

# **Size Effect and Moving Averages Crossover Strategy: An Empirical Analysis of Stocks of Companies Listed on National Stock Exchange (India)**

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**ABSTRACT:** This study analyses the size effect in Indian stock markets. The CNX Nifty, CNX Nifty Junior, Nifty Midcap, CNX Midcap50, CNX Smallcap are five indexes of the National Stock Exchange of India (NSE) representing stocks of different market capitalization. Using the top 10 stocks in each of these indexes five different portfolios are created. They are traded on a strategy based on the moving averages crossover for a period of five years to test the size effect.

The size effect is observed for the period under the study. The NIFTY (large-cap) portfolio lags every other portfolio on account of profitability and risk with SMALLCAP following closely. The winner is MIDCAP100 and not surprisingly the runner up is NIFTY Junior. Mid-cap is the most valuable segment on the NSE. The investment strategies based on the size of firms have a definite edge. A prudent investor should not ignore the size effect.

**KEYWORDS:** Size Effect, Technical Analysis, Stock Investing Strategies, Moving Averages Crossover Strategy, Indexes Of The National Stock Exchange (India), NIFTY, MIDCAP, SMALLCAP

## **I. INTRODUCTION**

Returns generated by firms of different sizes have cross sectional variations even in similar external environment. Banz (1981) observed that smaller firms had higher risk adjusted returns than larger firms. Reinganum (1983), found that smaller firms systematically outperformed the larger ones after returns were adjusted for risk as measured by beta. Fama et al.(1993, 1995) indicate that size effect alone may not be able to explain the cross sectional variation in stock returns. The size is only one of the three common risk factors in the returns on stocks, the other two being market factors and book-to-market equity. However, Horowitz et al. (1996), find that the average monthly returns are approximately constant across size deciles. Berk (1997), also supports this view. He argues, if the size of firms is measured correctly, small firms do not necessarily earn higher returns than larger firms. The size enigma results from the part of market value that measures the firm's discount rate and not from a relation between the size of firms and returns. Chieffe (2004), argues against the "small firm effect" and urges investors to exercise caution when buying small stocks.

The relationship between the size and on the return on investment on stock has been described in as size effect. Firms have been classified as large, midsize, and small. These classes have different relevance for investors and may put many restrictions on professional investment managers. For example, many mutual funds are mandated to invest only in stocks of particular size of firms. Large and small firms differ on matters of liquidity, turnover and public interest and analyst coverage implying that the risk profile and volatility across the size spectrum will be different. Are these differences significant and can they be turned into advantages?

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Total returns of a portfolio is a function of returns on individual of stock in the portfolio. A bad mixture not only brings down the overall returns but also increases the risk profile of the portfolio. For prudent portfolio management understanding the size effect becomes important. Chen et al. (2010), in their study analyze skills of investment managers in Australian small-cap equities find that small-cap equity managers possess superior stock selection ability, from both a statistical and economic, as the small-cap segment is generally both less liquid and has lower analyst coverage.

The purpose of this study is to understand this size effect by use of trading methods based on technical analysis.

## Technical analysis

Technical analysis is the study of market action for the purpose of forecasting future price trends. Unlike fundamental analysis which aims to translate the value of company related information into the market price of the stock, technical analysis studies the market data such as price and volume and tries to evaluate the market price of the stock.

Technical indicators are mathematical tools that analyze the price action and volume to predict the future price movements. They can be used in isolation or in combination for market analysis. Technical analysis has come up as a viable and efficient means of individual stock selection and timing the entries and exits. This study aims to compare performance of portfolios of stocks of different market capitalization that trade a system based on moving averages crossover.

## II. LITERATURE REVIEW

Ho et al., (2011) observed that the historical long-run return on small capitalization stocks has unquestionably outperformed large capitalization stocks since 1926. The phenomenon of size effect could be exploited effectively over long-term investment horizons. Asset managers and individual investors can enhance returns by using size effect. Brown et al.(1983), concluded that the size effect is linear in the logarithm of size, but rejected the hypothesis that excess return attributable to size is stable through time. Fama et al. (1993, 1995), identified size as only one of the three common risk factors in the returns on stocks. The other two are stock-market factors and book-to-market equity. Thereby indicating that size effect alone may not be able to explain the cross sectional variation in stock returns. They find firm sizes and book-to-market ratios are both highly correlated with the average returns of common stocks and that the association between these characteristics and returns arise because the characteristics are proxies for non-diversifiable factor risk.

According to Daniel et al. (1997), firm sizes and book-to-market ratios are both highly correlated with the average returns of common stocks. However the return premia on small capitalization and high book-to-market stocks does not arise because of the comovements of these stocks with pervasive factors. Basu et al. (1983) in the study of NYSE firms concluded that the size effect virtually disappears when returns are controlled for differences in risk and E/P ratios. Kothari et al. (1995), studied that the cross-section of expected returns reveals economically and statistically significant compensation for beta risk. However the relation between book-to-market equity and returns is weaker and less consistent than that in Fama et al. (1992). Chan et al.(1991), examined differences in structural characteristics that lead firms of different sizes to react differently to the same economic news and they are important in explaining the return difference between small and large firms because a small firm portfolio contains a large proportion of marginal firms—firms with low production efficiency and high financial leverage. Atiase (1980) as quoted by Freeman et al. (1987) in his differential information hypothesis stated that information production and dissemination by private parties for the purpose of identifying mispriced securities is an increasing function of firm size.

## III. OBJECTIVES OF THE STUDY

The large-cap, mid-cap and small-cap stocks have different rates of returns, volatility and risk profile. This study aims to construct different portfolios based on size of firms. After applying signals based on technical trading rules, these portfolios may yield different rate of return over the same investment period. Some portfolios may consistently

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outperform the others for many trading rules. These portfolios, then, are superior to others and therefore more desirable. This study aims to determine if such portfolios can be constructed for period under the study.

## IV. PROBLEM UNDER THE STUDY

The stocks traded on the National Stock Exchange of India (NSE) are classified as large-cap, mid-cap and small-cap on the basis of market capitalization. CNX Nifty, CNX Nifty Junior, Nifty Midcap, CNX Midcap50, CNX Smallcap are five indexes of the NSE representing stocks of different size of market capitalization. Using the top 10 stocks in each of these indexes five different portfolios are created. A trading strategy based on the moving averages crossover is applied to these portfolios for a period of five years to test the following hypothesis.

### Hypothesis

**H<sub>0</sub>:** Profitability and risk profile of five portfolios (NIFTY, NIFTY Junior, MIDCAP100, MIDCAP50 and SMALLCAP) constructed on the basis of market capitalization and traded by a system based on moving average crossover is not substantially different for period under the study.

**H<sub>1</sub>:** Profitability and risk profile of five portfolios (NIFTY, NIFTY Junior, MIDCAP100, MIDCAP50 and SMALLCAP) constructed on the basis of market capitalization and traded by a system based on moving average crossover is substantially different for period under the study.

## V. METHODOLOGY

### Moving Averages

A moving average is an indicator that shows the average value of a security's price over a period of time. The trading strategy adopted for the purpose of the study is Moving Averages Crossover. It is a trend following strategy looking for trend reversal for entries and exits. A reversal of trend happens when a short term moving average crosses a long term moving average. Each time the short-term average crosses above the long-term average, the trend changes to uptrend and a "Buy" or "Cover Short" signal is generated. When the short-term average crosses below the long-term average, the trend changes to downtrend and a "Sell" or "Sell Short" signal is generated. The study uses exponential moving averages based on daily closing prices. For example, for the 100/21 Moving Averages Crossover strategy if the 21-day moving average crosses above the 100-day moving average a "Buy" or "Cover Short" signal is generated, and when the 21-day moving average crosses below the 100-day moving average a "Sell" or "Sell Short" signal is generated. The study will consider only the long i.e. "Buy" and "Sell" signals.

### Choice of Stocks

Five indexes of the NSE are chosen to represent large-cap, mid-cap and small-cap stocks:

- CNX Nifty
- CNX Nifty Junior
- CNX Midcap50
- Nifty Midcap
- CNX Smallcap

**Table 1**  
**List of Selected Stocks from five indexes**

Sr	CNX NIFTY	CNX NIFTY JUNIOR
1	I T C Ltd.	Zee Entertainment Enterprises Ltd.
2	Infosys Ltd.	Shriram Transport Finance Co. Ltd.
3	Reliance Industries Ltd.	JSW Steel Ltd.
4	ICICI Bank Ltd.	Yes Bank Ltd.
5	HDFC Bank Ltd.	Idea Cellular Ltd.

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6	Housing Development Finance Corporation Ltd.	Titan Company Ltd.
7	Tata Consultancy Services Ltd.	Glaxosmithkline Pharmaceuticals Ltd.
8	Larsen & Toubro Ltd.	Godrej Consumer Products Ltd.
9	Tata Motors Ltd.	Dabur India Ltd.
10	State Bank of India	Bosch Ltd.

## List of Selected Stocks (Continued)

Sr	CNX MIDCAP50	CNX MIDCAP100	CNX SMALLCAP
1	Adani Enterprises Ltd.	Adani Ports and Special Economic Zone Ltd.	TVS Motor Company Ltd.
2	Divi's Laboratories Ltd.	Glenmark Pharmaceuticals Ltd.	NIIT Technologies Ltd.
3	Reliance Communications Ltd.	Motherson Sumi Systems Ltd.	PTC India Ltd.
4	Siemens Ltd.	Apollo Hospitals Enterprises Ltd.	Housing Development and Infrastructure Ltd.
5	Aurobindo Pharma Ltd.	Container Corporation of India Ltd.	Amtek Auto Ltd.
6	Power Finance Corporation Ltd.	Mahindra & Mahindra Financial Services Ltd.	Andhra Bank
7	Oracle Financial Services Software Ltd.	ING Vysya Bank Ltd.	eClerx Services Ltd.
8	Tata Global Beverages Ltd.	Eicher Motors Ltd.	Sobha Developers Ltd.
9	Aditya Birla Nuvo Ltd.	Reliance Infrastructure Ltd.	Dewan Housing Finance Corporation Ltd.
10	Steel Authority of India Ltd.	Ipca Laboratories Ltd.	India Cements Ltd.

Five different portfolios are created each having top ten stocks from the given index ranked on index weight. This list is modified to eliminate stock that appears in more than one portfolio. Such stock is removed from the higher portfolio and next ranking stock is selected. One stock from CNX Nifty Junior portfolio and three stocks from CNX Midcap portfolio were replaced for this reason. If the selected stocks are not traded for the entire period under the study, they are replaced by next ranking stock. Two stocks each from CNX Midcap and CNX SMALLCAP portfolio were replaced for this reason. The final list is given in table 1 above.

## Time Period of the Study

The study was conducted for a five year period from 1st January 2009 to 31<sup>st</sup> December 2013. The five year time period covers upward and downward movements of the market.

## Data Sources

The data is collected from various published sources of National Stock Exchange. Wherever necessary the past data is adjusted for splits and bonuses to make it comparable with current data.

## Method

The hypothesis will be tested by following method,

- For short term moving average two time periods of 11 and 21 days are used.
- For long term moving average five time periods of 50, 100, 150, 200 and 250 days are used.
- In all ten different combinations of one short term period and one long term period are applied to each stock in all portfolios for period under the study by using following rules.

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- Total five different portfolios of ten stocks each are maintained.
- Initial investment of Rs. 10,000 is made in each stock. Thus per portfolio the initial investment is Rs.1,00,000.
- Only Long signals are considered.
- “Buy” and “Sell” signals generated by Moving Average Crossover are used for sell or purchase of stocks.
- Separate “Buy” and “Sell” signals are calculated for each individual stock based on moving averages of its daily closing price.
- “Buy” when short term moving average crosses the long moving average from below.
- “Sell” when short term moving average crosses the long moving average from above.
- A “Sell” signal will be ignored if it comes before the first “Buy” signal.
- At “Buy” signal 100% of all available cash for that stock (either the initial capital or the cash from previous sale of that stock) is fully invested in the same stock at the open price of the next day.
- At “Sell” signal all quantity in hand is sold at the open price of the next day.
- After “Sell” signal the cash realized from sell is held idle till next “Buy” signal.
- Transaction charges are 0.55% of the transaction value.

The results for all five portfolios are then compared.

## Testing Parameters

These tests are conducted with following assumptions

- The dividend yield is ignored.
- The impact of income tax is ignored.
- Idle cash in hand does not generate any income.
- No other parameters of risk control than moving average crossover are used.
- Since the stocks have enough liquidity, buy or sell decision will not impact the price.

Following parameters are used for all strategies:

**Table 2**  
**Parameters for all strategies**

Particulars	For All Trading Strategies
Start Date	1-Jan-2009
End Date	31-Dec-2013
Period (Years)	5
Initial Investment (Rs)	100,000

All five portfolios are tested for profitability and risk. The measure of profitability is profits generated and compounded annual growth rate (CAGR). Risk of each portfolio is tested on maximum draw down and Sharpe ratio.

To test the null hypothesis, **Kolmogorov-Smirnov** test for testing normality, **Levene’s test** for testing Homogeneity of Variances, **ANOVA** for testing Equality of Means, **Welch and Brown-Forsythe** for testing robust tests of equality of means are used.

## V. ANALYSIS AND FINDINGS

Results of above trading strategy are as under:

The Profit of the Portfolio is calculated as:

$$P = FV - PV$$

Where:

$P$	=	Profit of Portfolio
$FV$	=	Ending Value of Capital
$PV$	=	Initial Value of Capital

The profit of all strategies is given in table 3.

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Table 3  
Profit of portfolio

	Trading strategy									
Portfolio	50/11	100/11	150/11	200/11	250/11	50/21	100/21	150/21	200/21	250/21
NIFTY	124,513	108,736	126,839	111,850	97,260	132,855	97,732	115,637	101,981	106,941
NIFTY Jr	172,967	170,652	168,989	166,111	169,023	193,162	163,201	160,204	152,320	166,362
MIDCAP50	265,648	190,626	154,778	116,512	111,712	247,863	183,254	94,727	94,493	108,549
MIDCAP100	252,001	255,881	314,999	312,210	302,838	193,469	272,564	322,141	305,687	285,897
SMALLCAP	249,791	236,712	162,920	121,445	89,692	262,944	200,681	109,107	105,603	76,850

The Compounded Annual Growth Rate calculated as:

$$CAGR_p = \left( \frac{FV}{PV} \right)^{\left( \frac{1}{n} \right)} - 1$$

Where:

$CAGR_p$  = Compounded Annual Growth Rate of Portfolio  
 $FV$  = Ending Value of Portfolio  
 $PV$  = Initial Value of Portfolio  
 $n$  = Number of Years

The compounded annual growth rate of all strategies is given in table 4.

Table 4  
Compounded annual growth rate

	Trading strategy									
Portfolio	50/11	100/11	150/11	200/11	250/11	50/21	100/21	150/21	200/21	250/21
NIFTY	17.56%	15.86%	17.80%	16.20%	14.55%	18.42%	14.61%	16.61%	15.10%	15.66%
NIFTY Jr	22.24%	22.03%	21.88%	21.62%	21.89%	24.00%	21.35%	21.08%	20.33%	21.65%
MIDCAP50	29.60%	23.78%	20.57%	16.71%	16.18%	28.32%	23.15%	14.26%	14.23%	15.84%
MIDCAP100	28.62%	28.90%	32.93%	32.75%	32.14%	24.03%	30.09%	33.38%	32.32%	31.01%
SMALLCAP	28.46%	27.48%	21.33%	17.23%	13.66%	29.41%	24.63%	15.90%	15.51%	12.08%

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Maximum draw down measures the risk of the portfolio. It measures the largest reduction in the value of portfolio from the highest its value till the date of largest reduction. When calculated as percentage it measures the maximum percentage reduction from highest value.

The Maximum Draw Down is calculated as:

$$MaxDD_P = \frac{HV-LV}{HV}$$

Where:

$MaxDD_P$  = Maximum Draw Down of Portfolio  
 $HV$  = Highest Value of Portfolio Till Date  
 $LV$  = Lowest Value of Portfolio Till Date

The maximum draw down of all strategies is given in table 5.

**Table 5**  
**Maximum draw down**

	Trading strategy									
Portfolio	50/11	100/11	150/11	200/11	250/11	50/21	100/21	150/21	200/21	250/21
NIFTY	16.78%	22.28%	17.69%	20.59%	18.16%	16.57%	24.25%	18.69%	19.96%	15.98%
NIFTY Jr	18.65%	17.04%	15.08%	16.55%	12.83%	16.19%	18.12%	17.98%	14.58%	11.38%
MIDCAP50	13.86%	17.89%	19.19%	21.10%	15.97%	13.49%	16.77%	26.38%	24.34%	16.42%
MIDCAP100	10.96%	10.48%	10.62%	12.31%	11.44%	10.21%	11.32%	11.58%	11.07%	11.12%
SMALLCAP	21.80%	20.96%	28.73%	30.58%	33.57%	25.48%	29.67%	35.11%	30.66%	33.35%

Sharpe ratio is return earned above risk free rate of return adjusted for volatility. It measures the risk of the portfolio. The risk free rate of return is usually the rate of return on treasury bonds. In our calculations it is assumed to be 7.5 % per annum (or 0.63 % per month).

The sharpe ratio is calculated as:

$$Sh_P = \frac{r_p - r_f}{\sigma_p}$$

Where:

$Sh_P$  = Sharpe ratio of Portfolio  
 $r_p$  = Average Monthly Return of Portfolio  
 $r_f$  = Monthly Return on Risk Free Investments  
 $\sigma_p$  = Monthly Volatility of Portfolio measured in Standard Deviation

The sharpe ratio of all strategies is given in table 6.

**Table 6**  
**Sharpe ratio**

	Trading strategy									
Portfolio	50/11	100/11	150/11	200/11	250/11	50/21	100/21	150/21	200/21	250/21
NIFTY	0.149	0.132	0.160	0.151	0.138	0.161	0.118	0.151	0.148	0.160
NIFTY Jr	0.238	0.239	0.254	0.281	0.291	0.254	0.231	0.257	0.259	0.290
MIDCAP50	0.245	0.210	0.194	0.151	0.161	0.241	0.208	0.116	0.127	0.160
MIDCAP100	0.301	0.313	0.362	0.372	0.368	0.245	0.328	0.383	0.373	0.355
SMALLCAP	0.212	0.219	0.186	0.172	0.123	0.227	0.204	0.140	0.155	0.099



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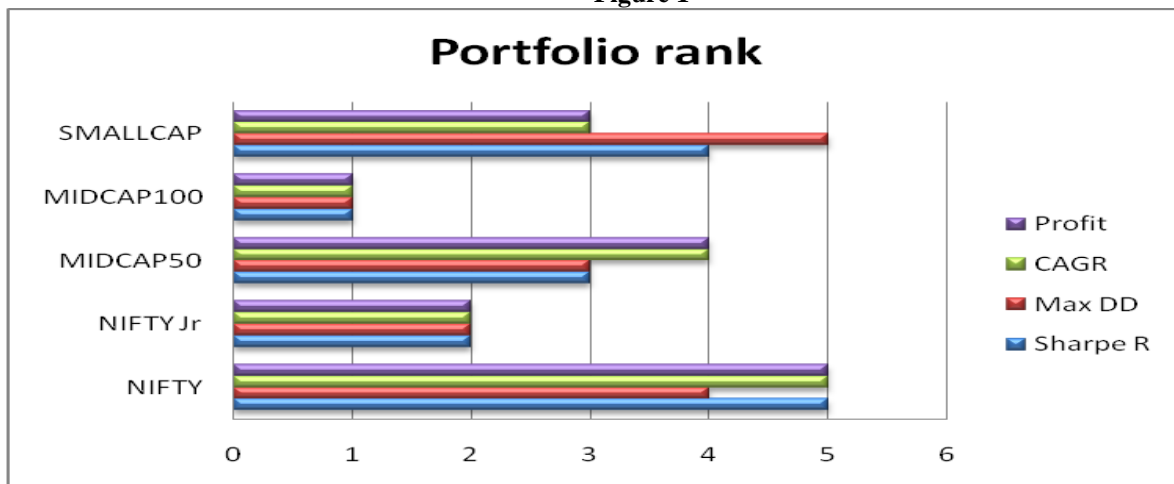
The portfolios are ranked on the basis of four criteria viz. profit, compounded annual growth rate, maximum draw down and the sharpe ratio. Where first rank indicates that the portfolio is most desirable and fifth rank makes the portfolio the least desirable. The results are summarised in table 7.

Table 7  
Overall rank

Portfolio	Based on			
	Profit	CAGR	Maximum draw down	Sharpe ratio
NIFTY	5	5	4	5
NIFTY Jr	2	2	2	2
MIDCAP50	4	4	3	3
MIDCAP100	1	1	1	1
SMALLCAP	3	3	5	4

The results give an unanimous verdict that MIDCAP100 portfolio is the most desirable on all four counts and NIFTY portfolio is the least desirable on three out of four counts. The results are also displayed in figure 1.

Figure 1



## OBSERVATIONS

All trading strategies are profitable for all portfolios. The 150/21 strategy for MIDCAP100 gives the best results. The 250/21 strategy for SMALLCAP gives the worst results. MIDCAP100 is the top ranked portfolio for all measures making it the most profitable and the least risky. NIFTY junior is the second ranked portfolio. NIFTY is the worst portfolio for four out of five measures. Overall it is the least desirable portfolio.

The results of statistical tests are tabulated in the following table.



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**Table 8**  
**Significant p values of K-S test, Levene's test, ANOVA, Welch test and Brown-Forsythe test**

		Significant p value				
		Test of normality	Test of homogeneity of variances	Tests of equality of means	Robust tests of equality of means	
	Portfolio	Kolmogorov-Smirnov (K-S)	Levene's	ANOVA	Welch	Brown-Forsythe
Profit	NIFTY	0.200	0.000	0.000	0.000	0.000
	NIFTY Junior	0.146				
	MIDCAP50	0.111				
	MIDCAP100	0.200				
	SMALLCAP	0.200				
CAGR	NIFTY	0.200	0.000	0.000	0.000	0.000
	NIFTY Junior	0.173				
	MIDCAP50	0.132				
	MIDCAP100	0.200				
	SMALLCAP	0.200				
Maximum draw down	NIFTY	0.200	0.002	0.000	0.000	0.000
	NIFTY Junior	0.200				
	MIDCAP50	0.200				
	MIDCAP100	0.200				
	SMALLCAP	0.200				
Sharpe ratio	NIFTY	0.158	0.002	0.000	0.000	0.000
	NIFTY Junior	0.200				
	MIDCAP50	0.200				
	MIDCAP100	0.118				
	SMALLCAP	0.200				

From the above table it is observed that all significant p values for k-s tests are greater than 0.05 clearly indicating normality of data for each portfolio. Hence we used parametric tests for testing significant difference between portfolios. Levene's test for testing homogeneity of variances p- values are all less than 0.01 indicating that all groups are homogeneous (equal variance). This also indicates that standard ANOVA must be discarded. Hence Robust Tests of Equality of Means namely Welch and Brown-Forsythe tests are used. All significant p values for Welch and Brown-Forsythe tests are less than 0.01 indicating significant difference between all portfolios. It is also noted that all significant p values for ANOVA are less than 0.01 supporting the above results. To analysis further, we use Post Hoc Test namely Least Significant Difference method (LSD) test to find pair-wise difference between the groups of portfolios. The details are given below.

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**Table 9**  
Significant p values of namely Least Significant Difference method (LSD) test

(I) Portfolio	(J) Portfolio	Significant p value			
		Profit	CAGR	Maximum draw down	Sharpe ratio
NIFTY	NIFTY Junior	0.010**	0.004**	0.033*	0.000**
	MIDCAP50	0.038*	0.035*	<b>0.711</b>	0.039*
	MIDCAP100	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
	SMALLCAP	0.023*	0.024*	0.000*	0.104
NIFTY Junior	NIFTY	0.010**	0.004**	0.033*	0.000**
	MIDCAP50	<b>0.584</b>	<b>0.410</b>	0.075*	0.000**
	MIDCAP100	<b>0.000**</b>	<b>0.000**</b>	<b>0.003**</b>	<b>0.000**</b>
	SMALLCAP	0.748	0.508	0.000**	0.000**
MIDCAP50	NIFTY	0.038*	0.035*	0.711	0.039*
	NIFTY Junior	0.584	0.410	0.075	0.000*
	MIDCAP100	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
	SMALLCAP	0.820	0.870	0.000**	0.641
MIDCAP100	NIFTY	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
	NIFTY Junior	<b>0.000**</b>	<b>0.000**</b>	<b>0.003**</b>	<b>0.000**</b>
	MIDCAP50	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
	SMALLCAP	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
SMALLCAP	NIFTY	0.023*	0.024*	0.000**	0.104
	NIFTY Junior	0.748	0.508	0.000**	0.000*
	MIDCAP50	0.820	0.870	0.000**	0.641
	MIDCAP100	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>	<b>0.000**</b>
** indicates significant difference at 1%. * indicates significant difference at 5%.					

From the above table it is observed that the difference between mean value of portfolios for all listed variables is significant (as given by figures marked with \*\*) at 1% level of significance. The figures with (\*) indicate 5% level of significance and figures without (\*) or (\*\*) indicate insignificant difference. There is highly significant difference between MIDCAP100 portfolio and remaining portfolios ( p value 0). Hence on the basis of the above data it is concluded that there is significant difference values of variables namely profits, CAGR, Maximum draw down and Sharpe ratio. The details of descriptive parameters are given below.

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**Table 10**  
**Descriptive parameters for different portfolios and different variables**

		N	Mean	Std. Deviation	Std. Error
<b>Profit</b>	<b>NIFTY</b>	10	1,12,434	12,385	3,917
	<b>NIFTY Junior</b>	10	1,68,299	10,551	3,336
	<b>MIDCAP50</b>	10	1,56,816	62,988	19,919
	<b>MIDCAP100</b>	10	<b>2,81,769</b>	39,626	12,531
	<b>SMALLCAP</b>	10	1,61,575	70,770	22,380
	<b>Total</b>	50	1,76,180	72,270	10,221
<b>CAGR</b>	<b>NIFTY</b>	10	0.1624	.01348	.00426
	<b>NIFTY Junior</b>	10	0.2181	.00944	.00299
	<b>MIDCAP50</b>	10	0.2026	.05718	.01808
	<b>MIDCAP100</b>	10	<b>0.3062</b>	.02858	.00904
	<b>SMALLCAP</b>	10	0.2057	.06529	.02065
	<b>Total</b>	50	0.2190	.06228	.00881
<b>Maximum draw down</b>	<b>NIFTY</b>	10	0.1909	.02668	.00844
	<b>NIFTY Junior</b>	10	0.1584	.02378	.00752
	<b>MIDCAP50</b>	10	0.1854	.04273	.01351
	<b>MIDCAP100</b>	10	<b>0.1111</b>	.00603	.00191
	<b>SMALLCAP</b>	10	0.2899	.04853	.01535
	<b>Total</b>	50	0.1872	.06721	.00950
<b>Sharpe ratio</b>	<b>NIFTY</b>	10	0.1469	.01396	.00442
	<b>NIFTY Junior</b>	10	0.2596	.02152	.00681
	<b>MIDCAP50</b>	10	0.1812	.04512	.01427
	<b>MIDCAP100</b>	10	<b>0.3401</b>	.04340	.01373
	<b>SMALLCAP</b>	10	0.1736	.04368	.01381
	<b>Total</b>	50	0.2203	.07931	.01122

From above table it is observed that:

- Mean profit for MIDCAP100 portfolio is more than other portfolios.
- Mean CAGR for MIDCAP100 portfolio is more than other portfolios.

Therefore MIDCAP100 portfolio is more profitable than other portfolios.

- Mean Sharpe ratio for MIDCAP100 portfolio is more than other portfolios.
- Mean maximum draw down for MIDCAP100 portfolio is less than other portfolios.

Therefore MIDCAP100 portfolio is simultaneously less risky than other portfolios.

Hence on the basis of the above analysis MIDCAP100 comes out as the best portfolio.

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The observations are not consistent with the null hypothesis that profitability and risk profile of five portfolios (NIFTY, NIFTY Junior, MIDCAP50, MIDCAP100 and SMALLCAP) constructed on the basis of market capitalization and traded on system based on moving average crossover is not substantially different for period under the study. Therefore alternate hypothesis accepted.

## VI. LIMITATIONS OF THE STUDY

The study is limited to five portfolios of top ten stocks ranked on weight in the particular index. The study is limited to a period of five years and uses moving averages crossover as trading strategy. Any change in these parameters may result in different observations and conclusions.

## VII. CONCLUSION

The results clearly point to cross sectional variations in returns. The size effect is observed for the period under the study. Judged on profitability and risk, the MIDCAP100 is the best portfolio. The NIFTY Junior comes a close second. By the same count, the NIFTY (large-cap) portfolio is the least desirable with SMALLCAP following closely. Mid-cap is the most valuable segment on the NSE. The investment strategies should take advantage of this observation.

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