BACK TESTING MAGIC FORMULA ON INDIAN STOCK MARKETS: An Analysis of Magic Formula Strategy

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ABSTRACT

The research tried to simulate functioning and evaluate results of a value investing strategy known as Magic formula developed by Joel Greenblatt. This strategy involves ranking a set of companies based on their Return on Capital Employed (ROCE) and Price-Earning (P/E) ratio, then adding these ranks to obtain a combined score and then choosing 30 companies with least joint score to form an equally weighted portfolio. In this research we show the working of this strategy for a period of 8 years starting from 1st July, 2012 till 1st February, 2020. Through this research we have tried to find answers to two important questions. First, whether the returns of this strategy outperforms the returns generated by broad market indices. In this research the broad market index taken into consideration for comparison is BSE Sensex. Second, whether the returns of this strategy improves on increasing/decreasing the number of companies to be included in the portfolio. To check this we have formed 10-stock and 50-stock portfolios and compared their returns and other variables with the primary 30-stock portfolio. For finding the answers to above questions, this strategy was used on the dataset of BSE 500 companies excluding financial companies and companies with negative earnings. The results obtained from the application of the Magic Formula have provided the following answers to the above mentioned questions. First, the risk-unadjusted returns generated exceeded market returns in 5 out of 8 years.
CAGR of BSE Sensex is 9.31% against 13.89% of 30-stock Magic Formula portfolio. Thus the Magic Formula outperformed the market significantly. Second, CAGR of 30-stock portfolio exceeded CAGR of both of 10-stock and 50-stock portfolios and thus it is evident that 30-stock Magic Formula portfolio provides the best possible returns. Thus, the results of this research bolsters the application of value investing strategy professed by Joel Greenblatt named as "The Magic Formula" in the Indian Markets. It not only reaffirms the use of Magic Formula ideology but also the adoption of elements such as the number of companies to be included in the portfolio.

KEYWORDS: Magic Formula, Value Investing, BSE SENSEX, CAGR, P/E Ratio, Earnings Yield

INTRODUCTION

Every investor seeks a way to outsmart Mr. Market, the next best investment strategy that earns high abnormal returns. Achieving abnormal return is perceived as an impossible task when we believe the Efficient Market Hypothesis (EMH) to hold true. General belief is that security markets are extremely efficient and reflect all available information. As soon as new information enters the market, the prices adjust immediately for the same. This renders past information analysis as futile. All market participants are assumed to possess the same information, and trading on the same information makes best obtainable return equal to the market return. In result, the optimal portfolio is the market portfolio itself. The investor cannot earn abnormal returns without taking additional risk. This paper tests whether in reality it is possible to beat the market using only publicly available information without taking any extra risk. Clearly this would violate the EMH and would thus be a market anomaly. Many anomalies have been discovered in the already existing research works like January effect and Weekend effect.

One famous persistent anomaly first advocated by Benjamin Graham and David Dodd in 1928 is the strategy named as Value investing. Value investing is school of thought on investing where the company's fundamental values are pertinent in the decision process to either buy or sell the share. The idea behind the approach is simple: "invest in stocks that have low price relative to some measure of their fundamental value". In this context the fundamental value can be book value, market value, intrinsic value etcetera. Value investing differs from regular investment theory in that it does not believe that the CAPM and beta are good determinants for a

share's market price. Modern Portfolio Theory in their eyes is inadequate and is not a reliable measure to determine price.
The magic formula as constructed by Greenblatt ranks companies based on two factors: Return on Capital Employed (ROCE) and Earnings Yields (EY). As a reciprocal of the P/E ratio it is important to consider how its use will affect the results. The difference lies in the use of a combination of value metrics. Greenblatt dubs the approach as a combination of Graham and Buffet, were you not only buy "cheap", but also buy "good". The EY helps to find the "cheap" stocks. ROCE indicates if the company is "good". The importance of the P/E ratio is researched by Campbell and Shiller (1998). Their research shows that P/E ratios explained as much as 40% of the variance in future returns. The main reason why this strategy needs to be evaluated is that it offers a different approach to the P/E ratio than what was previously done. Also, the magic formula offers exceptional risk-adjusted returns according to Greenblatt. Thus we have tried to find out whether the formula still earns abnormal returns as marketed by Joel Greenblatt in his book.

Also this research paper delves into examining the appropriate number of stocks in the portfolio to earn the best possible risk-adjusted returns. This is done by deviating from the usual number prescribed by Joel Greenblatt in his book. This is done to re-affirm the significance of having 30 stocks in the portfolio.
The results of this research will clarify whether this strategy which, claimed by many as a market anomaly is really one or not. And also it can be found out if this strategy contradicts the principles of widely followed concept of Efficient Market hypothesis (EMH). The strategy has already been tested for various regions of the world showing favorable results in most of the cases and thus has inspired the undertaking of this research for evaluating the results for the Indian stock markets.

Literature Review

One of the most recent forms of the value investment strategy is that suggested by Greenblatt (2006, 2010), who selects stocks for a portfolio based on the enterprise value to earnings before interest and taxes (EV/ EBIT) ratio and the return on invested capital (ROIC). Such a combination of stocks produced an annual return of 15.2% in the period 1988–2009, while the average return on the market index (S&P 500) was 9.5% p.a. Greenblatt (2006, 2010) referred to this sorting technique as the "magic formula" because of its ability to consistently beat the market. Gray and Carlisle (2013) further examine the performance of this value strategy and document that an average value portfolio sorted in the same manner as in Greenblatt (2010) outperforms a growth portfolio by 7.96% p.a., while the difference between the average annual returns of value and market portfolios was about 3.27% in the period 1964–2011. These results are also robust for risk adjustment.
Larkin (2011) tested several value investing strategies including Greenblatt's magic formula from 1998 until 2006 for the US market. All the value investing strategies outperformed the market's average by a significant margin, but overall Greenblatt's methodology exhibited less volatility and also was the only one that did not show negative returns during the entire period analysed.

Abbey and Larkin (2012) further built upon the analysis of Larkin (2011) by extending the study period from 1981 until 2010. They found that not only did the value investing strategies consistently outperformed the market portfolio weighted by market capitalization, but also without increasing the risk factor. Among all the strategies, Greenblatt's strategy had the best performance, yielding an annualized of 23.2% meanwhile the market annual rate of return was only 12.1%. Furthermore, it was exposed that despite the fact that value investing strategies are riskier, the Magic Formula methodology shows few episodes of negative returns over a period of 3 to 5 years.

Blij (2011) examined the magic formula for the US stock market from 1998 until 2009 using both equally weighted and market capitalization weighted portfolios. He found out that both the portfolios yielded excess risk adjusted returns when compared to the market vision.

It is important to notice that the period analysed by Blij (2011) and Abbey and Larkin (2012) covers the period studied in Greenblatt's (2006) and Greenblatt's (2010) and work as tests of Greenblatt's results. Further, other studies such as Alpert (2006),Lancetti and Montier (2006), have replicated Greenblatt's formula for the US market to validate his findings. The results found were similar but there were lower average returns mainly due to differences in accounting measures.

Pearson and Selander (2009) back test the strategy for the Nordic region during 1998 to 2008. The portfolio had a 14.68% compounded annual growth rate (CAGR) and was significantly higher than the MSCI Nordic for the same period (9.28%) and the S&P 500 (4.23%). In addition, the Sharpe ratio of different portfolios constructed was greater than the market portfolio. Another contribution made by Pearson and Selander (2009) was to insert the formula into an asset pricing theory perspective using both the CAPM and the Three Factor Fama-French model. Using these models and adjusting for risk, Greenblatt's formula could not statistically beat the market.

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Olin (2011) provides additional empirical evidence from a Nordic country. Olin (2011) researched the consistency of Magic Formula in the Finnish stock market during 2000 to 2009. He showed that the value portfolios formed had a performance between 9.4% and 20% while the market portfolio, which was the OMXH Cap Index, had an average annual yield of 3.5%.

Sareewiwatthana (2011) demonstrates a further evidence of Greenblatt's formula success in the Thailand stock market during the period from 1996 to 2010. After testing various value investing strategies, Sareewiwatthana (2011) shows that magic formula was the best performing strategy with an outstanding annual yield of 66.2% while the market annual return was 2.4% for the period. When comparing single year return, the magic formula underperformed the market 3 years out of the total 15 years.

Howard (2015) did a similar exercise and tested several value investing strategies for the Johannesburg stock exchange from 1998 until 2013. Howard (2015) found that the magic formula had only a 1% excess return comparing to the JSE ALSI TRI as the benchmark, which was not statistically significant.

Davyclov, Tikkanen and Äijö (2016) test the Magic Formula on the Finnish stock market and compares it against the market average and other commonly used value investment strategies. The Magic Formula showed a result which beat the market but was not superior to the other investment strategies in the study. The authors drew the conclusion that the Magic Formula might not be superior in a small market environment, such as the Finnish stock market. However, it does outperform the market with higher returns that are not just a compensation for the higher risk.

MATERIALS AND METHODS

This research performs the Magic Formula strategy on the set of BSE 500 companies annually for a period of 8 years from 2012 to 2019. The research includes only BSE 500 companies because the Magic Formula requires the elimination of Companies that do not fulfil a certain market capitalization criteria.
Two sources of data have been used to obtain the required variables for the construction of portfolios according to the Magic Formula (MF). First variable required is the earnings Yield (EY). In this research we have used Price-Earnings Ratio (P/E) as the measure of valuation instead of the EY that is used in the original Magic Formula strategy. P/E ratio used for the construction process is not the one reported by companies but has been calculated using Earnings per share (EPS), as reported in the annual reports, and opening price of the stock on the first working day of July. Earnings per share (EPS) data are taken from Capitaline Databases and Price data is taken from the BSE India site. The second variable required is Return on Capital Employed (ROCE). This variable value is used as reported by the companies and is taken from the Capitaline Databases.

Financial companies and companies with negative earnings have been deleted from the dataset. Financial firms were removed because ROCE data required for the portfolio construction cannot be obtained. Also financial firms can exhibit high leverage which indicates distress for industrial firms but has a different interpretation for financial firms. And companies with negative earnings were removed because negative earnings make P/E negative which is generally reported as N/A and thus cannot be taken into consideration while applying the Magic Formula.

This research takes the first working day of July as variables required for the application of Magic Formula strategy are reported by Companies in their Annual reports and almost all the annual reports have been released by the end of June. Thus application of strategy on the first working day of July vindicates the use of the required data and eliminates the problem of forward looking bias.
For comparing the returns of Magic Formula strategy we have obtained BSE Sensex returns statistics from BSE India. BSE Sensex index has been chosen as it includes 30 companies in the portfolio and is one of the most widely followed index in India.

PORTFOLIO CONSTRUCTION
After obtaining the required variables, the next step performed is the construction of portfolios as per the Magic Formula strategy. According to the Magic Formula strategy the portfolio, once created, must be revised not more than once a year. For the purpose of this research, this step of portfolio construction was performed annually on the first working day of July starting from July 2012 till July 2019.

The procedure of portfolio construction according to the Magic Formula strategy is as follows:

- First, rank companies based on their P/E Ratio in ascending order i.e. lowest P/E ratio stocks are given rank 1 and highest P/E stock is given the last rank.
- Second, rank companies based on their Return on Capital Employed (ROCE) in the descending order i.e. the stock with highest ROCE is given the first rank and stock with lowest ROCE is given last rank.
- Then, sum the ranks obtained for both variables to form a Total Score.
- Include 30 stocks with lowest total scores in the portfolio.
- Perform the above steps annually and revise portfolio accordingly.

Originally the Magic Formula advocates the inclusion of around 30 companies in the portfolio. But in this research, portfolios of 10 and 50 stocks have also been formed each year to see if deviating from the usual number of 30 stocks improves the returns generated.

In this paper the portfolios created are equally-weighted portfolios. This can be interpreted as allotting an equal amount of money for all the companies.

RETURNS

The returns for individual stocks included in the portfolio have been taken from the Capitaline Databases for a period from July of portfolio construction year to July of next year. Portfolios constructed in this paper are equally-weighted and thus for the calculation of portfolio returns simple average of returns of individual stocks is calculated.

The research includes the calculation of compounded annual growth return (CAGR) which gives the actual returns on an annualized basis in the period under consideration. The compound annual growth rate (CAGR) is the mean annual growth rate of an investment over a specified period of time longer than one year.
To calculate compound annual growth rate, divide the value of an investment at the end of the period in question by its value at the beginning of that period, raise the result to the power of one divided by the period length, and subtract one from the subsequent result.

In this research Average of 8 years returns have also been calculated as to have the best predicted value of next year returns. Returns have been calculated annually, wherein the changes in the portfolio have been made on the first working day of the month of July. Also the returns of the portfolio of year 2019 have been calculated till 1st February, 2020.

BENCHMARK INDEX

For testing if portfolio created using Magic formula has outperformed the market or not we have chosen BSE SENSEX as the benchmark index. We have chosen this index as it also includes 30 companies and is one of the most widely followed index followed in Indian Markets. The returns for BSE Sensex are not adjusted for dividends which also account for almost 1-2% as per empirical results.

After checking for The Magic Formula anomaly we wanted to go a step further to check if Magic Formula returns can be increased even further by changing the number of companies to be included in the portfolio. For this we compared returns of 30-stock portfolio with 10-stock and 50-stock portfolios to see if the returns obtained can be improved.

HYPOTHESES

This paper will examine the performance of a value investing strategy called the Magic Formula strategy and try some aberrations to check if the returns can be further improved. Although this formula was constructed and tested for this the purpose of the book on the US stock markets. The intuitive approach of the strategy gives certain confidence of it beating the Indian Broad market indices also and thus we have formed the following hypothesis.
$H(A_1)$: The returns generated using magic Formula strategy exceeds the returns on broad Indian Indices from July 2012 to December 2019.

Below is the hypothesis formed for testing if changing the number of companies in the portfolio has a positive effect on returns generated. First hypothesis is formed to check if reducing the number of stocks in the portfolio to 10 positively affects the returns generated.
$H(B_1)$: The returns generated using The Magic Formula strategy (10 stocks) exceeds the returns of return of 30-stock Magic formula portfolio.

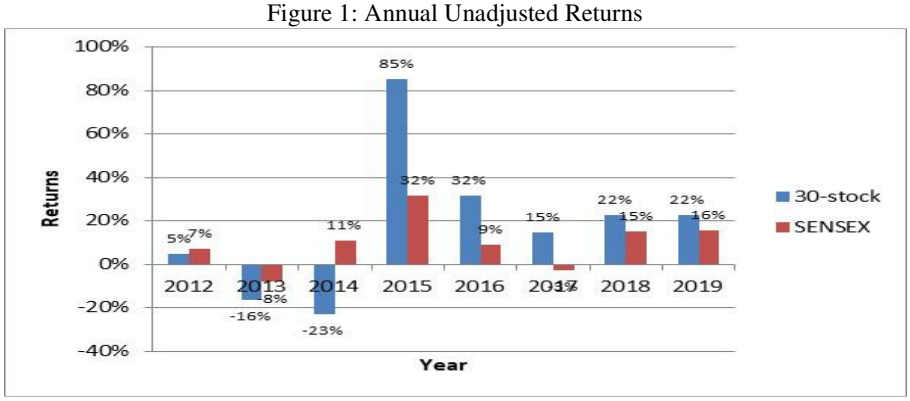
Second, we have formed the hypothesis to check id returns generated can be positively affected by increasing the number of stocks in the portfolio to 50.
$H(C_1)$: The returns generated using The Magic Formula strategy (50 stocks) exceeds the returns of 30-stock Magic formula portfolio.

RESULTS AND DISCUSSIONS

This section states the results of the simulation of the Magic Formula trading strategy when applied to the Indian markets and interprets the results accordingly.

First, we compare the 30-stock portfolio with BSE SENSEX to check if following the Magic Formula Strategy has generated abnormal returns over a period of 8 years on unadjusted basis. Raw Annual returns have been stated in the table below.

Figure 1: Annual Unadjusted Returns



In table 1 the Average Annual returns for 30-stock portfolio and the benchmark index are given which are also depicted in the bar graph. The Magic Formula portfolio has outperformed the market in 5 out of 8 years and cumulatively the average returns exceed the market returns. With Annualized rate of return of 17.73% The Magic Formula portfolio returns exceed the returns generated by BSE Sensex portfolio i.e. 9.89%. Therefore we reject the null hypothesis $H(A_0)$ and state that returns earned using magic Formula strategy exceeds the return on broad Indian indices from July 2012 to December 2019.

This bolsters the profitability of strategy published in the book "The little book that still beats the market". But we still cannot conclude that EMH doesn't hold as these excess returns might have been generated by taking on extra risk. Thus below we provide table containing Sharpe ratio values which provide risk adjusted measure for comparing portfolios with different level of risks.

Table-2: Descriptive statistics

Particulars	30-stock Portfolio	BSE Sensex
Average Return	17.73	9.89
CAGR	13.89	9.31
Median	18.49	10.11
Minimum	-22.82	-8.10
Maximum	85.17	31.61

From the table above it is evident that The Magic Formula strategy of investing is a market anomaly as it contradicts the semi-strong form of market efficiency that no one can earn abnormal returns persistently without taking additional risk using publicly available information.
In the above table Sharpe ratios for 30-stock portfolio and benchmark index
are 0.31 and 0.20 respectively. Even though the standard deviation of Magic Formula portfolio is 33.33% which is significantly higher than 12.09% of market portfolio but this risk is more than compensated by the abnormal returns earned.

As Sharpe Ratio of Magic Formula portfolio is more than Sharpe ratio of BSE Sensex, we reject null hypothesis $H(A'_0)$ and state that the return earned using magic Formula strategy exceeds the return on broad Indian indices from July 2012 to December 2019 even on a risk adjusted basis.

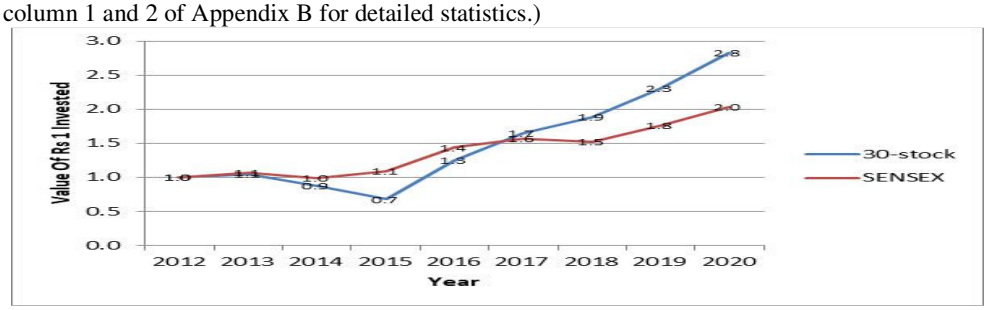
The magic formula portfolio has shown more erratic returns over the period of 8 years with a minimum return of negative 22.8% against negative 8.15 of market portfolio and a maximum of positive 85.7% against positive 31.61% of market portfolio.

The 18.49% median return of Magic Formula portfolio exceeds 10.11% median return of BSE Sensex. This measure of central tendency further shows the abnormal returns earned by the Magic Formula.

Below is the figure showing the progression of each rupee invested over the years in 30-stock portfolio and BSE Sensex returns.

Figure 2: Absolute growth of Re.1 invested

(Refer column 1 and 2 of Appendix B for detailed statistics.)



This graph shows the yearly progression of value of every Rupee invested in Magic Formula portfolio and BSE Sensex index. As evident from the graph, the investment made in an Index portfolio would have doubled in a period of eight years whereas the same amount invested using the Magic Formula strategy would almost tripled in the same period. Initially the short run the Magic Formula portfolio has underperformed but later it was able to beat the market by a significant margin. This is the reason why the strategy is solely for the purpose on long term investing.

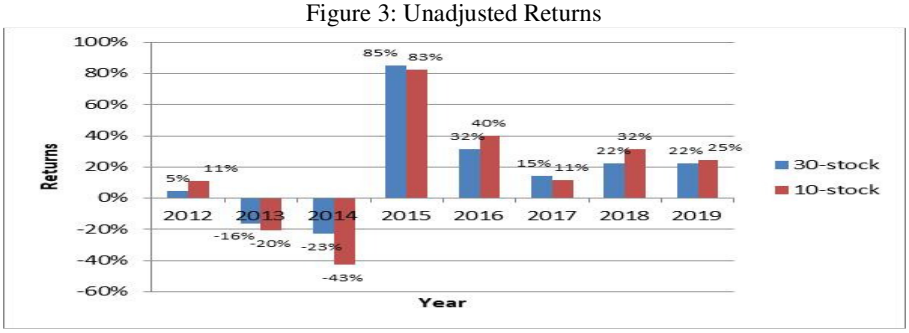
As we have observed above that The Magic Formula stands out as market anomaly that still persists. The next step is to check if the returns generated by the Magic Formula can be positively affected by deviating from the rule of including around 30 companies in the portfolio. For this purpose the research includes calculation of returns in two cases

1. When 10 stocks are included in the portfolio instead of 30.
2. When 50 stocks are included instead of 30.

For the first from the above, below is the table presenting annual unadjusted returns for 30-stock and 10-stock portfolios which is followed by a bar graph depicting the presented returns with years on x-axis and return percentage on y-axis.

The above table presents the annual unadjusted returns for both 30-stock and 10-stock portfolios. The 10-stock portfolio outperforms 30-stock portfolio in 4 out of 8 years. But still the Annual average for 30-stock portfolio is higher suggesting the superiority of returns generated by the 30-stock portfolio.

Figure 3: Unadjusted Returns



The above graph depicts the returns presented in Table 3. From this one noticeable point is the negative drawdown of returns in the year 2012. Due to this, the average of returns has been severely impacted for 10-stock portfolio.
From the Unadjusted returns presented above no conclusion should be drawn as the difference is not significant. For this reason the data presented below is to be referred to check for the superiority of returns. The table below includes mainly the Sharpe ratio and other measures for the comparison of 10-stock and 30-stock portfolios.

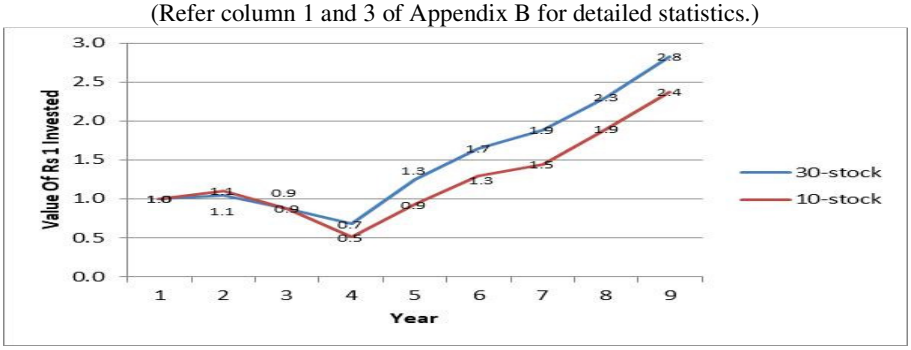
Table-4: Descriptive Statistics

Particulars	30-stock Portfolio	10-stock Portfolio
Average Return	17.73	17.34
CAGR	13.89	11.42
Median	18.49	18.11
Minimum	-22.82	-42.61
Maximum	85.17	82.73

The Sharpe ratio values presented in the above table shows that 30-stock portfolio outperforms the 10-stock portfolio when compared on a risk-adjusted basis with a Sharpe ratio equal to 0.31 against the 10-stock portfolio Sharpe ratio of 0.26. Thus we fail to reject the null hypothesis $H(B_0)$ and conclude that the return generated using The Magic Formula strategy (10 stocks) is less than the return of 30-stock Magic formula portfolio on a risk-adjusted basis.
Both portfolios had similar unadjusted returns but Standard deviation of 10-stock portfolio is higher and thus the Sharpe ratio is lower for this portfolio.
10-stock portfolio has a wider range of returns with a minimum return of negative 42.61% and maximum of positive 82.73%.

The graph below depicts the yearly progression of each rupee invested in 30-stock portfolio and 10-stock portfolio.

Figure 4: Absolute growth of Re.1
(Refer column 1 and 3 of Appendix B for detailed statistics.)



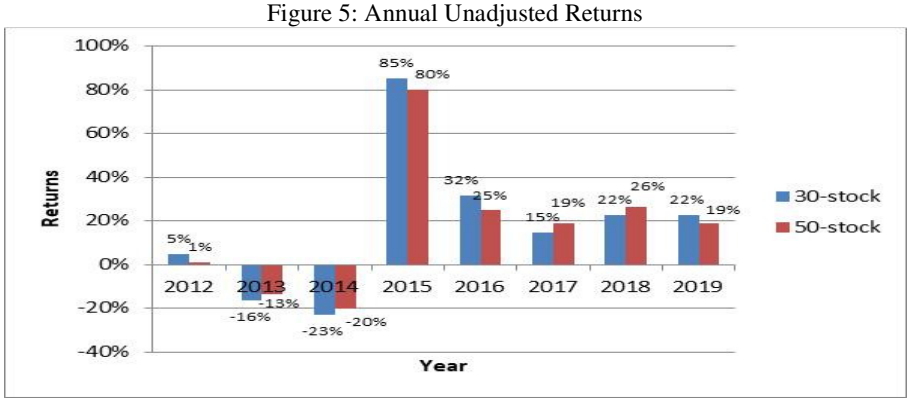
From the above it is comprehensible that the 10-stock portfolio shows more variation but still underperforms the 30-stock portfolio as value of each rupee invested in 10-stock portfolio would have been 2.38 whereas that of 30-stock portfolio would have been 2.83.

Now the second case involves comparison of 50-stock portfolio returns with 30-stock portfolio. The first step for this is to compare unadjusted returns of both the portfolios that are presented in Table-5.

From the table it is evident that the 30-stock portfolio beats the returns generated by 50-stock portfolio when compared on an unadjusted basis. The 30-stock portfolio average is 17.73% against 16.99% of 50-stock portfolio. Even though the 50-stock portfolio outperforms the 30-stock portfolio in 4 out of 8 years but still the average of the latter is higher.

Below graph depicts the data presented in Table taking years on x-axis and percentage returns on y-axis.

Figure 5: Annual Unadjusted Returns



Above unadjusted returns comparison cannot be used to conclude the superiority of returns of 30-stock portfolio. Therefore the next step is to compare is to compare the Sharpe ratios of the two portfolios.
The table below presents the Sharpe ratios and other descriptive measures for comparing the returns of both portfolios.

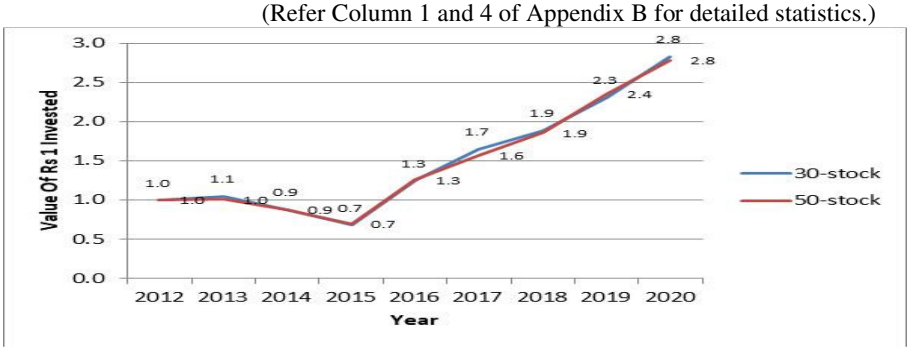
Table 6: Descriptive Statistics

Particulars	30-stock Portfolio	50-stock Portfolio
Average Return	17.73	16.99
CAGR	13.89	13.70
Median	18.49	18.78
Minimum	-22.82	-20.29
Maximum	85.17	79.82

From the table above it is seen that the Sharpe ratios of both 30-stock and 50-stock portfolios is same having value of 0.31. Thus we fail to reject the null hypothesis H(C_0) and conclude that the returns generated using The Magic Formula strategy (50 stocks) equal to the returns of 30-stock Magic formula portfolio on a risk-adjusted basis.

Below is the graph showing yearly progression of each rupee invested in 30-stock and 50-stock portfolios.

Figure 6: Absolute Growth of Re.1
(Refer Column 1 and 4 of Appendix B for detailed statistics.)



In the above graph it is shown that the 50-stock portfolio has traced the progression of 30-stock portfolio showing that the returns earned do not differ significantly.

From our results it is evident that the strategy as advocated by Joel Greenblatt is a market anomaly and using this strategy a person would have earned returns over above that of the market index for a period of 8 years from 2012-2020. This strategy surely contradicts the principle of Efficient market Hypothesis by earning abnormal returns using only publicly available information.

So from this simulation and evaluation of The Magic formula strategy for Indian markets we can suggest that a trader can use this simple strategy of value investing that filters a set of companies that are good and can be bought relatively cheaply for earning abnormal returns in the future too.

LIMITATIONS OF THE STUDY

During the course of the study, the following points emerged as the shortcomings of the procedure adopted and data used. These points are to be considered before drawing out conclusions.

- First, the dataset used in this research to evaluate the strategy may or may not differ from the dataset used in other independent research upon this topic and thus returns calculated in this paper might differ from that of other such evaluations.
- Use of P/E ratio instead of Earnings Yield is a point of prime importance. We chose to use P/E instead of the stated EY as P/E being the reciprocal of EY did not change the formula fundamentally but due to the advantage that P/E is considered a better variable for valuation purposes it seemed fair to opt for P/E for filtering of the stocks that relatively cheaper.
- The portfolios that were created using the Magic formula strategy for the purpose of this research are equally weighted in contrast to the benchmark to which the returns are compared, that is market capitalization weighted. This makes the return comparability difficult as in equal weighted portfolio all companies are allotted equal amount which can be unrealistic in real world as price may not be perfectly divisible by the decided amount for each company and thus the actual returns will differ from the calculated returns but this paper serves the purpose of getting an idea of returns and not the actual returns that this strategy would have generated.
- Another limitation of an equal weighted portfolio is that when we allot an equal amount to all stocks, general issue will be divisibility problems as the amount decided upon may or not be exactly divisible and thus the actual allotment will differ from the proposed allotment. Thus the actual returns would differ from the calculated returns.
- The returns calculated for benchmark index does not take into account the dividends etc. but the portfolio returns are adjusted for such variables. But as per empirical results such variables have average 1-2% additional returns and thus our portfolio will still significantly beat the Market index.

The points mentioned above are to be considered while forming any perceptions or decisions about the value investing strategy called The Magic Formula.

CONCLUSION

From the research conducted and results obtained we can conclude that the theory professed by Joel Greenblatt in his book “The Little Book that beats the market” is a market anomaly and contradicts the theory of semi-strong version of Efficient Market Hypothesis which states that no one can persistently earn returns over and above of the market return using only publicly available information without taking on additional risk. But the Magic Formula involves the use of two fundamentals variables that are reported by companies in their annual reports. This research involves testing of this strategy for a period of 8 years and the results show the persistent existence of abnormal returns. CAGR of Magic Formula portfolio exceeded CAGR of market index and thus shows the abnormal returns generated by The Magic Formula Strategy.

When comparing progression of each rupee invested in both Index portfolio and Magic Formula portfolio, former almost doubled the investment in years period while the latter almost tripled every rupee invested in that same period.

One point worth noticing when comparing this progression of investment is that in the initial years the strategy of Magic Formula actually underperformed the market but in the long run the strategy outperformed the index with a significant margin. This is the reason the Joel Greenblatt book discourages the use of this strategy for short term investment as the strategy filters good companies available at reasonable prices but does not include the element of market timing. So the formula can underperform the market portfolio in the short run but in the long run the strategy seems to produce abnormal returns.

The next aspect that this research checked about this strategy is the number of stocks to be included in this portfolio. For this the number of stocks was once increased to 50 and once decreased to 10. From the results obtained thereof it was seen that the returns generated by the 30-stock portfolio were optimal as no other portfolio had a higher CAGR. 30-stock portfolio had a CAGR significantly higher than 10-stock portfolio but similar to that of 50-stock portfolio. This above mentioned aspect focuses on the significance of the number of

stocks to be included as prescribed by the Magic Formula. The research results suggest that the 30 is the optimal number of stocks to earn highest returns.

The results obtained in this research support the application of the Magic Formula strategy for long term investing in the Indian Markets for earning abnormal returns. The simplicity of this strategy further promotes its use by the investors in the stock markets to beat Mr.Market.

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APPENDIX

APPENDIX B : VALUE OF RE.1 INVESTED

Year	30-stock	SENSEX	10-stock	50-stock
2010	1.00	1.00	1.00	1.00
2011	1.05	1.07	1.11	1.01
2012	0.88	0.99	0.88	0.88
2013	0.68	1.09	0.51	0.70
2014	1.25	1.44	0.93	1.26
2015	1.65	1.57	1.30	1.57
2016	1.89	1.53	1.45	1.86
2017	2.31	1.76	1.90	2.35
2018	2.83	2.04	2.38	2.79