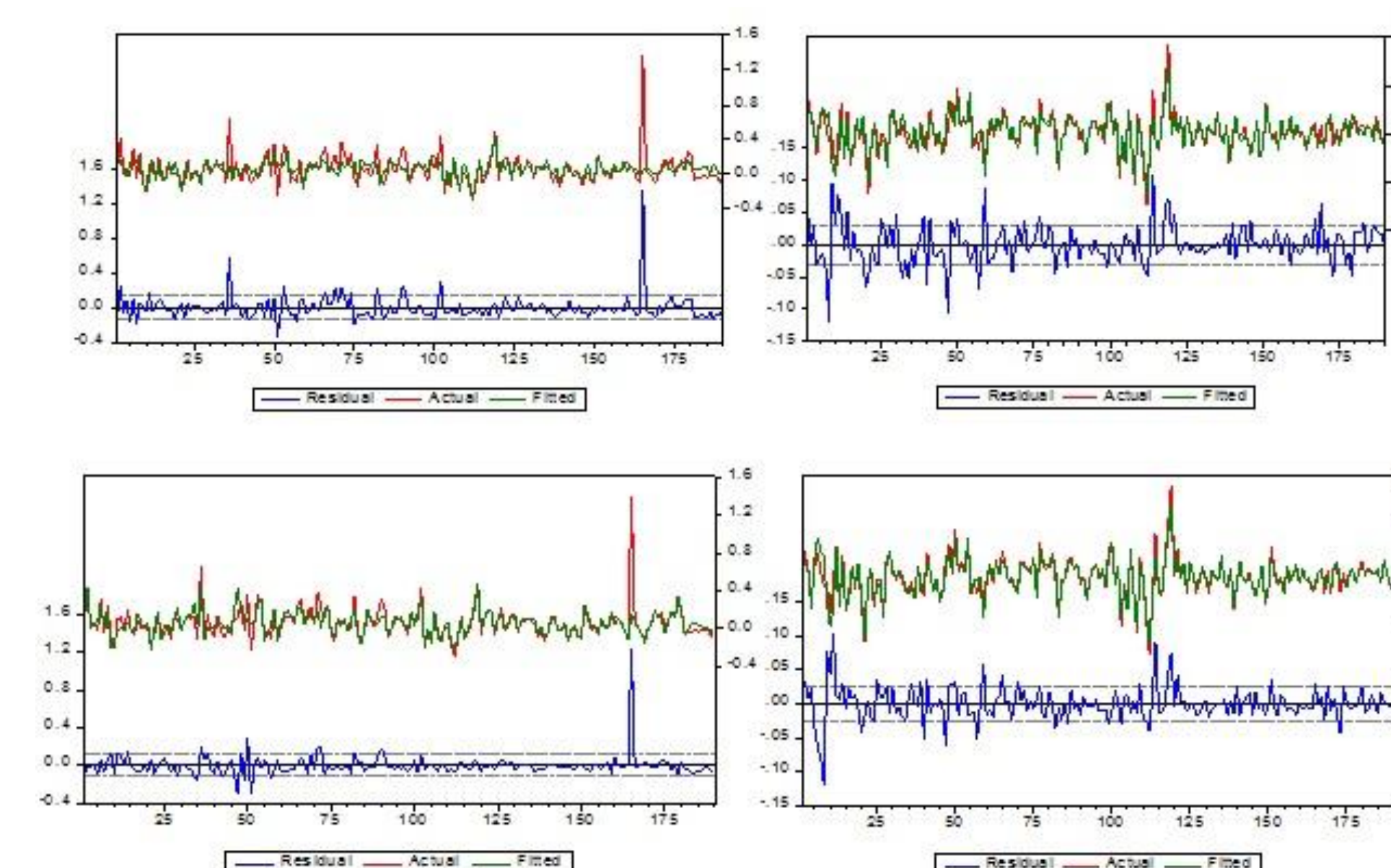
First row showing residual graph for Portfolio 1 (Smallest) and Portfolio 25 (Biggest) for CAPM; and second row for FFTF residual graph for Portfolio 1 (Smallest) and Portfolio 25 (Biggest)

Fama-MacBeth

Parameters	λ0	λrm	λsmb	λlmh	Adjusted R^2	F-statistics(P-Value)
Mean	0.007	0.001	0.022	0.006	0.609	13.451
Standard Deviation	0.127	0.152	0.053	0.054		(0.000)
T-Statistics	0.740	0.086	5.822	1.423		

GRS-Test

Factor Model	GRS F-Statistics	P-Value	Average Absolute alpha value	Average R^2
CAPM*	2.64	0.000	0.013	67.2
FFTF	1.26	0.056	0.005	79.7

Conclusion

The study finds average return on portfolio one which is the intersection of stocks of the smallest MC and the stocks of the lowest P/B is **6.2%** per month. While average return on portfolio 25 (last one) which consists of the biggest stock on MC and lowest value stocks on P/B is **0.6%** per month. The portfolios average returns suggest a strong size effect. Fama-MacBeth cross sectional result on 25 portfolios over the study period suggests that there is a strong size effect and mild value effect. Both Fama-MacBeth cross sectional test and GRS test rejects the CAPM model. The study uses different breakpoints of MC (Median, Market capitalisation, BSE breakpoints) and P/B (Equal weighted and Fama-French breakpoints) to study size and value effect in explaining stock returns. The study finds that the test results are sensitive to MC break points while it is not sensitive to the P/B breakpoints.