CHAPTER 2
REVIEW OF LITERATURE

After the death of Benjamin Graham in 1976, the investor community and the researchers brought the value investing theories into practice. Hence, the detonation of scholastic interest in value investment strategies could be traced back to 1970s, when different ratios discussed by Graham were used as valuation measure to determine whether a particular stock has value or not. On the basis of different empirical aspects relating to testing value investing strategies as well as the objectives of the dissertation, the review of literature has been categorized into four parts:

- Studies analyzing the performance of value stocks on the basis of different valuation metrics.
- Studies analyzing the performance of stock selection criteria of Benjamin Graham
- Studies analyzing the profitability of Piotroski’s F-Score
- Studies analyzing the profitability of Joel Greenblatt’s magic formula

2.1 STUDIES ANALYZING THE PERFORMANCE OF VALUE STOCKS ON THE BASIS OF DIFFERENT VALUATION METRICS

The different ratios discussed by Benjamin Graham have been used as valuation measure to determine whether a particular stock has value or not. The ratios have been used either in isolation or in combination with the other ratios. The stocks having high earnings to price, book to market value, sales to price, dividend yield and cash flow to price and lesser leverage are considered as value stocks and having low earnings to price, book to market value, sales to price, dividend yield and cash flow to price and higher leverage are considered as growth stocks. This section presents an overview of studies conducted around the globe examining the performance of value stocks over growth stocks.

Basu (1977) investigated whether stocks with low price to earnings ratios earned excess returns when compared to stocks with high price to earnings ratios which were traded on New York Stock Exchange (NYSE) for the period 1956-1971. The portfolio Performance measures like Sharpe ratio, Treynor ratio and Jensen alpha were used to
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assess portfolio performance. It was found that the portfolios built from low price to earnings ratio stocks earned higher return than those built from high price to earnings ratio stocks, even after adjusting returns for risk. He concluded that there was an information content present in publicly available price to earnings ratios, which could offer opportunities for investors and this was inconsistent with the semi strong form of efficient market hypothesis.

Fama and French (1992) studied the relative success of using value characteristics to explain average portfolio returns compared to market returns on New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and National Association of Securities Dealers Automated Quotations (NASADAQ) stocks. For this purpose, the impact of size, book to market, leverage and market beta was studied on average returns. The data for the purpose consisted of all non-financial firms, which was extracted from Compustat and Centre for Research in Security Prices (CRSP). The period of the study ranged from 1963 to 1990. The results revealed that the beta did not seem to explain the cross section of average stock returns, the combination of size and book to market equity absorbed the role of leverage and earnings to price ratio in explaining the average stock returns during the period of the study.

Capaul et al. (1993) analyzed the returns obtained from portfolios formed of stocks with high price to book ratios (growth stocks) and those obtained from portfolios of stocks with low price to book ratios (value stocks) for 6 countries i.e. France, Germany, Switzerland, the United Kingdom (UK), Japan and the United States (US). For U.S., the Standard and Poor (S&P)/ Barra Value Stock Index and the S&P/Barra Growth Stock Index, produced by Barra for Standard & Poor were used. For other five countries, indexes produced by the Union Bank of Switzerland's Institutional Investment Management Group were used over the period 1981-1992. Returns were analyzed using Sharpe ratio and t-test. It was observed that value stocks outperformed growth stocks on an average in each country during the period studied, both absolutely and after adjustment for risk. They suggested that cross country correlations of monthly value-growth spread were small and any decision to tilt a portfolio towards value stocks would be more effective if done globally.
Lakonishok et al. (1994) examined the performance of growth and value stocks classified on the basis of book to market ratio, cash flow to price ratio, earnings to price ratio and past growth in sales. The reason behind existence of value premium was also explored. For this purpose, return data regarding the stocks listed at NYSE and AMEX was drawn from CRSP and the accounting data was drawn from Compustat for the period 1963-1990. Annualized returns were computed for one, two, three, four and five years after portfolio formation each year. Multiple regression analysis was used to find out significant variables which could define glamour and value portfolios. They observed that value strategies based on cash flow to price ratio outperformed the glamour strategies by approximately by 10-11% per year. Also, the superior performance of value stocks was restricted to largest 50% or largest 20% of stocks by market capitalization. They concluded that value strategies yielded higher returns because those strategies exploited the sub optimal behavior of the typical investor and not because those strategies were fundamentally riskier.

Brouwer et al. (1996) analyzed value strategies for 4 European countries (i.e. France, Germany, Netherlands and U.K) on the basis of 4 value variables, that is, earnings to price (E/P ratio), book to market (B/M ratio), cash flow to price (CF/P ratio) and dividend yield. The ratios were divided into quintiles whereby the stocks in the highest quintile were grouped as value stocks and the stocks in lowest quintile on the basis of said ratios were grouped as growth stocks. For this purpose, the data regarding the portfolio performance was obtained from the stock exchanges of Paris, Frankfurt, Amsterdam and London for the period 1982-1993. In order to analyze which variables were significant in multiple context, multiple regression model was used and 11 cross-sectional regressions were performed for 11 portfolio formation periods. They found that the annual returns for the value portfolios outperformed the annual returns for the glamour portfolios and that difference turned out to be especially remarkable for CF/P ratio (20.8%). They further observed that the result could not be explained by risk differences alone and thus behavioral factors were conjectured to be responsible towards the presence of value premium.

Bauman and Miller (1997) compared the performance of value stocks and growth stocks on the stocks listed on NYSE, AMEX and NASDAQ stock exchanges. The
price to earnings ratio, price to cash flow ratio, price to book ratio and historical growth in earnings per share were used to classify stocks into quartiles whereby the stocks categorized into lowest quartile on the basis of these measures were called as value stocks and the stocks categorized into highest quartile were called as growth stocks. The study was conducted for the period of 14 years i.e. from 1980 to 1993. The data set was composed of stocks with necessary information provided in Compustat Annual Industrial and Research data files, listed in CRSP data files. One year buy and hold returns were computed for the purpose of analysis. The results revealed that the value stocks with relatively low price in relation to earnings per share, cash flow per share and low past earnings per share growth rate evinced favorable investment performance as they outperformed growth portfolio on the basis of total as well as risk adjusted return basis. Further, the adaptive expectations hypothesis, according to which the forecasters who relied too heavily upon the past trends while formulating their expectation about the future led to biased forecasts of future equity returns, was considered the explanation behind the difference in performance of value and growth stocks.

Doeswijk (1997) examined the performance of value investing strategies in Dutch stock market for the period 1973-1995. The valuation measures used to classify stocks into value, growth portfolios were earnings to price ratio, book to market ratio, cash flow to price ratio, dividend to price ratio and historic sales growth rate. Data for the stocks listed at Amsterdam stock exchange was collected from Datastream and Manual of Dutch stocks. Further, one year buy and hold annualized returns were computed for one, two and three years after portfolio formation. The results revealed the outperformance of value stocks over the growth stocks. The value premium ranged from 8% to 9% per annum during the three year post formation period. The results also confirmed that the reason behind the existence of value premium in Dutch stock market was not attributed to risk factor measured through asset pricing model’s beta and standard deviation of returns.

La Porta et al. (1997) examined the role of expectational errors in explaining the superior returns to value stocks in US stock market. For this purpose, the market’s reaction to earnings announcements to determine whether investors make systematic errors in pricing was examined. The time period of the study was from 1971 to 1993. The sample consisted of NYSE, AMEX and NASDAQ firms that appeared on CRSP and
Compustat tapes. In order to examine the earnings announcement return difference between value and glamour stocks, the book to market ratio, cash flow to price ratio and past growth in sales were used to classify stocks into value- growth portfolios. Further, one year buy and hold returns were computed for the purpose of analysis. The results showed that the announcement returns suggested that a significant portion of the return difference between value and growth stocks was attributable to earnings surprises which were systematically more positive for value stocks. Therefore the study conjectured the behavioral factors to be responsible for high returns to value stocks.

Mukherji et al. (1997) investigated the presence of value premium in Korean stock market for the period 1982 to 1993. The different valuation measures considered were beta, debt to equity ratio, earnings to price ratio, book to market ratio, market value of equity and sales to price ratio. The data required in the study was obtained from Pacific Basin Capital Markets (PACAP) databases- Korea compiled by the PACAP Research center at university of Rhode Island. Further, one year buy and hold returns were computed for the purpose of analysis. The results revealed that the value stocks outperformed growth stocks in Korean stock market. Book to market ratio and sales to price ratio were more consistent indicators of fundamental value than earnings to price ratio. Also, debt to equity ratio was found to be more reliable proxy for risk than beta. Moreover, stock returns in Korea were positively related to book to market ratio, sales to price ratio, debt to equity ratio and were negatively related to firm size. The results also revealed that earnings to price ratio and beta were not significantly related to overall returns in Korean stock market.

Vaidyanathan and Chava (1997) explored the potential of book to market ratio in yielding value premium in Indian stock market. For this purpose, the scrips actively traded at Bombay Stock Exchange from 1990 to 1997 were considered. Further, one year buy and hold returns were computed for the purpose of analysis. The significance of return difference between value and growth stocks was examined using independent sample t-test. The results revealed that significant difference in the mean returns of value and growth portfolios was not observed. Thus, the value stocks classified on the basis of book to market ratio could not yield any premium in Indian stock market.
Vos and Pepper (1997) examined whether the size and book to market ratios assisted in predicting future stock returns in New Zealand stock market. They conducted the study for the period of 5 years i.e. from 1991 to 1995. In order to measure the relationship between average stock return (dependent variable) and the independent variable (size and book to market), multi variable regression analysis was carried out. Correlation tests were also carried out to determine the nature and strength of relationship between dependent and independent variables. They found that the stock returns were negatively related to size and were positively related to book to market ratio. They therefore concluded that size and book to market variables had the significant impact on the overall returns in New Zealand stock market.

Arshanaplli et al. (1998) examined whether the value (i.e. high book to market) stocks outperformed growth (i.e. low book to market) stocks in 18 equity markets and 4 regions of the world economy (i.e. North America, Europe, Pacific Basin & International) and also if value stocks were riskier than growth stocks in these markets during the period 1975-1995. For this purpose, seemingly unrelated regression, chi squared tests and Fama & French’s three factor model were used to explain cross sectional variation in average returns on industry portfolios across countries. They observed that the annual difference between the average returns on portfolios of high and low book to market stocks was 12.94% in North America, 10.42% in Europe, 17.26% in Pacific Rim and value stocks outperformed growth stocks in 17 out of 18 national markets. They concluded that value-growth pattern in stock returns was explained by Fama and French’s three factor model.

Bauman et al. (1998) examined the differences in investment performance between growth stocks and value stocks strategies in 20 established markets represented in the Morgan Stanley Capital International (MSCI) Europe, Australia and Far East (EAFE) index as well as Canada. For this purpose, stock was divided into growth and value portfolio on the basis of 4 valuation ratio measures i.e. price to earnings ratio, price to cash flow, price to book and dividend yield. The study was conducted for the period of 10 years i.e. 1986-1996 and the data was drawn from Compustat global vantage file. It was found that value stocks outperformed growth stocks on a total return as well as risk adjusted basis in maximum number of years and in majority of the national markets.
Also, a small company effect was observed in most years of the study. The study further conjectured that value stocks outperformed growth stocks due to the overreaction tendency of investors and the inclination of research analysts towards the past corporate earnings record of growth stocks. They further held that due to mean reversion tendency of corporate growth trends, value stocks showed outperformance than the growth stocks.

**Fama and French (1998)** analyzed the returns on market, value and growth portfolios for U.S. and 12 major EAFE (Europe, Australia and Far East) countries i.e. Japan, Britain, France, Germany, Italy, Netherlands, Belgium, Switzerland, Sweden, Australia, Hong Kong and Singapore for the period 1975-1995. The book to market ratio was used as the valuation metric. For this purpose, the data regarding US stocks was drawn from CRSP and Compustat and the data for the markets outside U.S. was drawn from the electronic version of MSCI. Capital asset pricing model (CAPM) and intertemporal capital asset pricing model were used to explain monthly excess returns on global value and growth portfolios and the method of estimation used was ordinary least square. It was observed that value stocks outperformed the growth stocks in 12 out of 13 major markets during the period of the study and an international CAPM could not explain the value premium in international returns but international intertemporal capital asset pricing model considering the global market return and a risk factor for relative distress captured the value premium in country and global returns.

**Dhatt et al. (1999)** investigated whether an exploitable value premium existed for stocks in the Russell 2000 Index, the commonly used U.S. small cap benchmark. The period of the study ranged from 1979 to 1997. The stocks were classified into value and growth portfolios on the basis of price to earnings ratio, price to sales ratio and market to book value ratio. The significance of difference between the mean returns of value and growth portfolios was examined using independent sample t-test. They found that the value stocks outperformed growth stocks by 5.28-8.40% per year and had lower standard deviation and lower coefficient of variation than the growth stocks. They further found that the most of the value premium for small cap stocks was available in non-January months and was available for reasonably liquid stocks.

**Oertmann (2000)** studied the dynamics and economics of value- growth spreads in 18 countries covering three global regions i.e. Europe, North America and Pacific Rim.
The time period of the study ranged from Jan 1980 to June 1999. The price to book ratio was used to classify stocks into value and growth categories whereby one half of the stocks with lowest price to book ratio were called as value stocks and another half as growth stocks. Further, one year buy and hold returns were computed for the purpose of analysis. The results showed that across the period of 20 years, value stocks outperformed growth stocks on most of the international equity markets. Also, value-growth return spreads on equity markets reflected a compensation for systematic risk. Further, the correlation of expected value-growth spread indicated that the underlying risk factor was priced consistently across markets.

Ahmed and Nanda (2001) studied the performance of value stocks by incorporating growth characteristics in them on the stocks listed on NYSE, AMEX and NASDAQ stock exchanges. The stocks having high earnings to price ratio (E/P) were called as value stocks and the stocks with the growth in earnings per share were called as growth stocks. The period of the study ranged from 1982 to 1997. The data regarding monthly stocks returns was obtained from CRSP and the data regarding E/P and growth in EPS was obtained from Compustat. For the purpose of analysis, the annual buy and hold returns were computed by adding the monthly stock returns. The results revealed that the strategy focusing on investing in stocks that have dual characteristics of high E/P ratio (value stocks) and high growth in earnings per share (growth stocks) outperformed a strategy of high E/P (value stocks) alone. Thus, the value and growth investing strategies instead of being mutually exclusive could complement each other in selecting superior performing stocks.

Dhatt et al. (2001) determined the presence of value premium on the stocks listed on NYSE, AMEX and NASDAQ stock exchanges. The price to earnings ratio, price to cash flow ratio, price to book ratio and price to sales ratio were used to classify stocks into quartiles whereby the stocks categorized into lowest quartile on the basis of these measures were called as value stocks and the stocks categorized into highest quartile were called as growth stocks. The study was conducted for the period 1980-1998. One year buy and hold market adjusted returns were computed and analyzed using t-test statistic. They found that value stocks categorized on the basis of low price to sales ratio provided the highest return and the stocks categorized on the basis of low price to cash
flow ratio offered the lowest risk and best risk-return tradeoff across the period of the study.

Doukas et al. (2001) examined whether investors systematically overestimate (underestimate) the future earnings performance of glamour (value) stocks using analysts’ ex ante earnings forecast as a proxy for the market’s expectation of future earnings. They also examined whether value stocks were riskier than glamour stocks using the analysts’ dispersion of earnings forecasts as a proxy for investors’ perception of risk and the absolute forecast error as an alternative measure of risk. The period of the study ranged from 1979 to 1998. For this purpose, the book to market and size data was retrieved from Compustat and analysts earnings forecasts and actual earnings per share data from Institutional Brokers Estimate Systems (IBES). The results revealed that the evidence of the systematic errors made by investors in predicting earnings of value stocks as the reason behind existence of value premium was not found. They further concluded that the return advantage of value investing strategies reflected the compensation for bearing risk.

Anderson et al. (2003) examined the presence of value premium in Mongolia, the land of Chingis Khan. The different valuation measures considered in the study were size, book to market ratio, earnings to price ratio and leverage. The time period of the study ranged from 1992 to 1995. Further, annual buy and hold returns were computed for the purpose of analysis. The results revealed that the value stocks generated higher returns than the growth stocks in Mongolia. Further, the cross section of average stock returns in Mongolia was examined using regression analysis. The results showed that book to market ratio and earnings to price ratio were most consistent indicators of value and had significantly positive relation with the overall returns. Size had significantly negative and leverage had insignificant relation with the overall returns. Further, the risk factors could not explain the returns and returns were partially explained by the liquidity effect.

Dimson et al. (2003) examined the value effect in U.K. stock market with a focus on book to market and dividend yield as the measure of value. The study was conducted for the period of 46 years i.e. from 1955-2001. The data for fundamental and financial variables required in the study was extracted from Datastream. They observed that the
value premium existed within the small cap as well as large cap universe and the statistically significant amount of returns were observed taking book to market and dividend yield as valuation measures. They further concluded that managers attempting to capture the value premium in the small cap segment should pay particular attention to rebalancing induced portfolio turnover and market illiquidity in small cap stocks. Hence trading cost was more crucial determinant of overall performance.

Karan and Gonenc (2003) studied the comparison of returns between value and growth and between small and big portfolios for an emerging market i.e. Istanbul Stock Exchange (ISE). They formed value and growth portfolios using book to market ratios of traded stocks in the ISE for the period of 5 years i.e. 1993-1998. Time series regression results showed that the average returns on value and growth portfolios were not sensitive to market movements. They further concluded that size and book to market factors along with market risk premium produced better descriptions of the return on value and growth portfolios and the results reflected that the structure of market and the fundamental of stocks traded in ISE differed from markets around the world.

Dunis and Reilly (2004) examined the performance of value strategies in UK stock market for the period Dec 2000 to Dec 2002. The variables such as price to book value ratio, price to earnings ratio, cash flow to price ratio, dividend yield and market capitalization were used as valuation measures to classify stocks into value and growth stocks. The ratios were divided into deciles whereby the stocks in the highest deciles were grouped as value stocks and the stocks in lowest deciles on the basis of said ratios were grouped as growth stocks. It was observed that the lowest market capitalization deciles portfolio was the best performing value portfolio, in terms of its risk-adjusted return and the lowest price to earnings ratio and highest cash flow to price ratio deciles portfolios produced higher Sharpe ratio than the market. They also found that the level of returns for all the value deciles were significant across all five variables used.

Kumar and Sehgal (2004) examined the relationship between selected company characteristics and common stock returns to evaluate if there was significant size and value effect in Indian stock market and whether the investment strategies based on these effects could provide extra normal returns. Market capitalization, total asset, enterprise value and net sales were taken as different measures of size while book to market equity,
earnings to price and past sales growth were taken as different measures of value. The period of the study ranged from 1989 to 1999. The securities that formed the part of Credit Rating Information Services of India Limited (CRISIL)-500 list were drawn and share price data was extracted from Capital Market Line Software. Returns were analyzed using CAPM model and it was observed that there was strong size effect in Indian market in both market as well as non market based measures of company size and a weak value effect, especially for earning to price ratio as a relative distress proxy.

Yen et al. (2004) examined the presence of value premium up to five years after the value and growth portfolio formation in Singapore stock exchange. The study also examined if growth (value) stocks really indicated higher (lower) company profits in the later years and whether the analysts’ forecasts were overly optimistic/pessimistic for growth/ value shares respectively. The sample period covered in the study ranged from 1975 to 1997. All accounting and stock return data for Singapore companies were obtained from the Pacific Basin Capital Market (PACAP) Database. Every year, three pairs of (six) value and growth portfolios based on price to book value, price to earnings ratio, and price to cash flow ratios, respectively were formed and their post formation stock return performance was evaluated using the Jensen, Treynor and Sharpe measures. The findings suggested the presence of value premium for Singapore stocks, but the premium was concentrated only in the first 2 years after the portfolio formation. Further, the value (growth) stocks indicated low (high) earnings growth rates and low (high) return on equity (ROE) in the following years. Moreover, earnings growth was significantly overestimated for growth stocks but was not underestimated for value stocks, indicating a one-way overreaction.

Ding et al. (2005) examined the performance of value and growth portfolios in seven East Asian countries before the onslaught of 1997 Asian financial crisis. The seven countries covered were Indonesia, Japan, Thailand, Taiwan, Hong Kong, Malaysia and Singapore. The price to book value ratio, price to earnings ratio and price to dividend ratios were used to classify stocks into value and growth quartiles whereby the stocks grouped into highest quartile in the basis of these ratios were called as growth stocks and the stock grouped into lowest quartile were called as value stocks. The time period of the study ranged from 1975 to 1997. The data for the analysis was culled from Pacific Basin
Capital Markets (PACAP) database compiled by PACAP Research Center at university of Rhode Island. The results revealed that the positive value premium was found in all the countries, except Indonesia, Taiwan and Thailand. Also, after controlling for firm size, risk, liquidity, and growth potential, the study observed higher returns among value stocks with a small firm size and low growth potential in Hong Kong and Malaysia. In Japan and Singapore, higher returns were found in growth portfolios with a small firm size and low growth potential. Also, the growth stocks in Taiwan with a small firm size, and those in Thailand with a large firm size, generated higher returns.

Hart et al. (2005) examined the reason behind the profitability of different stock selection strategies in emerging markets. For this purpose, the stock selection strategies based on the value indicators, such as, book to market ratio and earnings to price ratio, based on momentum indicators as measured by the total return over previous six months and based on analysts’ earnings revisions measured by past three months average earnings revisions for the current fiscal year, were studied. The data for the stock returns, earnings and book value data was drawn from S&P International Finance Corporation (IFC) Emerging markets database. The study was conducted for the period 1988 to 2004. The four factor regression model including market risk, size, value and momentum as risk factors had been used for determining the excess returns. The results revealed that the four factor model could not explain the excess return of stock selection strategies in emerging markets. Thus, the behavioral factors were conjectured to the explanation behind the existence of value premium.

Kouwenberg and Solomon (2005) investigated the availability as well as reason for the existence of value premium in emerging markets. The study covered 23 emerging markets from Asia, Latin America, Europe, Middle East and Africa. The period of the study ranged from Jan 1991 to Dec 2001. The book to market ratio was used to classify stocks into value and glamour quartiles whereby the stocks in the highest quartile were grouped as value stocks and the stocks in the lowest quartile were grouped as growth stocks. The results revealed that a portfolio of countries with low price to book ratios significantly outperformed a portfolio of high price to book countries. Further, the global risk factors could not explain the outperformance of value stocks over growth stocks. The study further measured a number of macroeconomic variables of the countries in the long
and short value portfolios, as a proxy for local risk factors and found that the countries in the low price to book portfolio on average had significantly lower economic growth, higher growth volatility, higher inflation, more overvalued currencies and more volatile currencies, compared to the high price-to-book portfolio. The results also showed that after portfolio formation, the difference in economic fundamentals between the high and low price to book portfolios decreased significantly, which indicated that investors might be extrapolating past economic trends too far into the future.

Anderson and Brooks (2006) examined the presence of value premium in UK stock market using price to earnings ratio (P/E) as valuation measure. They used average of earnings over past eight years in order to calculate P/E ratio instead of calculating P/E ratio on the basis of previous year’s earnings. Stocks grouped into the lowest deciles of P/E ratio were called as value stocks and the stocks grouped into the highest deciles of P/E ratio were called as growth stocks. Further, the difference of value premium between the two measures was examined for the purpose of analysis. The period of the study ranged from 1975 to 2003. The share price data was obtained from London Share Price Database (LSPD) and the earnings data from Datastream. Also, one year buy and hold returns were computed for the purpose of analysis. The results showed that the difference in average annual returns between value and growth deciles was 6% using traditional P/E ratio and the value premium was doubled by calculating the P/E ratio using the earnings averaged over the previous eight years. Also, the value premium was not explained by the capital asset pricing model. The study thus conjectured the behavioral school of thought as the reason behind the existence of value premium in UK stock market.

Bird and Gerlach (2006) studied the role of fundamental accounting information in enhancing the performance of a value investment strategy that used price to book value as the valuation measure. The study was conducted for three markets- US, UK and Australia. The data for the variables required in the study was obtained from Compustat database. In order to extract true value maximizing stocks out of value stocks, the fundamental accounting variables relating to profitability, operating efficiency, financial stability, leverage and accrual etc. were used. Further, Gibbs sampling and model averaging were used in logistic regression setting for the purpose of analysis. The period of the study ranged from 1986 to 2001 for US and from 1990 to 2001 for UK and
Australia. The results revealed that the portfolio selected on the basis of said strategy significantly outperformed (5% level of significance) the high book to market strategy in USA, Australia and in UK, the improvement in performance was small but was achieved with overall reduction in risk. The results made it evident that the fundamental accounting information could be used to identify truly undervalued stocks so as to enhance profits in a simple value strategy.

**Hejari and Oskouei (2007)** examined the correlation between cash value added (CVA) and stock returns, price to earnings (P/E) ratio and stock returns on the stocks listed at Tehran Stock Exchange. They also analyzed which variable out of CVA and P/E ratio explained the variation in overall returns. The study was conducted for the period of 5 years i.e. from 1999 to 2003. Panel data regression model was used in which CVA and P/E ratio were taken as independent variable and stock returns was taken as dependent variable. The results revealed the correlation of CVA and P/E ratio with stock returns and it was observed that CVA better explained the variation in stock returns than P/E ratio.

**Kyriazis and Diacogiannis (2007)** examined the performance of value strategies in the Athens Stock Exchange based on the price to earnings ratio, dividend yield, size, market to book ratio, financial leverage ratios and systematic risk for the period 1995-2002. For this purpose, performance of portfolios of stocks formed on the basis of above criteria was analyzed using multiple regression analysis. Univariate portfolio analysis showed that the higher returns observed in high dividend yield stocks and low beta stocks were achieved with no additional level of risk taken. They, however, concluded that except the application of dividend yield variable, there was a little support for the argument of over performance of value strategies in case of Athens Stock Market.

**Abhyankar et al. (2008)** studied the relative performance of value strategies over growth strategies from the perspective of stochastic dominance. For this purpose, monthly stock return data on equally weighted value and growth portfolios was used which was based on 3 valuation ratios i.e. book to market (B/M), earnings to price (E/P) and cash flow to price (CF/P). They found that the value stocks stochastically dominated growth stocks in all 3 orders of stochastic dominance relations over the full sample period as well as during economic boom periods but no significant stochastic dominance relation was observed between value and growth stocks during recession periods.
Brown et al. (2008a) analyzed the performance of value strategies and momentum strategies (buying past winners and selling past losers in intermediate-term investment horizons) in combination rather than separately in four Asian markets, namely, Hong Kong, Korea, Singapore and Taiwan. For this purpose, a long portfolio containing the stocks which were both value and winner stocks and a short portfolio containing the stocks which were both growth and loser stocks in each of the four markets, was formed. Further, the different valuation measures considered in the study were book to price ratio, earnings to price ratio, cash flow to price ratio and dividend to price ratio. Also, 12 months buy and hold returns were considered in the study. The time period of the study ranged from 1990 to 2005. The stock price data was obtained from Datastream and the financial statement data was obtained from Worldscope. The results revealed that the combination of value and the momentum strategies did not provide a significant improvement over the value or the momentum strategy evaluated separately. The study thus conjectured that the value stocks and the winner stocks were not necessary moving in tandem in Asian markets.

Brown et al. (2008b) investigated the presence of returns in value strategies in four Asian markets- Hong Kong, Korea, Singapore and Taiwan. The price to book value, price to earnings ratio, cash flow to price ratio and dividend to price ratios were used as valuation measures. The period of the study ranged from 1990 to 2005. The dataset for the study was obtained from Datastream. Further, one year, two year and three year buy and hold period was considered for the purpose of analysis. The results revealed that the presence of significant value premium was observed in Hong Kong, Korea and Taiwan. Also, positive but insignificant value premium was observed in Singapore. The results also showed that the value premium was available in one year holding period only and declined when the holding period was extended to two and three years. Further, the impact of firm characteristics such as size, liquidity, price on value premium differed across the four markets. The robustness test further indicated that the value premium were time varying. They became greater in post crisis period indicating that the high volatility during the crisis period did understate the value premium.

Risager (2008) investigated the presence of value premium in Danish stock market and also investigated if the value premium is a long term characteristic of market
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or a short term phenomenon. The time period of the study ranged from 1950 to 2004. Price to earnings ratio was used to classify stocks into value and growth deciles whereby the stocks grouped in the highest decile on the basis of price to earnings ratio were categorized as growth stocks and the stocks in the lowest decile based on price to earnings ratio were categorized as value stocks. One year buy and hold returns were computed for the purpose of analysis. The results showed that the value premium was significantly positive in the majority of the ten year periods but the premium displayed considerable volatility across decades. Further, the reason behind the presence of value premium was determined, for which CAPM’s beta and the standard deviation of returns were calculated. The results revealed that the value portfolio was more risky than the growth portfolio in Danish stock market and the value premium represented the compensation for risk.

Arajarvi (2009) analyzed the differences in relative performance of value and growth portfolios based on individual and composite valuation criteria, namely, price to earnings multiple, price to sales multiple, price to book value multiple and dividend yield in the German equity market. The study was conducted for the period of 9 years i.e. 2000-2008. The ratios were divided into terciles whereby the stocks in the highest tercile were grouped as value stocks and the stocks in lowest tercile on the basis of said ratios were grouped as growth stocks. Further, EV/EBITDA (enterprise value to earnings before interest, tax, depreciation and amortization) and the beta sorting were used to enhance the performance of the portfolios formed on the basis of said ratios. The performance of the portfolios was analyzed using the Sharpe ratio, Sortino ratio and Jensen alpha. They found that the value stocks formed on the basis of price to book value generated highest amount of risk adjusted returns. Also, the greatest value premium was achieved by combining EBITDA/EV and book to market valuation measure with the low value of the beta.

Patari and Leivo (2009) examined the performance of various value strategies in the Finnish stock market for the period 1993-2008. For this purpose, the sample of stocks were divided into 3 portfolios based on 6 individual valuation ratios i.e. earnings to price (E/P), EBITDA/EV, cash flow to price, dividend yield, book to price and sales to price and 8 composite value measures. Stock market data as well as financial statement data
was drawn from DataStream. The performance of portfolios was evaluated on the basis of several performance metrics (i.e. the Sharpe ratio, the adjusted Sharpe ratio, the Jensen alpha and 2-factor alpha) that captured different dimensions of portfolio risk. It was observed that most of the value portfolios examined outperformed both the market portfolio and comparable value portfolios significantly.

Senthilkumar (2009) examined the relationship between expected stock returns and size and market to book ratio of selected Indian companies which were having more than rupees 500 crores sales turnover. In order to examine the cross sectional behavior of selected companies, companies were grouped into 5 industries i.e. automobile, cement, diversified, pharmaceuticals and textile industry and the data was obtained from Prowess database of Centre for Monitoring Indian Economy (CMIE) for the period April 2002-March 2008. Fama and Macbeth methodology was used to analyze cross sectional relationship between stock returns and size and market to book ratio respectively. He found no size effect in all the markets and a significant market to book effect in all the groups and when the test was allowed for both the variables, the negative relationship between size and average returns was less significant and the inclusion of market to book equity seemed to absorb the role of size in explaining stock returns.

Tripathi (2009) examined the presence of value premium in Indian stock market based on the valuation measures, such as, price to earnings ratio, book to market ratio, size and leverage. The relationship between the valuation measures and the equity returns in Indian stock market was also examined. The study was conducted for the period of 11 years i.e. from June 1997- June 2007. The data for share prices and the accounting variables required in the study was obtained from National Stock Exchange of India (NSEI), Securities and Exchange Board of India (SEBI), Reserve Bank of India (RBI) and Prowess. The CAPM and Fama and French model was used for the purpose of analysis. He observed the existence of a statistically positive relationship between book to market ratio, debt equity ratio and equity returns and negative relationship between size, price to earnings ratio and equity returns. Also, three- factor model based on market, size premium and value premium explained cross sectional variation in equity returns in India in much better way than the single factor CAPM.
Aghdaei and Naeni (2012) examined the performance of value and growth investing strategies in Tehran stock market. The book to market ratio has been used to classify stocks into value and growth portfolios. The time period of the study ranged from 2002 to 2006. In order to examine the difference in mean returns of value and growth portfolios, independent sample t-test was used. The study also examined the relationship between the portfolio returns and the net yield of book to market value with the help of regression analysis. The results revealed that the return of growth portfolio was significantly larger than the value portfolio across the period of study. Also, linear and the negative relationship was observed between the overall returns and the value effect (excess of high book to market returns over low book to market returns).

Gharghori et al. (2013) evaluated the performance of value strategies versus growth strategies in Australian stock market. The valuation measures, such as, book to market ratio, sales to price ratio, cash flow to price ratio and earnings to price ratio were used to classify stocks into value and growth deciles, whereby, the highest decile on the basis of these measured comprised value stocks and the lowest decile on the basis of these ratio was comprised of growth stocks. The study was conducted for the period 1993-2004. The share price data was collected from Australian Graduate School of Management and the accounting data from Aspect Huntley. The results confirmed the presence of strong value effect in Australia, whereby, book to market ratio was found to be the superior proxy for value strategies and best explained the cross sectional variation in equity returns. Along with this measure, sales to price ratio was also found to be the significant predictor of equity returns in Australian stock market.

Prasad and Verma (2013) examined the presence of size effect in Indian stock market for the period April 2001 to March 2010. The different measures of size taken were total assets and market capitalization of the stocks listed at NSEI (National Stock Exchange of India). They constructed equally weighted portfolios of thirty smallest and largest stocks each year and calculated their monthly returns. Correlation analysis, t-test statistic and capital asset pricing model were used for the purpose of analysis. They observed that the excess returns of the portfolios of smaller stocks were not significantly different from the returns of the stocks with larger size. Overall, they did not find the evidence of size effect in Indian stock market.
2.2 STUDIES ANALYZING THE PERFORMANCE OF STOCK SELECTION CRITERIA OF BENJAMIN GRAHAM

This section details the studies conducted around the globe examining the profitability of the literal principles given by Benjamin Graham for selection selection.

Oppenheimer and Schlarbaum (1981) analyzed the returns earned by an investor who invested in the defensive stocks as defined by Benjamin Graham in his book “The Intelligent Investor”. The stocks listed at NYSE were screened for the purpose of analysis. The data required for selecting securities for forming the portfolio of hypothetical investor was drawn from Moody’s Handbook of Common Stocks and Standard and Poor’s Security Owner’s stock guide. The period of the study ranged from 1956 to 1975. The portfolio containing 60 securities which satisfied the Graham’s stock selection criteria was developed and its monthly returns were observed and analyzed using capital asset pricing model. They found that the portfolio generated the market adjusted return of 3-3.5% per annum after ignoring transaction cost and taxes.

Oppenheimer (1984) tested the profitability of risk-reward combinations of Ben Graham’s stock selection criteria in US stock market. The combinations such as earnings to price yield at least twice the AAA bond yield with the principle of total debt lesser than the book value, principle of dividend yield at least 2/3rd the bond yield with the principle of total debt lesser than the book value, the principle of earnings yield with the principle of dividend yield and the principle of total debt lesser than book value, the principle of earnings yield with the principle of total debt lesser than book value and the principle of growth in earnings, principle of earnings yield with the principle of dividend yield, debt- equity ratio and growth in earnings. For this purpose, the stocks listed at New York & American stock exchange that met various sets of Graham’s criteria were screened for the period 1974-1981. The performance of portfolios formed was measured using the asset pricing model. He found that over the period of the study, the CRSP (Centre for Research in Security Prices) index of NYSE-AMEX (American Stock Exchange) securities provided a mean annual return of 14% and the combination of earnings to price ratio at least twice the AAA bond yield and total debt less than book value generated a mean annual return of 38%. He further concluded that the excess returns remained even after risk adjustment and adjustment for firm size effects.
Oppenheimer (1986) tested the profitability of Graham’s net current asset value strategy in US stock market. For this purpose, the portfolio of stocks having market price lesser than the two-third of the net current asset value rule was analyzed for the period of 13 years i.e. 1970-1982. The data for the variables required in the study was extracted from the security owner’s guide. The portfolio meeting the criteria was held for the period of 30 months each year and the returns so arrived were analyzed with the help of asset pricing model. He found that the portfolio meeting the net current asset value criterion had higher mean as well as risk adjusted returns than the benchmark over the 13 year period. Further, net current asset value portfolio consisting of the securities of the companies that had positive earnings but did not pay dividends had higher mean and risk adjusted returns than the portfolios of companies with positive earnings and which also paid dividends.

Lauterbach and Vu (1993) reexamined Ben Graham’s net current asset value principle using size adjusted methodology on the stocks listed at New York Stock Exchange (NYSE) for the period 1977-1984. A list of stocks selling at discount from net current asset value per share was obtained weekly from Value Line Investment Survey and the monthly returns of the stocks were obtained from CRSP monthly return file. Standard event study methodology has been used to obtain the excess returns. The results showed that the stocks meeting the principle of having market price lesser than 2/3rd of the net current asset value yielded cumulative average raw return of 40% in 1 to 24 months which was approximately 7.8 times higher than the cumulative average raw returns in months -24 to 0. The results thus made it evident that Benjamin Graham’s net current asset value rule provided excellent returns according to traditional performance measures. However, size adjustment procedure revealed that size adjusted excess return was approximately zero.

Bildersee et al. (1993) examined the performance of Graham’s net current asset value strategy in Japanese equity market. For this purpose, the portfolio of stocks having market price lesser than the two-third of the net current asset value rule was analyzed for the period of 13 years i.e. 1970-1982. Accounting information and stock price data for the Japanese firms was collected from the Needs database. The portfolio’s risk and the presence of abnormal returns were assessed through capital asset pricing model. The
results revealed that the portfolios meeting the criterion of having lesser price than their net current asset value showed the presence of abnormal returns and had lesser volatility than the market portfolio.

**Klerck and Maritz (1997)** tested the applicability of risk-reward combinations of Benjamin Graham’s stock selection criteria on the industrial markets in South Africa. For this purpose, the different combinations of criteria were used to create portfolios, such as, stocks meeting the principle of earnings yield at least twice the AAA bond yield with the principle of total debt lesser than book value, principle of dividend yield of at least \( \frac{2}{3} \) of the AAA bond yield along with the principle of total debt lesser than the book value, the principle of earnings yield being twice the AAA bond yield, dividend yield of at least \( \frac{2}{3} \) of the AAA bond yield and the principle of total debt lesser than the book value. The mean monthly returns of the portfolio and index were observed using asset pricing model for the period of 16 years i.e. 1977-1994. They found that all the combinations generated statistically significant risk adjusted returns to the investors.

**Vanstone et al. (2004)** studied the fundamental model and investigated the strategies which fundamental analysts use to make the selection process based on stock selection rules of Benjamin Graham. The predictability of the variables attributed in Graham’s criteria has been analyzed with the help of artificial neural networks. They briefly described the characteristics of the selection processes, their origins and credibility, and the enhancement of these processes using artificial neural networks on the Australian stock market for the period of 10 years i.e. 1994-2003. The neural network used in this study utilized the back propagation model and implemented a logistical sigmoid function as the activation function. The results demonstrated that artificial neural network can be trained to identify stocks with a potential to rise significantly, on the basis of the fundamental attributes showing the improved performance with the extension of holding period.

**Ahmed (2008)** analyzed the fundamental analysis approach based on Graham’s stock selection rules in selecting stocks for investment portfolios. In order to develop a value portfolio, stocks listed at Bombay Stock Exchange were passed through various filters like price earnings ratio below ten times earnings, low market value to book value ratio, increase in book value per share over the last 3 years, positive cash flow per share
and consistent and increasing return on equity. The returns so generated from the stocks meeting these filters were observed for the period of two weeks i.e. from March 31, 1997- April 14, 1997. He used Sharpe portfolio performance measure and found 38 undervalued stocks in 18 different industries. Further, 24 out of 38 stocks showed an increase in value, 12 stocks lost some value and 4 stocks did not change at all. He therefore concluded that there was an overall 0.89% increase in value over the two week period.

**Balik and Mehran (2008)** tested the seven criteria of stock selection for defensive investor given by Benjamin Graham in his book “The Intelligent Investor”. The stocks meeting the defensive investor criteria were screened every year from 2001 to 2007. The data for the purpose was drawn from Standard & Poor’s Compustat database. Only 9 stocks across the period of seven years formed the part of the study. In order to measure the performance of the portfolio, the time series regression intercept, or alpha, for the four factor model taking value, market, size and momentum as the risk factors was used. They found that the calculated alpha was negative but statistically insignificant. They further conjectured that the information regarding Graham’s defensive investment criteria was reflected in the current price of the stock and therefore the abnormal rates of return would occur only randomly.

**Quah (2008)** presented methodologies to select equities based on soft computing models which focus on applying fundamental analysis for equities screening based on stock selection rules of Benjamin Graham. Also, the performance of three soft-computing models, namely multi-layer perceptrons, adaptive neuro-fuzzy inference systems and general growing and pruning radial basis function were compared. He also studied their computational time complexity and applied several benchmark matrices to compare their performance, such as generalize rate, recall rate, confusion matrices and correlation to appreciation on Dow Jones Industrial Average (DJIA) stocks for the period of 10 years i.e. 1995-2004 (first 8 years for training and last 2 years for testing). He also suggested how equities could be picked systematically using relative operating characteristics curve. The results revealed that there was positive relationship between predictions of the trained networks based on Graham’s stock selection criteria and the equities appreciation, which would help in enhancing the earnings generated from an equity investment.
Xiao and Arnold (2008) tested the applicability of Graham’s net current asset value strategy on the stocks listed at the London Stock Exchange. For this purpose, the portfolio of stocks having market price lesser than the two-thirds of the net current asset value rule was analyzed for the period of 25 years i.e. 1981-2005. The stock return data was extracted from London Share Price Database (LSPD) and the annual accounting data was extracted from Datastream. They observed that stock with net current asset value to market value (NCAV/MV) greater than 1.5 displayed significantly positive market adjusted returns over different holding periods. They also found that the portfolio was lesser risky than the market index. They further observed that excess returns observed from value strategy could not be explained by the size effect as the risk factor. Further, Fama and French’s three factor model could not explain the abnormal return of the NCAV/MV strategy. He concluded that investment in the shares of companies having net current asset value greater than 1.5 times the current share price would generate superior returns over the market.

Guenster (2009) analyzed the performance of Graham’s net current asset value strategy on the stocks listed at US stock market for the period 1984 - 2008. The stock return data was extracted from CRSP and the financial accounting data from Compustat. The returns were analyzed using one sample t-test statistic and asset pricing models under varying holding periods. The results revealed that across the period of study, net current asset value portfolio strongly outperformed the market portfolio in case of one year holding period of stocks. Further, extending the holding period lowered the statistical significance of the results. Also, the asset pricing model showed the presence of abnormal return of 1.73% on the stocks meeting the net current asset value rule of Graham. However, he further found that the presence of abnormal risk adjusted return was attributed to institutional constraints, a high individual cost basis and was strongly influenced by the behavioral biases.

Chang (2011) studied the profitability of stock selection criteria of Benjamin Graham applied on the stocks listed at the stock exchange of Malaysia. The data regarding fundamentals of companies listed in the Financial Times Stock Exchange (FTSE) Bursa Malaysia Emas Index from the year 2000 to 2009 was extracted from Bloomberg Professional terminal Database. Five criteria were set up based on one or a
combination of price-to-earnings ratio, price-to-book value, current ratio and dividend yield. The stocks meeting the criteria were screened and their one year and two year market adjusted returns were calculated. The statistical significance of the returns was examined using t-test statistic. The results revealed that most of the portfolios formed with the stocks filtered using screening criteria generated significantly higher returns than the market. He, therefore, concluded that Benjamin Graham’s stock selection criteria which had been conceived over 80 years ago, was still profitable in the Malaysian stock market.

Mohanty et al. (2012) reexamined whether the portfolio formed on the basis of Graham’s principle of price being lesser than two-third of the net current asset value, continue to generate excess returns during 1975 to 2010 period in US stock market. Moreover, if excess returns were present, then the several risk factors and firm characteristics that account for such excess returns associated with NCAV firms were explored. The data for the purpose was extracted from Centre for Research in Security Prices (CRSP) and Cmpustat databases. The returns were analyzed using asset pricing model, Fama and French three factor model and augmented Fama and French model. The results showed that the average monthly return on NCAV portfolio was 5% over the 1975-2010 period and the average monthly return on market index was 1.4%, showing the outperformance of NCAV portfolio over the market portfolio. However, after controlling for the common risk factors, the evidence of significant excess returns on the net current asset value portfolio could not be determined.

2.3 STUDIES ANALYZING THE PROFITABILITY OF PIOTROSKI’S F-SCORE

Piotroski (2000) devised an accounting based fundamental analysis strategy which aimed to select the winner stocks amongst the entire group of value stocks i.e. high book to market stocks. The strategy is popularly known as F-score strategy. The edge of F-score strategy in classifying the value maximizers and value minimizers has been explored in the developed nations of the world mainly, USA, UK, France, etc. The research regarding the performance of such a strategy in emerging as well as developed economies is very scant. This section presents an overview of studies conducted in
developed as well as developing economies regarding the viability of F-score strategy in separating winners from losers amongst the broad group of value stocks.

**Piotroski (2000)** examined whether a simple accounting based fundamental analysis strategy, when applied to a broad portfolio of high book to market firms, could shift the distribution of returns earned by an investor. For this purpose, market value of equity and book to market ratio of the firms were calculated at fiscal year end for the period 1976-1996. The price and book value data was obtained from Compustat. The portfolios were formed on the basis of firm’s aggregate score (F-score). He found that the mean return earned by a high book to market investor could be increased by at least 7.5% annually through the selection of financially strong high B/M firms. Also, the investment strategy that bought expected winners and shorted expected losers generated a 23% annual return between 1976 and 1996 and the strategy appeared to be robust across time. He concluded the presence of positive relationship between the sign of the initial historical information and both future firm performance and subsequent quarterly earnings announcement reactions, suggesting that the market initially under reacted to the historical information.

**Kang and Ding (2003)** examined whether the future returns of high and low book to market portfolios could be enhanced by retaining only stocks whose current accounting information indicated strong financial information in prior years in the context of Asian stock markets. The analysis covered 6 Asian stock markets (i.e. Hong Kong, Korea, Malaysia, Singapore, Taiwan and Thailand) for the period Jan 1991- Dec 2002. To measure the aggregate financial signal, the formulae for F-score index in Piotroski (2000) was used which combined 9 binary signals on 3 aspects of corporate performance i.e. profitability, financial risk and operating efficiency. The results were analyzed using pooled cross- sectional regressions. The results revealed that the financial performance using such strategy could be improved in all markets except Malaysia and the financial signal effects in Asian markets were relatively small due to poor quality in accounting and financial information. However, current accounting information could contain substantial pricing information on the future returns of both value and glamour stocks in Asian markets.
Piotroski (2005) reexamined the strength and quality of historical performance trends on US stock market for the period 1972-2001. For this purpose, he used an aggregate score based on an array of nine readily available financial signals derived from traditional financial statement analysis i.e. F-score. The stock price data was extracted from CRSP return file and the financial statement data from Compustsat. The results reaffirmed that the firms with the strongest improvement in current fundamentals outperformed the firms with the highest deterioration in fundamentals by 13% approximately in one year period following portfolio formation. Further, the strongest firms alone can earn one year ahead market adjusted return of 8% (approx). Also, the returns to this fundamental strategy were monotonic across historical performance classifications and were robust to control for size, book to market ratio, momentum and bankruptcy risk. Further, partitioning the sample along book to market quintiles revealed that the predictive ability of F-score was significantly stronger in two extreme book to market portfolios.

Michou (2007) examined the profitability of a financial statement analysis investment strategy that distinguished firms between those with strong recent financial performance and those that had weak recent performance in UK stock market. For this purpose, he used an index based measure of financial statement analysis (F-score), that combined four different dimensions of the firm’s financial condition namely, profitability, financial leverage, liquidity and operational efficiency. The study period ranged from 1975 to 2006. The results showed that the mean raw returns for zero F-score portfolio were -24.65% while for the highest i.e. F-score of nine were 25.55% , showing that a portfolio strategy going long in high F-score firms and going short in low F-score firms was ideal for an investor. Further, pooled cross sectional analysis showed that the F-score had positive relation with future returns, both, before and after controlling for size, book to market effect and momentum effect.

Pettersson and Maican (2007) investigated the effectiveness of a strategy based on fundamental signals to enhance the returns of value strategy in Swedish stock market. For this purpose, the accounting measures related to firm’s profitability, long term as well as short term solvency and operating efficiency were clubbed to form a total score, called as F-score. F-score model was applied on all firms listed at Swedish stock exchange
whereby large part of the sample consisted of large cap stocks. The study was conducted for the period from 1995 to 2006. The results showed that the high score firms significantly outperformed low score firms. The risk adjusted returns showed that the success of high score firms was not accompanied by increasing risks. The results also revealed that the F-score strategy was not likely to be faced with high transaction cost, thinly traded market and negative price effects as the strategy was profitable amongst the stocks with large cap, high share price and huge trading volume. Moreover, the study held that the effectiveness of the strategy could be attributed to the risks unidentified by contemptuous asset pricing model.

Almas and Duque (2008) tested whether an investor can achieve higher returns over the long run by using a simple accounting based fundamental analysis strategy. For this purpose, they studied profitability of F-score strategy along with accrual and bankruptcy probability strategy on the shares listed on all Euronext markets i.e. Paris, Amsterdam, Brussels and Lisbon for the period 1993-2003. The data required for the purpose was extracted from Bloomberg Professional Service database. The results revealed that the average annual return obtained from the high book to market portfolio could be increased by 9.2% by using F-score strategy. Moreover, the entire high book to market return distribution could be shifted to right when the F-score screen is applied. The accrual and bankruptcy probability strategies, however, failed to prove as efficient strategies when compared to F-score strategy.

Aggarwal and Gupta (2009) investigated whether the accounting based fundamental analysis strategy could help an investor to earn excess returns on a portfolio of high book to market companies in Indian stock market. They conducted the study for the period of 5 years i.e. 2003-2007. The stocks listed at National Stock Exchange were screened for the purpose of analysis and the data for the required variables was culled from CMIE Prowess database. Raw as well as market adjusted returns were computed for the purpose of analysis. The results revealed that the fundamental analysis based investment strategy for high book to market companies could separate winners from eventual losers. They further found that the portfolios with high F-score (7 to 9) provided higher returns than the market returns. Portfolios with low F-score (0 to 3) underperformed the market. They further concluded that an investor could shift
distribution of returns rightwards by investing only in high F-score companies and shorting low F-score companies.

Dahl et al. (2009) studied the profitability of the value based investment strategy ‘F-score’ in enhancing the returns of the high book to market stocks listed at Stockholm stock exchange. For this purpose, he investigated whether the investors investing in high F-score stocks earned the returns greater than the market return on OMX Stockholm and whether the above market return, if present, be explained by beta effect and size effect. The eventual abnormal returns were observed using market adjusted returns and Jensen alpha. The study was conducted for the period of 18 years i.e. 1990 to 2007. The results revealed that the companies analyzed obtained higher return than the market before being ranked by F-score, showing the presence of value premium on OMX Stockholm. However, the firms getting an F-score of 8 or 9 did not show any outperformance than the market. Thus, the application of F-score strategy on Stockholm stock exchange could not be held.

Elleuch and Trabelsi (2009) examined whether a simple fundamental analysis strategy based on historical accounting information could predict stock returns in Tunisian stock market. For this purpose, they examined whether the simple screens based on historical financial signals i.e. F-score could shift the distribution of returns earned by an investor by separating eventual winners stocks from losers. The study period ranged from 1995 to 2001. The results revealed that that the historical accounting signals can be used to improve the entire distribution of future returns earned by an investor. They also found the positive correlation between the aggregate fundamental signal and the future earnings performance suggesting the predictive ability of aggregate signal. Further, the mean return difference of 24.8% between the high F-score firms and the low score firms, suggested that an investor could constitute a hedge portfolio that generate positive return by selling expected losers stocks and buying expected winners. They further found that the outperformance of high F-score firms could be the result of an under-reaction to historical accounting information due to which the market slowly incorporated the predictive ability of public historical accounting information into prices.

Kao-Yi and Min-Ren (2010) examined the profitability of F-score strategy through integrated fuzzy neural network model in Taiwan banking stocks during the
financial turmoil in 2008. The study integrated fuzzy set theory and decision method and further proposed a model for distinguishing strong financial prospect stocks within high book to market stocks. The results extended the boundary of F-score model proposed by Piotroski (2000) and showed that the return on equity variable played an important role while applying this model to stock market in Taiwan.

Tantipanichkul (2010) examined the strategy of separating winners from losers by using Piotroski’s F-score in Thai stock market for the period 1994 to 2008. The data required for the purpose was extracted from Datastream. The results indicated that a strategy based on buying high F-score stocks and selling low F-score stocks, generated significant future returns and the excess returns were also present after controlling for well documented risk factors, such as, momentum, size, accrual and value. He also found that the benefits of fundamental analysis were concentrated to some stock classes only as the results were not entirely robust across partitions based on size, valuation, and liquidity. The results also supported the mispricing theory, as opposed to the risk-based explanation, as stocks in the high book to market groups were found to be lesser risky than the market.

Turtle and Wang (2010) examined the ability of fundamental accounting information embedded in Piotroski’s F-score to achieve the superior conditional portfolio performance in US stock market. The sample of the study composed of the firms common in NYSE, AMEX and NASDAQ stock exchanges for the period of 37 years i.e. 1972- 2008. The share price data was extracted from Centre for Research in security prices (CRSP) and the accounting data from Compustat. The period of the study ranged from 1972 to 2008. The results revealed that after correcting for systematic risk sources, the portfolio with strong fundamental values displayed strong positive marginal performance.

Wellman (2011) examined whether the accounting based heuristic ‘F-score’ applied on a portfolio of high book to market firms, could enhance the returns earned by an investor on US stocks. The data for the purpose was extracted from Compustat database every year from 1976 to 1996. The results found that an investment strategy that purchased expected winners and shorted expected losers generated an annual return of 24% between 1976 and 1996. Considering other sources of cross-sectional variation in
returns, he further found that, after controlling for size and book-to-market differences, a one-point improvement in the aggregate F-score (i.e., one additional positive signal) was associated with an approximate 2.8% to 3.5% increase in the one-year market-adjusted return earned subsequent to portfolio formation. He further found that the performance of F-score strategy was robust across different known patterns in realized returns.

Van Der Merwe (2012) investigated the effectiveness of Piotroski’s screen to select financially sound stocks from the upper quintile of high book to market stocks on Johannesburg stock exchange (JSE). The period of study ranged from 2000 to 2011. The data required for the purpose was extracted from McGregor research domain. The results did not find any evidence of the effectiveness of the Piotroski’s screen to separate winners from losers in JSE. He found that the prevalence of bull period during the period of the study was the reason behind the ineffectiveness of the strategy. Also, the small cap effect was largely subsumed in high book to market population and the outperformance of small cap stocks over large caps could not be observed. Further, the results regarding the holding period suggested that the one year buy and hold strategy yielded far better returns than the five year buy and hold strategy and thus proposed the investors to adopt an annual portfolio balancing strategy.

Dosamantes (2013) examined the value relevance of accounting fundamentals reflected in Piotroski’s F-score in the Mexican Stock Market. The period of the study ranged from 1991 to 2011. The market adjusted performance of the portfolios formed on the basis of F-score was studied for the period of one year and two year after portfolio formation. The data for the purpose was collected from Economatica. The results revealed that the portfolios formed with high scores of these signals showed an average annual excess return of 1.62% across the period of study. The results further showed the existence of significantly positive relation between the F-score and buy and hold future market returns that after controlling for earnings, book-to-market ratio and firm size.

Hyde (2013) examined the role of Piotroski’s F-score to discriminate between high and low stock return in global emerging markets i.e. the countries listed in MSCI emerging market index. This index broadly covers 21 countries i.e. Indonesia, Malaysia, Philippines, Thailand, Chile, Colombia, Mexico, Peru, Czech Republic, Egypt, Hungary, Morocco, Poland, Russia, Turkey, Brazil, Korea, South Africa and Taiwan. The period of
study ranged from 2000 to 2011. The results revealed that the high F-score stocks generated higher average return than low F-score stocks, confirming the existence of a broad based premium to high F-score stocks. He further found that the premium was positive in all countries except Brazil where low F-score stocks outperformed the high F-score stocks. He found that the size effect could not be considered responsible for the existence of value premium. The premium was also not related to value and momentum premiums. It was larger for high value stocks, moderately higher for high momentum stocks and unrelated to stock size. He further conjectured that the existence of value premium to high F-score stocks could be attributed to behavioural biases.

2.4 STUDIES ANALYZING THE PROFITABILITY OF JOEL GREENBLATT’S MAGIC FORMULA

Value and growth are the two most popular school of investing. The outperformance of value stocks over growth stocks and the considerable premium generated by value stocks have attracted the interest of enormous investment community. In the same vein, in order to enhance the performance of value stocks, Greenblatt (2006) proposed a strategy in which only good companies (the stocks which have shown growth in certain financial attributes) are bought at bargain prices. This strategy is called as magic formula investing given by Greenblatt (2006) in his seminal work entitled “The Little Book that Beats the Market”. The developed economies of the world have witnessed considerable value premium generated by this strategy. This section presents an overview of studies conducted around the globe examining the profitability of magic formula strategy.

Larkin (2009) compared and analyzed the performance of the magic formula given by Joel Greenblatt and seven other one and two factor GARP (growth at reasonable price) and value based strategies. The strategies tested included return on assets and earnings yield, return on equity and earnings yield, return on assets alone, earnings yield strategy alone, book to market ratio and size, book to market ratio alone and size alone on the stocks listed at NYSE, AMEX and NASDAQ stock exchanges. The period of the study ranged from 1998-2006. The data for the fundamental and financial variables required in the study was extracted from Compustat Research Insight Database. The
findings revealed that all of the GARP and value strategies produced substantially higher average returns than the market portfolio but strategies comprising of Greenblatt’s magic formula, earnings yield alone and return on capital alone provided significantly higher risk adjusted returns.

**Persson and Selander (2009)** backtested the profitability of Joel Greenblatt’s magic formula in Nordic Region for the period of 10 years i.e. Jan 1998- Jan 2008. The returns derived through the magic formula were compared with the returns so derived from the benchmarks, such as, MSCI Nordic and S&P 500 as well as the return predicted by the CAPM and Fama and French’s three factor model. It was found that the intercept/alpha (the excess of actual returns over estimated returns) derived from asset pricing model and Fama and French three factor model was positive but statistically insignificant. They further found that the portfolio showed a compounded annual growth rate (CAGR) of 14.68% during the 10 year period as compared to CAGR of its benchmark i.e. 9.28% for MSCI Nordic and 4.23% for S&P 500 and the transaction cost further lowered the compounded annual growth rate to 11.98%.

**Goumas and Kallstrom (2010)** backtested the profitability of Joel Greenblatt’s Magic Formula in Swedish stock market. The period of the study ranged from March 1999 to Jan 2010. The returns derived from the magic formula were compared with the returns derived from market index. In order to measure the portfolio performance, different measures like Sharpe ratio, Treynor ratio and Fama and French three factor model were used. The results revealed that the magic formula portfolio outperformed the market indexes due to larger Sharpe and Treynor ratio provided by it than the market. Further, Fama and French three factor model found an annual excess return of 14.1% through investment on the basis of magic formula. Also, extending the holding period of the magic formula stocks from one year to three years, further improved the portfolio’s performance.

**Pena et al. (2010)** analyzed whether Fama and French model captured the differences in returns caused by differences in fundamentals in Spanish stock market. Different measures of profitability of firm as proxies for fundamentals taken were ROA (return on assets), ROE (return on equity) and natural log of sales. Along with it, 2 ratios of the magic formula i.e. earnings yield and return on capital were also tested for the
period Jan 1991-Dec 2004. It was found that Fama and French’s three factor model provided better estimate of expected returns than capital asset pricing model and it was found that when return on capital was used as a proxy for fundamentals, it produced significant variation in overall returns. Therefore, return on Capital was a useful fundamental variable used by investors in the Spanish stock market.

Vanstraceele and Allaeys (2010) tested different value investing strategies like magic formula by Greenblatt, Joseph Piotroski’s nine point scoring mechanism, Benjamin Graham’s net current asset value and their own Enterprise Resource Planning (ERP) 5 model and their combinations on Eurozone stock market for the period of 10 years i.e. 1999-2009. In order to compare the performance of the said value investing strategies over the market, a new benchmark based on the weighted sum of the 250 biggest traded companies in the Euro zone was constructed. The asset pricing model showed that all the value investing strategies had lesser value of beta than the market. It was also observed that over the long term, all the value investing strategies yielded greater return than the market and by combining different value screening methods like ERP 5 and Piotroski’s F-score, magic formula and Piotroski’s F-score, the investor could augment his returns.

Blij (2011) reexamined the profitability of Greenblatt’s magic formula in US stock market. The study was conducted for the period of 25 years i.e. from 1985 to 2010. The dataset for the purpose was composed of NYSE, AMEX and NASDAQ stocks and the data on different fundamental variables required in the study was extracted from Compustat. The results revealed that the magic formula portfolio yielded an average annual return of 23.32% and S&P 500 index yielded an annual return of 8.21% during the period of study. Further, the outperformance of Greenblatt’s magic formula over broad based US market index was confirmed through higher Sharpe ratio as well as significant risk adjusted abnormal returns generated by the model using capital asset pricing model and Fama and French’s three factor model. He further conjectured that the magic formula worked due to market anomaly which could be explained through behavioral heuristics.

Sareewiwatthana (2011) tested basic value investing rules based on price to book value, price to earnings ratio, dividend yield, return on equity and the magic formula ratios in the stock exchange of Thailand for the period of 15 years i.e. from Jan
1996- Dec 2010. The market adjusted returns yielded by the stocks screened through the rules were tested using one sample t-test. The results revealed that the portfolios so formed significantly outperformed the market and the portfolios formed on the basis of Greenblatt’s magic formula significantly beat the Thai market during the period tested.

2.5 CONCLUSION

The above literature suggests that around the globe, plenty of research has been conducted examining the performance of value stocks over growth stocks. Further, the studies examining the performance of Graham’s stock selection criteria have focused either upon single rule or some rules in combination. No comprehensive study could be found covering each and every principle of Graham’s stock selection criteria. Further, there is dearth of literature available on investigation of profitability of Piotroski’s F-score and Joel Greenblatt’s magic formula to enhance value premium. In addition, most of such studies relate to U.S. and other mature markets. In Indian perspective, the research on value investment strategies is in infancy. The studies, such as, Kumar and Sehgal (2004), Senthilkumar (2009), Tripathi (2009), Prasad and Verma (2013) conducted in Indian stock market have examined the performance of value strategies based on different valuation ratios only. As per the knowledge of the researcher, no serious attempt has been made so far to conduct a comprehensive study to examine the profitability of value investing strategies in Indian stock market. The necessity to address all the above inadequacies has motivated the need to carry out the study. The study thus fills the gap in literature by examining the profitability of the value premium in Indian stock market.