# Qualitative Construction of Growth Stock Portfolios – a Score Based Approach

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**Abstract:** The paper introduces and explains the need for a growth parameter analysis that can help identify clear winning stocks based on an investment index illustrated by Partha Mohanram [1]. This holds for any market scenario whether emerging or developed. The present paper aims to examine firms with low BM stocks. Stocks of such firms are termed as growth stocks or glamour stocks. Their value in the market can be put together in a ratio called book-to-market ratio. Moreover, it addresses companies that have low book-to-market ratio.

## 1 Introduction

Fundamental analysis has been a preferred tool of the investors over Technical Analysis with a view of long-term investments. Fundamental Analysis is purely based on analysing financial statements of the companies and reaching decisions based on their quarterly or annual performance. Technical Analysis, in contrast, involves that the stock's price discounts all the information and investment decisions can be taken purely using statistical analysis of the historical price and volume information of the stocks. This approach has gained popularity in recent years and a lot of tools have been developed to assist it. This research project is an attempt to check if the investors can significantly earn more returns on their portfolio using fundamental analysis methodology alone.

Fundamental analysis involves analysing the financial statements of the company to study its profitability and sustained growth which results in estimating their intrinsic value of stock [2]. This helps make concrete decisions for investment. However, this approach is highly time consuming and cumbersome. One approach is to select the companies with a low book-to-market value and analyse it with the growth fundaments. The book-to-market effect is well known in the field of financial research. Companies with low book-to-market value are also called glamour or growth companies as they demonstrate strong growth in the financial market for a sustained period. An investor may not find an opportunity to invest based on traditional fundamental analysis alone as the stock may seem to be overpriced. Indian Markets have improved efficiency and sophistication over the years and are emerging as a preferred investment destination [3]. The research also highlights the opportunities for investing in Indian Equity Markets using this approach. Similar research has been done for developed markets [1]. There is no evidence or research of using such fundamental analysis with growth metrics to analyze low book-to-market companies for the Indian Financial Markets. In this research project, we adopt a fresh approach to analyse low book-to-market value companies from various sectors listed on Indian NSE, which is believed to have a lower form of efficiency compared to developed markets like the NASDAQ or S&P500 on New York Stock Exchange [3].

The fundamental analysis with G score includes measuring traditional fundamental signals like earnings, revenues and cash flow along with growth fundamental signals like sustained growth and income variation along with the intensity of capital, advertisement, research and development expenditure. These individual signals are combined to generate a composite score-based index called the G score. This G score is then used to separate the winning companies from the losing one's based on their score. Three different portfolios were created by grouping the companies with higher, mid-range and lower G score.

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Constructing portfolios using top-performing companies (high G score) from various sectors doing business India also reduces the risk due to diversification. However, risk analysis of the portfolios is however out of the scope of this research and can be taken as an extension for further study.

The results from the empirical findings in this research project are convincing and show that measuring fundamental and growth metrics that form the firm's financial statements can be profitably used for making investment decisions in low book-to market value firms. The simple tools/signals help in isolating the clear winners from losers in the future performance of growth stocks. The findings show that the portfolios built with low book-to-market value companies from various sectors on National Stock Exchange (NSE) of India having higher G score, performed much better compared to the broader market index NIFTY that includes national top 50 performing companies of NSE. This strategy of investment based on G score is beneficial for holding period of about 2 years as it is linked to the future performance of the companies. One can even see the results in less than 2 years as these growth stocks tend to beat the earnings forecast and have a higher reaction from the market. The Portfolio formed using companies with G score of 6 and above gave an excess positive return of 47.57% for a period of 2 years compared to NIFTY"s returns of 26.11% for the same period. The results show there is a high correlation between the percentage returns for buy and hold portfolio and G score of the company. The portfolios with G score lower than 6 did not perform as much as the ones with G score of 6 and above.

## 2 Literature Review

Value investing in financial markets has captured significant attention recently both from financial analysts as well as academic institutions. The research available in this area can be broadly classified into the following categories [1]:

### 2.1 *The Book to Market Effect*

The book to market effect plays an important role as it helps categorize a stock into a value stock or a growth stock. The methodology for investment in both these categories varies vastly. The book to market effect for a growth stock is encapsulated below:

### 2.1.1 *The Cross-Section of Expected Stock Returns:*

Fama and French state that book-to-market equity describes the cross-section of the average stock returns [4,5,6,7]. From the years 1963-1990, there has been a strong relation between the book-to-market (BM) value and the average return. Thus, it was convincing that the book-to-market factor stood in between for risk factors in returns.

### 2.1.2 *Contrarian Investment, Extrapolation, and Risk*

Lakonishok, Shleifer and Vishny [8] reported that value stocks (high book-to-market value) have outperformed the glamour stocks from April 1968-90. Glamour stocks seemed to have done poorly because their growth rates of earnings, cash flow etc. stood out to be much lower than what they had done in the past. Thus, the market participant always had an overestimated picture of the firm's earnings leading them into investing in such stocks. They also investigated the riskiness of the high book-to-market (BM) value and the low book-to-market (BM) value stocks. Value stocks appeared to be less risky than the Glamour stocks, thereby affirming how the high book-to-market (BM) stocks were safer than the low BM ones. Also, investors expect a high growth rate for growth stocks as they had grown in the past. However, something called "mean reversion" takes place, i.e. stocks tend to average out in the future. Thus, growth stocks with high book-to-market value tend to lose momentum in the long run.

### 2.1.3 *Separating Winners from Losers among Low Book-to-Market Stocks using Financial Statement Analysis*

Bartov, Mohanram and Seethamraju [9] investigated whether low book-to-market (BM) firms when studied by applying financial statement analysis can help investors earn excess returns on a broad sample of growth stocks. He wanted to differentiate even within low book-to-market (BM) firms that could beat the markets. The paper was an extension to Piotroski"s F score with the only difference that F score is for firms that have high BM ratio and G score is for firms that have low book-to-market (BM) value. He used eight signals based on fundamental accounting. Thus, a firm would score in the range from 0 to 8. The study confirms that firms with high G score significantly outperform the ones with low G score suggesting that firms with high growth fundamental strategy stand out to be clear winners. It also lays that the markets are immature to interpret the fundamental accounting signals like the stability of earnings so they are likely to miss some of the growth stocks.

## 2.2 Tests for Fundamental Analysis

Value Investing connotes the use of historical financial statement information to separate winners from losers. Piotroski [10] examined a wider portfolio of high book-to-market firms to find out if accounting-based fundamental analysis can shift the distribution of returns earned by an investor. He concluded that mean returns earned by an investor can be raised at least by 7.5% annually by selecting high book-to-market (BM) firms that are financially strong. In addition, using a long (short) strategy, the returns obtained were 23% from the year 1976 to 1996 [10].

The strategy would work dynamically across an epoch and serve alternative strategies well. Within the high BM firm segment, the benefit of the analysis would be more convergent to firms that are small & mid-sized and have low share turnover and low analyst following. He also states that purchasing firms with share prices that are low would not perform well. In fact, only 44% of value stocks tend to outperform markets [10]. The market is also sensitive to initial earnings but may not react very efficiently in the short run and so provides an opportunity. Dorantes successfully conducted a similar study in Mexican markets [11] followed by Khatwani in Indian markets [12].

## 2.3 Simple Extrapolation: Expectations and the Cross-Section of Stock Returns

La Porta [13] examined if fundamentals such as earnings growth are the only reason why value stocks perform well. He concluded that value stocks do better than the growth ones not only because they have strong fundamentals but because they are the result of errors of expectations of the investors. Moreover, stocks that are sorted according to the earnings growth, i.e. high earning stocks placed above the low ones do not entail less risk. On the contrary, it is the low earning stock that is less risky and has fewer standard deviations. However, it is the high risky stocks that are included to form a portfolio which is a naive indication of the analyst's expectations.

## 2.4 Conservatism: Accounting Conservatism, the Quality of Earnings, and Stock Returns:

Penman and Zhang [14] attempted to find out a way to create a balance between earnings and creating reserves. If conservative accounting is practised the firm will end up creating too much in reserves and depress the earnings. However, when the reverse is practised it depletes the reserve and increases the earnings. When the change in investment is temporary the change in earnings is also temporary. Thus, to avoid the see-saw situation an index has been created only to find out poor quality earnings that resulted from changes in investment and conservative accounting.

## 2.5 The Qualitative Way

Several researchers, like Greenblats [15] and Dorantes [11], attempted to design their own scales; and some explored the efficacy of quality parameters in predicting the returns. Yan and Zheng used data mining and created over eighteen thousand signals by combining financial data to check if ignored accounting data was responsible for predicting stock performance [16]. They concluded that the basic liquidity, profitability and operational signals used by the researchers were better than other new signals. Huang successfully demonstrated the power of positive consumer reviews on sales and stock performance of US stock markets using millions of customer review data generated on Amazon platform [17].

## 3 Research Design

This research project exploits a powerful method of G score by Mohanram [1] for analysing performing companies listed on the National Stock Exchange of India. This method combines traditional fundamental analysis signals like company's earnings, revenue from sales and cash flows and growth metrics like growth and earnings stability along with the intensity of research and development activities, advertising and capital expenditure. An index is created by measuring these metrics and a composite score called the "G score" is created for each company. Further portfolios are created by grouping companies with a high, midrange and low G Score. The portfolio comprising of companies with a high G score significantly earns higher returns than the broader market index NIFTY that represents the country's top 50 stocks. Companies with higher G score have greater market response based on the annual forecasts done by the experts based on the quarterly and annual earnings report of these companies. This approach works best with companies that have lower book-to-market values. Companies with a low book-to-market value from 10 major sectors were selected. Only four companies with the lowest book-to-market score were analysed per sector to build the portfolios. Further research may be carried out by selecting more companies across about 450 diverse sectors segregated by SIC (Standard Industrial Classification) codes available in India. Building a portfolio with higher G score from various sectors also reduces risk due to a higher degree of diversification. The risk analysis, however, is beyond the scope of this paper.

## 3.1 Analysis of Low book-to-Market Value Firms

Low book-to-market value firms also known as growth or glamour stocks tend to show a lot of variation in the performance. This research aims to sort clear winners from losers by applying financial statement analysis to a selected sample of low book-to-market value firms to measure signals using traditional fundamental analysis and measure of growth metrics. This financial information is analysed from the company's historical annual reports that are available on the company websites.  The signals measured are broadly classified into three groups:  Traditional fundamental metrics, Extrapolation Metrics and Conventional Accounting Metrics.

These signals are then combined to form a composite score, or index called G score. The companies are sorted to create three separate portfolios based on the G score. Only the lowest book-to-market value companies were selected for analysis. How to measure these signals is explained in detail in the following sub-sections. It is important to note that for all the measurements where a firm is compared with its peer low book-to-market value firm, only firms that belong to the same NIC should be used. All these signals are derived by *Partha Mohanram* as illustrated in his research [1].

### 3.1.1. Traditional or Old School Fundamental Metrics (G1, G2, G3)

The first three signals measured are based on the traditional fundamental metrics like the profitability which is measured in terms of earnings and/or the cash flows generated. It is known that profitable firms are likely to have strong fundamentals which are also maintained in the future if future profits are based on current profits. The first growth signal: G1, is measured as "1" if a firm's return on assets (ROA) is greater than the median ROA for all peer low book-to-market value firms selected for comparison. Else this signal is "0".

For the firms in the early stage of business, measuring cash flows becomes more meaningful. These firms are also likely to be misrepresented among the peer of low book-to-market firms. The second growth signal: G2, is measured as "1" only if the firm's cash-flow ROA is greater than the mean cash-flow ROA for all peer low book-to-market value firms. Otherwise, this signal is "0"

If the company has more cash, it can perform its operations effectively, generate more cash in return and increase liquidity. So, the third growth signal: G3 is equal to "1" if the company's cash flow from operations is more than its net income. Otherwise, the value is "0".

Based on the forecasts, it is unclear if G1: G3 are effective measurements, especially for growth firms as some of these firms are overvalued (temporarily). Current fundamental signals, however, can help isolate growth firms from peers that are overvalued due to the mispricing effect created by the hype.

### 3.1.2 Extrapolation Metrics (G4, G5)

Measuring these metrics is based on less experienced experimentation, but it is effective as it measures the stability of a firm. The measurement of the stability of earnings and revenue generated from operations is done by comparing against the peer low book-to-market companies selected for analysis. The comparison helps isolate growth firms with similar measurements for the first three growth signals. If the compared firms are all strong, it is quite possible to have similar G1: G3 signals. Comparing the stability of these earnings and revenue can helps identify the winner in this case.

The fourth growth signal G4: is measured as equal "1" if a firm's variations in its net profit are lower than the mean variation of its peer firms with the same NIC code. Otherwise, the value is "0".
The fifth growth signal: G5 is measured as equal "1" if a firm's variation in growth from sales revenue is less than mean variation in the peer firms that belong to the same industry (same SIC/NIC code). Else, the value is "0".

### 3.1.3 Conventional Accounting Metrics (G6, G7, G8)

The growth signals G6 to G8 are measured based on the expenditure that the firm undertakes for its future profitability. These are in areas like expenditure on research, development, and advertisement and as well as capital expenditure. These metrics may reduce the earnings of the firm for the current year but should be seen as the firm's investment for future earnings.
Accordingly, each growth signal G6, G7, G8 is measured equal to "1" if a firm's research and development expenditure, capital expenditure, expenditure on advertisement are greater than the mean expenditure of corresponding metrics of peer low book-to-market firms belonging to the same industry (same NIC code). Otherwise, these values are "0".

## 4 Data Analysis

The sample analysis of the G-scale consists of low book-to-market companies from various sectors as listed in Table 1. About 200 companies were sampled to select the companies with the lowest book-to-market ratio. Four companies from each sector were selected based on the lowest book-to-market ratio among them for the particular sector. The book-to-market ratio for sorting the companies was calculated by diving the book value for the company in April 2017 by the market price on the same day. The scale recommends building a portfolio with low book-to-market companies across various sectors. A portfolio was constructed with 40 companies in April 2017. The portfolio contains 10 sectors, each of 4 companies. It is a requirement to have at least 4 peers for comparison of parameters discussed for the G score in the literature review. One may take more than 4 companies in the sector for better results. The sectors identified for analysis were Agriculture, Pharmaceutical, Oil and Gas, Domestic Appliances, Textiles and apparels, Media, Financial Services, Construction, Information Technology, and Automotive.

### 4.1 Calculating Returns

The returns of the portfolio are calculated on buy and hold basis. Winning companies were selected *based on their book-to-market ratio in April 2017 for each sector*. A portfolio (with long and short stocks) was built by selecting companies with G score higher than 5. The results are benchmarked against NIFTY index performance for the same period. Also, the sectorial performance is benchmarked with the performance of the individual sector for the same period as shown in the table below.

**Table 1:** Market and Individual sector performance (Source: Bloomberg April 2019).

| Sr. No | Sector | **FY2018** | **FY2019** |
|---|---|---|---|
| 1 | NIFTY AUTO | 12.42% | -15.19% |
| 2 | NIFTY PHARMA | -07.99% | -10.74% |
| 3 | NIFTY IT | 17.93% | 49.55% |
| 4 | NIFTY MEDIA | 06.59% | -21.40% |
| 5 | NIFTY REALITY | 35.97% | 21.95% |
| 6 | NIFTY ENERGY | 13.33% | 39.87% |
| 7 | NIFTY FMCG | 12.00% | 27.52% |
| 8 | NIFTY TEXTILES | 8.82% | 6.00% |
| 9 | NIFTY FIN SERVICES | 16.26% | 41.63% |
| 10 | NIFTY CONSUMPTION | 20.32% | 21.24% |
| | **NIFTY50** | 10.90% | 26.11% |

**Table 2:** Market composition sector wise (Source: Bloomberg April 2019).

| Sr. No | Sector | **% weight** |
|---|---|---|
| 1 | NIFTY AUTO | 5.34 |
| 2 | NIFTY PHARMA | 3.54 |
| 3 | NIFTY IT | 16.16 |
| 4 | NIFTY MEDIA | 1.92 |
| 5 | NIFTY REALITY | 2.63 |
| 6 | NIFTY ENERGY | 12.04 |
| 7 | NIFTY FMCG | 7.28 |
| 8 | NIFTY TEXTILES | 2.01 |
| 9 | NIFTY FIN SERVICES | 38.06 |
| 10 | NIFTY CONSUMPTION | 11.02 |
| | **NIFTY50** | 100 |

# 5 Findings

## 5.1 Co-Relation between the Scores and Returns

The chart in Figure 1 shows the distribution of companies based on the G score. There are fewer companies on the extreme score range. More companies usually tend to lie in the mid score range due to small difference between the performance of fundamentally strong companies. However, it is the extreme score that separates the winners from losers. In our case, the maximum number of companies from the sample listed in Table 1 forms a part of portfolio-2. Portfolio performance is illustrated in section 5.2.

From the distribution diagram in Figure 1, it is evident that companies with higher G score tend to have significant outliers. High performing companies (in portfolio1) tend to average out any effect of the negative performance of the company and perform better than the markets. Also, more companies are located on the scale with G score ranging from 3 to 5. These companies do not have clear signals and a portfolio created with such companies may perform at par with the market. We can see minimum companies placed on a lower scale of G score too. It is possible to have a few outliers. The effect of outliers can be eliminated by having a greater number of companies for analysis that will average out the false signals due to a smoothened mean value used in computing the midrange of G score.

Table 3 shows the summary of stocks along with their G score and price performance of the individual stock for two years. There is a high correlation between the high G score companies and their price performance in the market.
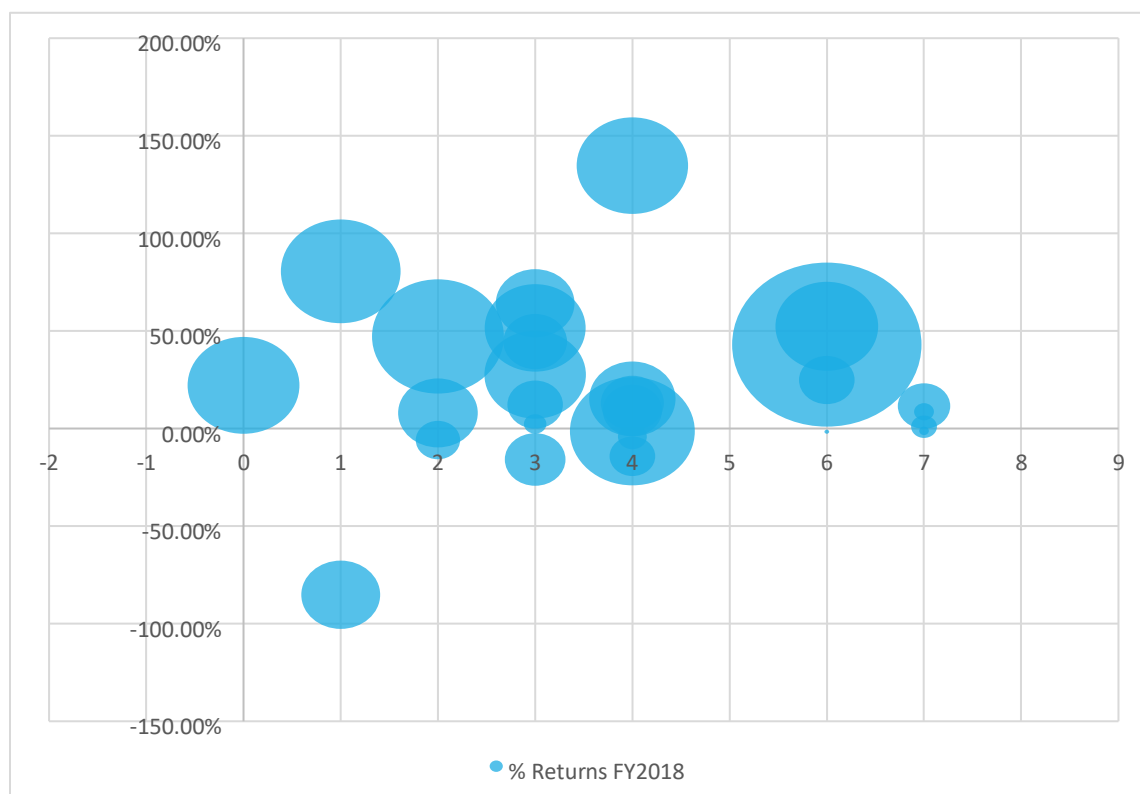


**Fig.1:** Distribution of Annualized Returns Vs G SCORE.

## 5.2 Portfolio Performance

Three separate portfolios were prepared based on the G score calculated for the companies listed in Table 1. Portfolio-1 consists of companies with G score 6,7 and 8. Portfolio-2 consists of companies with G Score 3,4,5. Portfolio-3 consists of companies with G score 0,1,2. The portfolio's buy and hold returns were compared with the performance of the overall market for the same period. The following table illustrates the portfolios along with the G Score for each company. The G1

to G8 signals are calculated using growth fundamental analysis as explained in literature review sections. G Score is a cumulative score formed by adding G1 to G8 score. The portfolios created by sorting companies according to the G score are listed in Tables 4, 5 and 6.

**Table 3:** G SCORE Summary (with returns) Source: Bloomberg April 2019.

| Sr | Sector | Company | G score | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | % Returns | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | 1 year | 2 year |
| 1 | AGRO | AGRO1 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 2.36 | 3.60 |
| | | AGRO2 | 7 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 8.60 | 2.80 |
| | | AGRO3 | 4 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 9.28 | 25.11 |
| | | AGRO4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | -85.17 | 44.28 |
| 2 | PHARMA | PHAR1 | 4 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | -1.40 | 111.08 |
| | | PHAR2 | 4 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 15.18 | 53.07 |
| | | PHAR3 | 6 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 42.99 | 255.51 |
| | | PHAR4 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | -15.86 | 26.24 |
| 3 | OIL & GAS | OG1 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | -12.63 | -43.80 |
| | | OG2 | 3 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 12.26 | 21.95 |
| | | OG3 | 5 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | -0.52 | -7.92 |
| | | OG4 | 7 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 11.53 | 19.58 |
| 4 | MEDIA | MEDIA1 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 9.54 | -18.32 |
| | | MEDIA2 | 5 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 8.14 | -20.84 |
| | | MEDIA3 | 4 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | -14.20 | 14.83 |
| | | MEDIA4 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | -5.90 | 14.02 |
| 5 | TEXTILE | TEXTILE1 | 6 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 52.38 | 75.12 |
| | | TEXTILE2 | 4 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 134.7 | 88.47 |
| | | TEXTILE3 | 3 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 44.56 | 28.96 |
| | | TEXTILE4 | 3 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 51.56 | 72.61 |
| 6 | DOMESTIC APPLIANCES | DA1 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 7.99 | 45.17 |
| | | DA2 | 4 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | -4.18 | 5.92 |
| | | DA3 | 6 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 24.85 | 22.00 |
| | | DA4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 17.22 | -10.46 |
| 7 | IT | IT1 | 4 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 4.03 | -9.80 |
| | | IT2 | 3 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | -14.4 | -18.69 |
| | | IT3 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 47.19 | 123.84 |
| | | IT4 | 4 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 13.07 | 28.23 |
| 8 | AUTO | AUTO1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22.12 | 89.09 |
| | | AUTO2 | 3 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 64.19 | 44.13 |
| | | AUTO3 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 10.75 | -21.51 |
| | | AUTO4 | 7 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0.91 | 4.74% |
| 9 | FINANCE | Fin1 | 5 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 31.64 | -17.82 |
| | | Fin2 | 4 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | -12.46 | -29.60 |
| | | Fin3 | 3 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 27.58 | 73.39 |
| | | Fin4 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -9.40 | -22.39 |

| 10 | Construction | Con1 | 6 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | -1.63 | 0.16 |
|----|--------------|------|---|---|---|---|---|---|---|---|---|-------|------|
| | | Con2 | 7 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | -1.20 | 0.66 |
| | | Con3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 80.54 | 102.13 |
| | | Con4 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 6.50 | -9.76 |

**Table 4:** Portfolio 1.

| Sr. | Company | G SCORE | % Returns | | Individual SCORE based portfolio | | Cumulative SCORE based portfolio | |
|-----|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | | FY2018 | FY2019 | FY2018 | FY2019 | FY2018 | FY2019 |
| 1 | Agro2 | 7 | 8.60% | 2.80% | 4.96% | 6.95% | 17.30% | 47.57% |
| 2 | OG4 | 7 | 11.53% | 19.58% | | | | |
| 3 | Auto4 | 7 | 0.91% | 4.74% | | | | |
| 4 | Cons2 | 7 | (1.20%) | 0.66% | | | | |
| 5 | Phar3 | 6 | 42.99% | 255.51% | 29.65% | 88.20% | | |
| 6 | Textiles1 | 6 | 52.38% | 75.12% | | | | |
| 7 | DA3 | 6 | 24.85% | 22.00% | | | | |
| 8 | Cons1 | 6 | (1.63%) | 0.16% | | | | |

Portfolio-1 compromises of companies with G score 6 and 7. These companies are clear winners and combined portfolio returns for 2 years holding period are a whopping 47.57%. Numerous companies in portfolio-1 will bring down the overall profitability due to the averaging effect but it will also reduce the chances of losses if any.

**Table 5:** Portfolio 2.

| Sr. | Company | G SCORE | % Returns | | Individual SCORE based portfolio | | Cumulative SCORE based portfolio | |
|-----|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | | FY2018 | FY2019 | FY2018 | FY2019 | FY2018 | FY2019 |
| 1 | OG3 | 5 | (0.52%) | (7.92%) | 13.09% | (15.53%) | 16.43% | 14.13% |
| 2 | Media2 | 5 | 8.14% | (20.84%) | | | | |
| 3 | Fin1 | 5 | 31.64% | (17.82%) | | | | |
| 4 | Agro3 | 4 | 9.28% | 25.11% | 16.00% | 31.92% | | |
| 5 | Phar1 | 4 | (1.40%) | 111.08% | | | | |
| 6 | Phar2 | 4 | 15.18% | 53.07% | | | | |
| 7 | Media4 | 4 | (14.21%) | 14.83% | | | | |
| 8 | Text2 | 4 | 134.69% | 88.47% | | | | |
| 9 | DA2 | 4 | (4.18%) | 5.92% | | | | |
| 10 | IT1 | 4 | 4.03% | (9.80%) | | | | |
| 11 | IT4 | 4 | 13.07% | 28.23% | | | | |

| 12 | Fin2 | 4 | (12.46%) | (29.60%) | | | | |
|---|---|---|---|---|---|---|---|---|
| 13 | Agro1 | 3 | 2.36% | 3.60% | 20.20% | 25.98% | | |
| 14 | Phar4 | 3 | (15.86%) | 26.24% | | | | |
| 15 | OG2 | 3 | 12.26% | 21.95% | | | | |
| 16 | Media1 | 3 | 9.54% | (18.32%) | | | | |
| 17 | Text3 | 3 | 44.56% | 28.96% | | | | |
| 18 | Text4 | 3 | 51.56% | 72.61% | | | | |
| 19 | IT2 | 3 | (14.37%) | (18.69%) | | | | |
| 20 | Auto2 | 3 | 64.19% | 44.13% | | | | |
| 21 | Auto3 | 3 | 27.58% | 73.39% | | | | |

Portfolio-2 mostly will contain a greater number of companies compared to portfolio-1 and portfolio-3. This can be attributed to minor differences between the parameters that separate the winners from losers. The competitive growthoriented companies will have similar fundamentals being low BM firms. Portfolio-2, in this case, underperformed compared to NIFTY over the period of 2 years from the creation of the portfolio.

**Table 6:** Portfolio 3.

| Sr. | Company | G SCORE | % Returns | | Individual SCORE based portfolio | | Cumulative SCORE based portfolio | |
|---|---|---|---|---|---|---|---|---|
| | | | FY2018 | FY2019 | FY2018 | FY2019 | FY2018 | FY2019 |
| 1 | OG1 | 2 | -12.63% | -43.80% | 8.98% | 17.99% | *4.89%* | *23.19%* |
| 2 | Media4 | 2 | -5.90% | 14.02% | | | | |
| 3 | DA1 | 2 | 7.99% | 47.17% | | | | |
| 4 | IT3 | 2 | 47.19% | 123.84% | | | | |
| 5 | Auto3 | 2 | 10.75% | -21.51% | | | | |
| 6 | Con4 | 2 | 6.50% | -9.76% | | | | |
| 7 | Agro4 | 1 | -85.17% | 44.28% | 0.79% | 28.39% | | |
| 8 | DA4 | 1 | 17.22% | -10.46% | | | | |
| 9 | Fin4 | 1 | -9.40% | -22.39% | | | | |
| 10 | Con3 | 1 | 80.54% | 102.13% | | | | |

Portfolio-3 surprisingly performed better than portfolio-2. This portfolio should be observed for returns over a longer duration than 2 years to understand the performance of the low G score companies. However, we will have to wait for the data to shape up as time progresses. Portfolio-3 according to the G Score theory is supposed to underperform the market and is recommended to short the companies from this portfolio for making profits. This strategy, however, would have incurred loss in our case.

Figure 2 Portfolio Vs Market Performance shows the overall performance of all the portfolios created in April 2017 against NIFTY for April 2018 and April 2019.
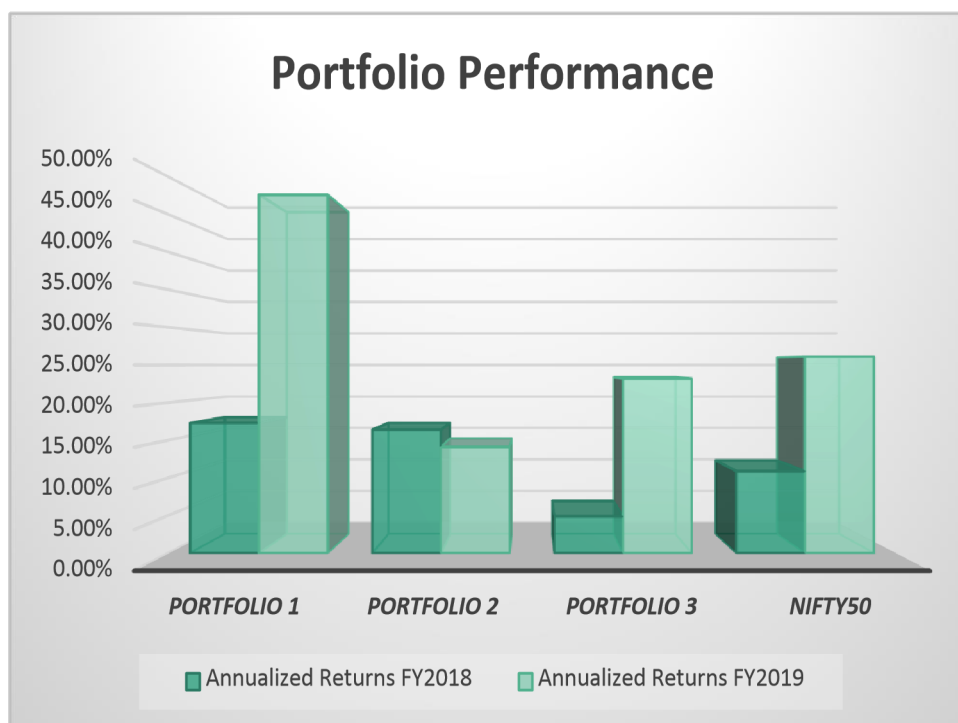
**Fig. 2:** Portfolio Vs Market Performance.

We have a clear winner in case of portfolio-1 that outperformed the NIFTY by huge margins. One must avoid stocks from portfolio-2 because it is hard to identify clear winners from these stocks.

## 6 Results and Discussion

The results obtained in the aforementioned case clearly establish that a portfolio based on high G score indeed provides higher benchmark returns, while the reverse cannot be attributed to low G scores as the performance of low G score stocks did not show any predictable trends.

The difference in the present study is that, unlike all the previous studies, where the focus was only on portfolio creation, the present study attempts to diversify the portfolio by running the G-score test on each of the identified ten sectors separately, then pick up stocks for each portfolio as per the score. Thus, there is a secular representation of all stocks in the portfolio, which creates superior diversification while at the same time conforming to the selection norms of the theory. Thus, as compared to the previous studies conducted on G score the present study provides a comparable portfolio with superior diversification. However, it still does not guarantee that all the sectors would be represented in the portfolio, although each sector individually gets a fair chance to be considered for the portfolio. The sampling done in previous studies was about picking up a low book to market value stocks irrespective of the sectors which could result in poor diversification and exclusion of many sectors in the portfolio altogether.

We further run Dickey fuller test to establish how each component ranging from G1, G2, …G8 affects the returns obtained. The result obtained clearly indicates that while G1, G2….G8 do not significantly impact the returns, their combined effect significantly affects the results and so vindicates the G score investment theory.

*6.1 Augmented Dickey-Fuller Test*

data: Return1

Dickey-Fuller = -3.7297, Lag order = 3, p-value = 0.03558

alternative hypothesis: stationary
The return is stationary at level.
Residuals:

| Min | 1Q | Median | 3Q | Max |
|-----|-----|--------|-----|-----|
|     |     |        |     |     |

| -0.7651 | -0.3216 | -0.1321 | 0.382 | 1.8831 |
|---------|---------|---------|-------|--------|

Coefficients:

|      | Estimate | Std. Error | t value | Pr(>\|t\|) |
|------|----------|-----------|---------|-----------|
| G1   | 0.03928  | 0.24731   | 0.159   | 0.875     |
| G2   | -0.16287 | 0.25398   | -0.641  | 0.526     |
| G3   | 0.09014  | 0.20013   | 0.45    | 0.655     |
| G4   | -0.03929 | 0.23335   | -0.168  | 0.867     |
| G5   | 0.28152  | 0.23228   | 1.212   | 0.234     |
| G6   | -0.14409 | 0.25306   | -0.569  | 0.573     |
| G7   | 0.07305  | 0.17436   | 0.419   | 0.678     |
| G8   | 0.2273   | 0.22893   | 0.993   | 0.328     |

Residual standard error: 0.5893 on 32 degrees of freedom
Multiple R-squared:  0.2812,          Adjusted R-squared:  0.1015
F-statistic: 1.565 on 8 and 32 DF, p-value: 0.1747

With all P values above 5%, it can be inferred that individual components from G1 to G8 do not significantly affects the returns.

| Min     | 1Q      | Median | 3Q     | Max    |
|---------|---------|--------|--------|--------|
| -0.5655 | -0.3754 | -0.131 | 0.3353 | 2.1726 |

|         | Estimate | Std. Error | t value | Pr(>\|t\|)  |
|---------|----------|-----------|---------|------------|
| G score | 0.06375  | 0.02212   | 2.883   | 0.00639**  |

Residual standard error: 0.5716 on 39 degrees of freedom
Multiple R-squared:  0.1756, Adjusted R-squared:  0.1545   F-statistic: 8.309 on 1 and 39 DF, p-value: 0.006386

With P-value above below 5% (0.639%), it can be inferred that Total G score significantly impact the returns. Thus, although individual components of G score fail to completely explain the stock returns, collectively they successfully explain the returns of the stock.

## 7 Conclusion, Limitations and Future Scope

The empirical evidence reveals that a portfolio of high book-to-market stocks created by analysing low BM firms using growth fundamentals will outperform the market over 1 year, 2-year period. Having more companies analysed and included in the portfolio averages out the profits and protect against the losses due to any uncertainty in the stocks. Including high G score firms from across the sectors creates a diverse portfolio and eliminates major risk in long term investments. One can make significant profits by going long on the stocks listed in portfolio-1

Companies from portfolio-2 are low beta stocks that do not react much to the market and may swing on either side of the markets. The returns of these stocks are mostly at par with the market. Portfolio-3 is formed with low G score stocks.

These stocks do not hold on to the high price due to mispricing and are likely to fall due to their weak fundamentals. One can make profits by shorting the stocks from this portfolio.

However, to obtain more granular and accurate results, G score may be separately applied on large-cap, mid-cap and small-cap stocks separately. Application in various sectors may also yield useful insights. In the present paper, only sectoral diversification, which included few stocks comprising the sector, has been covered. In the future, other parameters of growth stocks as given by different authors may be parallelly studied to be able to compare the results obtained by various theories. Also, the present study is conducted only in Indian markets which may be extended to other markets to test the applicability of the G score.

**Conflict of interest**

There is no conflict of interest in this work.

**Abbreviations**

Term   Description

| Term | Description |
|---|---|
| NIFTY50 | National 50 top performing stocks from diverse sectors that make the market index on national stock exchange |
| ROA | Return on assets |
| CFO | Cash flow from operations |
| G SCORE | Index created for investment by analysing stocks using growth driven fundamental analysis |
| BM | Book-to-market |
| NIC | National Industrial Classification |
| SIC | Standard Industrial Classification |
| BM | Book-to-Market |
| F_SCORE | Index created for investment by analysing stocks using value driven fundamental analysis |

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