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The Persistence of the Size Anomaly in the Indian Stock Market

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ABSTRACT

This paper analyzes (1) whether size-sorted portfolios can generate a size premium with the help of the CAPM model (2) the temporal consistency of the size premium, and (3) whether the size effect is driven by the market cycle. The sample consists of the data of companies listed on the NSE 500 index. Portfolios are constructed based on market capitalization. To examine the size effect, mean returns and CAPM time series regression are used. The dummy variable regression has been used to examine the sensitivity of the size effect for two subperiods. The dual-beta market model was used to examine the market cycle's impact on the size effect. It is concluded that the size effect exists from October 2005 to September 2019. The CAPM model fails to explain the size premium. The size effect is robust and consistent in both sub-periods (October 2005 to September 2012 and October 2012 to September 2019). Further, the size effect is not driven by the market cycle.

These results are beneficial for small investors and mutual funds for portfolio creation and performance evaluation.

Keywords: Size Effect, Market Capitalization, CAPM Model, Stock Returns

INTRODUCTION

The most common CAPM anomaly in the literature is the Size anomaly. It refers that smaller firms earn higher returns than larger firms. The CAPM (Capital Asset Pricing Model) theory suggests that the expected return of any asset and its systematic risk are directly associated. Higher systematic risk leads to higher expected returns. As a result, small firms should provide greater returns than large firms due to higher risk. However, empirical evidence suggests that small firms generate higher risk-adjusted returns. This outcome is known as the Size effect.

BACKGROUND

Banz (1981) was the first who gave the concept of a size effect. Studying the data of NYSE stocks during 1926-1975, it was concluded that smaller firms earn significantly larger abnormal returns than larger firms. Reingnum (1981) confirmed the result of Banz and concluded that a significant firm size effect was still detected after adjusting returns for any E/P (earnings-to-price) effect. But an independent E/P (earnings-to-price) effect was not emerged after adjusting returns for any firm size effect. Therefore, the size effect is strong compared to the E/P effect. Roll (1981) demonstrated that small-cap stocks traded infrequently and therefore, the risk would be biased downwards because of the auto-correlation in the portfolio returns of small firms. As a result, the risk-adjusted average returns are overestimated. Cook and Rozeff (1984) analyzed the size effect for the U.S. market and concluded that small firm-based portfolios show greater returns than large firm-based portfolios. Arbel and Strebel (1983) demonstrated a strong neglect of firm effect and found that information deficiency premium and inefficient pricing are the two factors that explain the larger returns on institutionally neglected firms. Keim (1983) examined the NYSE or AMEX stocks during 1963-79 and concluded that abnormal returns are negatively associated with firm size. Brown, Kleidon, and Marsh (1983) studied the size premium during 1967-79 and showed that the degree and the sign of size premium varied over time. Schultz (1983) examined the NYSE and AMEX stocks and showed that after controlling stock returns for transaction cost, a strong size effect

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was still detected. Cook and Rozeff (1984) analyzed the size premium for the U.S. market and concluded that small firm-based portfolios show greater returns than large firm-based portfolios. Dimson and Marsh (1984) demonstrated a robust size premium and concluded that the smallest portfolio earned 23 percent higher annual returns than the largest portfolio.

According to Fama and French (1992), the cross-sectional variation in average stock returns can be attributed to two major factors viz. Size and BE/ME equity. Fama and French (1993) found a three-factor model that explains abnormal returns in the market by including the market return, size, and BE/ME factors. Further research work by Fama and French (1995,1996) also demonstrated a robust size effect on the US stock market. Berk (1995) showed that expected returns are negatively associated with the firm's market value, and Berk (1996) found that average returns and market value of firms present a significant and negative relation, but average returns and non-market measures did not confirm a significant and negative relations. Cederburg and O'Doherty (2015) revealed that the size premium was restricted to micro and small firms in their 39-year study of US returns. Asness et al. (2018) examined the size premium for 23 developed markets during 1983–2012 and found that after controlling junk, a significant and consistent size premium occurred that was strong over time (including periods when no size premium appeared).

On the other hand, findings of studies on developed markets after Benz's discovery and announcement of the size effect in 1981 recommended that the size effect has reduced or vanished (Fama and French 1992, Chan et al. 2000, Dichev 1998, Horowitz et al. 2000a, Amihud 2002, Schwert 2003, Van Dijk 2011, Israel and Moskowitz 2013, Mclean and Pontiff 2016). Dimson and Marsh (1999) concluded that small-cap firms underperformed large-cap firms during 1983-1997. Dimson et al. (2002) studied the size effect in 19 countries and confirmed the reverse size effect in 18 countries. The size premium did not persist over time, according to Dimson et al. (2011). Fama & French (2011) analyzed the size effect in four regions during the period from 1991 to 2010 and found no size premium in any region during the sample period.

Further, in an emerging market like South Korea, Chui, and Wei (1998) discovered a significant size premium. Patel (2000) analysed the size premium in 22 developing markets from 1988 to 1998 and confirmed its existence only in 9 developing markets, including India. De Groot and Verschoor (2002) analysed the relations between size, BE/ME, and expected returns for the period from 1984 to 2000 in five emerging markets of Asia viz. India, South Korea, Malaysia, Thailand, and Taiwan. In South Korea, Malaysia, and Thailand, it was found a robust BE/ME effect and a robust size effect in all markets. Xu (2002) also stated a significant size effect by employing market capitalization as a measure in China. Barry et al. (2002) examined the size premium from 1985 to 2000 in 35 emerging markets and found no evidence of the size effect. From 2003 to 2006, Pasaribu (2009) found that size and BE/ME are significantly associated with the expected returns for the Indonesian stock market. The presence of a size anomaly was confirmed by Sehgal et al. (2014) in India, South Korea, and Brazil. Leite et al. (2018) revealed a significant size effect on excess stock market returns from 2007 to 2017 in twelve emerging markets.

Studies in the Indian market showed a significant size effect. Using market value as a measure of firm size, Mohanty (2001) showed the existence of a significant size effect between 1991 to 2000 in the Indian stock market. Kumar and Sehgal (2004) measured the relations between common stock returns and firm characteristics for the period 1989–1999 and observed the existence of a significant size effect in the Indian stock market. Sehgal and Tripathi (2005) analyzed the size effect in the Indian stock market from 1999 to 2003 and found a strong size premium. Dash and Mahakud (2014) provided evidence of the size premium by employing data on Indian equity during 1995-2011. Using data from 2003 to 2015 from the BSE 500, Pandey, and Sehgal (2016) revealed the existence of a significant size effect in the Indian market. Deb and Mishra (2019) examined Indian equity data from 1995 to 2014 and concluded that median portfolios had no size premium and value premium. But a positive size premium and value premium were noticed as market capitalization and price-to-book ratio decreased.

Chan, Chen, and Hsieh (1985) examined the size premium in the multi-factor pricing model for NYSE firms from 1958 to 1977. It was revealed that small firm›s stocks produce higher excess returns than large firm's stocks and, among economic variables, changing risk premium variable explicates a big share of the size premium, calculated by "difference in return of low-grade bonds and government bonds." Bhardwaj and Brooks (1993) studied the size premium in bull and bear months for NYSE and AMEX stocks from 1926 to 1988. It was concluded that potential differential return premiums between bull and bear months were captured by the dual beta market model. Further, the results of the dual-beta market model showed that large firm stocks earn greater returns than small firm stocks in both market conditions, and small firm stocks showed negative returns in both market conditions. Timmermann and Quiros (2000) examined the difference in the stock returns of small and large firms in different economic conditions by using the data from the CRSP (center for research in security prices) during 1954-1997. It was concluded that cyclical variations influence stock returns. Further, it also concluded that small firms are more adversely influenced by strained credit market conditions (as assessed by "higher interest rates, lower money supply growth, and higher default premia") in recession time compared to large firms because small firms lose collateral rapidly in recession, as a result, become riskier so investors demand a higher risk premium in this state. Keim and Burnie (2002) studied the relation between the economic cycle and the market value of a firm by using the Compustat file data from 1976 to 1995. By using the dual-beta market model, it is concluded that small firms outperform large firms, and small firms earn greater returns in the bear months than in the bull months.

The existing literature on the size effect is inconsistent and inconclusive in developed countries. The size effect varies across time and market. So, it is necessary to examine this phenomenon. This study examines whether size-sorted portfolios can generate a size premium with the help of the CAPM model by employing recent data in an emerging market like India. Further, this study is the first effort that considers the dummy variable regression model to analyze the temporal consistency of the size premium in the Indian Stock Market and considers the dual-beta market model to analyze the impact of the market cycle on the size premium in the Indian equity market by employing recent data.

In the third section, the data and its sources are discussed. The methodology used for this paper is described in section Fourth. This study›s findings are discussed in Section 5. In the Sixth section, there is a summary and conclusion and in the concluding section, limitations and future research directions are mentioned.

DATA AND SOURCES

The data for the study comprises all stocks listed on the NSE 500 index. The NSE-listed sample companies represent 96% of the total market capitalization on the National Stock Exchange. The sample comprises monthly closing prices from October 2005 to September 2019, adjusted for any capitalization changes such as stock splits, dividends, and/or bonuses. The sample period from October 2005 to September 2019 is taken because it shows a mixed set of the economic environment in the Indian environment. The sample period comprises the growth of the Indian equity market and crises like global crises and Eurozone crises. The data for all stocks has been extracted from the Prowess database of CMIE. The NSE 500 index is used as a representative of the market and the data for the same was collected from the NSE website (www.nseindia.com). To calculate the risk-free rate, the implicit yield on 91 days treasury bills has been taken into consideration, and the data for the same is collected from the RBI website (www.rbi.org).

METHODOLOGY

As the financial year-end for most Indian firms (89%) in March, portfolios are constructed in October of each year, assuming a three-month gap for accounting information publication. The closing prices of September of year t and the number of outstanding shares at the end of March of year t are matched for calculating market capitalization. At the September end-of-year t, all sample stocks are sorted by market capitalization (ME, outstanding shares times stock price), and then these stocks are allocated to the five portfolios (P1-P5) of equal weights. The smallest market capitalization portfolio is denoted by P5 comprising 20 percent of stocks with the smallest size measured by the market value of the firm, and P1 represents the largest market capitalization portfolio containing 20 percent of stocks with the highest size. Then equally weighted returns are computed for these portfolios from October

2005 to September 2006, and the rebalancing process is repeated till September 2019. The following formula is used for measuring stock returns.

$$r_i = \left(\frac{P_t - P_{t-1}}{P_{t-1}} \right)$$

Where, r_i = Stock Returns, P_t = Stock's closing price, P_{t-1} = Stock's Opening price

Further, to check the size effect, CAPM (Capital Asset Pricing Model) first pass regression model is used. The CAPM model presents the relation between expected return and systematic risk for assets. Extra portfolio returns are regressed on extra market returns by following the CAPM model equation.

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) \quad ...(1)$$

Where, r_{it} = the return on portfolio i in time t, r_{ft} = treasury bill returns in time t, r_{mt} = the return on the market portfolio in time t, β_i = beta coefficient.

Further, the size effect varies over time. As a result, the following dummy variable regression model is implemented to ascertain whether the alphas of size-sorted portfolios in two subperiods are significantly different.

$$r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + c_i D_t + e_{it} \quad ...(2)$$

Where, r_{it} = the return on portfolio i in time t, r_{ft} = treasury bill returns in time t, r_{mt} = the market return in time t, D_t = variable that has a value of zero for subperiod 1 and a value of one for subperiod 2.

The risk of security, as well as risk premiums, can change depending on market conditions. As a result, the dual-beta market model is implemented to ascertain whether alphas and betas of size-sorted portfolios over bull and bear markets are significantly different.

$$r_{it} - r_{ft} = \alpha_2 + \alpha_3 D_t + \beta_2 (r_{mt} - r_{ft}) + \beta_3 (r_{mt} - r_{ft}) D_t + e_{it} \quad ...(3)$$

Which is equivalent to

$$r_{it} - r_{ft} = \alpha_{bull} + (\alpha_{bear} - \alpha_{bull}) D_t + \beta_{bull} (r_m - r_f) + (\beta_{bear} - \beta_{bull}) (r_{mt} - r_{ft}) D_t + e_{it} \quad ...(3a)$$

Where, r_{it} = the return on portfolio i in time t, r_{mt} = the market return in time t, r_{ft} = treasury bill rate in time t, D_t = variable that has a value of one for bear markets and a value of zero for bull markets.

RESULTS AND DISCUSSION

Total Period Results of Size-sorted Portfolios

Market capitalization is a common method for determining firm size. Berk (1996) found that average returns and market value of firms presented a significant and negative relation, but average returns and non-market measures do not confirm significant and negative relations. So, to test the size effect, market capitalization is taken as a measure of firm size. It is depicted in table 1 that the mean monthly return of the P_5 portfolio was the highest at 2.37 percent per month, while P_1 was the lowest at 1.02 percent per month during the sample period, showing higher returns in small-cap stocks. The average SMB return is 0.81 percent per

Table 1 Summary Statistics for Five Size-Sorted Portfolios, October 2005–September 2019

Portfolios	*Mean*	*t- Mean*	*S.D*	*Skewness*	*Excess Kurtosis*
P_1 (Big)	1.02	1.86***	0.07	0.24	4.05
P_2	1.33	2.17**	0.08	0.47	5.60
P_3	1.26	1.97**	0.08	0.57	6.47
P_4	1.60	2.33*	0.09	0.47	4.77
P_5 (Small)	2.37	3.10*	0.10	0.40	3.16
SMB	0.81	2.84*	0.04	0.51	0.82

Source: The authors.

Mean – mean returns, S.D – standard deviation of the returns, t-Mean – mean to standard error ratio.

P1 – largest size portfolio, P5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest size portfolios minus the mean returns for the two highest size portfolios.

* reveal significance at 1% level, ** at 5% level and *** at 10% level.

month (significant at a level of 1 percent). The mean returns in all size sorted portfolios increase as a move to lower market capitalization except for the P_3 portfolio. These results reveal that small-cap stocks earn a higher return than large-cap stocks based on total returns and confirm a significant size effect. The standard deviation increases as a move to lower capitalization, showing higher return variability in small-cap stocks. A measure of skewness tells the direction and extent of skewness. Among the size sorted portfolios, the small size portfolio (P_5) shows positive and higher skewness than the enormous size portfolio (P_1). The positively skewed means the return distribution of the small-cap stocks has a long right tail showing that there is a higher probability of providing positive returns in small-cap stocks. The kurtosis tells whether a distribution is more peaked than a normal curve or a distribution has a flat top than a normal curve. The excess kurtosis of the small stocks portfolio (P_5) is greater than 0. It means the distribution of the mean returns is leptokurtic, and the data series of monthly returns has more instances of abnormal returns.

The results of regressions are depicted in Table 2. Beta describes the volatility in the market. The market risks of P_1 and P_5 portfolios are 1.04 and 1.25, respectively. A beta greater than one shows the stock is more volatile than the market. The systematic risks increase as a move to lower market capitalization. The systematic risk on the SMB portfolio is 0.14 (significant at the one percent level). These results reveal that small-cap stocks have a positive beta greater than large-cap stocks, which shows that small-cap stocks and the market move in the identical direction, but small-cap stocks move by a larger amount than the market. So, there is higher price volatility in small-cap stocks.

Further, Table 2 depicts that out of all five size-sorted portfolios, only the P_5 portfolio shows significant and positive abnormal returns at a 1 percent level of significance. Abnormal returns in all size sorted portfolios increase as a move to lower market capitalization, except for the P_3 portfolio. The abnormal return on the SMB portfolio is 1.24 percent per month (significant at the level of 1 percent). This implies that there are numerous factors other than beta that explain the average SMB return. The GRS statistic (3.06; P-value = 0.11) is significant at a level of 5 percent which implies that intercepts of all size sorted

Table 2 CAPM Time-Series Regressions for Five Size-Sorted Portfolios, October 2005–September 2019

CAPM Time-Series Regression Model[a]: $r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft})$

Portfolios[b]	α	β	t_α	t_β	R^2
P_1(Big)	–0.07	1.04	-0.80	79.00*	0.97
P_2	0.20	1.13	1.10	42.46*	0.92
P_3	0.11	1.14	0.50	34.42*	0.88
P_4	0.43	1.19	1.51	28.66*	0.83
P_5 (Small)	1.17	1.25	2.98*	21.68*	0.74
SMB	0.73	0.14	2.67*	3.47*	0.07
				GRS Statistic –	3.06
				P-value –	0.011**

Source: The authors.

[a] The variables for the above model are described as follows: r_{it} is the return on portfolio *i*, r_{ft} = treasury bill rate, r_{mt} = the market return,

[b] P_1 – Largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest market size portfolios minus the mean returns for the two highest size portfolios.

F-statistic of GRS (Gibbons. Ross, and Shanken (1989)) tests that the intercepts in the regression for all five size-sorted portfolios are all 0.0.

The Nifty 500 index is used to represent the market portfolio.

[*] reveal significance at 1% level, [**] at 5% level and [***] at 10% level.

portfolios are not equal. So, the CAPM model does not explain the return on Size-sorted portfolios.

The value of R^2 is low in small stock portfolios compared to large stock portfolios. Out of size-sorted portfolios, the small stock portfolio (P_5) shows a value of 0.74 for R^2. It means a 26 percent return in small-cap stocks is explained by non-systematic risk.

Temporal Consistency of Size Effect

The temporal consistency of the size effect across two sub-periods is evaluated in this section. Specifically, it tested whether the prominence of the size anomaly differs across two subperiods.

The sample period is divided into two equal subperiods.

(Hereafter mentioned as SPs):

1. SP 1, 2005-2012
2. SP 2, 2012-2019

Table 3 presents descriptive statistics on the five size-sorted portfolios (P_1 to P_5) for two subperiods. The mean returns are 2.41 percent and 1.32 percent per month in SP1 and 2.32 percent and 0.73 percent per month in SP2 for portfolios P_5 and P_1, respectively. P5 exhibits positive and significant average returns across both SPs, while P1 exhibits insignificant average returns across both SPs. The mean returns in all size sorted portfolios in both SPs increase as a move to lower market capitalization except for the P_3 portfolio. The average SMB return is significant in both sub periods. Based on total returns, small-cap stocks do better than large-cap stocks across both SPs, and the size premium is consistent in both subperiods. The total risks for all size-sorted portfolios are higher in SP1 than in SP2. The smallest size portfolio P_5 reflects higher standard deviations than the largest size portfolio P_1 in both SPs. Total risks in all size-sorted portfolios increase as a move to lower market capitalization. So, there is higher return variability in small-cap stocks compared to large-cap stocks in both SPs. The small stock

Table 3 Summary Statistics on Five Size-Sorted Portfolios for Two Subperiods: October 2005–September 2012, October 2012–September 2019

Portfolios	*Mean*	*t-test*	*S.D*	*Skewness*	*Excess Kurtosis*
Panel A: October 2005-September 2012					
P_1(Big)	1.32	1.33	9.04	0.15	2.42
P_2	1.61	1.49	9.86	0.45	4.19
P_3	1.60	1.45	10.11	0.58	5.29
P_4	1.86	1.62	10.50	0.51	4.30
P_5 (Small)	2.41	1.93***	11.44	0.55	3.30
SMB	0.67	1.65***	0.04	0.72	1.43
Panel B: October 2012-September 2019					
P_1(Big)	0.73	1.48	4.52	0.18	-0.11
P_2	1.06	1.75***	5.55	0.01	0.82
P_3	0.92	1.42	5.91	-0.06	0.14
P_4	1.34	1.77***	6.93	0.10	1.39
P_5 (Small)	2.32	2.62*	8.15	-0.07	0.23
SMB	0.94	2.36*	0.04	0.30	0.33

Source: The authors.

Mean – mean returns, S.D – standard deviation of the returns, t-Mean – mean to standard error ratio.

[b] P_1 – Largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest size portfolios minus the mean returns for the two highest size portfolios.

* reveal significance at 1% level, ** at 5% level and *** at 10% level.

portfolio (P_5) shows positive skewness in SP1 and negative skewness in SP2. It implies higher chances of providing a positive return in SP1 and a negative return in SP2. The small stock portfolio (P_5) displays positive and higher excess kurtosis in SP1 than in SP2. This means a higher probability of larger movements in SP1, so the data series of monthly returns have more instances of abnormal returns in SP1.

Table 4 presents the regression coefficients of the CAPM model for the two subperiods. The systematic risks (betas) of all size-sorted portfolios are greater in SP2 than in SP1, respectively. In both subperiods, the systematic risk (beta) of the P_5 portfolio is higher than P_1. The systematic risk on the SMB portfolio is positively significant in both sub-periods. This implies that small-cap stocks have higher price volatility as compared to large-cap stocks in both subperiods. The alpha values on the P_1 and P_5 portfolios are 0.10 and 1.10 percent p.m. in SP1, and 0.25 and 1.18 percent p.m. in SP2. The P_5 portfolio has a larger alpha than the P_1 portfolio in both sub-periods. The alpha value for only the P_5 portfolio is positively significant in

Table 4 CAPM Time-Series Regressions on Five Size sorted portfolios for Two Subperiods: October 2005–September 2012, October 2012–September 2019

CAPM Time-Series Regression Model[a]: $r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft})$

Portfolios[b]	α	β	t_α	t_β	R^2
Panel A: October 2005-September 2012					
P_1(Big)	0.10	1.03	0.82	72.72*	0.98
P_2	0.35	1.10	1.36	37.48*	0.94
P_3	0.33	1.11	0.97	27.96*	0.91
P_4	0.58	1.14	1.45	24.72*	0.88
P_5 (Small)	1.10	1.19	2.01**	18.78*	0.81
SMB	0.62	0.09	1.53	2.00**	0.05
				GRS Statistics –	1.01
				P-value –	0.415
Panel B: October 2012-September 2019					
P_1(Big)	-0.25	1.06	–1.94***	34.13*	0.93
P_2	0.03	1.22	0.12	20.02*	0.83
P_3	-0.14	1.28	–0.48	18.59*	0.81
P_4	0.23	1.44	0.59	15.42*	0.74
P_5 (Small)	1.18	1.55	2.14**	11.63*	0.62
SMB	0.81	0.36	2.22**	4.02*	0.16
				GRS Statistics –	3.22
				P-value –	0.011**

Source: The authors.

[a] The variables for the above model are described as follows: r_{it} is the return on portfolio *i*, r_{ft} = treasury bill rate, r_{mt} = the market return.

The Nifty 500 index is employed to represent the market portfolio.

[b] P_1 – largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest size portfolios minus the mean returns for the two highest size portfolios.

F-statistic of GRS (Gibbons. Ross, and Shanken (1989)) tests that the intercepts in the regression for all five size-sorted portfolios are all 0.0.

* reveal significance at 1% level, ** at 5% level and *** at 10% level.

Table 5 Results of Dummy Variable Regression Model

Dummy Variable Regression Model[a]: $r_{it} - r_{ft} = \alpha_i + \beta_i (r_{mt} - r_{ft}) + c_i D_t + e_{it}$

Portfolios[b]	α	β	*c*	*t*(α)	*t*(β)	*t*(c)	R^2
P_1(Big)	0.10	1.04	–0.34	0.79	79.58*	–1.92***	0.97
P_2	0.33	1.13	–0.27	1.30	42.38*	–0.75	0.92
P_3	0.31	1.14	–0.40	0.98	34.37*	–0.89	0.88
P_4	0.54	1.19	–0.23	1.35	28.57*	–0.40	40.83
P_5 (Small)	1.06	1.25	0.22	1.90***	21.62*	0.28	0.74
SMB	0.58	0.14	0.30	1.49	3.47*	0.55	0.07

Source: The authors.

[a]The variables for the above model are described as follows: is the return on portfolio i, r_{ft} = treasury bill return rate, r_{mt} = the market return, D_t = variable that has a value of zero for SP1 and a value of one for SP2. SP1 – October 2005–September 2012, SP2 – October 2012–September 2019

[b] P_1 – Largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest size portfolios minus the mean returns for the two highest size portfolios.

F-statistic of GRS (Gibbons. Ross, and Shanken (1989)) tests that the intercepts in the regression for all five size-sorted portfolios are all 0.0.

The Nifty 500 index is used to represent the market portfolio.

*reveal significance at 1% level, ** at 5% level and *** at 10% level.

both sub-periods. The alpha value for the P_1 portfolio is negative in SP2 and positive in SP1. The alpha value on the SMB portfolio is significant in SP2. It means small-cap stocks earn higher risk-adjusted returns in SP2. In both subperiods, abnormal returns in all size sorted portfolios increase as a move to lower market capitalization except for the P_3 portfolio. The GRS statistic is insignificant in SP1 and significant in SP2. This implies that the CAPM model explains returns on size-sorted portfolios for the first subperiod but fails to explain returns for the second subperiod.

Further, the outcomes of the dummy variable regression model are shown in Table 5. For the P_5 portfolio, the intercept of the dummy variable (as represented by c) is insignificant (0.22; t-value = 0.28). The intercept of the dummy variable for the P_1 portfolio is negative and significant at a level of 10 percent. The slope coefficient for SMB is insignificant. This implies that the size effect did not differ significantly for the two subperiods, but the returns on the large-cap stocks are declining. This contrasts with the proof from the United States and other mature markets, where size anomalies decrease/disappear over time. In the Indian stock market, the size premium is stable across time, but abnormal returns in large-cap stocks are decreasing over time.

Market Conditionality Test

This test is performed to analyze the size anomaly in the bull-bear markets. There are no formal definitions for identifying bull and bear months. Practitioners, for example, have employed a rule of thumb by which months during which stock prices are declining 20 percent or more from the recent high, are called bear months, and those during which stock prices are rising 20 percent or more from the recent low, are called as bull months (Hanna, 2003; Pagan and Sossounov, 2003). So, the above rule is taken into consideration for the classification of the sample period into bull and bear months. NSE Nifty 50 stock prices are taken as a base for bull and bear months classification.

Classification of sample period into Bull and Bear months (October 2005–September 2019)

Sample Period	*Market Cycle*
October 05–Dec 07	Bull
Jan 08–Feb 09	Bear
March 09–Dec 10	Bull
Jan 11–Dec 11	Bear
Jan 12–Feb 15	Bull
March 15–Feb 16	Bear
March 16–September 19	Bull

Table 6 Summary Statistics for Five Size-sorted Portfolios in Bull and Bear Months

Portfolios	*Mean*	*t-Mean*	*SD*	*Skewness*	*Excess Kurtosis*
Panel A: Bull months[a]					
P_1(Big)	2.34	4.24*	6.31	1.21	5.35
P_2	2.74	4.36*	7.16	1.46	8.52
P_3	2.79	4.29*	7.40	1.68	10.06
P_4	3.04	4.26*	8.13	1.31	7.00
P_5 (Small)	4.02	4.98*	9.22	0.95	4.40
SMB	0.99	3.05*	3.70	0.44	1.02
Panel B: Bear months[b]					
P_1(Big)	–3.50	–2.71*	7.98	–0.51	1.36
P_2	–3.47	–2.42*	8.83	–0.45	0.98
P_3	–3.97	–2.72*	9.02	–0.52	1.06
P_4	–3.33	–2.13*	9.63	–0.56	0.10
P_5 (Small)	–3.29	–2.00*	10.16	–0.37	–0.06
SMB	0.17	0.30	3.60	0.79	0.51

Source: The authors.

[a] Months during which S&P NSE Nifty 50 stock prices are declining 20% or more from the recent high are called bear months; [b] Months during which stock prices are rising 20% or more from the recent low, are called bull months.

Mean – mean returns, S.D – standard deviation of the returns, t-mean – mean to standard error ratio.

P_1 – largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two smallest size portfolios minus the mean returns for the two largest size portfolios.

* reveal significance at 1% level, ** at 5% level and *** at 10% level.

Table 6 presented descriptive statistics on the five size-sorted portfolios (P1 to P5) in the bull and bear months. The mean returns are 4.02 and 2.34 percent p.m. in bull months and –3.29 and –3.50 percent p.m. in bear months for portfolios P5 and P1, respectively. In bear markets, all size sorted portfolios have negative mean returns, while in bull markets, all have positive mean returns. The mean return on the SMB portfolio is positive and significant in bull months while positive and insignificant in bear months. This implies that small firm stocks do better than large firm stocks in bull months in terms of total returns and size premium are significant in bull months and insignificant in bear months. The total risks for all size sorted portfolios are higher in bear months than in bull months. The smallest portfolio, P_5 reflects a higher standard deviation than the largest portfolio in both market conditions. So, there is higher return variability in small-cap stocks. All size-sorted portfolios show higher returns in bull months and higher risks in bear months, which contradicts the theory of higher risk leads to a higher return. All size sorted portfolios show positive skewness in the bull months and negative skewness in bear months. It means a greater probability of providing positive returns in the bull months and negative returns in the bear months. All size sorted portfolios (except P_5) display positive and higher kurtosis in bull months than bear months. This means a higher probability of larger movements in bull months. So, the data series of monthly returns have more instances of abnormal returns.

Table 7 presents the regression coefficients of the dual-beta market model over the bull and bear months. The systematic risks (betas) of all size sorted portfolios are greater in bull months than bear months, respectively. However, the difference in systematic risks (betas) between bull and bear markets is significant at the level of 10 percent for large-cap stocks only, with $\beta_{bull} > \beta_{bear}$. In both market conditions, the risk of the smallest size portfolio is greater than the largest size portfolio. However, the difference in systematic risks on the SMB portfolio in both market conditions is not significant.

Table 7 Alphas Estimates and Systematic Risks with Dual Beta Market Model

Dual Beta Market Model[a]: $r_i - r_f = \alpha_{bull} + (\alpha_{bear} - \alpha_{bull}) D_1 + \beta_{bull} (r_m - r_f) + (\beta_{bear} - \beta_{bull}) (r_m - r_f) D_1 + e_{it}$

Portfolio[b]	α_{bull}	α_{bear}	$\alpha_{bear-bull}$	β_{bull}	β_{bear}	$\beta_{bear-bull}$	$t(\alpha_{bull})$	$t(\alpha_{bear})$	$t(\alpha_{bear-bull})$	$t(\beta_{bull})$	$t(\beta_{bear})$	$t(\beta_{bear-bull})$	R^2
P_1	–0.18	–0.06	0.11	1.07	1.00	–0.07	–1.68***	–0.30	0.49	62.11*	42.26*	–2.40**	0.97
P_2	0.05	0.34	0.29	1.16	1.09	–0.07	0.24	0.80	0.60	32.95*	22.55*	–1.16	0.92
P_3	0.07	–0.21	–0.29	1.17	1.08	–0.09	0.28	–0.40	–0.48	26.58*	17.78*	–1.27	0.88
P_4	0.20	0.72	0.51	1.24	1.15	–0.09	0.61	1.07	0.69	22.43*	15.12*	–0.98	0.83
P_5	1.08	0.82	–0.26	1.30	1.16	–0.14	2.30*	0.88	–0.25	16.90*	11.00*	–1.05	0.74
SMB	0.70	0.62	–0.07	0.15	0.11	–0.04	2.13**	0.95	–0.10	2.89*	1.49	–0.49	0.07

Source: The authors.

[a] The variables for the above model are described as follows: r_i is the return on a portfolio i, r_f = treasury bill return rate, r_m = the market return, D_1 is a variable with a value of one for bear months and zero for bull months.

The Nifty 500 index is used to represent the market portfolio.

[b] P_1 – Largest size portfolio, P_5 – Smallest size portfolio.

The size premium, SMB, is the mean returns for the two lowest size portfolios minus the mean returns for the two highest size portfolios.

The values of b_{bear} are calculated by adding the values of $b_{bear} - b_{bull}$ and b_{bull} from the Dual beta market model. Likewise, the values of α_{bear} are calculated by adding the values of $\alpha_{bear} - \alpha_{bull}$ and α_{bull}.

* Reveal significance at 1% level, ** at 5% level and *** at 10% level.

The alpha values on the P_1 and P_5 portfolios are –0.18 and 1.08 percent p.m., and –0.06 and 0.82 percent p.m. in bull and bear months, respectively. The P_5 portfolio has larger alpha than does P_1 portfolio in both market conditions. The alpha values on the P_5 and the SMB portfolios are positively significant in bull months, but the difference in alpha values is not statistically significant for any portfolios in both market conditions. These results reveal that small-cap stocks earn a significant abnormal return in boom months but market conditions have no role in explaining the size premium. This contrasts with research from the U.S. and other mature markets (Chan et al. 1985: Timmermann et al. 2000) where small firms are reflecting higher risk premium around business recession periods.

CONCLUSION AND POLICY IMPLICATIONS

The initial aim of the study was to investigate whether the size effect exists in the Indian stock market from October 2005 to September 2019 and explain its sensitivity over time. This paper also analyzed whether the size effect is driven by the market cycle. The results showed a significant size effect. Small-cap stocks showed positive and significant mean returns, and large-cap stocks showed positive and insignificant mean returns. The difference in the mean return of the small-cap portfolio and the large-cap portfolio is positive and significant. This implies a significant size effect persists in the Indian stock market from October 2005 to September 2019. The CAPM model fails to explain the size premium. There are other factors in addition to the market that explain the size premium.

Further, it showed that the smallest size portfolio showed positive and significant mean returns in both subperiods. In contrast, large-size portfolios show positive and insignificant mean returns in both subperiods. The size premium (SMB) is significant in both subperiods. The CAPM model explains the size premium in the first subperiod but fails to describe the size premium in the second subperiod. The abnormal return on the SMB portfolio is positive and significant in the second subperiod and insignificant in the first subperiod. It means small-cap stocks earn a significant risk premium from October 2012 to September 2019. The difference in the magnitude of size premium between subperiods is not statistically significant. So, the size premium does not differ significantly for the two subperiods of October 2005 to September 2019. There is no empirical support that abnormal returns in small-cap stocks are diminishing as anticipated in an efficient market, but abnormal returns in large-cap stocks are decreasing over time. Our evidence does not support the claim that investors are becoming aware of the effect and arbitrating it away.

Further, the abnormal returns in small-cap stocks are positive in both market conditions but statistically significant in the bull period, while abnormal returns in large-cap stocks are negative in both market conditions and negatively significant in the bull period. The differences in the abnormal returns between bull and bear markets are insignificant in all size-sorted portfolios. The abnormal return on SMB does not differ significantly in either market conditions. Hence, market conditions have no role in explaining the size premium.

These results are beneficial for small investors and mutual funds for portfolio creation and performance evaluation. As a move to lower capitalization returns increase. The market cycle has no role in explaining the abnormal returns in small-cap stocks.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

While this research sheds light on size anomaly, considering the market factor. There are other firm-specific factors such as book-to-market equity, price-to-earnings ratio, liquidity, profitability, and investment that explain abnormal returns in small-cap stocks. The first limitation of the study is that this study does not clarify the numerous factors that identify quality small-cap stocks. Second, this study has not taken into consideration the impact of Covid-19 on the size anomaly. So, future research can be conducted on the impact of firm-specific factors on the size anomaly by taking more recent data including covid-19.

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