

Fundamental scoring for the portfolio of winners on Indian bourses

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ABSTRACT

This paper tries to examine whether application of 'simple historical financial information based fundamental analysis', when applied to a broad portfolio of companies ranging across industries selected based on the principals of value investing, can shift the distribution of returns earned by an investor to the right of the return curve. We show that 'fundamental scoring – based selection strategy' (V_SCORE) in portfolio formation of expected winners provide significant excess market-adjusted returns over portfolio of expected losers. We analyze the performance of the portfolios formed by measuring company specific returns as '1 year & 2 year Buy – & – Hold' returns earned from the end of 1st quarter after fiscal year end over period of 1 & 2 years respectively. We conduct an empirical assessment of returns made from portfolio selected based on fundamental analysis carried over historical financial data pertaining to FY 2008-09, FY 2011-12 & FY 2014-15 to assess the robustness of the strategy across different time periods and conditions in stock markets. Furthermore, we present our results pertaining to shift in the distribution of the returns earned by the investor, to the right of the return curve through our V_SCORE investment strategy and test the statistical significance of the same using Mann-Whitney U-Test. Overall, we bring home the fact that our strategy can provide an excellent starting point in the valuation of the stocks.

1. Introduction

Not all undervalued stocks may have the potential to appreciate over the period of time. Among value stocks, it is the healthiest of the firms that appear to generate the strongest returns (Fama & French, 1998). Other researches also indicate that success of any value investment strategy depends on relying on the strong performance of a few firms while tolerating the performance of other deteriorating firms (Piotroski, Jan, 2002). Buying stocks with a strong intrinsic value on fundamental strength has been historically proven to pick the winners. This paper constructs a fundamental indicator that identifies those value stocks that has the potential of winning among the other undervalued stocks in the market, which benefits the investor to build a winning portfolio. In this paper, first we provide the fundamental indicators that we use to rank firms based on a multi-point fundamental scoring V_SCORE scale. We empirically assess the performance (based on return from investment) of all companies from an array of industries chosen on the principles of value investing and then, present our results to show that distribution of returns can be shifted to the right of the return curve by holding a portfolio of ultimate winners and avoiding portfolio of loser firms which we determine from our multi-point fundamental V_SCORE scale. Finally, we provide statistical significance of the results we obtain and provide avenues for further research in value investing through our model and help investors make sound investment decisions.

2. Literature Review

a) Value Investing: Use of Historical Financial Statement Information to Separate Winners from Losers (Piotroski, Jan, 2002)

This research is aimed at formulating a score by assessing the fundamentals of stocks that have high BTM value i.e. are undervalued stocks, which get seldom covered

by analysts but deliver sound financial position. Piotroski by use of financial performance signals prove that through a selection of financially strong high BM firms an investor can gain abnormal returns. Author gives a score along with scoring card from 0-9 where score of 0-1 is considered low F_score and a score of 8-9 is considered a high F_score firm. This paper asks whether a simple financial statement based heuristic, when applied to these out of favor stocks, can discriminate between firms with strong prospects and firms with weak prospects. We find that F_score focuses on improvement rather than absolute levels. In doing so firms with low profitability and high leverage can still get a perfect F_score given there has been improvement from the previous year.

b) Fundamental Information Analysis (Lev & Thiagarajan, 1993)

The research focuses on identifying the financial variables which can help in determining the value of corporate securities. It is seen if the fundamental factors identified are actually used by the investors to assess the growth of the securities. The paper hypothesizes that the fundamental signals identified in this study are used by investors to assess the quality and growth of reported earnings and in order to support this hypothesis, demonstration of significant relation between aggregate score reflecting the information in the fundamentals and the 2 indicators of quality which is the earnings response coefficient and future earnings growth is done. The research uses 12 fundamental signals which are Inventory, Accounts Receivables, Capital Expenditure, Research & Development, Gross Margin, Sales & Admin Expenses, Provision for Doubtful debts, Effective Tax, Order Backlog, Labour Force, LIFO earnings and Audit qualification.

3. Research Design

Problem statement

Stock market has been consistently delivering stupendous returns to almost all investors having long term horizon in mind for their equity investments. Sufficient literature exists to support that stock market returns can be amplified if investment decisions are coupled with fundamental analysis. The only issue at hand being, to devise a simple, straightforward, calculable yet effective method of conducting fundamental analysis and thereby assist in investment decisions with assurance of significant excess market adjusted returns in the coming years.

Sample selection

Value investing works on the principle of identifying out – of – flavor stocks/ bargain – priced stocks. The defining characteristics of value stocks are relatively lower price – to –

earnings ratio (P/E ratio) & price – to – book ratio (P/B ratio). Our research also revolves around value investing in Indian stock market scenario wherein we have considered the year 2009, 2012 & 2015 as three different periods of investment for analyzing the results over 1 year and 2 year from date of investment.

Industry Selection – Among all the industries shown on Ace Analyzer for year 2009, 2012 & 2015, we have considered top 10 industries ranked on the basis of 4 indicators listed below along with the manner of ranking:

Top Rank Industry				Low Rank Industry			
P/B Ratio	Low	EPS	High	P/B Ratio	Low	EPS	High
P/E Ratio	Low	ROA	High	P/E Ratio	Low	ROA	High

We have allocated scores to each of the industry based on the above indicators (with top rank industry receiving higher score over low rank industry) and retained the top 10 industries (with highest top 10 scores) in all the three years.

Company Selection – Having selected industries based on value screening, we proceed by considering all the companies in the industries selected, with sufficient historical financial data¹. This provides us with a final sample of 43 companies for year 2009, 59 companies for year 2012 & 61 companies for year 2015. These selected companies have sufficient historical financial information and stock price data needed to carry out the analysis.

Research Objectives

The overall objective of this paper is to show that investment strategy based on fundamental-scoring can help investor shift his distribution to the right with following specific objectives:

- Establish multi fundamental-scoring method to identify potential winner and loser stocks by use of publicly available financial information and without relying on forecasted cash flows and future profits, which are inherently uncertain and prone to errors.
- To empirically demonstrate the shift in the distribution of returns to the right of the return curve via use of V_SCORE strategy applied on firms belonging to industries selected on Value Investing principles.
- Build portfolios of potential winners using V_SCORE strategy and compare its return vis-à-vis portfolio of potential losers and test the statistical significance of shift of the returns distribution.

Source of Data

¹ We have considered companies that had all the fundamental data required to calculate the V_SCORE (which shall be introduced in the subsequent sections) along with share price data for the past 1 year and next 2 years from the date of formation of portfolio.

- <https://www.bseindia.com/markets>
- <https://www.nseindia.com/products.htm>
- <http://www.aceanalyser.com/>

Hypothesis

H₀ (Null Hypothesis): Differences in distribution of returns of the portfolios belonging to High_V_Score & Low_V_Score are not statistically significantly different.

H₁ (Alternate Hypothesis): Differences in distribution of returns of the portfolios belonging to High_V_Score & Low_V_Score are statistically significantly different.

Limitations of the research

- We have selected only a period of 10 years starting 2007 to 2017 for analysis of returns for application of our fundamental scoring investment strategy.
- In each of the 3 years of portfolio formation, we have considered only the top 10 industries as part of our sample selection.
- Amongst the industries selected, only those companies which had sufficient historical financial information and return data available for analysis were selected.

We have extracted majority of the data used in this research from Ace_Analyzer website. In order to test the accuracy of the data on the portal, we have applied test checks for few companies and found data to be appropriate. Based on same, we have assessed the accuracy of data of the population.

Formulation of V_SCORE & Investment strategy

We select 9 fundamental and 1 growth signals based on the international evidence that growth and fundamental strategy complement each other and can not only help add diversity to one's portfolio but also exemplify portfolio returns (Fama & French, 1998). Our scoring signals measure a stock

from 4 dimensions of profitability, financial leverage, operating efficiency and market return which are defined as follows:

➤ Profitability

- **Return on assets (ROA)**

ROA is defined as net profit before tax divided by total assets.

- **CFO (cash flow from operations)**

CFO equals cash flow from operations divided by total assets

- **ΔEPS (change in EPS)**

ΔEPS is current year's EPS subtracted by the prior year's EPS.

- **ΔROA (change in ROA)**

ΔROA is current year's ROA subtracted by the prior year's ROA.

- **ACCRUAL**

ACCRUAL signal is defined as ROA minus CFO and V_Score equals 1 if CFO > ROA, else 0.

For first 4 signals above, we award a V_SCORE of 1 when result comes out to be positive, otherwise 0. Improvement in all the above scores is an indication of strong fundamentals of the company.

➤ Financial Leverage

- **ΔLIQUID (change in liquidity)**

ΔLIQUID measures liquidity and equals the change in the current ratio between current and prior year. An improvement gets awarded with V_Score of 1, otherwise 0.

- **ΔLEVER (change in leverage)**

ΔLEVER variable is the change in the ratio of total non-current liabilities to total assets. Increase in leverage is assumed to be bad for value stocks and awarded a V_Score of 0, otherwise 1.

➤ Operating Efficiency

- **ΔEBIT_UP**

ΔEBIT_UP is the change in EBIT Growth over prior year's EBIT Growth and V_Score equals 1 if Δ EBIT growth > 0, otherwise 0.

- **ΔTURN**

ΔTURN is defined as the change in a firm's total asset turnover (current year sales scaled by total assets). If the asset turnover improves, V_Score equals 1, otherwise 0.

➤ Market return

- **RETURN**

RETURN measures the change in the price of the stock over previous year calculated by considering the difference

between the closing price as at June end of current year and previous year.

Stock return turning positive might indicate initial discovery of value stock and probable excess returns over next 1 to 2 years, V_Score equals 1 if Return comes out to be positive, otherwise 0.

V_SCORE being the sum of all the ten binary indicators can be shown as:

$$V_SCORE = V_ROA + V_CFO + V_ΔEPS + V_ΔROA + V_ACCRUAL + V_ΔLIQUID + V_ΔLEVER + V_EBIT_UP + V_ΔTURN + V_MARKET_RETURN$$

4. Empirical results and analysis

In this section, we discuss about the results we obtained based on the application of V_SCORE investment strategy. We shall divide our discussion into 3 parts which are outlined as follows:

- I. Calculation of Mean 1-year & 2-year Buy-&Hold Gross returns and Median Market-Adjusted Returns along with its comparison across different V_SCORES.
- II. Empirical analysis of distribution of Market Adjusted 1-year & 2-year Buy & Hold returns and graphical presentation of distribution of Market Adjusted Returns (MAR) via Boxplots.
- III. Portfolio creation based on V_SCORE investment strategy and evaluation of returns under different portfolio choices along with test of statistical significance through Mann-Whitney U-Test.

Calculation of Mean 1-year & 2-year Buy & Hold Gross returns

Table 1, Table 2 & Table 3 provides data on historical Mean Gross returns (T=0) along with Mean and Median 1 year (T=1) & 2year (T=2) Buy - & - Hold Gross Returns for firms classified based on V_SCORE along with returns earned from the portfolio made up of all the firms. We find that most of the observations are clustered around V_SCORE of 3 – 7. Moreover, we also find that there were no firms in any of the three years of portfolio formulation which had a V_SCORE of 10 on 10. This could have resulted due to selection of industry or lack of needed data for a particular company. The most striking results from the empirical assessment as shown through a graded colour scale in Table 1 is the distribution of higher gross mean returns and median market-adjusted returns (as evidenced by Rank 1 -4) in the bottom half (RP_SCORE of 5-8) as compared to the top half (RP_SCORE of 1-4). We find similar results in Table 2 & Table 3 as well.

TABLE 1
Buy - & - Hold returns over 1 year & 2 year period based on V SCORE investment strategy
(FY 2008-09)

V SCORE	Gross Mean Returns (GMR) (%)			Average GMR (%)	RANK	Median Market Adjusted Returns (MAR) (%)			Firms with +ve Market Adjusted Returns (No.)			Average +ve MAR (%)	RANK	N
	T=0	T=1	T=2			T=0	T=1	T=2						
1	-0.23	0.17	0.12	0.02	6	-0.246	0.004	-0.167	0	1	0	0.33	7	1
2	-0.45	0.00	-0.16	-0.2	8	-0.387	-0.066	-0.381	0	2	0	0.17	8	4
3	-0.14	0.19	-0.04	0	7	-0.232	0.008	-0.401	3	6	2	0.37	6	10
4	-0.13	0.69	0.43	0.33	5	-0.135	0.494	0.184	3	5	4	0.57	5	7
5	0.07	1.10	1.08	0.75	2	-0.042	0.926	0.654	2	5	5	0.67	4	6
6	0.26	0.65	0.28	0.4	4	0.159	0.377	-0.125	4	5	2	0.73	3	5
7	0.34	0.85	0.86	0.69	3	0.247	0.483	0.247	6	6	4	0.89	2	6
8	0.16	2.19	6.06	2.8	1	0.185	1.165	1.214	3	4	4	0.92	1	4
All Firms	0	0.71	0.92	0.54	3.5	-0.002	0.363	-0.017	21	34	21	0.59	4.5	43



In the order of Lowest – to – highest return from the portfolio
 T=0: Historical stock return (Jun'08 – Jun'09); T=1: Stock return (Jun'09 – Jun'10)
 T=2: Stock return (Jun'09 – Jun'11)
 N: No. of observations/ samples

TABLE 2
Buy - & - Hold returns over 1 year & 2 year period based on V SCORE investment strategy
(2011-12)

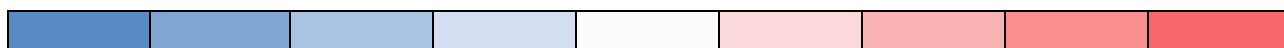
V SCORE	Gross Mean Returns (GMR) (%)			Average GMR (%)	RANK	Median Market Adjusted Returns (MAR) (%)			+ve Market Adjusted Returns (No.)			Average +ve MAR (%)	RANK	N
	T=0	T=1	T=2			T=0	T=1	T=2						
1	-0.08	-0.26	0.17	-0.06	8	-0.085	-0.368	-0.248	0	0	0	-	9	1
2	-0.36	-0.38	-0.19	-0.31	9	-0.386	-0.53	-0.715	0	2	1	0.13	8	8
3	-0.19	-0.15	0.49	0.05	7	-0.277	-0.373	-0.329	1	2	1	0.22	7	6
4	-0.16	-0.09	0.77	0.17	5	-0.187	-0.228	0.043	2	2	6	0.3	6	11
5	0.01	0.16	1.1	0.42	2	0.003	-0.091	0.449	6	5	7	0.6	2	10
6	0.06	-0.02	1.03	0.36	3	0.073	-0.167	0.5	6	3	8	0.57	3	10
7	0.02	0.01	0.85	0.29	4	-0.072	-0.118	0.188	3	3	6	0.5	4.5	8
8	0.06	-0.23	0.4	0.08	6	0.043	-0.331	-0.075	4	0	2	0.5	4.5	4
9	0.18	0.43	4.73	1.78	1	0.176	0.324	4.308	1	1	1	1	1	1
All Firms	-0.08	-0.07	0.75	0.2	4.5	-0.085	-0.235	0.073	23	18	32	0.41	5	59



In the order of Lowest – to – highest return from the portfolio
 T=0: Historical stock return (Jun'08 – Jun'09); T=1: Stock return (Jun'09 – Jun'10)
 T=2: Stock return (Jun'09 – Jun'11)
 N: No. of observations/ samples

TABLE 3
Buy - & - Hold returns over 1 year & 2 year period based on V_SCORE investment strategy
(FY 2014-15)

V SCORE	Gross (GMR) (%)	Mean Returns	Average GMR (%)	RANK	Median Market Adjusted Returns (MAR) (%)			+ve Market Adjusted Returns (No.)			Average +ve MAR (%)	RANK	N	
					T=0	T=1	T=2							
1	-0.23	0.16	0.3	0.08	8	-0.343	0.155	0.16	0	2	1	0.5	8	2
2	-0.33	0.18	0.36	0.07	9	-0.333	0.398	0.496	0	2	2	0.44	9	3
3	-0.13	0.61	3.03	1.17	2	-0.291	0.6	1.42	1	7	8	0.67	6	8
4	-0.11	0.61	0.51	0.34	7	-0.344	0.308	0.328	2	6	4	0.57	7	7
5	1.72	0.26	1.62	1.2	1	-0.131	0.122	1.369	2	6	6	0.78	4	6
6	0.05	1.08	2.37	1.16	3	-0.214	0.985	2.063	4	10	9	0.77	5	10
7	0.63	0.37	1.11	0.7	5	0.508	0.416	0.746	14	12	13	0.93	1	14
8	0.81	0.53	0.97	0.77	4	0.786	0.54	0.625	6	5	7	0.86	2	7
9	0.68	0.26	0.87	0.6	6	0.532	0.112	0.592	4	2	4	0.83	3	4
All Firms	0.41	0.53	1.45	0.8	4.5	0.115	0.398	0.884	33	52	54	0.76	6	61



In the order of Lowest – to – highest return from the portfolio

T=0: Historical stock return (Jun'08 – Jun'09); T=1: Stock return (Jun'09 – Jun'10)
 T=2: Stock return (Jun'09 – Jun'11)

N: No. of observations/ samples

Distribution of Market Adjusted 1-year & 2-year Buy & Hold returns

We extend our discussion of the empirical analysis of the mean and median returns obtained from firms belonging to different V_SCORES to “Distribution of Market-Adjusted Returns” which was indeed one of our stated objective i.e. to see if the V_SCORE investment strategy can help an investor shift the distribution of returns earned by him from portfolio of value stocks, to the right of the curve.

In line with our objective, from Table 1, 2 and 3, we find that the median returns of the firms in higher V_SCORES is significantly higher than the firms in lower V_SCORES. Similarly, we find that the proportion of firms with positive market adjusted returns (MAR) is significantly higher in case of high V_SCORE firms relative to low V_SCORE firms and we present this via no. of firms which have +ve MAR and also present average proportion of firms which have +ve MAR and rank them based on a multi-point scale.

We through Figure 1, 2 and 3 present graphical distribution of the market-adjusted historical (T=0) and 1-year

(T=1) and 2-year (T=2) Buy-&-hold returns relating to FY 2008-09, FY 2011-12 & 2014-15 respectively, for firms in each of the V_SCORE through Boxplots. We can visualize that the return distribution for High V_Score firms is on the higher side as compared to Low V_Score firms.

Overall, it is clear from the results obtained that investment strategy based on V_SCORE can help investors discriminate between potential winners and losers and help build portfolio of potential winners on the bourses.

Now, since we have empirically analyzed and graphically visualized the potential of providing superior market-adjusted returns for High V_Score firms, we shall now in the next section, build portfolio of potential winners (selecting firms with V_SCORES on the higher side of the scale) and compare their returns (along with distribution of returns) to see if the results are statistically significantly different than results obtained from portfolio of Low V_Score firms.

Representation of distribution of returns based on V_SCORES via Boxplots

Figure 1.1
FY 2008-09

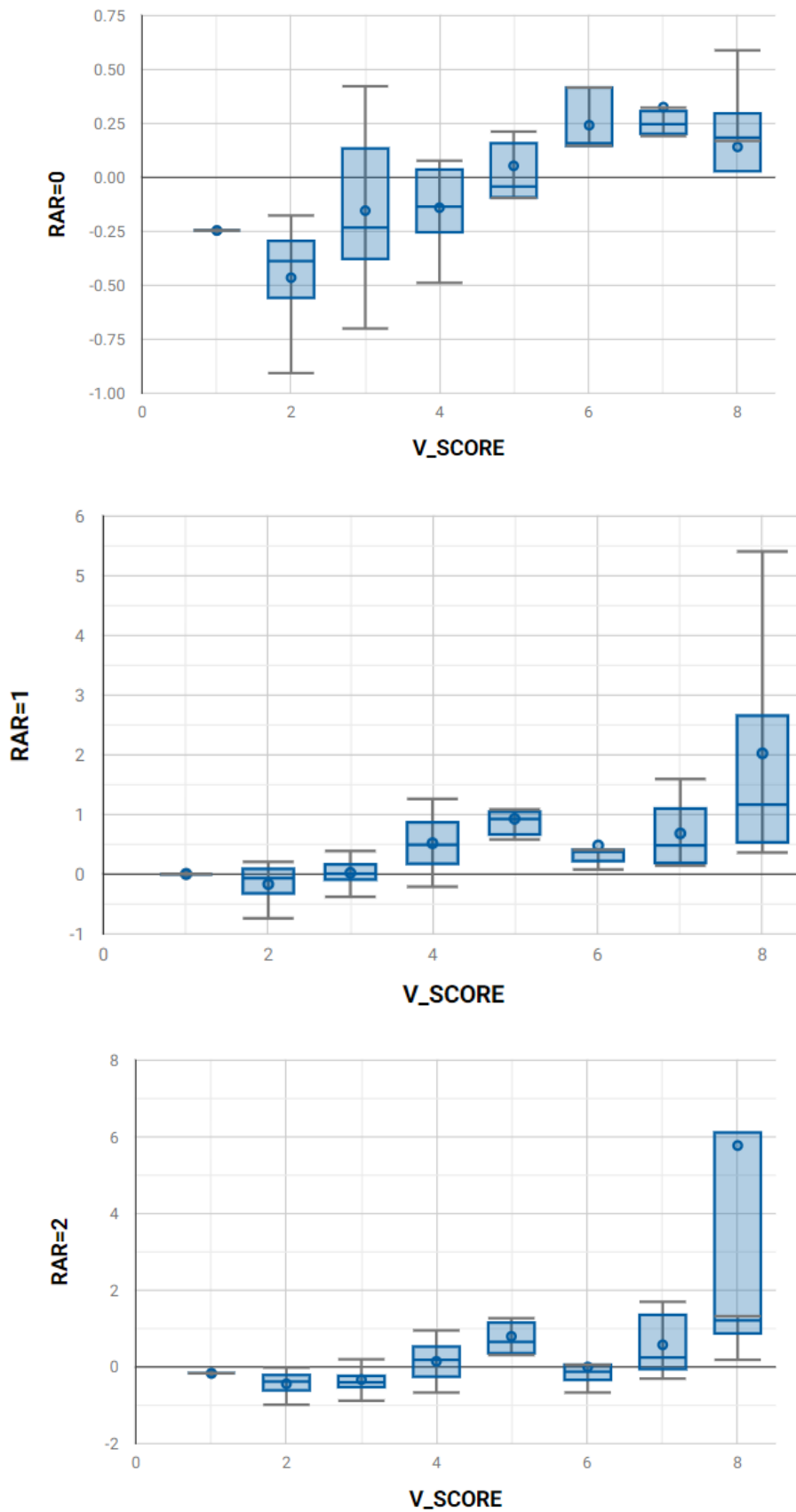


Figure 1.2
FY 2011-12

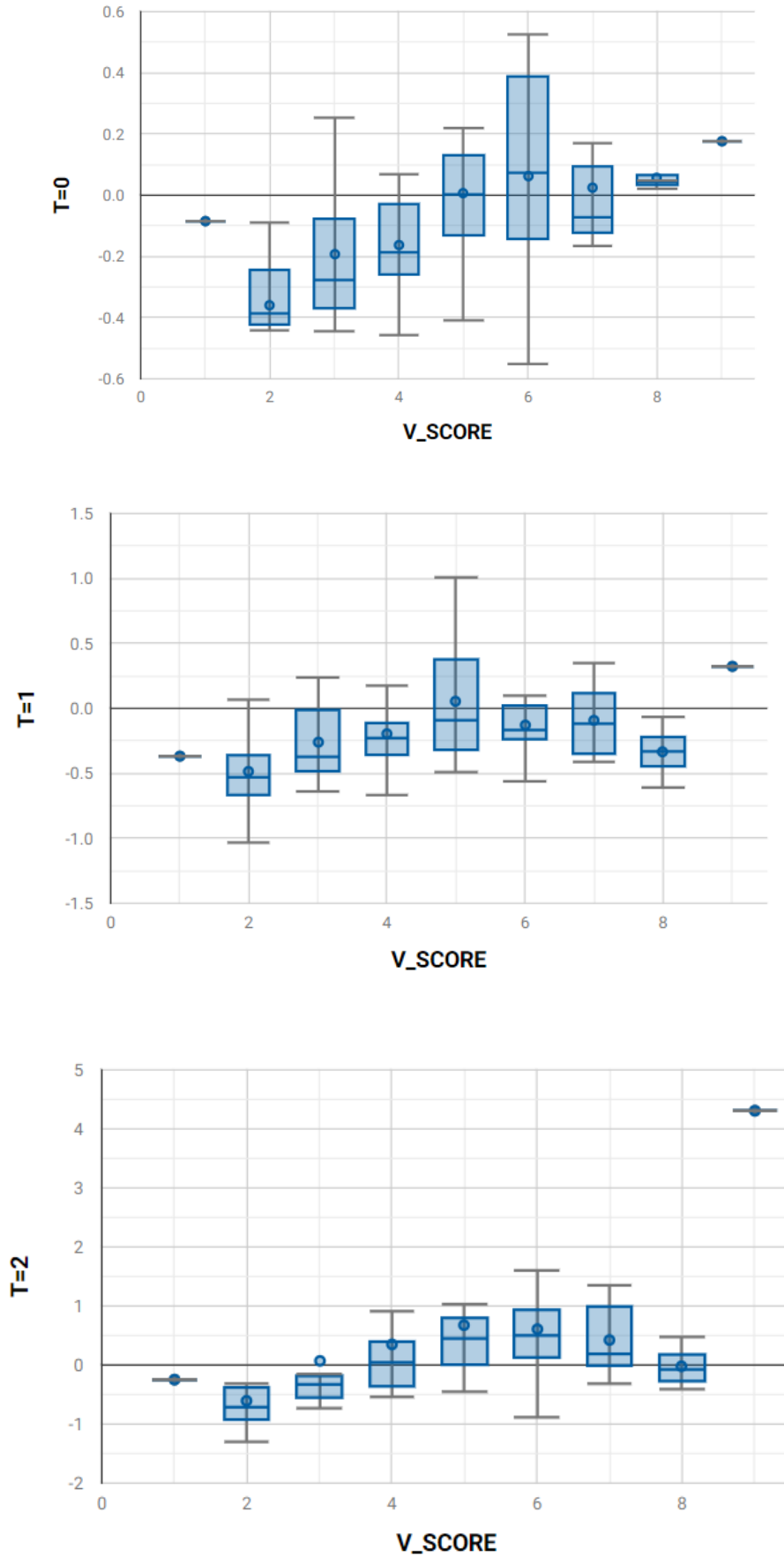
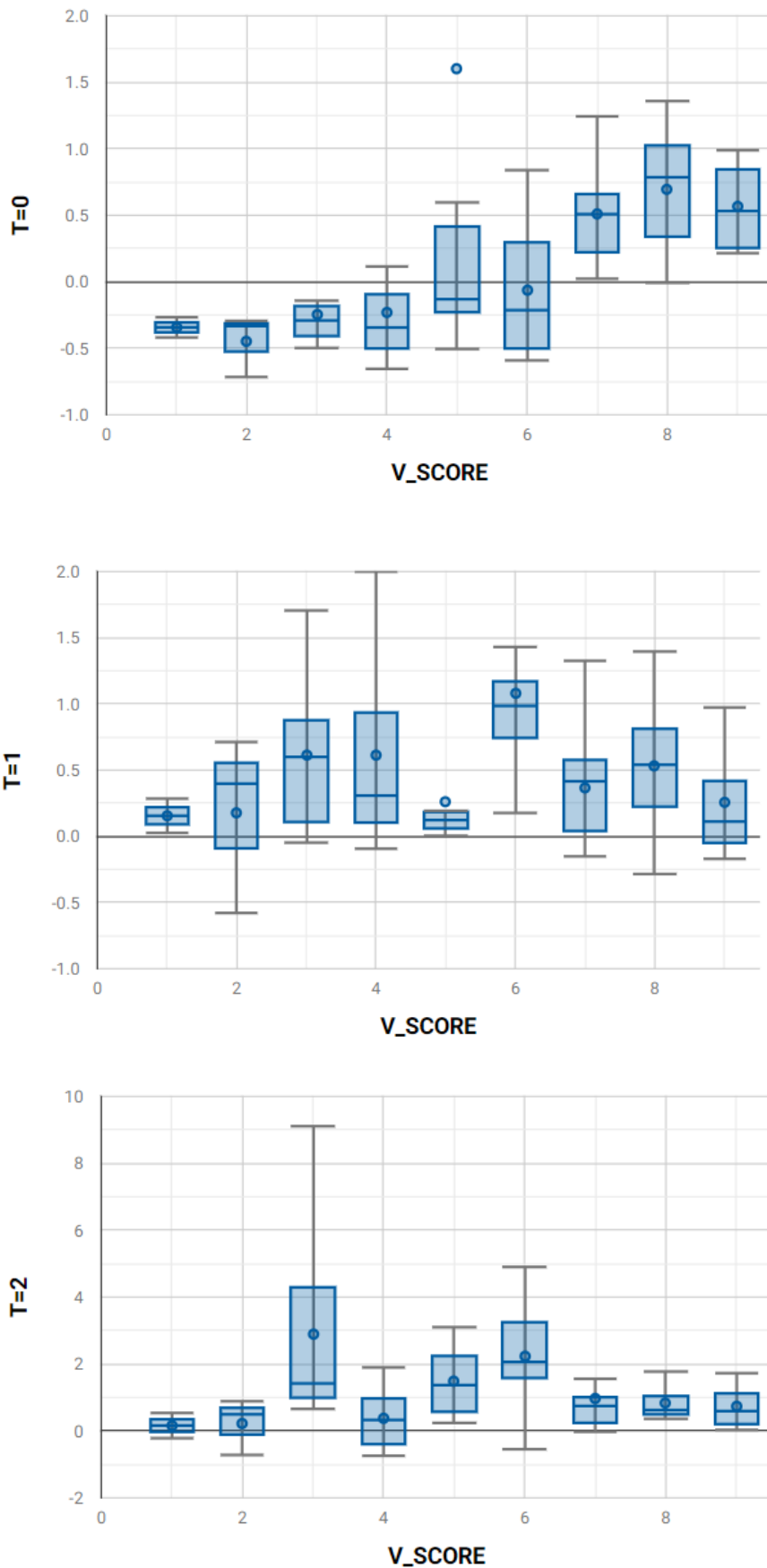


Figure 1.3
FY 2011-12



I. Portfolio Creation & Analysis of Returns

In this section, we discuss about the creation of portfolios based on V_SCORE investment strategy and attempt to test the statistical significance of the shift in the distribution of the returns to the right in case of high V_SCORE portfolios vis-a-vis low V_SCORE portfolios.

Table 4
Descriptive Statistics and Test of Statistical Significance
for High & Low V_SCORE portfolios

LOW_V_SCORE	2008-09			2011-12			2014-15		
	T=0	T=1	T=2	T=0	T=1	T=2	T=0	T=1	T=2
Mean	-0.21	0.15	-0.19	-0.23	-0.31	-0.03	-0.28	0.5	1.34
Standard Error	0.07	0.11	0.11	0.04	0.07	0.21	0.07	0.14	0.51
Median	-0.23	0.03	-0.33	-0.26	-0.35	-0.3	-0.34	0.35	0.74
Standard Deviation	0.33	0.49	0.51	0.21	0.36	1.09	0.3	0.65	2.29
Sample Variance	0.11	0.24	0.26	0.04	0.13	1.18	0.09	0.42	5.26
Sum	-4.62	3.2	-4.23	-5.91	-7.96	-0.85	-5.62	10.04	26.77
Count (N)	22	22	22	26	26	26	20	20	20
HIGH_V_SCORE	2008-09			2011-12			2014-15		
	T=0	T=1	T=2	T=0	T=1	T=2	T=0	T=1	T=2
Mean	0.19	0.96	1.49	0.05	-0.13	0.59	0.57	0.39	0.89
Standard Error	0.09	0.26	0.97	0.06	0.06	0.23	0.08	0.09	0.2
Median	0.19	0.59	0.46	0.04	-0.18	0.29	0.55	0.42	0.63
Standard Deviation	0.39	1.18	4.45	0.27	0.29	1.11	0.41	0.45	1.01
Sample Variance	0.15	1.39	19.78	0.07	0.08	1.24	0.17	0.2	1.02
Sum	4.06	20.19	31.33	1.22	-3.04	13.68	14.28	9.87	22.36
Count (N)	21	21	21	23	23	23	25	25	25
U_Value ²	101*	90*	106*	112*	203**	157*	26*	266	259
Critical U_Value	150	150	150	200	200	200	163	163	163

²* : Statistically significant at 95% confidence level; ** : Statistically significant at 90% confidence level

We form 2 portfolios namely Winner portfolio (HIGH_V_SCORE) & Loser portfolio (LOW_V_SCORE) with former having firms with V_SCORES of 5 or more while the latter consists of firms with V_SCORES of 4 or less. We provide descriptive statistics of the two portfolios and also provide that the difference in distribution of returns for the two portfolios is statistically significant by employing "Mann-Whitney U-Test" based on ranks for each firm in these 2 portfolios, and thereby accepting our alternate hypothesis that High V_Score portfolio can provide superior market-adjusted returns vi-a-vis Low V_Score portfolio.

5. Conclusion

This paper shows that a scoring model formulated based on fundamental accounting signals can help an investor to make intelligent investment decisions and help shift the distribution of returns to the right. This paper presents evidence that if an investor creates a portfolio where he goes

long on the firms belonging to High V_SCORE (5 or more) and avoids the firms belonging to the Low V_SCORE (4 or less), he can gain significant excess market-adjusted returns. By focusing on years through 2007 – 2017, we were able to prove that our scoring model is reliable by bringing in the concept of 1-year buy-&-hold, 2-year buy-&-hold returns. The ranking horizon that has been formulated has further scope for development as well with each fundamental signal being provided weights based on correlational analysis of each signal with stock returns. The research paper shows not only the direction of movement of returns but is also able to quantify the improvement in returns between different portfolios and across all V_SCOREs. Our research, in conclusion has been successful in creating a model based on scoring fundamental variables which is robust and has garnered the results expected.

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