ANALYSIS OF ASSET PRICING MODELS IN THE INDIAN STOCK MARKET

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CERTIFICATE

This is to certify that the thesis work done on "Analysis of Asset Pricing Models in the Indian Stock Market" is a bonafide work carried out By Mr. Debajit Rabha under my supervision and guidance. The thesis is submitted towards the partial fulfillment of the award of Degree of Doctor of Philosophy in Management, Mizoram University.

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ABBREVIATIONS

AMEX	**:**	American Stock Exchange
BE	**:**	Book Value of Equity
BE/ME	**:**	Book Equity to Market Equity
BSE	**:**	Bombay Stock Exchange
CAPM	**:**	Capital Asset Pricing Model
CMA	**:**	Conservative Minus Aggressive
CNX	**:**	Credit Rating Information Services of India Limited (CRISIL) and the National Stock Exchange of India.
CFFM	**:**	Carhart Four Factor Model
DII	**:**	Domestic Institutional Investor
FFFF	**:**	Fama French Five Factor Model
FFSF	**:**	Fama French Six Factor Model
FFTF	**:**	Fama French Three Factor Model
FII	**:**	Foreign Institutional Investor
GRS	**:**	Gibbons, Ross & Shanken
ICAPM	**:**	Intertemporal Capital Asset Pricing Model
INV	**:**	Investment
LMH	**:**	Low Minus High
MC	**:**	Market Capitalization
ME	**:**	Market Capitalization
MOM	**:**	Momentum

NASDAQ	**:**	National Association of Securities Dealers Automated Quotations
NSE	**:**	National Stock Exchange
NYSE	**:**	New York Stock Exchange
P/B	**:**	Price-to-Book Ratio
P/B	**:**	Price-to-Book Value
RBI	**:**	Reserve bank of India
RMW	**:**	Robust Minus Weak
ROE	**:**	Return on Equity
S&P	**:**	Standard & Poor
SMB	**:**	Small Minus Big
T-Bill	**:**	Treasury Bill
TA	**:**	Total Asset Growth
UMD	**:**	Up Minus Down
SL	**:**	Small Low
SM	**:**	Small Medium (P/B)
SH	**:**	Small High
BL	**:**	Big Low
BM	**:**	Big Medium (P/B)
BH	**:**	Big High
SC	**:**	Small Conservative
SM	**:**	Small Medium (Investment)
SA	**:**	Small Aggressive
BC	**:**	Big Conservative

BM	**:**	Big Medium (Investment)
BA	**:**	Big Aggressive
SR	**:**	Small Robust
SM	**:**	Small Medium (Profitability)
SW	**:**	Small Weak
BR	**:**	Big Robust
BM	**:**	Big Medium (Profitability)
BW	**:**	Big Weak
SU	**:**	Small Up
SM	**:**	Small Medium (Momentum)
SD	**:**	Small Down
BU	**:**	Big Up
BM	**:**	Big Medium (Momentum)
BD	**:**	Big Down

CHAPTER-1

INTRODUCTION

1.1 Introduction

Capital market is an important aspect under the discipline of finance. It is a platform where financial assets such as long-term debt or equity backed stocks are traded. In capital market, funds are raised for investment and capital formation which is very important for the economic development of a nation. It plays a very crucial role in the financial system. It provides the aid of capital formation of the nation's industries. It helps in mobilizing the idle resources efficiently to the one who need it. It acts as a channel through which savings are allocated for investment. One of the major functions of capital market apart from trading in securities is that it helps in mobilizing the funds which lie idle in the fund-surplus households. It encourages the household to invest the idle savings which can be utilized for the productive purposes. The savings are channelised to meet the deficit of the business enterprises which invest more money than they have or spend beyond their revenue. The savings are also utilised even to finance the government deficit. In addition, capital markets are also functioning as the medium of the allocation of funds and the flow of funds from less profitable to high profitable assets. Commercial banks, co-operative banks and other financial institutions are the intermediaries operating in capital markets to channelise the borrowing and lending of surpluses and deficits. The funds are allocated to the companies of different sectors of the economy in the forms of loans or investment which ultimately used this fund for the growth, expansion or investing in new projects, etc. Therefore, the capital market is a type of financial market where financial securities with an indefinite or a long maturity are being traded.

The major participants in the capital market are the Foreign Institutional Investors (FIIs) & Domestic Institutional Investors (DIIs), domestic & foreign individual investors, domestic & foreign retail brokerage firms, etc. It is an issue for an investor to decide where to invest because there are thousand companies listed in the stock exchanges. In the National Stock exchange (NSE) more than two thousand companies are available for trading as on 31st March 2023 likewise more than four thousand companies are listed under the Bombay Stock Exchange (BSE) as on May 19, 2023. In USA, 7710 companies are listed in three exchanges of National Association of Securities Dealers Automated Quotations (NASDAQ), New York Stock Exchange (NYSE) and American Stock Exchange (AMEX). There are around 140 plus exchanges in the world and almost all of them allow direct foreign investment in those exchanges. So choosing the best companies out of thousands of companies is a complex process, especially for the retail investors who does not have resources for evaluating all the stocks and finally making the investment. In choosing the securities the investors can get more assured return if they have rightly valued the particular securities. Thus, the asset valuation can be of a help to the existing investors and prospective investors in choosing the right securities.

In the area of financial management asset valuation or asset pricing have an important place. During the early birth of the discipline, it was concerned with only valuation of individual securities and the market environment. In today's scenario, it covers different types of assets and the broader aspects of asset valuation. The modern financial experts and academicians have developed different methodologies like Capital Asset Pricing Model (CAPM), Fama-French Three Factor Model (FTFM), Carhart Four Factor Model (CFFM), etc. for valuation of different types of assets so that investors can assess the risk involved with those assets. Asset pricing theories are also responsible for the growth and development of derivatives markets. Derivatives are a type of financial instrument that are based on underlying asset, such as a futures contract or an option. Exchange-traded derivatives make up one segment of the market, while over-the counter derivatives make up the other. Apart from evolution of different methodologies the rapid technological innovation helps the investors for quick decision. The modern computer technologies make it easy for the analysis of the asset pricing models due to the easy availability data for stocks and bonds. The continuous and rigorous studies of the asset pricing models by many academicians leads to evolution of new model for better understanding of the asset's risk-return relationship. For an investor asset valuation is very important because it will ultimately lead to determine the true profit. Asset pricing is an important part of the financial market literatures and discourse.

In the modern financial era various models are developed for valuation of different types of assets that are traded in the stock exchanges which helps investors for better decision making. The concept of asset pricing begin with the introduction of market portfolio model or Markowitz model (Harry Markowitz, 1959) on the basis of which the Capital Asset Pricing Model (CAPM), a single factor model was proposed by William Sharpe (1964), John Linter (1965) and Jan Mossin (1966). After the CAPM many other models were evolved but still CAPM is considered as the pioneer in the area of financial management and widely used and tested around the world (Rabha & Singh, 2021). The second model which is also widely used and tested in different market around the world is Fama-French Three Factor Model (FFTF) (Fama & French, 1993). Thirdly, the Carhart Four Factor Model (Cahart, 1997) was developed which is also an important model but not widely used. The fourth one is the Fama and French Five Factor Model (FFFF) proposed by Fama & French (2015). Lastly, Fama and French Six Factor Model (Fama & French, 2018) which is the most recent addition in the asset pricing models.

1.2 Background of the Models

The CAPM evaluates a stock's sensitivity based on a single element, which compares the beta coefficient of the stock to the mean-variance coefficient of the market portfolio. At the beginning of the 1970s, the CAPM was widely utilized as a tool to facilitate investors due to its use of a single element to quantify the risk of a stock. During the course of time many researchers questions the validity of the model and proposed new models (Merton, 1973; Ross, 1977; Fama & French, 1992; Carhart, 1996; Fama & French, 2015; Fama & French, 2018).

Merton (1973) proposed new model Intertemporal Capital Asset Pricing Model (ICAPM) which allows for more realistic investors' behaviour, so that the investors can protect their capital from market uncertainties and build risk-hedging dynamic portfolio. A new multi-factor model i.e., Arbitrage Pricing Theory (APT) was introduced which says securities returns can be predicted using the linear relationship between the security's expected return and many macroeconomic variables that represent systematic risk (Ross, 1976). Few other researchers reported size effect on the securities return (Reinganum,1981; Banz, 1981; Keim, 1983) and few other researchers report value effect (like Rosenberg et al.,1985; Bhandari,1988; Chan et al.,1991). During that time Fama and French came out with a model i.e. three factor model to cover those short coming by including size and value factors into the existing CAPM. In many nations, it has been hypothesised and debated that the three-factor model offers a more satisfactory explanation than the CAPM does. Many researchers confirmed the size and value premiums in the Indian stock market (Kumar & Sehgal, 2004; Mehta & Chander, 2010; Taneja, 2010; Sehgal & Balakrishnan, 2013; Balakrishnan, 2016) as well as around the globe (Daniel & Titman, 1997; Chui & Wei, 1998; Connor & Sehgal, 2001; Chen & Yeh, 2002). They found strong relationship between BE/ME and returns. Whereas other academicians found contradicting result (Bartholdy, 2002; Manjuantha & Mallikarjunappa, 2011). Manjuantha & Mallikarjunappa (2011) found that three factor model failed to explain the portfolios returns in the Indian stock market. Sobti (2016) also confirm no value effect in India but it found size effect. On the other hand, Upadhyay (2017) found no size effect but found weak value effect. Carhart (1997) proposed another model with addition of momentum factor into the FFTF model which is also considered to be an important factor for explaining the securities return (Jagadeesh & Titman,1993; Agarwalla et al., 2017; Balakrishnan, 2016).

Fama & French (2006) found that profitable and highly invested companies with high BE/ME ratios have higher returns. Given book-to-market equity, strong investment and profitability expectations lead to large stock returns. In addition to size, BE/ME, and momentum anomalies, Fama & French (2008) identify net stock issues, accruals, operational profit, and investment abnormalities. These abnormalities greatly influence typical stock returns. The above association also spans micro, small, and large groupings. Gulen et al. (2008) found that moderate investment in total assets yield higher risk-adjusted returns than aggressive investment. Their investigation shows that company asset growth outperforms market capitalization (MC), book-to-market equity, accruals, momentum, net stock issuance, and buy-back effects in predicting future stock returns.

Fama & French (2012) evaluated the integration between stock returns and three significant stock return anomalies—size, BE/ME, and momentum—for four geographical regions. The analysis shows value premiums (BE/ME impact) in stock returns in all four locations and high momentum effects everywhere except Japan. Size, value, accruals, and net stock issues increase stock returns, but profitability decreases them (Sehgal et al., 2012). They also show that Fama–French model reflects average portfolio returns based on the above measures. Average returns have been found to be correlated positively with profits (Novy et al. 2013), whereas investment has been found to correlate negatively with returns (Titman et al., 2004; Anderson et al., 2006).

To defend the criticism, Fama & French (2015) established the five-factor model that adds profitability and investment to three-factor model, one of the most popular asset pricing models with market, size, and value. Five-factor model asset pricing results reveal that the model can capture average excess returns on portfolios constructed with size–value, size–operating profit, and size–investment. Fama & French (2015) further show that FFTF model no longer explains portfolio average returns. By putting their five-factor model through its paces in the markets of four different developed-country regions (North America, the European Union, Japan, and Asia-Pacific), Fama & French (2017) demonstrated the model's potential as globally applicable, industry-standard tool for asset valuation and pricing. But, no sooner the five-factor model could be largely accepted, that it was crowded with concerns and criticism. Blitz et al. (2018) pointed out that firstly the model ignored momentum factor which is too pervasive and important to be ignored and secondly the FFFF model is not significant enough to explain many other anomalies that are closely related to profitability and investment. Zaremba et al. (2019) also found momentum variable significant for explaining the asset’s premium. In response to this, Fama and French once more unveiled their six-factor model in 2018, which differed from the five-factor method in that it included the momentum factor.

Both Fama and French’s five factor (FFFF) and six factor (FFSF) model are new in the financial literature and five factor model is widely tested in different economies around the globe as well as in India. But only a handful of literatures are found for the six-factor model in India. Maiti & Balakrishnan (2018) tested FFSF but a new variable i.e. human capital is introduced by replacing the momentum. The study confirm the importance of human capital variable specially by those who are planning to invest on the basis of firm’s investment decision. Goel & Garg (2020) tested the FFSF model in the Indian equity market and confirm the presence of size factor if combined with other factors but the rejects the profitability factor.

So the present study tested the standard Fama and French six factor model in the Indian stock market using NSE Nifty 500 index listed stocks from January 2006 to December 2021. Another importance of the present study is that it uses both financial and non-financial stocks by creating three baskets of portfolios i.e., fixed basket, non-financial basket and variable basket. Financial institutions were not part of the Fama and French's series of research on the topic of asset pricing. According to them, “financial enterprises tend to have more financial leverage,” whereas “high leverage” has a different meaning and can be termed financial difficulty for non-financial firms (Fama & French, 1992). When empirically evaluating the three-factor model on different stock markets, most studies took the same strategy and omitted financial stocks.

Rarely highlighted in the academic literature are the distinctive qualities of India's financial companies, such as their high levels of liquidity and active engagement, as well as the considerably major proportion of their market value to the entire value of the index's market value. There are two major indices in the country i.e., NSE Nifty 500 index and the BSE S&P 500 which represent 96.10 percent and 95 percent of the total free market float market capitalization respectively. The significant portion of these indices are represented by the financial services sector, around 32.24 percent in the NSE Nifty 500 and 31.37 percent in the BSE S&P 500. When compared to the US stock market and other developed stock markets, such as those discussed in Fama & French (1998, 2017), these characteristics differ significantly. In the US and other developed stock markets, stocks of financial firms are thinly traded and do not make up a significant portion of the total market value of the index.

Modigliani & Miller (1958, 1963) theoretically demonstrate that leverage affects the firm's risk profile (beta), but it does not invalidate the asset pricing model. Thus, the pricing model should be applied to all firms, not only nonfinancial ones. Baek & Bilson (2015) used the Modigliani-Miller theory to estimate the cross-section of expected stock return in US financial and non-financial companies using size and value parameters. Size and value premiums were found in financial and non-financial organizations. Ali et al. (2018) also examined FFTF in the Pakistan stock market using both financial and non-financial companies, and they discovered the resilience of constructing portfolios in a variety of different methods. Since financial sector enterprises should not be excluded in India, we include both financial and nonfinancial firms for the present study.

The present study used data from both financial and non-financial companies in the construction of three distinct portfolio "baskets" for this study i.e. “fixed basket”, “non-financial basket”, and “variable basket”. The first basket i.e. "fixed basket," contains only those companies whose complete data are available during the whole study period which is sixteen years. Second, the non-financial basket is comprised of all of the non-financial companies, whereas the constituents of the portfolio are rebalanced on an annual basis. Lastly, the variable basket constitutes all of the companies' portfolios, both financial and non-financial but the basket constituents vary from year to year.

1.3 Significance of the Study

The capital market is considered as the barometer of a country’s economy. The stock market or the capital market also works as indicator for financial performance of a nation’s economy. In the era of globalization where most of the economies around the world are open to trade freely that’s why economies as well as all capital market are interlinked to each. If anything happens to a part of the world’s economy it will also have an impact in the economies of the other part of the world.

In addition, as a result of market incorporation, the capital markets are subject to influence from a variety of risk factors. These risk factors originate from a variety of diverse sources. These risk characteristics are not unique to a single market; rather, they are widespread throughout all markets, including mature capital markets and emerging capital markets. The risk-return connection of high-risk financial assets, such as equity shares, is an important feature that needs to be carefully attended to. The dangers associated with investing in common stocks stem from a variety of diverse sources, including socioeconomic and political considerations.

Asset pricing models are a collection of economic models established by scholars in financial economics. These models are used to understand the risk and return relationship of a financial asset so that an investor can have a better decision while making investment. Asset pricing models have been put to the test in stock markets all around the globe by different financial researchers. When it comes to describing the risk-return relation of equity stocks, empirical evidence further substantiates its performance (Saraf & Kayal, 2023). But the empirical results vary market to market, like most of the models are tested in developed markets and found robustness of the models whereas the same model may not be valid in developing and underdeveloped market indicating a deviation in the markets (Ali et al., 2018). Due to its status as a developing market with a large market capitalization, trading volume, liquidity, and investor engagement, the Indian stock market necessitates complex economic or financial modelling in order to quantify the equity stock's risk-reward relationship.

Indian stocks market is one of the largest stock markets in the world and currently the National Stock Exchange of India (NSE) ranked 8th position in terms of market capitalization as on 31st March 2023. In Asia, the Shanghai Stock Exchange, Japan Exchange Group, Inc, Shenzhen Stock Exchange and Hong Kong Exchange Exchanges and Clearing Limited are top exchanges. Japan and Hong Kong are considered to be developed economy. Even the Chinese economy is also considered to be a developed one. The Indian economy is a developing economy which have huge potential to grow further due to geo-political issues like USA-China trade war, Russia-Ukraine war which gives India as a favorable place for foreign investors for its investment destination. The present study tries to determine which risk factors are most important for predicting stocks returns. The current study also explores whether different baskets of portfolios have impact while explaining the risk-return relationship. The present study has been carried out on the Indian equity market but the findings may have high relevance and can be replicated on the developing and developed stock markets.

1.4 Limitations of the Study

The fact that this investigation was only carried out within the Indian context is one of the limitations of the current work. As a result of this, the conclusions and findings may not be generalized to other parts of the world. In addition, the potential applications of the research in the future can be broad enough to be applicable to other emerging and developed markets. A limitation of the present work is that the present study is undertaken only in the Indian context and only NSE Nifty 500 index stocks are covered in the study. Hence, the results and findings may not be generalized.

1.5 Structure of the Thesis:

The thesis is divided into five chapters as summarized below:

Chapter 1: INTRODUCTION

The first chapter gives an introduction to the study which includes overview of the models as well as the significance of the study.

Chapter 2: LITERATURE REVIEW

The literature review of the study is discussed in further detail in chapter two. It provides an in-depth discussion of the significant studies that have been done on both the global stock market and the Indian stock market. This section presents sufficient rationale to motivate the current study, and it also extracts the research topic from the previous section.

Chapter 3: METHODOLOGY

In this chapter the detail methodology adopted for the study undertaken has been given. The variables used; the model used are explained in the chapter.

Chapter 4: DATA ANALYSIS AND DISCUSSION

The analysis of the study is presented and discussed in chapter 4 under the heading empirical results and discussion. The analysis is done for all the three baskets of portfolios. The result of the analysis is presented for all the three baskets for all the different asset pricing models viz. CAPM, FFTM, CFFM, FFFM, FFSFM.

Chapter 5: CONCLUSIONS AND SUGGESTIONS

In this chapter the summary of the findings of the study are given. Suggestions, conclusions and future scope of study forms part of this chapter.

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CHAPTER-2

LITERATURE REVIEW

2.1 Introduction

The literature review is an essential component of a thesis because it justifies the study's existence. The present study conducted a comprehensive literature analysis pertaining to the models in the study and categorized the literature into five sections based on model: CAPM, FFTF, CFFM, FFFF, and FFSF.

2.2. Review of Literature for CAPM

Since the evolution of stock market many academic and researchers have tried to understand the financial market. One of the outcomes of their research is pricing the stocks or assets which are available in the market for minimizing the risk. Another important concept for minimizing the risk is diversification. In 1959, Harry Markowitz discovered the notion of diversification, which he addressed in a paper titled "Portfolio Selection: Efficient Diversification of Investments." A solid portfolio is comprised of more than a long list of high-quality equities and bonds. It is a well-rounded package that provides the investor with protections and chances for a wide variety of scenarios (Markowitz, 1959).

Markowitz (1959) introduced the concept of diversification as "don't put all your eggs in one basket" and initiated the portfolio selection process based on quantitative methodologies. He supported the creation of portfolios through the diversification of assets to reduce risk of a portfolio. Using a statistical technique, he discovered that investors can select a portfolio with a low variance of portfolio risk-premium and a specific or maximum expected risk-premium, with a set variance level. For this reason, the Markowitz portfolio model is also known as the mean-variance model. The CAPM was developed by Sharpe (1964), Linter (1965), and Mossin (1966) as an upgrade to the Markowitz portfolio model. The CAPM describes the relationship between risk and return on investment. The model demonstrates that the return of a certain security is correlated with market risk, or in financial parlance, the security's "beta," which estimates the sensitivity of the security's return to market limitations.

Sharpe (1964) highlighted the fact that there is a one-to-one correlation between the price of a security and the various other risk factors that are associated with that specific security. If an investor is prepared to take on a greater level of potential risk in exchange for the possibility of receiving a greater level of potential reward, then the investor will see improved returns on the investments that they have made.

Linter (1965) presented an explanation of how the Capital Asset Pricing Model provided support for the concept that, in competitive equilibrium, assets earn a premium over the risk-free rate that increases with their risk. This premium is proportional to the level of risk associated with the asset. He did this by demonstrating that the covariance between the asset and the market portfolio was the determining effect on risk premium, rather than the asset's own risk. This was more important than the asset's own risk.

Mossin (1966) focused on how investors attempt to maximize preference functions in regard to expected yield and variance of return on their respective portfolios. It has been demonstrated that the presence of general equilibrium presupposes the existence of a line that is referred to as the “market line.” This line provides a link between the expected yield per dollar and the standard deviation of yield. The angle this line forms with the graph exemplifies the idea of a risk premium, which can be found in this illustration.

Fama & MacBeth (1973) investigated whether or not there is a correlation between the average return and the risk of New York Stock Exchange common stocks. In their study, they took into account every equity stock that was traded on the NYSE between the years 1926 and 1968. A four-year portfolio building phase, a five-year beta estimation period, and a five-year testing period were some of the sub-periods that made up the overall study period that was investigated. They employed a three-step approach to construct 20 portfolios, each of which was based on the ranked betas of the individual securities that were held throughout the first sub-period. The “two-parameter” portfolio model, as well as models of market equilibrium that are developed from the “two-parameter” portfolio model, serve as the theoretical foundation for the testing. The “fair game” qualities of the observed coefficients and residuals of the risk-return regressions are compatible with an “efficient capital market.” An efficient capital market is a market in which the prices of securities completely reflect the information that is available.

Modigliani et al. (1973) tested the CAPM using daily stock prices and dividend data for 234 equity shares (or common stocks) of eight key European nations from March 1966 to March 1971. Later security returns were converted into bi-weekly basis which reduces the difficulties of measuring error naturally available in daily return and also sampling inefficiencies related with longer breaks. The eight European countries stocks chosen for test were: France (65), Italy (30), United Kingdom (40), Germany (35), Netherland (24), Switzerland (17), Belgium (17), Sweden (6), and United States (900). The United States data from NYSE were chosen for comparison and collected from Chicago CRSP monthly stock price and dividend for all stocks listed on the NYSE during the period of January 1926 to June 1970. Then portfolios were constructed for four major European market and US market according to their beta value, the highest beta value in the first and lowest in the last. France had five portfolios with 12 stocks each, Italy had three portfolios with ten stocks each, UK had four portfolios with ten stocks each, Germany had three portfolios with eleven stocks each and US had ten portfolios from all available stocks. The grouping criteria for US market was constructed on estimated beta value in the earlier five-year period and all the constructed portfolios for the study were updated each year for including new stocks. Approximately 75 stocks on average are in each portfolio for a longer period and from March 1967 to June 1970 it was 100 stocks each. The study found that systematic risk plays an important factor for pricing the stocks in the European market. The study also showed positive relationship between risk and return in all the European country except Germany.

Roll (1977) claimed that, without knowing the precise make-up of the market's actual portfolio, it was impossible to verify asset pricing theory. When adopting a market proxy, two concerns arise: first, the proxy may be mean-variance efficient even if the actual market portfolio is not; and second, the proxy may be inefficient whereas the market may be either mean-variance efficient or actually inefficient. Therefore, an empirical test of CAPM was not feasible.

Litzenberger & Ramaswamy (1979) found a CAPM model that takes tax into account. The analysis made use of share price information ranging from January of 1936 through December of 1977 (504 periods). According to the findings of the research, there is a significant positive connection between the predicted returns of common stocks before taxes and the dividend yields of those equities.

Roll & Ross (1980) supported the hypothesis that the estimated factor loadings are dependent on the estimated expected returns, and variables such as the own standard deviation, despite having a high correlation with estimated expected returns, do not add any additional explanatory power to that of the factor loadings.

Banz (1981) also reported the size effect for the purpose of explaining the asset's return. The research was conducted to investigate the connection that existed between the return on stocks and the aggregate value of NYSE equity shares. For the purpose of the study, monthly data were collected for all equity stocks that were listed on the New York Stock Exchange for a minimum of five years between 1926 and 1975. According to the findings of the study, when it comes to returns on investment, companies of a smaller size do better than those of a medium or big size. According to the findings of the study, the market value of a company is an essential component in developing a linear model for pricing assets. The CAPM was not accepted since the model was unable to maintain its position. Despite the fact that the study discovered that size is a significant factor in asset price, it was unable to reach a conclusion regarding the veracity of this finding because it did not uncover any theoretical evidence to support it. The study discovered that there is a significant connection between market equity and cross-sectional returns.

Reinganum (1981) confirmed the empirical anomalies with the CAPM, who also discovered that the size of a company is a key element in determining how well it explains the return on an investment. The CAPM forecasts a certain set of average returns for portfolios, but those that are created on the basis of size or E/P ratios experience returns that are consistently different. Another significant conclusion from the research is that the aberrant returns continue for at least two years, which lowers the probability that these outcomes are the consequence of an inefficient market. Instead, the evidence tends to point to the conclusion that the equilibrium pricing model has some important details missing. The research project used a sample of 566 firms from the New York Stock Exchange and the American Stock Exchange; however, by the time the sample period was over, there were only 535 companies left in business. For the quarterly statistics of the sample companies, beginning with the fourth quarter of 1975 and continuing through the third quarter of 1977 for a total of eight quarters, the data was acquired from the Wall Street Journal. The P/E effect, as reported by Basu (1977), disappears for stocks traded on the NYSE and AMEX when controls for size are applied; however, there is still a significant size effect even when controls are applied to the P/E-ratio; in other words, the P/E-ratio effect is a proxy for the size effect and not vice versa.

Gupta (1981) tested beta using a 606 sample companies' equity shares and calculated average annual returns for fifteen years periods from 1961 to 1976. The high and low price of each stock during a year were considered and the data has been collected from three exchanges namely- Bombay Stock Exchange, Calcutta Stock Exchange and Madras Stock Exchange. The study found that the CAPM is not valid in the Indian capital market.

Roll (1981) also confirms the size effect on the risk-premium of equities. However, small businesses' riskiness has been incorrectly evaluated. Due to low trading frequency, autocorrelation in portfolio returns appears to be the main source of the error. It is probable that the apparent strength of other anomalous predictors of risk-adjusted returns, such as price-to-earnings ratios and dividend yields, originates from the same error.

Basu (1983) discovered that stocks with a low earnings to price (E/P) ratio exhibit higher returns, but stocks with a high earnings to price (E/P) ratio show lower returns for US equities, which invalidated the CAPM's forecasts.

Bont & Thaler (1985) investigated the momentum and contrarian effect by demonstrating that stocks that had seen low average risk-premium over the previous three years saw high risk-premium in the long run and vice versa.

Lakonishok & Shapiro (1986) found that there is no significant relationship between market risks or 'beta' and average return. They found that both traditional measure of risk which is 'beta' and alternative measure of risk which is variance or residual standard deviation are not able to explain the cross-sectional variation in returns, only the size appeared to be mattered. They carry forward the study grounded on the work of Banz (1981) and Reinganum (1981). The study covered a time period of 1962 to 1981 and found that it is the size which matter the most. During the course of time some other factors were discovered which are presumed to be the explanatory of the average return.

Srinivasan (1988) conducted an empirical test of CAPM on Indian market using two phase regression. He basically tested the relationship and the impact of diversification in the Indian capital market. The first phase of regression comprise of the time series regression of 85 firms traded on the BSE, where securities return is regressed to the market premium. The second phase of regression involves cross sectional regression of portfolio premium to portfolio systematic risk or beta. They found significant relationship between portfolio premium and portfolio beta but he suggested that to draw a proper conclusion about CAPM validity in India a larger sample size was required.

Yalwar (1988) did an empirical analysis on BSE about the expected rates of returns and efficiency using 122 actively traded companies for 20 years from 1963 to 1982. He used geometric mean monthly return method to determine the required rate of return for each individual stock for holding periods of 1 year, 5 years, 10 years and 15 years period. The study found that higher beta stocks generate returns more than low beta stocks. Even though Yalwar (1988) had conducted on individual stock return instead of portfolio return he observed that CAPM is a respectable model to describe the stock's returns.

Varma (1988) tested CAPM in the Indian capital market using a database of over 30000 prices on 45 stocks from BSE. The study mainly deals with the condition where the betas may vary over time. The author used three alternative methods to estimate the non-stationary betas: Kaman Filtering, Bayesian Detection of Structural Breaks and Mixed Model. The study found significant proof for nonstationary of betas in the Indian capital market. Apart from statistical significance, he observed changes in the betas are substantial in magnitude. The study does not reject the CAPM. However, the author conclude that a larger sample is required to draw a proper conclusion in favor of the theory.

Bhandari (1988) found that expected equity stock risk premium are positively related to the D/E ratio of preference share, even when controlling for the market risk and company size and including as well as excluding January, with the relation being much larger in January. This finding was based on the fact that expected risk premium of equity stocks are positively related to the D/E ratio of preference shares. This association is unaffected by changes in the market proxy, estimating approach, or anything else of the sort. According to the available information, it is highly unlikely that the return associated with the D/E ratio is just some kind of risk premium.

Chan et al. (1991) investigated the possibility that fundamentals may accurately forecast the returns of Japanese stocks. They used a monthly data collection from the TSE (Tokyo Stock Exchange) beginning in January 1971 and continuing all the way through December 1988. The ability of various fundamental factors, such as earning per share, cash flow yield (earnings plus depreciation), and BE/ME (book-to-market) ratio, to accurately anticipate future events was evaluated using a series of tests. They discovered a substantial connection between the various variables and the anticipated returns in the Japanese market.

Chan & Chen (1991) investigated the question of why small and large companies had distinctively distinct patterns of risk and return. The data set covered the period of time from 1956 to 1985 and comprised of 19 different industry groupings at the NYSE. It was found that due to differences in production efficiency, leverage, and accessibility to external financing, small companies tended to be at a higher risk than large companies. This was the case even though large companies were subjected to more statistical testing.

Gupta & Sehgal (1993) did an empirical analysis of CAPM on the BSE Sensex thirty listed companies’ monthly average stocks prices for a period of 10 years from 1979 to 1989. The researchers constructed three well balanced portfolio according to their beta value and size of the stock using portfolio method. The study also clearly talked about the non-linearity as well as the importance of residual risk for describing returns of an asset. The study has found insignificance of the model for describing the asset return in the Indian capital market.

Pettingill et al. (1995) identified a substantial association between systematic risk and stocks’ returns when they examined CAPM using data acquired from CRSP monthly returns for the period starting in 1926 and ending in 1990. The sample period was split into 15-year sub periods for testing purposes, and these sub periods were further split for beta calculation and portfolio formation. The beta value was used to create twenty distinct portfolios. One portfolio has the stocks with the lowest beta, another contains the stocks with the next-lowest beta, and so on. Results showed a positive relationship between systematic risk and average portfolio risk-premium, leading the researcher to conclude that systematic risk is a reliable indicator of future premium.

Chan (1997) presented a multivariate testing of the Sharpe-Linter CAPM and Black’s CAPM for the Hong Kong stock market in their study. Chan tested the model using data from the Hong Kong stock market. The findings of the estimation do not support either version of CAPM. The company size impact appears to be the source of the rejection, as it has been discovered that small firms (who also have small betas) have received returns that are more than what the CAPM has predicted they will earn. A further finding of the Black CAPM is that the predicted return of the zero-beta portfolio is not statistically significant.

Sehgal (1997) found that CAPM is not a good model for asset valuation in the Indian stock market. The researcher used the BSE National Index and select 80 securities over the period April 1984 to March 1993. From the collected data ten portfolios were formed randomly of eight stocks each. They found that there is no significant relationship between beta and average return. Further, randomly formed portfolios of eight securities each is also found to significantly deviate from normality. Therefore, the researcher sum-up that CAPM is unable to determine the asset price appropriately.

Madhusoodanan (1997) did an empirical test of CAPM by taking 120 stocks traded on the BSE for a period of January 1987 to March 1995. He created 10 portfolios of 12 stocks in each portfolio. The study found high risky portfolio gave the lowest return whereas the low risky portfolio gave higher returns. So in Indian capital market the CAPM failed to explain the asset prices accurately.

Vipul (1998) analyzed the relationship between beta and size of the firm, industry and liquidity of the stocks by using 114 stocks traded at BSE covering the period from 1986 to 1993. The study found that the systematic risk or beta is influenced by the size of the firm and perceive that stocks liquidity and industry do not influence the beta stability.

Ansari (2000) conducted research to determine whether or not the CAPM theory is applicable to the Indian stock market. In order to accomplish this, he reviewed a variety of research articles that had previously been published and carried out an exhaustive analysis of the empirical performance of the model in India. Research on the capability of the CAPM was carried out by Ansari himself. He analysed the monthly returns of 96 BSE-listed stocks beginning in January 1990 and continuing through December 1996 for the purpose of his study. The researcher then constructed five portfolios out of those stocks, each of which had the same weighting. In order to evaluate the data, he made use of both the time series regression and the cross-sectional regression analysis techniques. His research has demonstrated that the CAPM model is applicable to the Indian stock market.

Sehgal & Tripathi (2005) did an empirical analysis on size effect in the Indian capital market using BSE 500 equity index. From BSE 500 they selected top 482 companies and collected monthly adjusted returns for the same for the period of

1990-2003. The study found strong presence of size effect in the market using six alternative measures (market capitalization, enterprise value, net fixed assets, net annual sales, total assets and net working capital) of company size. The study also found the size-based investment strategy seems to be economically feasible as it provides extra normal returns on risk adjusted basis and also found no effect of any seasonality or business cycle factors.

Sehgal & Tripathi (2007) tested if there was a value effect in the Indian stock market using monthly adjusted returns of 482 companies' stocks listed with the BSE S&P500 index for the period of 1990 to 2003. The study found significant value effect on the return of the securities. The study used alternative procedures such as book to market equity (BE/ME), earing to price (E/P), cash flows to price (C/P) and dividends to price (D/P). The study found value effects for the return of a stock.

Dai, Hu & Lan (2014) tested the validity of CAPM model on the Chinese market (Shanghai Stock Exchange) covering the study period between January 1991 to December 2012. There are only 9 stocks who met the requirement of 200 trading month of all stocks and data were collected on monthly basis. The study found CAPM is valid in the Chinese market.

Aziz & Ansari (2014) tested that size and value premiums have effect or not on return of the stocks. For the study the data have been collected from BSE-500 listed stocks monthly returns for the period April, 2000 to March, 2012. They have tested using both Fama-French Model and CAPM. The study found that there is a significant impact of size on the return of a firm. They have concluded that Fama-French three factor model perform better than CAPM in determining the asset price.

Bajpai & Sharma (2015) tested the CAPM with the traditional model in the Indian Equity Market. Their study was conducted on daily returns of NSE CNX 500 listed companies for the period of 10 years ranging from January 2004 to December 2013. Out of 500 stocks the researchers choose those stocks which were traded for ten years uninterruptedly. Then the researchers construct 10 portfolios and each portfolio consist of 29 stocks. To analyze the data the researchers use two rolling regression model one use intercept and other one without intercept. The study found positive result when there was no intercept term and with intercept term the model completely fail the Indian Equity Market. When the rolling regression model exempt intercept term the model was able to describe the correlation between risk and return in the Indian equity market. They concluded that CAPM is valid in India when the intercept term is removed from the model which is confirmed by Rabha and Singh (2022).

Nyangara, et al. (2016) using cross-sectional stocks returns on 31 stocks listed on Zimbabwe stock market (ZSE) found CAPM is not a good model to predict the risk and return in the ZSE. The study has used the data from March 2009 to February 2014, and concluded that beta value is not helpful in predicting the expected returns for one month time horizon but it is useful for forecasting the expected average monthly returns over a one-year horizon.

Karakoc (2016) conducted a validity test of CAPM in the Istanbul stock exchange using seven years data of 25 large companies from BIST 100 index and the time period covers from 2007 to 2014. The study found that CAPM is able to explain the changes in the rate of profits statistically but the model couldn't explain the relationship between beta and return of the stocks.

Pandey (2016) tested the applicability of CAPM in the Indian capital market. The study covered monthly returns of 5 years of NSE Nifty index. The study randomly selected 21 companies from NSE Nifty. The study found that the model is a good model to describe the security returns in the Indian capital market because the model is able to explain the excess market returns.

Chaudhary (2016) found that CAPM is not able explain properly about the dissimilarities in cross sectional returns for the Indian capital market. For the study data were collected from NSE 500 index monthly returns and the sample size was 250 companies. Out of which he constructed 25 portfolios of 10 companies in all the portfolios. The portfolios were constructed according to their beta value from highest beta value to lowest beta value stock. He found that CAPM is not significant for the asset valuation in India.

Johri et al. (2016) studied the validity of CAPM in India using 10 years data of 50 firms for a period from 2003 to 2013. The data were collected from BSE, NSE and Yahoo Finance. Out of the 50 companies 10 companies are from FMCG sector, 10 from IT sector, 10 from Pharma, 10 from Telecom sector and 10 from Auto sector. The study found that CAPM is invalid in the Indian market as the model is unable to make a relationship between asset return & corresponding beta value as proposed. The study also found beta value is stable over a period of time. The study concluded that stock market is volatile hence predicting the market is very difficult. They observe that during the course of time so many theories have been developed among which CAPM has been one of the major achievements which predict the future return through beta value or systematic risk.

Hussain & Islam (2017) found that CAPM is not a good model in explaining risk-return relationship. To determine the asset prices in India they have used stock’s monthly returns of 62 companies listed in the NSE Nifty 100 index for the period from January 2003 to December 2015. They used Fama & Macbeth (1973) two-step testing method for asset pricing and time series regression analysis method to test the data. The study found CAPM invalid in India. However, the researcher pointed out that the rejection of the model maybe due to insufficient criteria for the selection of market proxy.

Shrivastav (2017) tested CAPM using monthly closing prices of 15 companies listed in the National Stock Exchange covering a time period of 5 years from January 2006 to December 2010. From the collected data 5 equally-weighted portfolios of 3 stocks each were constructed. Two methods were adopted for analysis of data i.e. cross-sectional analysis and portfolio analysis. The study found both individual as well as portfolio didn’t establish the philosophy that higher beta stocks generate higher return. Finally the study concluded that CAPM is not valid in India.

Ratra (2017) tested the applicability of CAPM in India. The study used daily adjusted close prices of top 10 companies of NSE with the highest market capitalization for the period from January 1, 2012 to December 31, 2016. The companies were selected from the list of 500 companies according to the survey of

Economic Times which is one of the leading financial newspapers. The study found that there was a significant difference in expected returns and actual at normal risk. The study concluded that CAPM is not applicable in Indian capital market.

Cheriyan & Lazar (2017) tested CAPM using 5-minutes returns of 10 most active stocks listed on the BSE S&P Sensex for the period from January 15, 2016 to July 15, 2016. The data had been collected from Bloomberg. The study found validity of a liquidity adjusted CAPM model and it also found evidences that liquidity risk is significantly priced in Indian stock market. It is also found that the expected liquidity plays a vital role in determining the asset prices.

Gahe et al. (2017) tested the validity of CAPM for the West African Economic and Monetary Union (WAEMU) stock market. The study used monthly return of twenty Cote d'Ivoire's listed companies from January 2002 to December 2011. The period had been divided into two different sub-period i.e. the first period used for estimation of beta and second one as testing period. Due to small sample size only one portfolio was formed. The basic hypothesis that high beta stocks generate high return is found insignificant. However, the study found significant evidence of non-systematic risk impact on the sub period five. Therefore, the study concluded that CAPM is invalid in the West Africa and Monetary Union.

Al-Afeef (2017) examined the CAPM on the U.S. stock market utilising the monthly return of Amazon shares listed in the NYSE S&P 500 from 2009 to 2016. Multiple linear regression was utilised to analyse the given data. The study indicated that the recovery of the US stock market has a significant impact on the predicted return of Amazon shares. In addition, the study demonstrated that beta can explain the needed rate of return, leading the researchers to conclude that CAPM is applicable to the US stock market.

Rabha & Singh (2022) examined the CAPM in the Indian stock market using the weekly stock return data for 10 years of Nifty 50 index listed stocks. The study created five portfolios and each portfolio has 10 stocks except the last portfolio which have only 8 stocks. The first portfolio has the highest beta value and last portfolio have the least beta value. The study used a constrained model proposed by

Bajpai & Sharma (2015) in which there is no intercept and made comparison between the traditional model. The study confirmed the validity of the CAPM using the constrained model as it performs better than the traditional model.

2.3 Review of Literature for Fama and French Three Factor Model

The CAPM is a single factor model and one period investment due to which so many academicians' questions validity of the model in today's scenario. The greater average returns of NYSE small size stocks are not fully reflected by the systematic risk or market β, (Banz, 1981). The research shows that small-cap stocks have a greater average return pattern than large-cap companies do. The term "size impact" describes the trend of declining average stock returns from small to large enterprises. Similar to the findings of Reinganum's (1981) study, which employs earning yield (P/E) to explain CAPM's misspecification, Basu (1983) found that the 'β' alone fail to explain the positive correlation between the earning yield (P/E) and stock returns. The P/E and size effect is reexamined from a longer-term perspective in Jeffe et al. (1989) study on earnings yield, market values, and stock returns. Average stock returns are found to have a strong correlation with both size and P/E, according to the research.

Keim (1983) discovered a seasonality impact in the stock's return. Roll (1981) also shows that seasonality affects the average stock return in January. The positive correlation between BE/ME and stock returns is not well explained by CAPM alone (Rosenberg et al.,1985). Bhandari (1988) finds that the average stock return is positively correlated with the leverage (D/E). The dividend yield is related to the average stock return that is not explained by the CAPM, as found by Rozeff (1984), Shiller et al. (1984), and Fama-French (1988). According to Fama & French (1988), the correlation between dividend yield and average stock returns is stronger over the long term (two to four years) than the short term. When economic conditions are good, predicted average stock returns are lower, and when economic conditions are bad, projected average stock returns are greater, as documented by Fama & French (1989) for the business environment and average stock returns. Fama

& French (1992) examine how systematic risk, size, E/P, leverage, and book-to-market equity (BE/ME) affect average stock returns. They found β alone or with other factors provides little information about average stock returns whereas size, E/P, leverage, and BE/ME equity explain alone. Size and book-to- BE/ME appear to replace leverage and E/P in average returns and confirm they explain maximum variation in cross section of returns using time series analysis as proposed by Jensen et al. (1972). Another significant advancement in the field of financial economics was made by Fama & French (1993), when they proposed a three-factor model that included size and BE/ME as new variables in the CAPM.

Berk (1995) proposed that the return on a company's equity stock had a fundamentally inverse relationship with the market valuation of the company. In order to determine whether or not there was a size effect, he examined the company using five distinct measurements of its size: MC (market capitalization), BVA (book value of total assets), book value of un-depreciated properly, plant and equipment, annual sales values, and number of employees. All of these metrics were taken into consideration. The study found that size plays a crucial role for explaining the cross-sectional returns. The relationship between the portfolio returns and three components was studied in the technique of this study. As a result, the study concluded that market risk plays a significant influence in setting stock prices. However, the large company effect also occurs, and the model did not fully explain the factors affecting stock pricing, indicating that the existence of additional possible factors also affects stock pricing.

Daniel & Titman (1997) came to the conclusion that predicted returns are determined more by the characteristics of the firm than by the factor loadings on the SMB and HML portfolios. There was essentially no correlation between risk-premium and loadings on the SMB component within portfolios that were built based on size. This constituted evidence against a financial distress interpretation of the SMB factor and suggested that expected stock risk-premium were related to their characteristics for reasons that might not have anything to do with the covariance structure of returns. Additionally, this suggested that expected stock risk-premium were related to their characteristics for reasons that could have nothing to do with the covariance structure of risk-premium.

Kim (1997) came to the conclusion that systematic risk had economically and statistically significant force regardless of the absence or presence of the company's size, BE/ME (book-to-market equity), and E/P (earning-price) ratio. This was the case regardless of whether or not the firm size was taken into account. Book-to-market ratio, on the other hand, provided strong explanatory power to average stock risk-premium, in contrast to company size and earnings price.

Fama & French (1998, 2012) augment the robustness of the FFTF in describing the size and BE/ME variation in the mean securities returns in an international environment by discovering comparable types of results (Fama & French, 1993). Investors and academics whose decisions are primarily based on the empirical asset pricing framework use FFTF extensively among the alternatives available. Analysts and fund managers frequently utilize FFTF alpha (α) intercepts to evaluate the performance of funds.

Chui & Wei (1998) found validity of the FFTF using stock markets in Hong Kong, Korea, Taiwan, Malaysia, and Thailand to test the model. Their findings showed that the size and BE/ME factor are able to predict the average stocks return.

Pandey (2001) conducted research on a panel data set consisting of 1729 observations with the goal of locating characteristics that could explain the predicted returns of Malaysian stocks. The natural log of market capitalization has the most explanatory power, followed by the size of the company. It was discovered that beta had a consistently positive link with stock returns, both by itself and in conjunction with other variables. However, the power of this variable to explain was not as great as that of size and other variables. In contrast to the findings of Fama and French (1993), the book-to-market ratio was not consistently a significant variable. The significance of the variable vanished after they included size and price-to-earnings ratio in their regression analysis.

Faff (2001) found that market risk premium and value factor are valid but the size is negative in the Australian stock exchange. Ajili (2002) found that a company's size and BE/ME ratio strongly affect equity stock risk premiums. Chen & Yeh (2002) found a strong connection between BE/ME and average stock returns.

Bartholdy & Peare (2002) examined the effectiveness of the CAPM and Fama & French for analysing the performance of individual equities. The primary purpose of this study is to evaluate and contrast the effectiveness of these two models when applied to individual stocks. First, estimates for individual stock returns based on CAPM are created by utilizing various time frames, data frequencies, and indexes. These estimates are then used to determine individual stock risk-premium. Five years' worth of monthly data and an equal-weight index, as opposed to the value-weight index that is typically recommended, have been shown to produce the most accurate estimation. The performance of the model, on the other hand, is relatively low; it explains just about three percent of the average variations in risk-premium. However, this model does not perform significantly better; regardless of the index that is employed, it only explains five percent of the average variance in return differences. These findings provide a plausible explanation for why practitioners use CAPM to such an extended degree; the additional factors associated with Fama and French is not justified. The applicability of either model for the assessment of individual stock risk-premium is called into doubt as a result of these findings, however.

Aksu & Onder (2003) investigated the Istanbul Stock Exchange to determine whether or not the size and book to market equity existed there. Additionally, they wanted to determine whether or not these indicators serve as proxies for firm-specific risk. In order to accomplish this, they chose 173 different businesses that were active between the years 1993 and 1997. In order to do an individual analysis of the data, the CAPM and the Fama-French Three Factor Model were each utilised. It was discovered that parameters related to beta and size have significant power to explain. The findings of the study also showed that size and value impacts act as stand-ins for firm-specific risk.

Connor & Sehgal (2003) empirically tested the Fama and French three factor model in the Indian equity market. The study included 364 stocks from June 1989 to

March 1999 and their month-end adjusted share prices collected. The sample stocks were part of CRISIL-500 which is a broad-based and value-weighed stock market index in India constructed along the lines of the S&P index in the USA. The stocks data has been collected from Capital Market Line which is a financial database widely used in India by researchers and other practitioners. The researchers constructed six portfolios, three small stock portfolios (S/L, S/M and S/H) and three big stock portfolios (B/L, B/M and B/H). The descriptive statistics on the return series of the study confirms the negative relationship average return and size premium which is also found in other capital markets around the world. Positive relationship between value and average return has been found for small stocks but negative for big stocks. The portfolio returns had high volatility. The study also tested the seasonality affect in the stocks returns i.e., January, March, April and October and November in India and found that there was no seasonality affect except October-November but negative which spread across equally between size and value spectrum. The study applied the adjusted Wald statistic proposed by Gibbons Ross and Shanken (1989) to test all the intercepts jointly found with a market factor alone (the CAPM) the intercepts of the three small stock portfolios are positive and all are significant at the 95% confidence level. But still it (CAPM) was rejected due to positive intercepts for the small size portfolios. The GRS statistic was significant with high confidence. But when the three-factor model was applied the intercept values for all sample portfolios are indistinguishable from zero at the 95% level. The result shows the ability of the three-factor model to capture cross-section of average returns missed by the standard CAPM.

Drew et al. (2003) conducted research on firm market capitalization as size, BE/ME (book-to-market equity) as value, and stocks returns on the Shanghai Stock Exchange (China). They came to the conclusion that mean-variance efficient investors in China were able to generate superior risk-adjusted returns by selecting certain combinations of small and low book-to-market equity firms in addition to the market portfolio.

Gaunt (2004) conducted research on FFTF in the Australian stock market to investigate the size and value effect and determine whether or not it is real. The previous research by Halliwell, Heaney, and Sawicki (1999) looked at the years 1981–1991. The current study extends that time period another 10 years, to the year 2000, and addresses several of the shortcomings and findings from that study. In contrast to the findings of Halliwell, Heaney, and Sawicki, the current research demonstrates that the three-factor model offers much improved explanatory power in comparison to the CAPM, as well as evidence that the value factor plays an important role in explain the risk-premium.

Vassalou & Xing (2004) conducted research to evaluate the relationship between the size and book-to-market effects and market risk. Market risk is the chance that a company may be unable to satisfy its debt commitments. Although the size and value variable represent by SMB and HML factors do contains some information relevant to market risk, the study found that market risk did not account for the explanatory power of the Fama-French three-factor model.

Kumar & Sehgal (2004) explained the relationship between companies' characteristics and stock's return. The following features of the companies were taken into account: (a) for the size effect, which included market capitalization, total assets, enterprise value, and net sales; and (b) for the value effect, which included book equity to market equity, price-to-earnings ratio, and post sales growth ratio. The software Capital Market Line (CML) was used to compile the data, which consisted of the adjusted share prices at the end of each month for 364 distinct companies from July 1989 to March 1999. For the returns of the Indian stock market, they concluded that there was a significant size effect, but only a tiny value effect.

Rahim & Nor (2006) found both size and value factor to be valid in the Bursa Malaysia stock exchange. Rahman (2006) examined the FFTF (Fama and French three-factor model) of stock returns and its modifications, including the one-factor Capital Asset Pricing Model, for 79 Indian BSE-100 equities. The market element was the strongest explanatory factor in all portfolios. He confirmed that the FFTF model better explains stock return variation than the CAPM. The FFTF model better explains portfolio cross-section returns than its versions and the CAPM.

Mirza (2008) assessed FFTF model performance in KSE (Karachi Stock Exchange). After size and book-to-market sorting six portfolios, multivariate regression was used in the study. KSE equities were chosen to represent each sector. Daily returns were used from 2003 to 2007. The three-factor model did well. The FFTF model explained most portfolio returns, even when the sample was halved.

Eom & Park (2008) used the Fama-French test to look at the three-factor model on the emerging Korean stock market. Also found that the three-factor model doesn't work for our whole sample period and most subperiods, which is different from what most developed countries have found. In the few subperiods where the Fama-French test doesn't rule out the three-factor model, they found that the Daniel-Titman test of the three-factor model against the characteristics model isn't clear-cut. They found that the factor loadings on the Korean stock market are unstable. This could explain why the three-factor model was thrown out and why the Daniel-Titman test didn't give a clear answer.

Trimech et al. (2009) conducted a study for assessing the French stock market using the Fama-French three factor model. The empirical findings demonstrate that the wavelet-based three factor model's explanatory power depends on the size of the sample. The market element has a positive impact on investments held for intermediate and longer periods of time. In addition, portfolios made up of small size securities are observed to have a negative size factor. At the longest horizon, large investments also experience a negative size risk. The value proxy HML is significant across a wide range of resolution levels, but is rejected for the single factor model.

Firozaee & Jelodar (2010), Balnco (2012), also found same result that both size and value premium are able to explain the risk-return relationship.

Mehta & Chander (2010), Taneja (2010) found positive size and value effect in the Indian stock market. Manjuantha & Thathaiah (2011) found that three factor model failed to explain the portfolios returns in the Indian stock market.

Phong & Hoang (2012) evaluate the use of the Fama and French three factors' models in the Vietnamese stock market from January 2007 through December 2011. The results indicate that the Fama and French three component models, which attempt to explain the relationship between rate of return and risk, perform better than the CAPM, particularly in these portfolios: S/L, S/H, and B/L.

Alves (2013) found Fama and French Model was significantly more advantageous than the CAPM for small and high-book to market enterprises. In this particular scenario, the presence of foreign factors boosts the predictability of predicted returns.

Dash & Mahakud (2013) looked at three different unconditional multifactor models to explain the behaviour of cross-sectional stock returns in the Indian stock market. The Fama and French time series regression method is used to look at how market risk premium, size, book-to-market equity, momentum, and liquidity affect stock returns as risk factors. The empirical results show that the three factors that Fama and French (1993) proposed to explain the cross-section of stock returns beyond size and book-to-market equity characteristics are still important.

Baek & Bilson (2015) conducted research on the FFTF model in the stock market of the United States. In contrast to earlier research, this one takes into account solely financial institutions but does not provide any theoretical context. Therefore, in order to estimate the cross-section of predicted stock returns in financial organizations, evaluate the validity of size risk and value risk as common risk variables. Two conclusions can be drawn from empirical examinations of asset price. First, size and value risk premia are widely seen in both nonfinancial and financial organizations, even though two elements are less explicable in financial firms. This is despite the fact that size and value risk premia are commonly found in both types of firms. Second, a financial firm is the only type of business that can have an interest rate risk premium.

Sobti (2016) also confirmed no value effect in India but it found size effect. On the other hand, Upadhyay (2017) found no size effect but found weak value effect. Choudhury (2017) confirms weak value effect in the Bangladesh stock market.

Chodhury (2017) investigated whether or not the FFTF model might be applied in the Chittagong Stock Exchange (CSE). From January 2010 through

December 2014, the daily closing prices of thirty choice stocks on the CSE were used to construct a total of nine different portfolios. The interest rate on Bangladesh's Treasury bills is frequently used as a stand-in for the rate on risk-free investments. According to this study's findings, the performance of stocks with a smaller market capitalization is superior to that of firms with a larger market capitalization. In addition to this, it notes that a larger book to market ratio results in lower earnings. Return on the CSE is highly influenced by rational size but only marginally influenced by value. This is despite the fact that return is significantly influenced by value. Due to the fact that the CSE market is driven by rumors and is inefficient, the FF model has positive but less powerful explanatory capacity on stock returns.

Ali et al. (2018) conducted an empirical investigation of FFTF in Pakistani stock returns. They use three distinct approaches to generate factors and identify some potential difficulties along the way. According to what they discovered, the unique characteristics of Pakistan have a substantial impact not only on the size and value factors but also on the explanatory power of the FFTF. In addition to this, the article investigates whether or not the three criteria can accurately forecast the expansion of Pakistan's economy in the coming years. Using monthly data of both financial and non-financial companies between 2002 and 2016, the article empirically investigates and found that: (1) size and book-to-market factors exist in the Pakistani stock market, two mimic portfolios SMB and HML generate a return of 9.15 percent and 12.27 percent per annum, respectively; (2) adding SMB and HML factors into the model meaningfully increases the explanatory power of the model; and (3) the model's factors, except for valuation, explain the stock market performance. Their findings hold true when compared across sub-periods and risk regimes, as well as when analyzed using three distinct approaches to factor construction.

Seth & Mehra (2019) found that in Indian capital market small firms frequently outperform big companies. In India, growth premium replaces value premium. Using the Fama-French 2006 model, investors get a growth premium on three of the four lowest quintiles but a substantial value premium on the largest. CAPM explains the value premium in big stocks but not the growth premium in small stocks. This study affects manager evaluation. Investors should evaluate small company management using the market factor, SBM factor, and another form of the HML factor, GMV or Growth Minus Value. Managers investing in large firms should be evaluated using CAPM alone.

Guo et al. (2022) tested the three-factor model in the Chinese stock market. The relationship between the portfolio returns and three components were studied. They concluded that market risk plays a significant influence in setting stock prices. The “big size company effect” also occurs, however, the model did not fully explain the factors affecting stock pricing, indicating of the existence of additional possible factors affecting stock prices.

2.4 Review of Literature for Carhart Four Factor Model

Despite the fact that the FFTF has covered the vast majority of the asset price anomalies that the CAPM overlooked, there are still a few anomalies remaining. Fama & French (1996, 2008) investigate whether or not the FFTF can account for abnormalities in the CAPM. Although it is successful in describing certain anomalies, such as earning yield, value, size, etc., the model is unable to absorb other well-known anomalies, such as momentum, as Jegadeesh & Titman (1993) have demonstrated. Jegadeesh & Titman (1993) discovered that short-term average stock returns exhibited a substantial momentum impact. The momentum element in stock return becomes the greatest obstacle to overcome for all asset pricing models that do not include exposure to momentum as an explanatory factor. This is because the efficiency of the market is dependent on these models. Carhart (1997) proposes a four-factor model that includes a momentum element in order to account for the largest amount of variation in the average stock returns. When conducting studies on mutual funds, researchers frequently employ a model that is analogous to Carhart (1997), Kosowski et al. (2006), and Fama & French (2010) to determine how effective the funds are. The model uses FFTF alpha intercepts and augments them with a momentum factor.

Eun et al. (2010) tested the four factors in ten developed countries and found all the factors are positive for most of the countries. Czapkiewicz & Wojtaowiczn (2014) support the four-factor model and found that it perform better than the three-factor model in the Polish stock market. Lagvilava (2014), Nwani (2014) also found positive result using the momentum factor. Fama & French (2012), Gregory et.al. (2013) and Costa et al. (2014) also confirm that momentum fail to explain the stocks returns.

Balakrishnan (2016) tested size, value, and momentum effects in stock returns of Indian capital market. It used the data of 484 companies from BSE S&P 500 and the data include month end adjusted stocks prices, market capitalization and price-to-book ratio of the period from January 1997 to August 2014 which were collected from CMIE Prowess. The study used BSE S&P200 as market proxy. The study found that size and value have a strong presence in the Indian stock market and CAPM failed to capture the average returns on size-value and size-momentum sorted portfolios. However, the researcher found that four factor model is more effective for determining average returns on size-momentum sorted portfolios.

Dhankar & Maheshwari (2016) examined the profitability of momentum tactics in the Indian stock market. The study examined momentum effect as a size, value, or illiquidity effect. The study created portfolios using monthly stock return data from 470 BSE-listed stocks from January 1997 to March 2013. The study supports Indian stock market momentum profitability. Unlike the literature, momentum profitability is driven by winning stocks, therefore buying past winners in the Indian stock market yields larger returns than shorting losers. After controlling for stock size, value, and volume, momentum profits were strong. This implies that momentum impact in the Indian stock market is not caused by small size, value, or illiquidity effects.

Agarwalla et al. (2017) found that factor investing based on value and momentum is a feasible investment strategy in India, however factor investing based on size does not perform well. Even if short positions are disregarded, and only value and momentum tilts to the market portfolio are taken into consideration, this statement will still hold true.

Singh & Walia (2021) used both time-series and cross-section to examine the momentum premium for their significance in India's stock market. After accounting for market, size, and value, these gains still stand out as substantial. Time-series momentum also does not reverse over the long term, as evidenced by the fact that the significance of the effect does not diminish while holding stocks for longer periods of time. Specifically, the study finds that net long investments in time-series momentum strategies is the key source of difference between the performances of these two techniques, and that time-series momentum strategies create greater returns than cross-sectional momentum strategies.

2.5 Review of Literature for Fama and French Five Factor Model

Subsequent research provide evidence that previous abnormalities in the stock market's return on investment become less influential in explaining stock returns, and that other factors begin to play a larger role. Fama & French (1996) examine the relationship between size and book to market equity with security returns and earnings. Consistent with the literature, the results of this study indicate that high book to market equity stocks have poor earnings and low book to market equity stocks have great earnings. The study demonstrates that market and size variables in earnings are associated with average stock returns, however BE/ME elements in earnings are not. Two major research by Novy & Marx (2013) and Aharoni et al. (2013) highlighted two important elements, profitability and investment, that Fama-French (1993) and prior studies omit in explaining security returns. Following that, Fama & French (2015) FFTF by enhancing these two parameters, namely profitability and investment in the model.

To back up their inclusion of profitability and investment, Fama & French (2015) cite the dividend discount model. The study found that FFFF did a better job at describing the variation in average stock returns than FFTF did. Fama & French (2016) discuss anomalies with the five-factor model pertaining to positive exposures to RMW and CMA (stock returns that behave like those of profitable firms that invest conservatively), which capture the high average returns associated with low market beta, share repurchases, and low stock return volatility. In contrast, negative RMW and CMA slopes (such as those of somewhat unsuccessful enterprises that spend aggressively) assist in explaining the low average stock returns associated with high, big share issues, and highly variable returns. Fama & French (2017) find similar types of results across worldwide markets, confirming the robustness of FFFF in characterizing size, value (BE/ME), profitability, and investment (asset growth) trends in average stock returns (2015). Fama and French (2015) have included the factors of profitability and investment (asset growth), which runs counter to their earlier findings in 2008. Profitability and investment (asset growth) are reported to have a weaker association by Fama and French (2008), who use the identical factors (2015).

Veen (2016) explore the Fama and French five-factor model as it applies to European stocks. Although they have relatively modest alphas, the size and value factors in Europe both have high average returns and are responsible for explaining a sizeable portion of the variance in test portfolio results. The Fama-Macbeth two-step regression forecasts a considerable risk premium for the size component, while the estimate for the risk premium associated with the value factor is significantly lower. When employing test portfolios double-sorted on size and the book-to-market ratio, the GRS-test demonstrates that the alphas do not have a statistically significant impact on the outcome. Both the average return and the risk premium in Europe are statistically negligible as a result of the determinants of operating profitability and relative investment level. The addition of these factors to the three-factor model does not result in a significant reduction in alpha size in comparison to Fama & French (2015).

French & Fama (2017) found the book-to-market ratio (B/M) and profitability both have a positive correlation with average stock returns in North America, Europe, and Asia Pacific, whereas investment has a negative correlation with stock returns. Although there is a high connection between average returns and B/M for Japan, there is not much of a connection between average returns and either profitability or investment. The patterns in average returns can be largely explained by using a five-factor model instead of Fama & French's (1993) three-factor model. This model expands on the earlier model by include profitability and investment components. The primary flaw of the model, which is also present in Fama & French's (2015, 2016) work, is that it is unable to accurately predict the low average returns of small stocks, whose returns behave similarly to those of poor profitability companies that spend aggressively.

Acaravci & Karaomer (2017) examined the reliability of the FFFF model in relation to the performance of Borsa Istanbul (BIST) over the course of 132 months, beginning in July 2005 and ending in June 2016. As a result, the excess returns of fourteen distinct intersecting portfolios, each of which was formed on the basis of size, market to book ratio, profitability, and investing characteristics, were used for the period spanning July 2005 to June 2016, inclusive. According to the findings of the GRS-F test of FFFF conducted by Gibbons et al. (1989), their findings indicate that there is no price inaccuracy. As a result, it would appear that FFFF is correct in the BIST. In addition to this, it seems as though FFFF can explain fluctuations in excess portfolio returns.

Li et al. (2017) study the United States stock market using a new five-factor model. The data that they use come from 48 different industry portfolios (Jul. 1963-Jan. 2017). The MLE is used to estimate the parameters. For the model diagnostics, LR and KS are utilized. AIC is used to compare the different models. The findings indicate that the Fama-French 5 criteria are still operational. The model presented in Zhou & Li (2016) provides a better fit to the available data than the one presented by Fama & French (2015).

Balakrishnan et al. (2018) tested the Fama-French five factor model in the Indian stock market. The study found that Indian stock market is strongly influenced by the factors i.e. size, value, profitability and investment. The study used BSE-200 listed stocks monthly end adjusted closing prices from January 1999 to April 2015. It constructed the portfolios using the equally weighted portfolios methodology.

Leite & Cortez (2020) research adds to the existing body of evidence supporting the use of the Fama-French five-factor model for assessing the success of foreign equity funds. Funds underperformed the market from 2000 to 2017 after this model was extended to a conditional framework to account for time-varying risk and performance. Both worldwide and Europe-focused funds favor aggressive companies, but only the latter are exposed to companies with low profitability. Therefore, they conclude that the investment component is more important than the profitability factor in explaining fund returns, and this holds true regardless of the geographical area in which the funds invest.

After the introduction of the five factors model many academicians tested the model globally and found mix results. Fama & French (2015) tested the model in the 23 developed stock market which are consisted from different part of the globe. They found that for the small stocks average stock returns for North America, Europe, and Asia Pacific increase with the book-to-market ratio (B/M) and profitability on the other hand these were weaker for big stocks and are negatively related to investment. For Japan the relation between average returns and B/M is strong, but average returns show little relation to profitability or investment.

Lin (2017) found that both value and profitability factors are important, while the investment factor is found to be redundant for describing average returns. The study also found that the model fail to fully capture the high average returns of stocks whose returns perform like those of growth firms that invest conservatively due to low profitability for the double-sorted left-hand-side (LHS) portfolios. On the other hand the study found mix results in the three-dimensional sorting, the LHS portfolios with extremely low average returns are those that cause serious problems for the five-factor model.

Foye (2018) found that five factor model consistently outperform the three-factor model in Eastern Europe and Latin America. However, a profitability or investment premium cannot be distinguished in the Asian factors and the five-factor model fails to provide an improved description of equity returns in the region.

Li & Duan (2021) tested the fama-French three-factor and five factor model using thirty American based industry portfolios. The significance rate of all variables is compared using ordinary least square estimations. From the comparison it has been observed that the COVID-19 pandemic has major effects on the markets as well as on the Fama-French models. Consequently, the level of significance of all independent variables has grown during the COVID-19 pandemic. During the pandemic, the five-factor model achieves a more considerable rise in efficiency, and certain variables, such as HML and CMA, undergo significant alterations. Contrary to many prior research, the market becomes less sophisticated during the pandemic, and the Fama-French five-factor model may be more applicable for estimation in some market circumstances.

2.6 Review of Literature for Fama and French Six Factor Model

Fama & French (2018) developed insights about the maximum squared Sharpe ratio for model factors as a metric for ranking asset pricing models. They consider nested and non-nested models. The nested models are the capital asset pricing model, the three-factor model of Fama & French (1993), the five-factor extension in Fama & French (2015), and a six-factor model that adds a momentum factor. The non-nested models examine three issues about factor choice in the six-factor model: (1) cash profitability versus operating profitability as the variable used to construct profitability factors, (2) long-short spread factors versus excess return factors, and (3) factors that use small or big stocks versus factors that use both.

Maiti (2018) tested a six-factor model by adding two new variables in the Fama and French Six factor model. The new six factor model includes leverage against BE/ME (Book-to-market equity) as value proxy and HC (human capital). The study used 491 companies listed with the BSE S&P 500 from January 1999 to April 2015. The study made a comparative analysis between traditional asset pricing model i.e., CAPM and Fama and French three factor model, it was found that the Fama and French three factor model performs better than the CAPM. Strong size effect has been detected in India while low value effect during the evaluation of cross-sectional relationship between stocks characteristics, financial leverage and stock returns. It also found strong leverage effect among the small size firms but when it comes to medium size firms reverse effect and for large firms leverage effect disappears. Both the traditional and new three factor model provided similar results.

Goel & Garg (2020) tested the Fama and French Six factor model in the Indian capital market using 402 companies from Nifty 500 which exclude the 99 financial service companies. The study used monthly data of 17 years for the portfolio construction from July 2002 to June 2019. The researchers used the LHS portfolio with RHS factors in the regression. The study included only those stocks which have complete data, stocks with positive BE/ME and which have all the factors i.e., value, size, profitability, investment and momentum. The study constructed 25 portfolios each year after sorting the stocks and the number of stocks in each portfolio ranges from 7 to 16 in a given year.

2.7 Research Gap

Following an exhaustive evaluation procedure, the present study identifies the following research gaps, each of which will be filled by the current study. No research have been discovered that used this construction method for the portfolio. Modigliani & Miller (1958, 1963) explain in theoretical terms that the risk profile (beta) of the firms can be modified by leverage, but this does not contradict the essential concept of the asset pricing model. These explanations were published in 1958 and 1963 respectively. As a result, it is preferable that the pricing model be implemented across the board rather than of being limited to the use of non-financial businesses solely. Baek & Bilson (2015) evaluated the size and value components to estimate the cross-section of projected stock return in financial and non-financial enterprises that are traded on the US stock market. Their study was motivated by the Modigliani-Miller theory. According to the findings of the empirical study, size and value premiums are quite widespread in all types of businesses, including financial and non-financial ones. For this reason, the present study has included both financial and nonfinancial organizations, since it is believed that it would not be appropriate in the context of India to exclude companies from the financial sector. The data of both financial and non-financial companies are used in the creation of three different types of portfolios: the fixed basket, the non-financial basket, and the variable basket. No previous research has ever attempted to establish a "basket" to investigate the effects of diverse types of investment portfolios except Ali et al. (2018) who studied the impact of creating baskets but tested only on FFTF. The results of the research is expected to provide a clear image about the viability of constructing numerous portfolios utilizing companies including both the financial and non-financial in nature.

The present study argues that special features are important in the Indian market and compares three different factor construction methodologies. These methodologies may significantly affect the performance of the three-factor model, the four-factor model, the five-factor model, and the six-factor model. In addition, the study argues that special features are important in other markets as well. The terms “fixed basket,” “non-financial basket,” and “variable basket” are used to refer to the three distinct types of stock baskets that can be built. The only stocks that are included in the fixed basket are those that make it through the entirety of the sample period. The non-financial basket and the variable basket, on the other hand, add (or remove) companies from the basket on an annual basis depending on whether or not they meet the sample selection and criteria limitations. The non-financial basket is the only one that contains non-financial equities, while the variable basket contains all of the stocks in the market. Because the sample sizes employed by the vast majority of investigations are very small, the present study make use of a bigger sample size, specifically 16 years. It is anticipated that a dataset that is relatively larger and includes all liquid stocks will improve the power of the tests and capture variation in stock returns to a greater extent than any previous studies in India.

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CHAPTER- 3

METHODOLOGY

3.1 Research Design

Research design simply is the way of conducting research. It can also be defined as the synopsis for the research work. The procedure followed for conducting the research work is presented in this chapter entitled Methodology.

3.2 Statement of the Problem

Indian stock market is one of the largest stock markets in the world. Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) are the two largest stock exchanges in the country. BSE has the highest numbers of listed companies around the world with 5322 companies as on 6^{th} February 2023 and 2113 companies are listed in NSE as on 31^{st} December 2022. Understanding the risk and return of the investment are important for any investors to find out the expected rate of returns from its investment. It is important to do research into risk factor as the numbers of individual as well as institutional investors are increasing at rapid scale. Investors, both the individuals as well as the institutional investors, invest their funds into risk factor portfolios and different index providers create factor indices based on the size, value, volatility, dividend and momentum. On the basis of these risk factor indices, exchange traded funds and asset managers have a benchmark to construct a portfolio while investing using risk factors (Bender et al., 2013). The investment strategies which are based on risk factor are used not only for stocks but also for other types of assets like fixed income assets i.e., corporate bonds, which use the characteristics of the firms that issue the bonds and the bond market as a way to create risk factor portfolios (Houweling & van Zundert, 2017).

The investment strategies based on factors originates from the Fama and French three factor model (1993) where they included two more variables in the CAPM for explaining the cross-sectional variations in returns. Another researcher

Carhart (1997) proposed a model which include another variable in the Fama and French three factor model i.e. momentum. He tested the model in the mutual fund sector of the US equity market and found that with the momentum factor the explanation power of the three-factor model increased. Fama & French (2015) again came up with a new model by adding two more variables i.e., profitability and investment in their previous three factor model. They tested the five factors model in the US and European stock market where they compare the model's effectiveness in both the market. The five-factor approach was first well-received, but it quickly became mired in doubts and controversy. The momentum component is too prevalent and crucial to be disregarded, as Blitz et al. (2018) found out that the FFFF model is not significant enough to explain many other anomalies that are strongly tied to profitability and investment, as the same authors pointed out.

There are so many factors which affect the stock market. The present study is an attempt to analyze the validity of the different factors (market risk, size, value, momentum, profitability and investment) in the Indian stock market on the basis of which all the four models are based. The finding of the study is expected to give a clear picture about the validity of the factors and the model associated with to choose the best factor while constructing the portfolio to get the maximum return at minimal risk.

3.3 Objectives of the Study

The following are the objectives of the present study undertaken:

1. To examine the impact of different baskets on the portfolio returns.
2. To test the validity of the Capital Asset Pricing Model in the Indian capital market
3. To test validity of the Fama and French three factor model in the Indian capital market
4. To test applicability of the Carhart four factor model in the Indian capital market
5. To test the applicability of the five-factor model in the Indian capital market

6. To examine whether six factor model is a better model compare with its predecessor models in the Indian context.

3.4 Variables used in the Study

The present study uses the following variables:

- NSE-500 monthly closing share prices to calculate the returns
- Market capitalization (MC) as proxy for size
- Price to book value (P/B) as proxy for value
- Total asset growth (TA) as the proxy for investment.
- Return on Equity (ROE) as the proxy for profitability
- Momentum (MOM)
- NSE-200 index monthly average return as proxy for market returns (R_m)
- 91 Days T-Bill weekly return data as proxy for risk free interest rate (R_f)

All the data for the NSE 500 index stocks are downloaded from Capitaline database. The market return data and risk-free rate of return i.e., 91 Days T-Bill are downloaded from NSE and RBI official websites.

3.5 Research Methodology

3.5.1 Data Source

The study is based on secondary data. The data have been collected from the Capitaline Database, NSE website, RBI website, etc. The other information relating to the study have been collected from the official websites of the companies, annual reports, books, journals, newspaper and other printed media, etc.

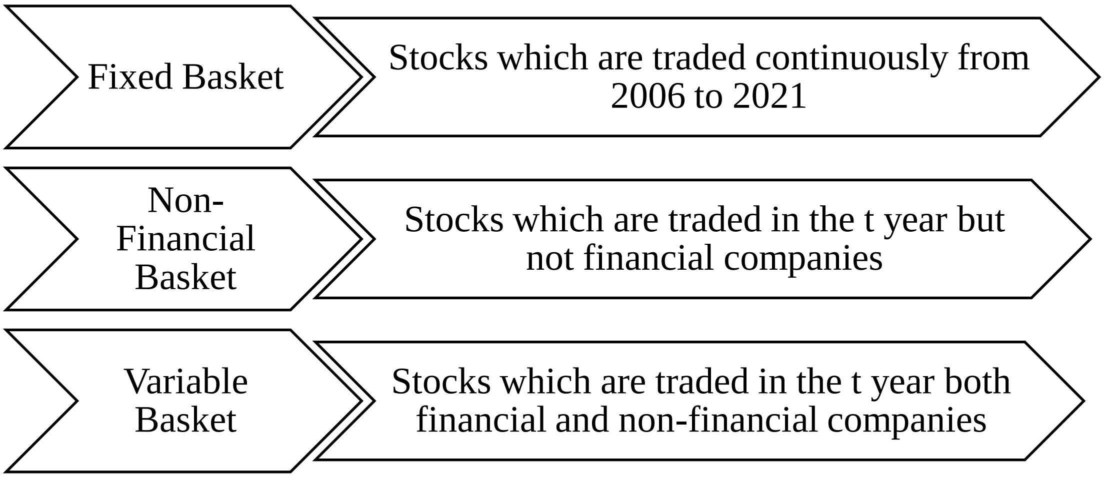
3.5.2 Period of the Study

The data covers a period of 16 years starting January 2006 to December 2021.

3.5.3 Sample

For the study monthly closing price data of the companies listed in the NSE CNX Nifty 500 index as on 3rd June 2022 have been collected. NSE CNX Nifty 500 index represent about 95 percent of the free float market capitalization of the stocks listed on NSE as on 31st March, 2019.The present study created three baskets of portfolios i.e., fixed basket, non-financial basket and variable basket. The fixed basket contains the stocks which are traded from beginning of the study period till the end i.e., 177 stocks. The non-financial basket includes only those which are not part of financial sector but portfolio vary each year. Lastly, the variable baskets includes all the stocks but vary each year. Due to fluctuations in the availability of financial and accounting data, the total number of companies change from year to year in the non-financial and variable basket. The Table 3.1 shows all the stocks that were found to have the data and selected for the present study. The NSE Nifty 200 index is selected as the market proxy for the market return. For the risk-free rate of return the 91 days T-Bill is selected and data have been collected from the RBI database.

Figure 3.1: Baskets of Portfolios



Source: Author's Computation

Table 3.1: Yearly Sample Size from 2006 to 2021

Year	Fixed Basket	Non-Financial	Variable Basket
2006	177	155	180
2007	177	183	210
2008	177	252	292
2009	177	262	304
2010	177	278	319
2011	177	289	332
2012	177	294	338
2013	177	299	342
2014	177	284	325
2015	177	304	347
2016	177	307	350
2017	177	315	361
2018	177	320	375
2019	177	325	380
2020	177	335	390
2021	177	331	386

Source: Author's computation

3.5.4 Models

This section outlines the models taken under study.

a) Capital Asset Pricing Model (CAPM)

$$R_{it} - R_{ft} = \alpha_i + \beta_i \left(R_{mt} - R_{ft}\right) + e_{it}$$

Where,

R_{it}= Return of Stock *'i'* for time period 't'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

e_{it}= Error term

b) Fama-French Three Factor Model (FFTF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + l_i LMH_t + e_{it}$$

Where,

R_{it}	=	Return of Stock *'i'* for time period 't'
R_{ft}	=	Risk-free Rate of Return i.e., 91 Days T-Bill
α_i	=	Alpha/Intercept
β_i	=	Beta Coefficient for Market Premium
R_{mt}	=	Return of Benchmark Market Index
SMB_t	=	Size Risk Premium
LMH_t	=	Value Risk Premium
s_i	=	Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

e_{it} = Error term

c) CFFM (Carhart Four Factor Model)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + u_i UMD_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

UMD_t= Momentum Factor

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

u_i = Coefficient of Momentum Risk Premium

e_{it} = Error term

d) Fama-French Five Factor Model (FFFF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta coefficient for market premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

RMW_t= Operating Profitability Risk Premium

CMA_t= Investment Growth Risk Premium

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

c_i = Coefficient of Investment Risk Premium

r_i = Coefficient of Profitability Risk Premium

e_{it} = Error term

e) Fama-French Six Factor Model (FFSF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + u_i UMD_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

RMW_t= Operating Profitability Risk Premium

CMA_t= Investment Growth Risk Premium

UMD_t= Momentum Factor

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

c_i = Coefficient of Investment Risk Premium

r_i = Coefficient of Profitability Risk Premium

u_i = Coefficient of Momentum Risk Premium

e_{it} = Error term

Figure 3.2: Models Flow Chart

Factors / Models	$R_m - R_f$	**SMB (Size)**	**LMH (Value)**	**CMA (Investment)**	**RMW (Profitability)**	**UMD (Momentum)**
CAPM	✓					
FFTF	✓	✓	✓			
CFFM	✓	✓	✓			✓
FFFF	✓	✓	✓	✓	✓	
FFSF	✓	✓	✓	✓	✓	✓

Source: Author’s Computation

3.5.5 Construction of Variables

The first variable of the study is monthly stocks returns variable, R_{it} for every constituent. The monthly adjusted closing price are collected for calculating monthly stock returns. The equation for calculating the monthly stock returns is given in Table 3.2.

The second variable of the study is market capitalization, MC_{it} which are calculated using market data by taking the product of monthly closing stock price P_{it} and the number of outstanding shares (SO_{it}) for each constituent 'i' at the end of every month 't'. The market capitalization variable is used as the proxy for the size of the stock/company and are used to construct size-based portfolios. The equation for calculating the market capitalization variable is mentioned in the Table 3.2.

The third variable is the value represented by Price-to-Book Value, P/B_{it}. The P/B_{it} for the stocks are obtained by dividing the market capitalization $MC_{p,t}$ variable with book value of equity (BE_{it}). The P/B_{it} ratio represents the value risk factor and companies with lower $P/B_{i,t}$ ratio are considered to be undervalued by the market. On the other hand, companies with a relatively high P/B_{it} ratio are considered to be overvalued by the market. The equitation for calculating the P/B_{it} variable is mentioned in the Table 3.2.

The next variable is profitability, P_{it} Return on equity (ROE) is used as the proxy for profitability. The profitability, P_{it} variable is constructed dividing the net income by Shareholder's equity. In this study the variable taken is different from the Fama & French (2015) where they used OP (Operating Profit). They constructed the operating profit variable by taking the annual revenues minus the cost of goods sold, minus general, administrative and selling expenses, minus interest expense and then divide the resulting operating profits by the book value of equity (BE_{it}). The equation for creating the PRO_{it} variable is given in Table 3.2.

The fifth variable is investment, INV_{it} and this variable is calculated by looking at the change in the value of the total assets held by the company. For calculating the change in the value of the assets we have divided the difference between the total assets of the company in the previous financial year i.e., *t-1* and the total assets of the company in the current financial year i.e., *t* by the total assets of the company in the previous financial year *t-1*. The outcome of the variable shows us the change in the value of the total assets held by the company in relation to the total value of the company's assets. The equation for investment variable is given at Table 3.2.

The last variable of the study is momentum, MOM_{it}. This particular variable is calculated by taking the moving average of returns for the previous financial years i.e., twelve months. The stocks returns of the twelve months are equally weighted which are considered to show a trend in recent returns in accordance with the model of Carhart (1997) that shows that on average recent returns with a positive or negative sign are followed by stocks return of the same sign in the short-term future. The equation for calculating the momentum variable is given at Table 3.2.

Table 3.2: Construction of Variables

Variables	Equations
Stocks Return, R_{it}	$R_{it} = \frac{P_{it}-P_{t-1}}{P_{t-1}} * 100$
Market Capitalization, MC_{it}	$MC_{it} = P_{it} * SO_{it}$
Price-to-Book Value, P/B_{it}	$P/B_{it} = MC_{it}/BE_{it}$
Profitability, PRO_{it}	$P_{it} = Net\ Income_{it}/Shareholder's\ Equity_{it}$
Investment, INV_{it}	$INV_{it} = (TA_{it} - TA_{it-1})/TA_{it-1}$
Momentum, MOM_{it}	$MOM_{it} = \sum_{j=1}^{12} R_{it-j} /12$

Source: Author's computation

3.5.6 Portfolio Construction

The study uses Fama & French (1993) methodology to construct portfolios. Both the single and double sorting techniques are used to construct the portfolios as explained in the following paragraphs and are presented in the Table 3.3.

3.5.6.1 Single Sorting

In the month of January year (t), ranking is done for the sample stocks based on MC and 5 equally weighted portfolios are formed. Portfolio one (M_1) is the small MC portfolio as the bottom 20% of the sample securities are there in M_1 while portfolio five (M_5) is the big MC portfolio as it contains of top 20% of the sample stocks. Next, in the month of January year (t+1), ranking done for the sample stocks based on P/B ratio and 5 equally weighted portfolios are constructed. Portfolio one (P_1) is the portfolio that has low P/B stocks while portfolio five is the (P_5) portfolio that comprises of stocks which are of high P/B stocks.

3.5.6.2 Double Sorting

Then, 25 portfolios (MP_{11} to MP_{55}) are constructed from the intersection of 5 MC based portfolios and 5 P/B based portfolios. MP_{11}consists of the small MC stocks and low value P/B stocks whereas MP_{55} consists of big MC stocks and high P/B stocks. Then all portfolios mean excess returns are calculated. Next revision of portfolio formation is done in year (t+1) and the process of portfolio revision continues till the end year.

3.5.6.3 Single Sorted Mimicking Portfolios

In the month of January year (t), ranking done for the sample stocks based on MC and 2 equally weighted portfolios are formed. Portfolio one Small(S) is the small MC portfolio as the bottom 50% of the sample securities are there in Small while portfolio Big(B) is the big MC portfolio as it contains of top 50% of the sample stocks. Next, in the month of January year (t), ranking done for the sample stocks based on P/B ratio and 3 equally weighted portfolios are constructed. Portfolio Low(L) is the portfolio that has low value stocks while portfolio High(H) is the portfolio that comprises of stocks which are of high P/B stocks and rest grouped in the Medium(M).

3.5.6.4 Double Sorted Mimicking Portfolios

Then, six portfolios (S/L, S/M, S/H, B/L, B/M and B/H) are constructed from the intersection of 2 MC based portfolios and 3 P/B ratio-based portfolios. S/L consists of the small MC stocks and low P/B stocks whereas B/H consists of big MC stocks and high P/B stocks. Then mean excess returns of all the portfolios are calculated. Next revision of portfolio formation is done in year (t+1) and the process of portfolio revision continues till the end year.

Table 3.3a: Single and Double Sorted Portfolios of Size-Value (P/B)

Size Sorted	**Single Sort**	**Single Sort**	**Double Sort**
Size-Value	**Market Capitalization**	**P/B Ratio**	**25 Portfolios from the Cross of 5MC & 5 P/B Portfolios**
	Small	Low	Small/Low (MP11); Small/1(MP12);…; Small/High (MP15)
	1	1	1/Low (MP21); 1/1(MP22);…; (MP25)
	2	2	2/Low (MP31); 2/1(MP32);…; (MP35)
	3	3	3/Low (MP41); 3/1(MP42);…; (MP45)
	Big	High	Big/Low (MP51); 5/1(MP52);…; Big/High (MP55)
	Market Capitalization	**P/B Ratio**	**6-Portfolios from the Cross of 2 MC & 3 P/B Portfolios**
		Low(L)	
	Small	Medium(M)	S/L; S/M; S/H
	Big	High(H)	B/L; B/M; B/H

Source: Author's computation

Table 3.3b: Single and Double Sorted Portfolios of Size-Investment

Size Sorted	**Single Sort**	**Single Sort**	**Double Sort**
Size-INV	**Market Capitalization**	**Investment**	**25 Portfolios from the Cross of 5 MC & 5 INV Portfolios**
	Small	Conservative	Small/Conservative (MP11); Small/1(MP12);…; Small/Aggressive (MP15)
	1	1	1/Conservative (MP21); 1/1(MP22);…; (MP25)
	2	2	2/Conservative (MP31); 2/1(MP32);…; (MP35)
	3	3	3/Conservative (MP41); 3/1(MP42);…; (MP45)
	Big	Aggressive	Big/Conservative (MP51); 5/1(MP52);…; Big/Aggressive (MP55)
	Market Capitalization	**Investment**	**6 Portfolios from the Cross of 2 MC & 3 INV Portfolios**
		Conservative(C)	
	Small	Medium(M)	S/C; S/M; S/A
	Big	Aggressive(H)	B/C; B/M; B/A

Source: Author's computation

Table 3.3c: Single and Double Sorted Portfolios of Size-Profitability

Size Sorted	**Single Sort**	**Single Sort**	**Double Sort**
Size - PRO	**Market Capitalization**	**Profitability**	**25 Portfolios from the cross of 5MC & 5 Profitability Portfolios**
	Small	Robust	Small/Robust (MP11); Small/1(MP12);…; Small/Weak (MP15)
	1	1	1/Robust (MP21); 1/1(MP22);…; (MP25)
	2	2	2/Robust (MP31); 2/1(MP32);…; (MP35)
	3	3	3/Robust (MP41); 3/1(MP42);…; (MP45)
	Big	Weak	Big/Robust (MP51); 5/1(MP52);…; Big/Weak (MP55)
	Market Capitalization	**Profitability**	**6-Portfolios from the Cross of 2 MC & 3 Profitability Portfolios**
		Robust(R)	
	Small	Medium (M)	S/R; S/M; S/W
	Big	Weak(W)	B/R; B/M; B/W

Source: Author's computation

Table 3.3d: Single and Double Sorted Portfolios of Size-Momentum

<table>
<tr><th>Size Sorted</th><th>Single Sort</th><th>Single Sort</th><th>Double Sort</th></tr>
<tr><td rowspan="12">Size - MOM</td><td>Market Capitalization</td><td>Momentum</td><td>25 Portfolios from the Cross of 5MC & 5 Profitability portfolios</td></tr>
<tr><td>Small</td><td>Up</td><td>Small/Up (MP11); Small/1(MP12);…; Small/Down (MP15)</td></tr>
<tr><td>1</td><td>1</td><td>1/Up (MP21); 1/1(MP22);…; (MP25)</td></tr>
<tr><td>2</td><td>2</td><td>2/Up (MP31); 2/1(MP32);…; (MP35)</td></tr>
<tr><td>3</td><td>3</td><td>3/Up (MP41); 3/1(MP42);…; (MP45)</td></tr>
<tr><td>Big</td><td>Down</td><td>Big/Up (MP51); 5/1(MP52);…; Big/Down (MP55)</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Market Capitalization</td><td>Momentum</td><td>6-Portfolios from the Cross of 2 MC & 3 Momentum portfolios</td></tr>
<tr><td></td><td>Up(U)</td><td></td></tr>
<tr><td>Small</td><td>Medium (M)</td><td>S/U; S/M; S/D</td></tr>
<tr><td>Big</td><td>Down(D)</td><td>B/U; B/M; B/D</td></tr>
</table>

Source: Author's computation

3.5.7 Construction of Factors

As the variables have been constructed, these variables are used to create the risk factors through assigning the stocks returns to a particular portfolio weighted by their market capitalization MC_{it}. The decision for buying or selling a portfolio is based on the factors. The portfolios are constructed on the basis of the market capitalization MC_{it} or a given variable of the stocks i.e., highest to lowest MC_{it}.

The size factor i.e., Small minus Big (SMB_t), is created with the help of six double-sorted portfolios which are again created using the market capitalization MC_{it} and price-to-book ratio (P/B_{it}). All the portfolios are constructed with equal weight i.e., the size MC_{pt} 50-50 and 33.33 each. The securities with the smallest and biggest 50-50 values are used to construct the *S* and *B* portfolios. These portfolios are again sorted on the basis of the P/B_{it} of the company. The securities with the lowest, medium and the highest P/B_{it} are constructed as the *L*, *M* and *H* portfolios respectively. Based on the intersection of the *S & B* and *L, M & H* portfolios six new portfolios are constructed as SL_t, SM_t, SH_t, BL_t, BM_t and BH_t. For constructing the value factor SMB_t, the equally weighted average returns of the portfolios with the small market capitalization, the sum of SL_t, $SM_t$and SH_t minus the equally weighted average returns of the largest market capitalization, the sum of BL_t, BM_t and BH_t.The equation for creating the value factor is mentioned in the Table 3.4.

In the study first the value factor i.e., Low minus High (LMH_t), is created with the help of six double-sorted portfolios which are again created using price-to-book ratio (P/B_{it}) and the market capitalization MC_{it}. All the portfolios are constructed with equal weight i.e., 33.33 each and the size MC_{pt} 50-50. The securities with the lowest and highest 33.33 percent P/B_{it} values are used to construct the *L* and *H* portfolios. These portfolios are again sorted on the basis of the market capitalization of the company. The securities with the smallest and the largest market capitalization are constructed as the *S* and *B* portfolios respectively. The selected securities for each portfolio have their returns weighted based on their market capitalization and to create the portfolio return. Based on the intersection of the L & H and S & B portfolios four new portfolios are constructed as SL_t, SH_t, BL_t and BH_t. For constructing the value factor LMH_t, the equally weighted average returns of the portfolios with the lowest book-to-market ratio, the sum of SL_t and BL_t minus the equally weighted average returns of the highest P/B_{it} ratio, the sum of SH_t and BH_t.The equation for creating the value factor is mentioned in the Table 3.4.

Next three factors investment i.e., Conservative minus Aggressive (CMA_t), profitability i.e., Robust minus Weak (RMW_t) and momentum i.e., Up minus Down (UMD_t) are constructed in similar way i.e., by constructing double-sorted portfolios with value weighted returns using the top 33.33 and bottom 33.33 percentiles as breakpoints. The investment factor differs in this regard from the other factors, by considering the returns of the portfolios with the lowest investment levels, the sum of $SC_t$and BC_t minus the returns of the portfolios with the highest investment levels, the sum of $SA_t$and BA_t, as higher the investment level of investment coincides with relatively lower returns based on Fama & French (2015).

In the last the market factor is constructed according to the Capital Asset Pricing Model by Sharpe (1964), Linter (1965) and Black (1972).

Table 3.4: Construction of Factors

Size	$SMB_t = \frac{1}{3}(SL_t + SM_t + SH_t) - \frac{1}{3}(BL_t + BM_t + BH_t)$
Value	$LMH_t = \frac{1}{2}(SL_t + BL_t) - \frac{1}{2}(SH_t + BH_t)$
Profitability	$RMW_t = \frac{1}{2}(SR_t + BR_t) - \frac{1}{2}(SW_t + BW_t)$
Investment	$CMA_t = \frac{1}{2}(SC_t + BC_t) - \frac{1}{2}(SA_t + BA_t)$
Momentum	$UMD_t = \frac{1}{2}(SU_t + BU_t) - \frac{1}{2}(SD_t + BD_t)$

Source: Author's computation

3.6 Conclusion

The present study used LMH factor instead of HML because P/B replace BE/ME ratio as the value proxy, which is the inverse of P/B. Similar methodology was adopted by Sehgal & Balakrishnan (2013). The data analysis has been conducted by taking average return of the 25 portfolios of all the baskets. The regression results are obtained for each of the six risk-based portfolios. The linear regression also run for 25 portfolios for all the five models viz. CAPM. FFTF, CFFM, FFFF and FFSF. Finally, as a confirmatory test, GRS-Test is conducted for all the models. The data analysis and discussion of the above models are presented in the chapter 4.

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CHAPTER - 4
DATA ANALYSIS AND DISCUSSION

In this chapter the data have been analyzed, interpreted under various sub-headings. Data have been analyzed to find out the validity of the five models for all the three baskets of portfolios constructed.

4.1 Independent Variables

Table 4.1a, 4.1b and 4.1c show the descriptive statistics of the monthly returns of the factors of SMB (Small Minus Big), LMH (Low variable Minus High), CMA (Conservative Minus Aggressive), RMW (Robust Minus Weak) and UMD (Ups Minus Down) for fixed basket stocks, non-financial basket stocks, basket stocks.

Table 4.1a: Descriptive Statistics for the Independent Variables of Fixed Basket Portfolios

Factors	Observation	Mean	Std. Dev.	Min	Max
Rm-Rf	191	1.47	13.11	-35.70	62.61
SMB	191	-0.04	3.07	-12.80	11.23
LMH	191	0.11	2.00	-5.64	6.08
CMA	191	-0.40	2.22	-5.93	6.84
RMW	191	0.71	3.17	-12.28	8.22
UMD	191	3.14	3.24	-6.91	13.15

Source: Author's computation

As given in the Table 4.1a, there are 191 observations in the fixed basket portfolio. The market premium of 1.47 percent, size premium of -0.04, value premium of 0.11 percent, capital investment premium of 0.11 percent, profitability premium of -0.40 percent and momentum premium of 3.14 percent per month are observed in the portfolio average monthly return patterns. As can be seen from the Table 4.1a, it is observed that investment decision based on momentum of the company yield higher average stock returns than investment decision based on other factors.

Table 4.1b: Descriptive Statistics for the Independent Variables of Non-Financial Basket Portfolios

Factors	Observation	Mean	Std. Dev.	Min	Max
Rm-Rf	191	1.47	13.11	-35.70	62.61
SMB	191	-0.09	3.18	-9.19	11.80
LMH	191	0.21	1.75	-5.05	8.83
CMA	191	-1.33	2.46	-11.21	7.39
RMW	191	1.37	3.34	-11.05	10.57
UMD	191	6.65	3.78	-4.30	23.02

Source: Author's computation

Table 4.1b shows the descriptive statistics for the independent variables $Rm-R_f$, SMB, LMH, CMA, RMW and UMD for the non-financial basket portfolios. Market premium of 1.47 percent, size Premium of -0.09, value premium of -0.10 percent, capital investment premium of -0.10 percent, profitability premium of -1.33 percent and momentum premium of 6.65 percent per month is observed in the portfolio's average monthly return patterns. Similar with fixed basket portfolios, in the case of non-financial basket portfolios also investment decision based on momentum of the company yield higher average stock return than investment decision based on other variables. After momentum market risk i.e., Beta and profitability of the company yield higher average stock returns. It is also observed from the descriptive statistics that size and investment factors give negative returns.

Table 4.1c: Descriptive Statistics for the Independent Variables of Variable Basket Portfolios

Factors	Observation	Mean	Std. Dev.	Min	Max
Rm-Rf	191	1.47	13.11	-35.7	62.61
SMB	191	-0.03	3.12	-9.31	9.45
LMH	191	0.17	1.75	-4.58	8.476
CMA	191	-1.48	2.25	-10.00	5.79
RMW	191	1.43	3.76	-11.45	11.69
UMD	191	5.87	3.89	-5.181	21.79

Source: Author's computation

Table 4.1c shows the descriptive statistics for the independent variables *Rm-Rf*, SMB, LMH, CMA, RMW and UMD for the variable basket portfolio. Market Premium of 1.47 percent, size premium of -0.03, value premium of 0.17 percent, capital investment premium of -1.48 percent, profitability premium of 1.43 percent and momentum premium of 5.87 percent per month is observed in the portfolio average monthly return patterns. Investment decision based on momentum of the company yield higher average stock returns than investment decision based on other variables. After momentum market risk i.e., Beta and profitability of the company yield higher average stock returns. Similar with the non-financial basket portfolios, the variable basket portfolio based on size and investment factor also give negative returns.

4.2 Correlation Between the Independent Variables

Table 4.2a, 4.2b & 4.2c describes the correlation between the independent variables Rm-Rf, SMB, LMH, CMA, RMW and UMD of fixed basket, non-financial basket and variable basket. Correlations were computed to find out the relationship among the factors.

Table 4.2a: Correlation Matrix for Explanatory Variables of Fixed Basket Portfolios

	Rm-Rf	**SMB**	**LMH**	**CMA**	**RMW**	**UMD**
Rm-Rf	1					
SMB	0.18	1				
LMH	-0.09	0.00	1			
CMA	0.13	0.16	0.06	1		
RMW	-0.25	-0.03	0.08	-0.27	1	
UMD	-0.04	0.07	0.07	0.00	0.18	1

Source: Author's computation

As given in the Table 4.2a the market risk (Rm-Rf) is positively related to SMB and CMA factors, and negatively related to LMH, RMW and UMD factors. Similarly, SMB and LMH is positively related. RMW is negatively related to all other factors except LMH. In terms of fixed basket portfolios, there is no significant correlation among the factors. The highest correlation observed is between Rm-Rf and RMW which is negatively correlated with a value of -0.25.

Table 4.2b: Correlation Matrix for Explanatory Variables of Non-Financial Basket Portfolios

	Rm-Rf	SMB	LMH	CMA	RMW	UMD
Rm-Rf	1					
SMB	0.21	1				
LMH	0.11	0.18	1			
CMA	0.18	0.08	0.01	1		
RMW	-0.47	-0.21	-0.16	-0.39	1	
UMD	0.12	0.11	0.00	-0.16	0.01	1

Source: Author's computation

Table 4.2b describes the correlation between the independent variables Rm-Rf, SMB, LMH, CMA, RMW and UMD for non-financial basket. Market risk (Rm-Rf) is positively related to SMB, LMH, CMA and UMD factors, and negatively related to RMW factor. Similarly, SMB and LMH is positively related. RMW is negatively related to all other factors.

Table 4.2c: Correlation Matrix for Explanatory Variables of Variable Basket Portfolios

	Rm-Rf	SMB	LMH	CMA	RMW	UMD
Rm-Rf	1					
SMB	0.24	1				
LMH	0.23	0.96	1			
CMA	0.30	0.10	0.10	1		
RMW	-0.38	-0.24	-0.21	-0.51	1	
UMD	0.12	0.18	0.16	-0.14	0.04	1

Source: Author's computation

Table 4.2c describes the correlation between the independent variables Rm-Rf, SMB, LMH, CMA, RMW and UMD for variable basket. Market risk (Rm-Rf) is positively related to SMB, LMH, CMA and UMD factors, and negatively related to RMW factor. Similarly, SMB and LMH is highly related with value of 0.96. CMA and UMD is negatively corelated and RMW is negatively corelated to all other factors.

4.3 Average Returns of the 25 Portfolios

The average returns of 25 portfolios of the three baskets are given below.

4.3.1 Average Returns of the 25 Portfolios for Fixed Basket

In Table 4.3a, 4.3b, 4.3c and 4.3d the monthly average returns of 25 portfolios formed on size-value, size-investment, size-profitability and size-momentum respectively for fixed basket from 2006 to 2021are given.

Table 4.3a: Monthly Average Returns of 25 Portfolios formed on Size-Value Crossed Portfolio for Fixed Basket

	Low	**2**	**3**	**4**	**High**
Small	0.9	1.85	1.41	0.69	1.46
2	2.11	1.33	2.09	1.7	1.22
3	1.32	1.5	1.96	1.83	1.79
4	1.69	1.54	1.47	1.34	0.83
Big	1.35	1.54	1.22	1.68	1.44

Source: Author's computation

Table 4.3b: Monthly Average Returns of 25 Portfolios formed on Size-Investment Crossed Portfolio for Fixed Basket

	Conservative	**2**	**3**	**4**	**Aggressive**
Small	1.86	0.86	1.1	1	1.69
2	2	1.05	1.59	1.59	1.7
3	1.72	0.69	1.96	1.27	2.38
4	0.81	1.19	1.19	1.82	1.78
Big	1.51	1.17	1.41	1.42	1.49

Source: Author's computation

Table 4.3c: Monthly Average Returns of 25 Portfolios formed on Size-Profitability Crossed Portfolio for Fixed Basket

	Robust	**2**	**3**	**4**	**Weak**
Small	2.47	0.98	1.35	1.12	1
2	3.46	1.57	2.16	1.02	0.64
3	2.12	1.72	1.47	1.38	1.99
4	1.58	1.55	0.74	1.05	1.37
Big	1.76	0.98	1.61	0.88	0.97

Source: Author's computation

Table 4.3d: Monthly Average Returns of 25 Portfolios formed on Size-Momentum Crossed Portfolio for Fixed Basket

	Up	2	3	4	Down
Small	4.12	1.73	1.29	0.54	-1.19
2	4.13	2.1	1.56	0.52	-0.79
3	2.08	4.3	1.37	0.68	-0.43
4	3.3	2.25	1.32	0.55	-0.16
Big	3.55	2.07	0.77	1.08	-0.26

Source: Author's computation

The monthly average returns of 25 portfolios formed on size-value, size-investment, size-profitability and size-momentum crosses for fixed basket are given in Table 4.3a to 4.3d. As there is no clear difference in the value of the mean excess return of the 25 portfolios formed on size and value, it thus shows unclear picture of size and value effect on the stock return. This is due to fact that none of the smallest size and value sorted portfolio or other size cross portfolios produced the highest mean excess return whereas MP21 portfolio produced the highest return. In fact, MP11 portfolio of size and value cross portfolio produced the third least mean excess return at 0.90 after MP14 (0.69) and MP45 (0.83). MP32 portfolio from size-momentum cross produced the highest mean excess return with a value of 4.3 among all the size cross portfolios. This finding is contrary to the findings of Fama & French (1993, 2015) in the USA context and Connor & Sehgal (2003); Kumar & Sehgal (2004), Sehgal and Balakrishnan (2013); Maiti (2018) and Goel & Garg (2020) in the Indian stock market context.

The size-profitability cross portfolios show clear effect of profitability factor as the high profitable firms outperform the lowest one. Likewise, size-momentum cross portfolios provide a clear picture about momentum factor effect in the stocks return. The high momentum firms produced higher mean excess return whereas the least momentum firms produced negative premium. This finding proves the presence of momentum effect in the Indian stock return.

4.3.2 Average Returns of the 25 Portfolios for Non-Financial Basket

In Table 4.4a, 4.4b, 4.4c and 4.4d the monthly average returns of 25 portfolios formed on size-value, size-investment, size-profitability and size-momentum for Non-Financial Basket from 2006 to 2021 are given.

Table 4.4a: Monthly Average Returns of 25 Portfolios Formed on Size-Value Cross Portfolios for Non-Financial Basket

	Low	2	3	4	High
Small	0.82	1.53	1.04	0.54	1.57
2	1.71	1.65	1.54	1.57	1.55
3	2.13	1.69	1.85	2.05	1.81
4	2.11	1.71	1.66	1.82	0.91
Big	1.41	1.58	1.12	1.18	1.29

Source: Author's computation

Table 4.4b: Monthly Average Returns of 25 Portfolios Formed on Size-Investment Cross Portfolios for Non-Financial Basket

	Conservative	2	3	4	Aggressive
Small	0.57	0.97	1.04	0.92	1.85
2	1.14	1.26	0.98	1.96	2.47
3	1.71	1.23	1.91	1.49	2.58
4	1.49	1.28	1.78	1.67	2.9
Big	1.05	1.54	1.18	1.06	1.91

Source: Author's computation

Table 4.4c: Monthly Average Returns of 25 Portfolios Formed on Size-Profitability Cross Portfolios for Non-Financial Basket

	Robust	2	3	4	Weak
Small	2.69	1.76	1.56	1.05	0.27
2	3.21	2.65	1.87	1.58	0.44
3	3.28	2.27	1.4	1.49	2.03
4	2.11	1.97	1.44	1.13	1.04
Big	1.38	1.19	1.29	0.99	1.45

Source: Author's computation

Table 4.4d: Monthly Average Returns of 25 Portfolios Formed on Size-Momentum Cross Portfolios for Non-Financial Basket

	Up	2	3	4	Down
Small	5.89	6.13	6.41	5.97	5.38
2	2.14	2.96	2.78	2.89	2.92
3	1.37	1.45	1.39	1.54	1.41
4	0.18	0.25	0.19	0.22	0.09
Big	-1.93	-1.6	-1.7	-1.67	-1.52

Source: Author's computation

The monthly average returns of 25 portfolios formed on size-value, size-investment, size-profitability and size-momentum crosses for non-financial basket are given in Table 4.4a to 4.4d. The mean excess return pattern of the 25 portfolios formed on size and value measure for non-financial basket show no size and value effect. Like fixed basket the smallest size and value sorted portfolio do not give highest return whereas MP31 portfolio produced the highest return. MP11 portfolio of size and value cross portfolio produced the second least mean excess return at 0.82 after MP14 (0.54). MP32 portfolio from size-momentum cross produced the highest mean excess return among all the size cross portfolios. This finding is contrary to the findings of Fama & French (1993, 2015) in the USA context and Connor & Sehgal (2003); Sehgal & Balakrishnan (2013), Balakrishnan (2016); Maiti (2018) and Goel & Garg (2020) in the Indian stock market context. As we can see from Table 4.4d, there is a clear size factor effect in the size-momentum cross portfolios but other size cross portfolios do not provide a clear size factor effect in the stocks return. It is observed from the Table 4.4d, the smallest size firms outperform the large size firms while all the large size firms produce negative returns.

4.3.3 Average Returns of the 25 Portfolios for Variable Basket

In Table 4.5a, 4.5b, 4.5c and 4.5d the monthly average returns of 25 portfolios formed on size-value, size-investment, size-profitability and size momentum for Variable Basket from 2006 to 2021 are given.

Table 4.5a: Monthly Average Returns of 25 Portfolios Formed on Size-Value Cross Portfolios for Variable Basket

	Low	2	3	4	High
Small	0.82	1.35	1.22	0.85	1.16
2	1.68	1.7	1.52	1.63	1.66
3	1.62	1.46	1.69	2.01	1.61
4	2.05	1.79	1.18	1.61	1.17
Big	1.7	1.43	1.21	1.25	1.3

Source: Author’s computation

Table 4.5b: Monthly Average Returns of 25 Portfolios formed on Size-Investment Cross Portfolios for Variable Basket

	Conservative	2	3	4	Aggressive
Small	0.43	0.57	1.13	1.43	2.18
2	0.83	1.38	1.72	2.2	2.62
3	0.95	0.66	1.65	1.7	2.66
4	0.98	1.05	1.58	1.77	2.82
Big	0.5	1.23	1.28	1.45	1.85

Source: Author's computation

Table 4.5c: Monthly Average Returns of 25 Portfolios formed on Size-Profitability Cross Portfolios for Variable Basket

	Robust	2	3	4	Weak
Small	3.2	1.52	1.4	0.95	0.09
2	2.85	2.32	1.58	1.43	0.45
3	3.2	2.2	1.42	1.05	1.02
4	2.07	2.01	1.23	1.36	0.61
Big	1.47	1.43	1.28	0.7	1.09

Source: Author's computation

Table 4.5d: Monthly Average Returns of 25 Portfolios formed on Size-Momentum Cross Portfolios for Variable Basket

	Up	2	3	4	Down
Small	5.91	2.68	1.06	0.11	-2.21
2	5.82	2.78	1.69	-0.25	-1.93
3	6.16	2.72	1.3	0.04	-2.13
4	5.5	2.98	1.21	-0.15	-2.07
Big	4.6	2.55	1.23	0.02	-1.82

Source: Author's computation

As can be observed in the Table 4.5a to 4.5d, the mean excess return pattern of the 25 portfolios formed on size and value measure for variable basket show no size and value effect. Like fixed and non-financial basket, the smallest size and value sorted portfolio produced least mean excess return whereas MP41 portfolio produced the highest return of 2.05 percent. This finding is contrary to the findings of Fama & French (1993, 2015) in the USA context and Connor & Sehgal (2003); Sehgal & Balakrishnan (2013), Balakrishnan (2016); Maiti (2018) and Goel & Garg (2020) in the Indian stock market context. The size-investment cross portfolios' return show that the most aggressively invested firm produce high mean excess return in comparison to least invested firms but no size effect. Similarly, size-profitability cross portfolio also shows high profit firms produce better mean excess return compared to low profitable firms (Novy-Marx, 2013). Likewise, there is clear momentum effect instead of size as in the size-momentum cross portfolios the high momentum firms outperform the low momentum firms. All the low momentum firms produce negative returns.

So, from the above discussion it is clear that there is no size effect in the Indian stock market irrespective of the basket of portfolios as revealed by the result given in the Table 4.5a to 4.5d.

4.4 Regression Results for each of the Six Risk-Based Portfolios

In this section, the analysis are conducted on the standard CAPM, Fama-French Three Factor model, Carhart Four Factor model, Fama-French Five Factor model and Fama-French Six Factor model by employing linear regression for each of the six factors viz. Size-P/B (SL, SM, SH, BL, BM, BH), Size-Investment (SC, SM, SA, BC, BM, BA), Size-Profitability (SR, SM, SW, BR, BM, BW), and Size-Momentum portfolios (SU, SM, SD, BU, BM, BD). The objective of this approach is to identify the role of size, value, investment, profitability and momentum factors in capturing the variation in stock returns during the period from January 2006 to December 2021. The study started with single factor CAPM in Table 4.6a – 4.9c in order to make a comparison with the three-factor model, four factor model, five factor model and six factor model.

4.4.1 CAPM Regression Analysis of Six Risk-Based Portfolios with Market Risk (R_m-R_f) as the Independent Variable

$$R_{it} - R_{ft} = \alpha_i + \beta_i \left(R_{mt} - R_{ft}\right) + \mathrm{e}_{it}$$

4.4.1.1 CAPM Regression Analysis of the Size-Value Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), as the Independent Variable for CAPM

Table 4.6a: CAPM Regression Result on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Fixed Basket)

	α	β	R^2	Adj. R^2
SL	1.36	0.42	0.43	0.42
t-value	(2.89)***	(11.84)***		
SM	1.32	0.44	0.46	0.46
t-value	(2.89)***	(12.67)***		
SH	1.3	0.44	0.46	0.45
t-value	(2.82)***	(12.61)***		
BL	1.48	0.4	0.52	0.52
t-value	(4.06)***	(14.31)***		
BM	1.52	0.38	0.55	0.54
t-value	(4.6)***	(15.07)***		
BH	1.28	0.4	0.55	0.55
t-value	(3.69)***	(15.26)***		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CAPM of fixed baskets. Stocks are sorted into size-value portfolios (SL, SM, SH, BL, BM, BH). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.).*

Table 4.6b: CAPM Regression Result on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Non-Financial Basket)

	α	β	R^2	Adj. R^2
SL	1.34	0.44	0.42	0.41
t-value	(2.7)***	(11.6)***		
SM	1.39	0.42	0.44	0.44
t-value	(3.11)***	(12.24)***		
SH	1.4	0.43	0.46	0.45
t-value	(3.08)***	(12.59)***		
BL	1.8	0.37	0.49	0.49
t-value	(4.97)***	(13.48)***		
BM	1.52	0.36	0.52	0.52
t-value	(4.57)***	(14.33)***		
BH	1.31	0.38	0.53	0.53
t-value	(3.85)***	(14.56)***		

Source: Author's computation
Note: *Author's calculation. The table reports the estimation results of the single factor CAPM of the non-financial basket. Stocks are sorted into size-value portfolios (SL, SM, SH, BL, BM, BH). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

Table 4.6c: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Variable Basket)

	α	β	R^2	Adj. R^2
SL	1.23	0.45	0.43	0.42
t-value	(2.45)**	(11.89)***		
SM	1.32	0.44	0.48	0.48
t-value	(3.05)***	(13.3)***		
SH	1.39	0.43	0.45	0.45
t-value	(3.05)***	(12.46)***		
BL	1.69	0.4	0.53	0.53
t-value	(4.67)***	(14.56)***		
BM	1.35	0.38	0.56	0.56
t-value	(4.16)***	(15.45)***		
BH	1.23	0.39	0.56	0.56
t-value	(3.7)***	(15.58)***		

Source: Author's computation
***Note:** The table reports the estimation results of the single factor CAPM of the variable basket. Stocks are sorted into size-value portfolios (SL, SM, SH, BL, BM, BH). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

The Table 4.6a, 4.6b and 4.6c shows the size-value sorted portfolios linear regression of CAPM for three baskets of portfolios. The regression results show the average R^2 value is approximately 50 percent for the fixed basket portfolio, 48 percent for non-financial basket portfolio and 50 percent for variable basket portfolio. It suggests that CAPM doesn't explain majority of the time-series variations in securities return. The market factors are found to be significant at 1 percent for all the portfolios of three different baskets. The intercept term is found to be significant at 1 percent for all baskets except SL portfolio from variable basket which is significant at 5 percent. This indicates that the model is unable to explain the return of the portfolios and there is a need for some other variable to be estimated in predicting the return of the portfolio.

4.4.1.2 Regression Analysis of the Size-Investment Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), as the Independent Variable for CAPM

Table 4.7a: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Fixed Basket)

	α	β	R^2	Adj. R^2
SC	1.23	0.46	0.46	0.45
t-value	(2.52)**	(12.56)***		
SM	1.08	0.42	0.45	0.44
t-value	(2.37)**	(12.31)***		
SA	1.58	0.41	0.44	0.43
t-value	(3.51)***	(12.13)***		
BC	1.09	0.4	0.51	0.51
t-value	(2.93)***	(13.98)***		
BM	1.5	0.37	0.53	0.53
t-value	(4.57)***	(14.71)***		
BA	1.61	0.41	0.55	0.55
t-value	(4.61)***	(15.24)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the fixed baskets. Stocks are sorted into size-investment portfolios (SC, SM, SA, BC, BM, BA). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

Table 4.7b: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Non-Financial Basket)

	α	β	R^2	Adj. R^2
SC	0.77	0.46	0.45	0.45
t-value	1.59	(12.44)***		
SM	1.25	0.43	0.47	0.47
t-value	(2.86)***	(12.96)***		
SA	2.29	0.38	0.37	0.37
t-value	(4.8)***	(10.62)***		
BC	0.91	0.4	0.53	0.52
t-value	(2.5)**	(14.47)***		
BM	1.36	0.36	0.51	0.51
t-value	(4.01)***	(14)***		
BA	2.22	0.36	0.48	0.48
t-value	(6.22)***	(13.24)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the non-financial baskets. Stocks are sorted into size-investment portfolios (SC, SM, SA, BC, BM, BA). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

Table 4.7c: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Variable Basket)

	α	β	R^2	Adj. R^2
SC	0.74	0.46	0.46	0.45
t-value	1.53	(12.57)***		
SM	1.11	0.43	0.48	0.48
t-value	(2.58)**	(13.21)***		
SA	2.35	0.41	0.41	0.41
t-value	(5.03)***	(11.46)***		
BC	0.67	0.4	0.53	0.53
t-value	(1.84)*	(14.6)***		
BM	1.29	0.38	0.55	0.55
t-value	(3.99)***	(15.34)***		
BA	2.13	0.39	0.54	0.54
t-value	(6.17)***	(15)***		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CAPM of variable baskets. Stocks are sorted into size-investment portfolios (SC, SM, SA, BC, BM, BA). t-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

The Table 4.7a, 4.7b and 4.7c show the CAPM linear regression result of the size-investment sorted portfolios for three baskets of portfolios. The average R^2 value for all the baskets is found to be below 50 (fixed basket 49, non-financial basket 47 and variable basket 50 percent) which suggest that CAPM failed to explain the return of the portfolios.

The regression results for the fixed baskets show that the intercept term of double sorted mimicking portfolios to be significant at 1 percent except SC and SM portfolios at 5 percent. For the non-financial baskets, the intercept term of double sorted mimicking portfolios is found to be significant at 1 percent except BC portfolios which is significant at 5 percent while SC is found to be insignificant. For the variable basket three portfolio i.e., SA, BM & BA are found to be significant at 1 percent, SM at 5 percent and BC at 10 percent. Similar with non -financial basket portfolios in variable basket portfolio SC are found to be insignificant. From the regression results it is also observed that the aggressively invested firms are found to produce higher alpha values then lower investment firms.

4.4.1.3 CAPM Regression Analysis of the Size-Profitability Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), as the Independent Variable

Table 4.8a: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Fixed Basket)

	α	β	R^2	Adj. R^2
SR	2.29	0.44	0.41	0.41
t-value	(4.48)***	(11.47)***		
SM	1.22	0.43	0.47	0.46
t-value	(2.8)***	(12.88)***		
SW	1.04	0.44	0.48	0.48
t-value	(2.39)**	(13.29)***		
BR	1.67	0.32	0.5	0.5
t-value	(5.38)***	(13.81)***		
BM	1.21	0.41	0.57	0.57
t-value	(3.59)***	(15.95)***		
BW	1.32	0.45	0.52	0.52
t-value	(3.2)***	(14.4)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the fixed basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

Table 4.8b: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Non-Financial Basket)

	α	β	R^2	Adj. R^2
SR	2.61	0.36	0.38	0.38
t-value	(5.93)***	(10.85)***		
SM	1.55	0.38	0.46	0.45
t-value	(3.92)***	(12.63)***		
SW	0.71	0.4	0.43	0.43
t-value	1.63	(11.93)***		
BR	2.15	0.24	0.42	0.41
t-value	(7.96)***	(11.6)***		
BM	1.33	0.34	0.51	0.51
t-value	(4.24)***	(14.16)***		
BW	1.02	0.4	0.51	0.51
t-value	(2.72)***	(13.98)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the non-financial basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations).*

Table 4.8c: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Variable Basket)

	α	β	R^2	Adj. R^2
SR	2.63	0.41	0.42	0.42
t-value	(5.78)***	(11.8)***		
SM	1.41	0.41	0.45	0.45
t-value	(3.27)***	(12.52)***		
SW	0.57	0.5	0.46	0.46
t-value	1.11	(12.67)***		
BR	1.98	0.3	0.45	0.44
t-value	(6.25)***	(12.38)***		
BM	1.25	0.41	0.59	0.59
t-value	(3.79)***	(16.52)***		
BW	0.78	0.48	0.54	0.53
t-value	(1.82)*	(14.77)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the variable basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.8a, 4.8b and 4.8c show the size-profitability sorted portfolios linear regression of CAPM for three baskets of portfolios. The regression results show that the highly profitable firms produce higher alpha values then low profitable firms. The average R^2 value for all the baskets is found to be below 50 (fixed basket 49, non-financial basket 47 and variable basket 49 percent) which suggest that CAPM failed to explain the portfolios return. The market factor for all the baskets is found to be significant at 1 percent which means that there is something left unexplained by the model except for SW portfolio of both non-financial and variable basket which is found to be insignificant and closest to zero.

4.4.1.4 CAPM Regression Analysis of the Size-Momentum Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), as the Independent Variable

Table 4.9a: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Fixed Basket)

	α	β	R^2	Adj. R^2
SU	3.27	0.44	0.4	0.4
t-value	(6.35)***	(11.31)***		
SM	1.18	0.43	0.47	0.47
t-value	(2.72)***	(12.96)***		
SD	-0.51	0.44	0.47	0.47
t-value	-1.14	(12.93)***		
BU	2.73	0.38	0.52	0.52
t-value	(7.7)***	(14.28)***		
BM	1.29	0.4	0.56	0.56
t-value	(3.83)***	(15.64)***		
BD	0.2	0.41	0.5	0.5
t-value	0.5	(13.77)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CAPM of the fixed basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.9b: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Non-financial Basket)

	α	β	R^2	Adj. R^2
SU	5.2	0.41	0.37	0.37
t-value	(10.2)***	(10.63)***		
SM	1.11	0.42	0.48	0.48
t-value	(2.66)***	(13.16)***		
SD	-1.86	0.38	0.43	0.43
t-value	(-4.49)***	(12)***		
BU	4.67	0.39	0.47	0.47
t-value	(11.75)***	(12.95)***		
BM	1.2	0.36	0.51	0.51
t-value	(3.56)***	(14)***		
BD	-1.47	0.36	0.49	0.49
t-value	(-4.23)***	(13.56)***		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CAPM of the non-financial basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.9c: CAPM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Variable Basket)

	α	β	R^2	Adj. R^2
SU	4.74	0.46	0.43	0.43
t-value	(9.46)***	(11.94)***		
SM	1.62	0.41	0.42	0.42
t-value	(3.47)***	(11.69)***		
SD	-1.63	0.4	0.43	0.43
t-value	(-3.68)***	(11.94)***		
BU	3.84	0.42	0.5	0.5
t-value	(9.68)***	(13.81)***		
BM	1.17	0.4	0.55	0.55
t-value	(3.41)***	(15.25)***		
BD	-1.43	0.4	0.52	0.52
t-value	(-3.93)***	(14.33)***		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CAPM of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.9a, 4.9b and 4.9c shows the size-momentum sorted portfolios CAPM linear regression for three baskets of portfolios. The average R^2 value for all the baskets is found to be below 50 (fixed basket 49, non-financial basket 46 and variable basket 48 percent) which suggest that CAPM fails to explain the portfolios return. The high momentum firms are found to produce higher alpha values compared to low momentum firms. The market factor for all the baskets is found to be significant at 1 percent. The regression results show that for the fixed baskets the intercept term was found to be significant at 1 percent for the double sorted mimicking portfolios except the intercept of SD & BD portfolios which were insignificant. The regression results show that for both non-financial and variable baskets' intercept term are found to be significant at 1 percent for the double sorted mimicking portfolios.

4.4.2 Fama-French Three Factor Model (FFTF) Regression Analysis of the Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

$$R_{it} - R_f = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + \mathrm{e}_{it}$$

4.4.2.1 FFTF Regression Analysis of the Size-Value Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

Table 4.10a: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Fixed Basket)

	α	β	s	l	R^2	Adj. R^2
SL	1.42	0.37	1.47	0.69	0.73	0.72
t-value	(4.35)***	(14.66)***	(13.65)***	(4.26)***		
SM	1.43	0.38	1.38	0.2	0.7	0.7
t-value	(4.21)***	(14.54)***	(12.31)***	1.15		
SH	1.49	0.38	1.48	-0.27	0.73	0.73
t	(4.55)***	(14.85)***	(13.75)***	(-1.67)*		
BL	1.43	0.39	0.45	0.74	0.6	0.59
t-value	(4.26)***	(14.9)***	(4.05)***	(4.41)***		
BM	1.55	0.36	0.45	0.17	0.59	0.58
t-value	(4.89)***	(14.77)***	(4.35)***	1.08		
BH	1.36	0.38	0.43	-0.29	0.59	0.59
t-value	(4.07)***	(14.72)***	(3.92)***	(-1.75)*		

Source: Author's computation
Note: *The table reports the estimation results of the single factor FFTF of the fixed basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.10b: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Non-Financial Basket)

	α	β	s	l	R^2	Adj. R^2
SL	0.34	0.36	1.41	0.19	0.73	0.73
t-value	(3.96)***	(13.57)***	(12.85)***	(5.76)***		
SM	1.57	0.34	1.32	0.22	0.7	0.7
t-value	(4.71)***	(13.16)***	(12.32)***	1.17		
SH	1.66	0.35	1.37	-0.11	0.71	0.7
t-value	(4.91)***	(13.54)***	(12.62)***	-0.57		
BL	1.67	0.35	0.35	0.88	0.57	0.57
t-value	(4.96)***	(13.5)***	(3.17)***	(4.6)***		
BM	0.32	0.03	0.1	0.18	0.56	0.55
t-value	(4.74)***	(13.58)***	(3.65)***	1.31		
BH	1.35	0.35	0.38	0.1	0.56	0.55
t-value	(4.05)***	(13.71)***	(3.48)***	0.51		

Source: Author's computation
Note: *The table reports the estimation results of the single factor FFTF of the non-financial basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.10c: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Variable Basket)

	α	**β**	**s**	**l**	R^2	**Adj.** R^2
SL	1.2	0.36	1.47	1.24	0.77	0.76
t-value	(3.7)***	(14.34)***	(13.77)***	(6.64)***		
SM	1.41	0.37	1.32	0.38	0.74	0.74
t-value	(4.52)***	(15.18)***	(12.88)***	(2.13)**		
SH	1.53	0.36	1.45	0.09	0.73	0.73
t-value	(4.76)***	(14.29)***	(13.66)***	0.48		
BL	1.57	0.36	0.38	1.07	0.63	0.63
t-value	(4.87)***	(14.61)***	(3.57)***	(5.77)***		
BM	1.33	0.35	0.46	0.42	0.62	0.62
t-value	(4.4)***	(14.93)***	(4.58)***	(2.42)**		
BH	1.24	0.37	0.4	0.22	0.6	0.59
t-value	(3.86)***	(14.86)***	(3.83)***	1.2		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the variable basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.10a, 4.10b, 4.10c show FFTF linear regression result of the size-value sorted portfolios for three baskets of portfolios. The market coefficient for all the baskets is found to be significant at 1 percent. The size coefficient for all the portfolios of three different baskets is found to be significant at 1 percent. The regression results shows that the small size firms produce higher coefficient values than big size firms for all the baskets. The small size firms produce coefficient values of greater than 1 whereas big size firms produce coefficient values less than 0.50. The value factor is found to have mix results but mostly low values firms tend to produce higher coefficient than the high value firms. For the fixed basket four portfolios' coefficients are found to be significant. SL & BL are significant at 1 percent and SH & BH are significant at 10 percent but with negative coefficient value. For the non-financial basket coefficient of only two portfolios are found to be significant. SL & BL are significant at 1 percent. For the variable basket coefficient of four portfolios are found to be significant. SL & BL are significant at 1 percent and SM & BM are significant at 5 percent. The average R^2 value for fixed basket, non-financial basket and variable basket are 66, 64 and 68 percent respectively. The value of R^2 found in this model are more than the value found in the CAPM model due to addition of extra variables in the model. The intercept of the all the baskets for the double sorted mimicking portfolios are found to be significant at 1 percent which means that the return of the stocks is failed to be explained by this model and there is still missing variable in the model.

4.4.2.2 FFTF Regression Analysis of the Size-Investment Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

Table 4.11a: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Fixed Basket)

	α	β	s	l	R^2	Adj. R^2
SC	1.35	0.4	1.59	0.31	0.74	0.74
t-value	(4)***	(15.38)***	(14.26)***	(1.82)*		
SM	1.21	0.37	1.36	0.06	0.69	0.68
t-value	(3.51)***	(13.84)***	(11.98)***	0.37		
SA	1.69	0.36	1.35	0.21	0.69	0.68
t-value	(5.01)***	(13.79)***	(12.15)***	1.25		
BC	1.11	0.38	0.44	0.23	0.55	0.54
t-value	(3.07)***	(13.62)***	(3.7)***	1.25		
BM	1.5	0.35	0.43	0.31	0.58	0.58
t-value	(4.8)***	(14.56)***	(4.14)***	(1.97)**		
BA	1.64	0.39	0.48	0.16	0.59	0.59
t-value	(4.9)***	(14.93)***	(4.35)***	0.97		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the fixed basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

Table 4.11b: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Non-Financial Basket)

	α	β	s	l	R^2	Adj. R^2
SC	0.91	0.38	1.43	0.47	0.72	0.71
t-value	(2.58)**	(13.71)***	(12.51)***	(2.33)**		
SM	1.4	0.36	1.22	0.26	0.69	0.69
t-value	(4.14)***	(13.72)***	(11.18)***	1.37		
SA	2.41	0.3	1.41	0.53	0.68	0.68
t-value	(7.02)***	(11.38)***	(12.7)***	(2.71)***		
BC	0.9	0.38	0.38	0.35	0.56	0.56
t-value	(2.54)**	(13.78)***	(3.32)***	(1.76)*		
BM	0.33	0.03	0.11	0.19	0.55	0.54
t-value	(4.19)***	(13.2)***	(3.62)***	0.98		
BA	2.14	0.34	0.32	0.59	0.53	0.53
t-value	(6.25)***	(12.8)***	(2.89)***	(3.04)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the non-financial basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.11c: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Variable Basket)

	α	β	s	l	R^2	Adj. R^2
SC	0.8	0.38	1.49	0.64	0.75	0.74
t-value	(2.41)**	(14.62)***	(13.57)***	(3.36)***		
SM	1.18	0.36	1.26	0.42	0.72	0.72
t-value	(3.72)***	(14.72)***	(12.06)***	(2.28)**		
SA	2.41	0.32	1.45	0.61	0.73	0.73
t-value	(7.57)***	(13.15)***	(13.85)***	(3.36)***		
BC	0.62	0.37	0.44	0.61	0.59	0.59
t-value	(1.84)*	(14.05)***	(3.94)***	(3.1)***		
BM	1.27	0.35	0.39	0.41	0.6	0.6
t-value	(4.13)***	(14.7)***	(3.82)***	(2.33)**		
BA	2.07	0.36	0.41	0.68	0.61	0.61
t-value	(6.45)***	(14.57)***	(3.85)***	(3.69)***		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the variable basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.11a, 4.11b and 4.11c show FFTF linear regression result of the size-investment sorted portfolios for three baskets of portfolios. The market coefficient for all the baskets is found to be significant at 1 percent. The size coefficient for all the portfolios of three different baskets are also found to be significant at 1 percent. The regression results show that the small size firms produce higher coefficient values than big size firms for all the baskets. The coefficient value of the small size firms is found to be more than 1 whereas the coefficient value of the big size firms is found to be less than 0.50. The value factor is found to have mix results but mostly low values firms tend to produce higher coefficient than high value firms. For the fixed basket the coefficient of only two portfolios is found to be significant. SL & BL are significant at 10 percent & 5 percent respectively and rest are insignificant. The value factor for fixed basket is found to be low ranging from 0.06 to 0.31. For the non-financial baskets, the coefficient of four portfolios is found to be significant. SA & BA are significant at 1 percent whereas SC & BC are significant at 5 & 10 percent respectively. For the variable basket the coefficient of all the portfolios for value factor is found to be significant at 1 percent except SM & BM which are significant at 5 percent. The average R^2 value for fixed baskets is 0.64, non-financial basket is 0.62 and variable basket is 0.67 approximately thus this model performs better than CAPM due to addition of extra variables in the model. The intercept for all the double sorted mimicking portfolios baskets is found to be significant at 1 percent except SC & BC from non-financial basket portfolio which is significant at 5 percent; for variable basket portfolio, SC & BC are found significant at 5 & 10 percent respectively which suggest that something is left unexplained by the model.

4.4.2.3 FFTF Regression Analysis of the Size-Profitability Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

Table 4.12a: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Fixed Basket)

	α	β	s	l	R^2	Adj. R^2
SR	2.41	0.39	1.48	0.23	0.65	0.65
t-value	(6.12)***	(12.64)***	(11.39)***	1.16		
SM	1.33	0.38	1.28	0.24	0.7	0.69
t-value	(3.98)***	(14.61)***	(11.7)***	1.42		
SW	1.14	0.39	1.13	0.12	0.65	0.65
t-value	(3.18)***	(14.18)***	(9.61)***	0.67		
BR	1.66	0.32	0.31	0.31	0.54	0.53
t-value	(5.51)***	(13.57)***	(3.11)***	(2.05)**		
BM	1.24	0.39	0.45	0.08	0.61	0.61
t-value	(3.84)***	(15.56)***	(4.23)***	0.5		
BW	1.36	0.43	0.62	0.23	0.58	0.57
t-value	(3.46)***	(14.17)***	(4.79)***	1.19		

Source: Author's computation
***Note:** The table reports the estimation results of the single factor FFTF of the fixed basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively)*

Table 4.12b: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Non-Financial Basket)

	α	β	s	l	R^2	Adj. R^2
SR	2.7	0.3	1.13	0.48	0.62	0.61
t-value	(7.66)***	(10.91)***	(9.92)***	(2.37)**		
SM	1.67	0.31	1.12	0.35	0.7	0.69
t-value	(5.56)***	(13.57)***	(11.6)***	(2.03)**		
SW	0.85	0.32	1.29	0.4	0.7	0.7
t-value	(2.64)***	(12.95)***	(12.37)***	(2.17)**		
BR	2.12	0.22	0.24	0.34	0.46	0.45
t-value	(8.03)***	(10.99)***	(2.8)***	(2.3)**		
BM	1.31	0.32	0.27	0.3	0.54	0.54
t-value	(4.25)***	(13.46)***	(2.76)***	(1.71)*		
BW	1.02	0.38	0.42	0.35	0.55	0.54
t-value	(2.79)***	(13.28)***	(3.56)***	(1.68)*		

Source: Author's computation
***Note:** The table reports the estimation results of the single factor FFTF of the non-financial basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.12c: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Variable Basket)

	α	β	s	l	R^2	Adj. R^2
SR	2.72	0.33	1.41	0.41	0.72	0.72
t-value	(8.51)***	(13.35)***	(13.41)***	(2.22)**		
SM	1.47	0.34	1.26	0.54	0.72	0.71
t-value	(4.68)***	(13.96)***	(12.26)***	(2.98)***		
SW	0.59	0.41	1.41	0.87	0.71	0.7
t-value	1.54	(13.89)***	(11.19)***	(3.96)***		
BR	1.93	0.27	0.37	0.61	0.53	0.52
t-value	(6.51)***	(11.79)***	(3.75)***	(3.61)***		
BM	1.2	0.39	0.35	0.61	0.64	0.64
t-value	(3.85)***	(16.06)***	(3.45)***	(3.42)***		
BW	0.77	0.44	0.62	0.52	0.6	0.6
t-value	(1.91)*	(14.21)***	(4.66)***	(2.27)**		

Source: Author's computation
Note: *The table reports the estimation results of the single factor FFTF of the variable basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.12a, 4.12b and 4.12c show FFTF linear regression result of the size-profitability sorted portfolios for three baskets of portfolios. The market coefficient for all the baskets is found to be significant at 1 percent. The size coefficient for all the portfolios of three different baskets also found to be significant at 1 percent. The regression results found that the small size firms produce higher coefficient values than the big size firms for all the baskets. The small size firms produce coefficient values of more than 1 whereas big size firms produced coefficient value of less than 0.62. For the fixed basket the coefficient of only one portfolio BR is found to be significant at 5 percent and rest of the portfolio is insignificant. The coefficient of value factor for fixed basket is found to be very low ranging from 0.80 to 0.31. For the non-financial basket, the coefficient value of all the portfolios for value factor is found to be significant at 5 percent except for BM & BW which is significant at 10 percent. For the variable basket the coefficient of all the portfolios for value factor is found to be significant at 1 percent except for SR &

BW which is significant at 5 percent. The average R^2 value for portfolios of fixed baskets is 0.62, non-financial basket is 0.59 and variable basket is 0.65 approximately which indicates that this model performs better than CAPM due to the addition of extra variables in the model. The regression results show that the intercept term for the double sorted mimicking portfolios for all the baskets is found to be significant at 1 percent except for variable basket BW portfolio which is significant at 10 percent. The regression result shows that the high profitable firms are having higher alpha value compared to low profit firms.

4.4.2.4 FFTF Regression Analysis of the Size-Momentum Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

Table 4.13a: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Fixed Basket)

	α	β	s	l	R^2	Adj. R^2
SU	3.41	0.38	1.62	0.21	0.69	0.69
t-value	(9.11)***	(13.04)***	(13.09)***	1.13		
SM	1.29	0.37	1.31	0.16	0.71	0.7
t-value	(3.98)***	(14.87)***	(12.24)***	1		
SD	-0.38	0.38	1.29	0.07	0.69	0.68
t-value	-1.11	(14.37)***	(11.34)***	0.38		
BU	2.73	0.37	0.38	0.31	0.55	0.55
t-value	(7.93)***	(14.01)***	(3.35)***	(1.82)*		
BM	1.33	0.38	0.5	0.11	0.61	0.61
t-value	(4.14)***	(15.36)***	(4.72)***	0.7		
BD	0.22	0.39	0.55	0.23	0.55	0.55
t-value	0.59	(13.48)***	(4.44)***	1.26		

Source: Author's computation
Note: *The table reports the estimation results of the single factor FFTF of the fixed basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.13b: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Non-Financial Basket)

	α	β	s	l	R^2	Adj. R^2
SU	5.35	0.32	1.55	0.52	0.69	0.69
t-value	(14.76)***	(11.51)***	(13.2)***	(2.53)**		
SM	1.26	0.35	1.16	0.2	0.69	0.69
t-value	(3.89)***	(13.87)***	(11.03)***	1.07		
SD	-1.74	0.31	1.11	0.34	0.65	0.65
t-value	(-5.31)***	(12.36)***	(10.42)***	(1.81)*		
BU	4.62	0.37	0.36	0.52	0.51	0.5
t-value	(11.92)***	(12.36)***	(2.84)***	(2.35)**		
BM	1.19	0.34	0.38	0.36	0.55	0.55
t-value	(3.64)***	(13.35)***	(3.57)***	(1.95)**		
BD	-1.44	0.33	0.46	0.24	0.55	0.54
t-value	(-4.32)***	(12.82)***	(4.26)***	1.26		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the non-financial basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.13c: FFTF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Variable Basket)

	α	β	s	l	R^2	Adj. R^2
SU	4.83	0.37	1.54	0.51	0.72	0.72
t-value	(13.65)***	(13.49)***	(13.2)***	(2.5)**		
SM	1.66	0.34	1.25	0.62	0.66	0.66
t-value	(4.62)***	(12.29)***	(10.61)***	(3)***		
SD	-1.6	0.33	1.21	0.66	0.69	0.68
t-value	(-4.81)***	(12.82)***	(11.09)***	(3.45)***		
BU	3.81	0.39	0.44	0.5	0.55	0.54
t-value	(10.03)***	(13.1)***	(3.52)***	(2.29)**		
BM	1.12	0.37	0.42	0.63	0.62	0.61
t-value	(3.51)***	(14.8)***	(4.030***	(3.42)***		
BD	-1.44	0.36	0.55	0.46	0.6	0.59
t-value	(-4.26)***	(13.8)***	(4.9)***	(2.36)**		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFTF of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.13a, 4.13b, and 4.13c show FFTF linear regression result of the size-momentum sorted portfolios for three baskets of portfolios. The market coefficient for all the baskets is found to be significant at 1 percent. The size coefficient for all the portfolios of three different baskets also found to be significant at 1 percent. From the regression result it is also found that small size firms produce higher coefficient values then big size firms for all the baskets. The coefficient value of small size firms produces more than 1 whereas big size firms produce coefficient value of less than 0.55. For the fixed basket the coefficient of only one portfolio, BU, for value factor is found to be significant at 10 percent and rest are insignificant. The value factor coefficient for fixed basket is found to be low ranging from 0.07 to 0.3. For the non-financial basket, the coefficient of only four portfolios for value factor is found to be significant at 5 percent except SD which is significant at 10 percent; the SM & BD portfolio are found to be insignificant. The value factor coefficient for non-financial basket is found to be ranging from 0.20 to 0.52. For the variable basket, the coefficient of three portfolios for value factor is found to be significant at 1 percent and rests are significant at 5 percent. The value factor coefficient for variable basket is found to be low with the value ranging from 0.46 to 0.66. The average R^2 value for fixed baskets is 0.63, non-financial basket is 0.60 and variable basket is 0.63 approximately which indicate that FFTM performs better than CAPM due to addition of extra variables in the model. The regression results show that for all the baskets the intercept term for the double sorted mimicking portfolios is significant at 1 percent except for fixed basket portfolios of BD & BD which is significant at 5 percent. The regression result shows that the intercept term of high momentum firms is having higher value compared to low momentum firms. The value of intercept of all the low momentum portfolios are found to be negative.

4.4.3 CFFM Regression Analysis of the Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + u_i UMD_t + \mathrm{e}_{it}$$

4.4.3.1 CFFM Regression analysis of the Size-Value Cross of Six Risk-Based Portfolios with Market risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

Table 4.14a: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Fixed Basket)

	α	β	s	l	u	R^2	Adj. R^2
SL	1.6	0.37	1.47	0.7	-0.06	0.73	0.72
t-value	(3.5)***	(14.59)***	(13.63)***	(4.29)***	-0.56		
SM	1.48	0.38	1.38	0.2	-0.02	0.7	0.7
t-value	(3.11)***	(14.48)***	(12.26)***	1.16	-0.15		
SH	1.76	0.38	1.49	-0.26	-0.09	0.73	0.73
t-value	(3.84)***	(14.78)***	(13.77)***	-1.61	-0.84		
BL	1.64	0.39	0.45	0.75	-0.07	0.6	0.59
t-value	(3.5)***	(14.83)***	(4.08)***	(4.44)***	-0.64		
BM	1.71	0.36	0.46	0.18	-0.05	0.59	0.58
t-value	(3.87)***	(14.7)***	(4.37)***	1.11	-0.53		
BH	1.48	0.38	0.44	-0.29	-0.04	0.59	0.59
t-value	(3.17)***	(14.65)***	(3.93)***	(-1.72)*	-0.37		

Source: Author's computation

Note: *The table reports the estimation results of the single factor Carhart Four Factor Model of the fixed basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.14b: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Non-Financial Basket)

	α	β	s	l	u	R^2	Adj. R^2
SL	0.42	0.35	1.38	1.08	0.14	0.74	0.73
t-value	0.61	(13.44)***	(12.56)***	(5.58)***	1.55		
SM	0.18	0.33	1.29	0.17	0.21	0.71	0.7
t-value	0.27	(13.08)***	(12.03)***	0.92	(2.4)**		
SH	0.32	0.35	1.34	-0.16	0.2	0.72	0.71
t-value	0.47	(13.45)***	(12.32)***	-0.82	(2.28)**		
BL	0.24	0.35	0.31	0.83	0.22	0.59	0.58
t-value	0.36	(13.43)***	(2.85)***	(4.37)***	(2.44)**		
BM	0.32	0.34	0.35	0.2	0.18	0.57	0.56
t-value	0.49	(13.48)***	(3.35)***	1.09	(2.15)**		
BH	0.35	0.35	0.35	0.06	0.15	0.57	0.56
t-value	0.52	(13.59)***	(3.23)***	0.33	(1.72)*		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the non-financial basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.14c: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Variable Basket)

	α	β	s	l	u	R^2	Adj. R^2
SL	1.08	0.36	1.47	1.24	0.02	0.77	0.76
t-value	(1.83)*	(14.2)***	(13.67)***	(6.63)***	0.25		
SM	0.79	0.36	1.31	0.39	0.11	0.74	0.74
t-value	1.4	(14.99)***	(12.74)***	(2.16)**	1.32		
SH	0.97	0.35	1.44	0.09	0.1	0.73	0.73
t-value	(1.68)*	(14.1)***	(13.53)***	0.5	1.15		
BL	0.8	0.36	0.36	1.07	0.13	0.64	0.63
t-value	1.38	(14.42)***	(3.43)***	(5.83)***	1.59		
BM	1.14	0.35	0.45	0.42	0.03	0.62	0.61
t-value	(2.07)**	(14.77)***	(4.51)***	(2.43)**	0.43		
BH	0.9	0.37	0.4	0.23	0.06	0.6	0.59
t-value	1.56	(14.69)***	(3.75)***	1.22	0.69		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the variable basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.14a, 4.14b and 14.4c show CFFM regression result of the size-value sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent. The small size firms are found to produce higher coefficient values then big size firms for all the baskets. For the fixed basket coefficient of only three portfolios for value factor are found to be significant at 1 percent except BH which is significant at 10 percent and coefficient of rest of the portfolios are insignificant. For the non-financial baskets, the coefficient of value factor only two portfolios, SL & BL, are found to be significant at 1 percent. For the variable basket four portfolios for value factor are found to be significant, SL & BL at 1 percent and SM & BM at 5 percent. The momentum factor for the portfolios of different baskets is found to be insignificant except five portfolios from non-financial basket which are significant at 5 percent and BH at 10 percent. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.68 approximately which indicates that this model performs better than CAPM due to the addition of extra variables in the model.

The regression results show that the intercept term for the double sorted mimicking portfolios of fixed basket to be significant at 1 percent. But none of the intercept for the non-financial basket is found to be significant. For the variable basket also the intercept term is found to be insignificant except three portfolios, BM which is significant at 5 percent and SL & SH which is significant at 10 percent.

4.4.3.2 CFFM Regression Analysis of the Size-Investment Cross of Six Risk-Based Portfolios with Market risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

Table 4.15a: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Fixed Basket)

	α	β	s	l	u	R^2	Adj. R^2
SC	1.41	0.4	1.59	0.31	-0.02	0.74	0.74
t-value	(2.99)**	(15.31)***	(14.2)***	(1.82)*	-0.19		
SM	1.56	0.37	1.36	0.08	-0.11	0.69	0.68
t-value	(3.26)***	(13.78)***	(12.03)***	0.45	-1.06		
SA	1.81	0.36	1.35	0.21	-0.04	0.69	0.68
t-value	(3.84)***	(13.72)***	(12.12)***	1.26	-0.37		
BC	1.27	0.38	0.45	0.23	-0.05	0.55	0.54
t-value	(2.51)**	(13.55)***	(3.71)***	1.28	-0.46		
BM	1.8	0.35	0.44	0.32	-0.09	0.58	0.57
t-value	(4.11)***	(14.49)***	(4.2)***	(2.03)**	-0.97		
BA	1.71	0.39	0.48	0.17	-0.02	0.6	0.59
t-value	(3.65)***	(14.87)***	(4.34)***	0.98	-0.21		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CFFM of the fixed basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.15b: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Non-financial Basket)

	α	β	s	l	u	R^2	Adj. R^2
SC	-0.02	0.37	1.4	0.43	0.14	0.72	0.71
t-value	-0.03	(13.58)***	(12.23)***	(2.16)**	1.51		
SM	0.68	0.36	1.21	0.24	0.11	0.69	0.69
t-value	0.99	(13.59)***	(10.92)***	1.23	1.22		
SA	0.48	0.3	1.36	0.46	0.29	0.7	0.69
t-value	0.71	(11.36)***	(12.45)***	(2.41)**	(3.27)***		
BC	0.23	0.37	0.36	0.33	0.1	0.57	0.56
t-value	0.32	(13.65)***	(3.14)***	1.63	1.08		
BM	-0.02	0.33	0.35	0.13	0.21	0.56	0.55
t-value	-0.02	(13.12)***	(3.3)***	0.72	(2.44)**		
BA	0.95	0.34	0.29	0.55	0.18	0.54	0.53
t-value	1.38	(12.69)***	(2.61)**	(2.83)***	(1.99)**		

Source: Author's computation
Note: *The table reports the estimation results of the single factor CFFM of the non-financial basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.15c: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Variable Basket)

	α	β	s	l	u	R^2	Adj. R^2
SC	0.38	0.38	1.48	0.65	0.07	0.75	0.74
t-value	0.63	(14.44)***	(13.43)***	(3.37)***	0.85		
SM	0.94	0.36	1.26	0.42	0.04	0.72	0.72
t-value	1.63	(14.55)***	(11.95)***	(2.29)**	0.51		
SA	1.7	0.32	1.44	0.62	0.12	0.73	0.73
t-value	(2.97)***	(12.96)***	(13.72)***	(3.4)***	1.49		
BC	0.79	0.37	0.44	0.6	-0.03	0.59	0.59
t-value	1.28	(13.970***	(3.94)***	(3.08)***	-0.32		
BM	0.8	0.35	0.38	0.42	0.08	0.61	0.6
t-value	1.44	(14.51)***	(3.72)***	(2.35)**	1.02		
BA	1.24	0.36	0.39	0.69	0.14	0.62	0.61
t-value	(2.15)**	(14.38)***	(3.71)***	(3.75)***	(1.72)*		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the variable basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.15a, 4.15b and 4.15c shows the size-investment sorted portfolios linear regression of CFFM for three baskets of portfolios. The market coefficient and size for all the baskets are also found to be significant at 1 percent except BA portfolio from non-financial basket significant at 5 percent. The study also found small size firms found to produce higher coefficient values then big size firms for all the baskets. Only SC & BM portfolios of value coefficient for the fixed basket found to be significant at 10 percent and 5 percent respectively. For the non-financial basket two portfolios for value factor found to be significant at 5 percent i.e., BM & BA and SA found to be significant at 1 percent. For the variable basket all the portfolio's value coefficient found to be significant at 1 percent except SM & BM significant at 5 percent. The momentum factor for the portfolios of different baskets found to be insignificant except three portfolios from non-financial which are SA significant at 1 percent and BM & BH at 5 percent; and only 1 portfolio from variable basket BA significant at 10 percent. The average R^2 value for fixed baskets is 0.64, non-financial basket is 0.63 and variable basket is 0.67 approximately which it performs better than CAPM due to addition extra variables in the model. The regression results show for fixed baskets the intercept term found for the double sorted mimicking portfolios to be significant at 1 percent except SC & BC portfolios significant at 5 percent. But none of the intercept for the non-financial basket found to be significant. For the variable basket only two portfolios' intercept term found to be significant SA & BA at 1 percent & 5 percent respectively.

4.4.3.3 CFFM Regression Analysis of the Size-Profitability Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

Table 4.16a: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Fixed Basket)

	α	β	s	l	u	R^2	Adj. R^2
SR	1.86	0.39	1.46	0.21	0.17	0.66	0.65
t-value	(3.4)***	(12.73)***	(11.28)***	1.06	1.43		
SM	1.55	0.38	1.29	0.24	-0.07	0.7	0.69
t-value	(3.33)***	(14.54)***	(11.71)***	1.46	-0.69		
SW	1.38	0.39	1.14	0.13	-0.08	0.66	0.65
t-value	(2.76)***	(14.11)***	(9.62)***	0.71	-0.69		
BR	1.67	0.32	0.31	0.31	0	0.54	0.53
t-value	(3.97)***	(13.52)***	(3.1)***	(2.04)**	-0.04		
BM	1.6	0.39	0.46	0.09	-0.11	0.61	0.61
t-value	(3.54)***	(15.51)***	(4.3)***	0.58	-1.13		
BW	1.61	0.43	0.63	0.24	-0.08	0.58	0.57
t-value	(2.95)***	(14.1)***	(4.82)***	1.23	-0.67		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the fixed basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.16b: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Non-Financial Basket)

	α	β	s	l	u	R^2	Adj. R^2
SR	1.33	0.29	1.09	0.43	0.21	0.63	0.62
t-value	(1.88)*	(10.8)***	(9.62)***	(2.14)**	(2.23)**		
SM	0.1	0.31	1.08	0.29	0.24	0.71	0.71
t-value	0.18	(13.56)***	(11.32)***	(1.73)*	(3.03)***		
SW	0.43	0.32	1.28	0.38	0.06	0.7	0.69
t-value	0.66	(12.82)***	(12.13)***	(2.08)**	0.73		
BR	1.11	0.22	0.21	0.31	0.15	0.47	0.46
t-value	(2.1)**	(10.88)***	(2.5)**	(2.07)**	(2.2)**		
BM	0.76	0.32	0.26	0.28	0.08	0.55	0.54
t-value	1.22	(13.33)***	(2.59)***	1.59	1.02		
BW	0.33	0.37	0.4	0.32	0.1	0.55	0.54
t-value	0.44	(13.15)***	(3.38)***	1.55	1.08		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the non-financial basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.16c: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Variable Basket)

	α	β	s	l	u	R^2	Adj. R^2
SR	2.18	0.33	1.4	0.41	0.09	0.72	0.72
t-value	(3.78)***	(13.17)***	(13.27)***	(2.25)**	1.12		
SM	0.64	0.33	1.25	0.54	0.14	0.72	0.72
t-value	1.14	(13.77)***	(12.13)***	(3.04)***	(1.76)*		
SW	0.4	0.41	1.4	0.87	0.03	0.71	0.7
t-value	0.57	(13.74)***	(11.09)***	(3.95)***	0.34		
BR	1.32	0.27	0.35	0.62	0.1	0.53	0.52
t-value	(2.47)**	(11.6)***	(3.63)***	(3.65)***	1.37		
BM	0.95	0.39	0.35	0.62	0.04	0.64	0.64
t-value	(1.69)*	(15.88)***	(3.39)***	(3.43)***	0.52		
BW	0.64	0.44	0.61	0.53	0.02	0.6	0.59
t-value	0.89	(14.07)***	(4.61)***	(2.27)**	0.2		

Source: Author's computation

Note: *The table reports the estimation results of the single factor CFFM of the variable basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.16a, 4.16b and 4.16c shows CFFM linear regression results of the size-profitability sorted portfolios three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent except BR portfolio from non-financial basket which is significant at 5 percent. The regression result shows that small size firms produce higher coefficient values then big size firms for all the baskets. Regarding the value coefficient for fixed basket portfolio only BR portfolio is found to be significant at 5 percent; for the non-financial basket only four portfolios SR, SW & BR are found to be significant at 1 percent and portfolio SM is found to be significant at 10 percent; and for variable basket all portfolios are found to be significant at 1 percent except SR & which is significant at 5 percent. The momentum coefficient for all the portfolios of all three baskets is found to be insignificant except three portfolios of SR and BR significant at 5 percent; SM significant at 1 percent from non-financial. SM portfolio from variable basket is significant at 10 percent. The average R^2 value for fixed baskets is 0.63, non-financial basket is 0.60 and variable basket is 0.65 approximately which suggest that the CFFM performs better than CAPM due to addition extra variables in the model; however, it does not show any significant improvement or difference from the FFTF model. The regression results show that for fixed baskets the intercept term for the double sorted mimicking portfolios is found to be significant at 1 percent; for the non-financial basket only SR & BR are found to be significant at 10 percent and 5 percent respectively; lastly for variable basket only three portfolios of SR, BR & BM are found to be significant at 1, 5 & 10 percent respectively.

4.4.3.4 CFFM Regression analysis of the Size-Momentum Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

Table 4.17a: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Fixed Basket)

	α	β	s	l	u	R^2	Adj. R^2
SU	1.55	0.38	1.57	0.14	0.59	0.73	0.73
t-value	(3.19)***	(14.27)***	(13.64)***	0.83	(5.49)***		
SM	1.76	0.37	1.32	0.18	-0.15	0.71	0.7
t-value	(3.89)***	(14.83)***	(12.36)***	1.1	-1.48		
SD	1.45	0.38	1.34	0.13	-0.58	0.74	0.73
t-value	(3.27)***	(15.33)***	(12.73)***	0.82	(-5.92)***		
BU	1.59	0.38	0.35	0.27	0.36	0.58	0.57
t-value	(3.42)***	(14.57)***	(3.18)***	1.63	(3.49)***		
BM	1.69	0.38	0.51	0.13	-0.11	0.61	0.61
t-value	(3.78)***	(15.3)***	(4.8)***	0.78	-1.16		
BD	1.7	0.38	0.58	0.29	-0.47	0.59	0.58

Source: Author's computation
Note: *The table reports the estimation results of the four factor CFFM of the fixed basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.17b: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Non-Financial Basket)

	α	β	s	l	u	R^2	Adj. R^2
SU	0.64	0.31	1.43	0.36	0.72	0.78	0.78
t-value	1.03	(12.87)***	(14.29)***	(2.03)**	(8.76)***		
SM	0.22	0.35	1.13	0.16	0.16	0.7	0.69
t-value	0.33	(13.75)***	(10.73)***	0.87	(1.84)*		
SD	0.06	0.32	1.15	0.4	-0.27	0.67	0.67
t-value	0.09	(12.88)***	(11.01)***	(2.19)**	(-3.19)***		
BU	0.27	0.35	0.24	0.36	0.66	0.62	0.61
t-value	0.38	(13.29)***	(2.18)**	(1.86)*	(7.2)***		
BM	0.85	0.34	0.37	0.35	0.05	0.56	0.55
t-value	1.29	(13.23)***	(3.45)***	(1.87)*	0.58		
BD	0.84	0.34	0.52	0.32	-0.35	0.58	0.57
t-value	1.3	(13.63)***	(4.95)***	(1.74)*	(-4.05)***		

Source: Author's computation
Note: *The table reports the estimation results of the four factor CFFM of the non-financial basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.17c: CFFM Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Variable Basket)

	α	β	s	l	u	R^2	Adj. R^2
SU	1.41	0.35	1.47	0.54	0.59	0.78	0.78
t-value	(2.49)**	(14.39)***	(14.24)***	(3)***	(7.25)***		
SM	1.28	0.34	1.25	0.62	0.07	0.66	0.66
t-value	(1.97)**	(12.13)***	(10.49)***	(3.01)***	0.71		
SD	0.59	0.34	1.25	0.64	-0.37	0.72	0.71
t-value	1.03	(13.91)***	(12.02)***	(3.52)***	(-4.6)***		
BU	0.32	0.37	0.37	0.53	0.6	0.64	0.63
t-value	0.52	(13.8)***	(3.32)***	(2.71)***	(6.8)***		
BM	0.92	0.37	0.42	0.63	0.03	0.62	0.61
t-value	1.59	(14.64)***	(3.97)***	(3.42)***	0.41		
BD	1.14	0.38	0.59	0.44	-0.44	0.65	0.64
t-value	(2.01)**	(15.32)***	(5.71)***	(2.4)**	(-5.45)***		

Source: Author's computation
Note: *The table reports the estimation results of the four factor CFFM of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.17a, 4.17b and 4.17c show CFFM linear regression result of the size-momentum sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent. The regression result shows that small size firms produce higher coefficient values than big size firms for all the baskets. All the value coefficient for the fixed basket portfolios is found to be insignificant. For the non-financial basket SU & SD portfolios are significant at 5 percent and BU, BM & BD are significant at 10 percent for the value factor. For the variable basket all the portfolios for value factor are found to be significant at 1 percent except BD which is significant at 5 percent. The momentum coefficient for all the portfolios is found to be significant at 1 percent except SM & BM portfolios of fixed portfolios which are insignificant; in non-financial basket SM is significant at 10 percent & BM insignificant; and for variable basket SM & BM are insignificant. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.68 approximately which means it performs better than CAPM due to addition extra variables in the model. However, it does not show any significant improvement or difference from the FFTF model. The regression results show that for the double sorted mimicking portfolios the intercept term of only the fixed baskets is found to be significant at 1 percent. But none of the intercept for the non-financial basket is found to be significant. For the variable basket intercept term of only three portfolios are found to be significant at 5 percent.

4.4.4 FFFF Regression Analysis of the Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + \mathrm{e}_{it}$$

4.4.4.1 FFFF Regression analysis of the Size-Value Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.18a: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Fixed Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SL	1.59	0.36	1.45	0.69	0.16	-0.13	0.73	0.72
t-value	(4.69)***	(13.84)***	(13.43)***	(4.25)***	1.02	-1.15		
SM	1.61	0.37	1.36	0.19	0.19	-0.12	0.71	0.7
t-value	(4.56)***	(13.74)***	(12.08)***	1.12	1.21	-1.04		
SH	1.67	0.36	1.48	-0.27	0.12	-0.16	0.74	0.73
t-value	(4.92)***	(13.98)***	(13.59)***	-1.64	0.75	-1.5		
BL	1.67	0.37	0.44	0.75	0.16	-0.21	0.61	0.6
t-value	(4.81)***	(13.99)***	(3.94)***	(4.47)***	1.01	-1.87		
BM	1.62	0.36	0.44	0.16	0.11	-0.03	0.59	0.58
t-value	(4.89)***	(14.1)***	(4.2)***	1.03	0.73	-0.28		
BH	1.59	0.37	0.42	-0.29	0.2	-0.17	0.6	0.59
t-value	(4.59)***	(13.85)***	(3.76)***	(-1.76)*	1.27	-1.52		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the fixed basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.18b: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Non-Financial Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SL	1.65	0.34	1.37	1.12	0.04	-0.18	0.74	0.73
t-value	(4.14)***	(12.03)***	(12.42)***	(5.8)***	0.24	-1.44		
SM	1.91	0.32	1.28	0.22	-0.04	-0.27	0.71	0.7
t-value	(4.9)***	(11.59)***	(11.86)***	1.19	-0.26	(-2.24)**		
SH	2.08	0.33	1.33	-0.1	0.01	-0.27	0.72	0.71
t-value	(5.28)***	(11.86)***	(12.16)***	-0.51	0.09	(-2.24)**		
BL	2.1	0.33	0.29	0.89	-0.02	-0.31	0.59	0.58
t-value	(5.36)***	(11.81)***	(2.7)***	(4.68)***	-0.11	(-2.55)**		
BM	1.86	0.32	0.35	0.25	0.02	-0.2	0.57	0.56
t-value	(4.87)***	(12.01)***	(3.29)***	1.37	0.14	(-1.67)*		
BH	1.68	0.34	0.34	0.11	0.01	-0.21	0.57	0.56
t-value	(4.27)***	(12.13)***	(3.12)***	0.56	0.05	(-1.76)*		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the non-financial basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.18c: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Variable Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SL	2.05	0.3	1.41	1.15	0.02	-0.5	0.8	0.79
t-value	(5.46)***	(11.370***	(14.07)***	(6.56)***	0.11	(-5.15)***		
SM	2.16	0.31	1.26	0.3	0	-0.46	0.77	0.77
t-value	(5.94)***	(12.21)***	(13.03)***	(1.75)*	0.01	(-4.83)***		
SH	2.39	0.29	1.38	-0.01	0.01	-0.51	0.77	0.76
t-value	(6.45)***	(11.3)***	(14.01)***	-0.04	0.06	(-5.33)***		
BL	2.42	0.3	0.31	0.97	0.01	-0.51	0.69	0.68
t-value	(6.52)***	(11.62)***	(3.18)***	(5.63)***	0.09	(-5.25)***		
BM	2.1	0.29	0.4	0.33	0	-0.47	0.67	0.67
t-value	(5.99)***	(11.94)***	(4.26)***	(2.05)**	-0.03	(-5.16)***		
BH	2.08	0.31	0.34	0.13	0.02	-0.5	0.66	0.65
t-value	(5.62)***	(11.87)***	(3.46)***	0.75	0.13	(-5.15)***		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the variable basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.18a, 4.18b and 4.18c show FFFF linear regression result of the size-P/B sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent. The study also found that small size firms produce higher coefficient values than big size firms for all the baskets. The P/B coefficient of only three portfolios of fixed basket is found to be significant i.e., SL & BL at 1 percent and BH at 10 percent. For the non-financial basket SL & BL portfolios are significant at1 percent. For the variable basket, SL & BL portfolios are significant at 1 percent and SM & BM are significant at 5 & 10 percent respectively for value factor. The investment coefficient for all the portfolios is found to be insignificant. The profitability coefficient for fixed basket is found to be insignificant. The non-financial basket portfolio's profitability coefficient is significant for SM, SH & BL at 5 percent and BM & BH at 10 percent. For variable basket all portfolios are significant at 1 percent but with negative coefficient value. All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.73 approximately which means that it performs better than CAPM, FFTF & Carhart due to addition of extra variables in the model. The regression results shows that intercept term of all the baskets portfolios' to be significant at 1 percent which suggest that this model fails to explain the return of the stock.

4.4.4.2 FFFF Regression analysis of the Size-Investment Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.19a: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Fixed Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SC	1.73	0.38	1.53	0.27	0.63	-0.14	0.77	0.76
t-value	(5.2)***	(14.94)***	(14.33)***	(1.67)*	(4.14)***	-1.29		
SM	1.44	0.35	1.35	0.08	0.12	-0.23	0.7	0.69
t-value	(4.06)***	(12.94)***	(11.9)***	0.44	0.75	(-2)**		
SA	1.55	0.36	1.4	0.26	-0.47	-0.09	0.7	0.69
t-value	(4.5)***	(13.72)***	(12.68)***	1.54	(-3)***	-0.79		
BC	1.46	0.36	0.38	0.19	0.6	-0.11	0.58	0.57
t-value	(4.02)***	(13.08)***	(3.31)***	1.08	(3.65)***	-0.93		
BM	1.72	0.34	0.4	0.3	0.27	-0.13	0.6	0.58
t-value	(5.33)***	(13.76)***	(3.91)***	(1.92)**	(1.82)*	-1.21		
BA	1.64	0.38	0.51	0.2	-0.3	-0.16	0.6	0.59
t-value	(4.72)***	(14.39)***	(4.62)***	1.21	(-1.89)*	-1.43		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the fixed basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.19b: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Non-Financial Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SC	2.01	0.32	1.36	0.55	0.45	-0.32	0.75	0.75
t-value	(5.15)***	(11.7)***	(12.51)***	(2.9)***	(2.88)***	(-2.69)***		
SM	1.65	0.35	1.2	0.28	0.06	-0.11	0.7	0.69
t-value	(4.12)***	(12.29)***	(10.82)***	1.43	0.39	-0.89		
SA	1.97	0.31	1.38	0.44	-0.66	-0.32	0.71	0.7
t-value	(5.06)***	(11.33)***	(12.78)***	(2.34)**	(-4.24)***	(-2.67)***		
BC	1.88	0.33	0.32	0.43	0.49	-0.21	0.61	0.6
t-value	(4.72)***	(11.87)***	(2.95)***	(2.26)**	(3.07)***	(-1.71)*		
BM	1.94	0.31	0.33	0.2	0.04	-0.34	0.57	0.56
t-value	(5.08)***	(11.4)***	(3.1)***	1.09	0.25	(-2.9)***		
BA	1.91	0.34	0.3	0.54	-0.4	-0.21	0.55	0.54
t-value	(4.77)***	(12.15)***	(2.69)***	(2.79)***	(-2.46)***	(-1.72)***		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the non-financial basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.19c: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Variable Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SC	2.32	0.3	1.41	0.56	0.44	-0.51	0.81	0.8
t-value	(6.39)***	(11.88)***	(14.58)***	(3.3)***	(3.14)***	(-5.45)***		
SM	2.1	0.31	1.21	0.35	0.16	-0.41	0.76	0.75
t-value	(5.630***	(11.83)***	(12.15)***	(1.99)**	1.14	(-4.18)***		
SA	2.28	0.28	1.41	0.5	-0.66	-0.53	0.78	0.77
t-value	(6.32)***	(11.08)***	(14.67)***	(2.99)***	(-4.72)***	(-5.63)***		
BC	2.17	0.29	0.36	0.53	0.49	-0.48	0.69	0.68
t-value	(5.81)***	(11.36)***	(3.67)***	(3.04)***	(3.43)***	(-4.96)***		
BM	2.2	0.28	0.32	0.31	0.01	-0.55	0.68	0.67
t-value	(6.32)***	(11.66)***	(3.45)***	(1.92)**	0.09	(-6.09)***		
BA	2.21	0.32	0.36	0.58	-0.41	-0.47	0.66	0.65
t-value	(5.85)***	(12.06)***	(3.62)***	(3.33)***	(-2.84)***	(-4.76)***		

Source: Author's computation
Note: *The table reports the estimation results of the five factor FFFF of the variable basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.19a, 419b and 4.19c show FFFF linear regression result of the size-investment sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent. The study also found small size firms produce higher coefficient values than big size firms for all the baskets. The value coefficient of only two portfolios for the fixed basket are found to be significant i.e., SC & BM at 10 & 5 percent respectively.

For the non-financial basket SC & BA portfolios is significant 1 percent and SA & BC at 5 percent. For value factor of the portfolios under variable basket is found significant at 1 percent except SM & BM which is significant at 5 percent. The investment coefficient for all the portfolios of fixed basket is found to be significant at 1 percent except BM & BA which is significant at 10 percent. The investment coefficient for all the portfolios of non-financial basket is found to be significant at 1 percent except BM & BA which are insignificant. The investment coefficient for all the portfolios of variable basket is found to be significant at 1 percent except BM & BA which are insignificant. The profitability coefficient for fixed basket is found to be insignificant except SM which is significant at 5 percent. The profitability coefficient of all portfolios under non-financial basket is significant at 1 percent except BC which is significant at 10 percent but SM insignificant. For variable basket all portfolios are significant at 1 percent. All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.73 approximately which indicates that it performs better than CAPM, FFTF & CFFM due to addition of extra variables in the model. The regression results shows that the intercept term for the double sorted mimicking portfolios in all the baskets to be significant at 1 percent which suggest that the model is still unfit to explain the return of the stock.

4.4.4.3 FFFF Regression analysis of the Size-Profitability Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.20a: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Fixed Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SR	2.15	0.41	1.44	0.16	0.28	0.49	0.68	0.67
t-value	(5.41)***	(13.47)***	(11.37)***	0.84	1.56	(3.83)***		
SM	1.52	0.36	1.28	0.24	0.12	-0.18	0.7	0.69
t-value	(4.4)***	(13.74)***	(11.56)***	1.46	0.76	-1.57		
SW	1.71	0.35	1.12	0.16	0.2	-0.62	0.72	0.71
t-value	(5.04)***	(13.49)***	(10.34)***	0.97	1.32	(-5.64)***		
BR	1.57	0.32	0.29	0.28	0.12	0.17	0.54	0.53
t-value	(5.04)***	(13.53)***	(2.94)***	(1.88)*	0.83	(1.71)*		
BM	1.37	0.38	0.44	0.08	0.11	-0.1	0.62	0.61
t-value	(4.07)***	(14.75)***	(4.1)***	0.5	0.73	-0.92		
BW	2.01	0.38	0.61	0.28	0.2	-0.72	0.66	0.65
t-value	(5.45)***	(13.53)***	(5.19)***	1.59	1.17	(-6.04)***		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the fixed basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.20b: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Financial Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SR	2.09	0.34	1.21	0.47	0.05	0.45	0.65	0.64
t-value	(5.2)***	(11.84)***	(10.81)***	(2.39)**	0.28	(3.67)***		
SM	1.73	0.31	1.1	0.34	-0.09	-0.13	0.7	0.69
t-value	(4.88)***	(12.35)***	(11.23)***	(1.96)**	-0.65	-1.19		
SW	1.81	0.26	1.17	0.41	-0.09	-0.74	0.77	0.77
t-value	(5.44)***	(11.24)***	(12.64)***	(2.56)**	-0.69	(-7.21)***		
BR	1.93	0.23	0.25	0.33	-0.07	0.06	0.46	0.45
t-value	(6.18)**	(10.62)***	(2.91)***	(2.19)**	-0.57	0.63		
BM	1.66	0.3	0.23	0.31	-0.02	-0.25	0.56	0.55
t-value	(4.6)***	(11.83)***	(2.32)**	(1.75)*	-0.12	(-2.28)**		
BW	2.21	0.31	0.29	0.39	0.07	-0.75	0.65	0.64
t-value	(5.81)***	(11.4)***	(2.75)***	(2.09)**	0.44	(-6.38)***		

Source: Author's computation

***Note:** The table reports the estimation results of the five factor FFFF of the non-financial basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.20c: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Variable Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SR	2.68	0.31	0.48	0.34	0.15	-1.02	0.77	0.76
t-value	(6.96)***	(11.52)***	(4.72)***	(1.88)*	1.01	(-10.24)***		
SM	2.07	0.29	1.21	0.45	-0.08	-0.44	0.75	0.74
t-value	(5.6)***	(11.11)***	(12.3)***	(2.63)***	-0.55	(-4.57)***		
SW	2.1	0.29	1.28	0.68	-0.1	-1.01	0.82	0.82
t-value	(5.66)***	(11.08)***	(12.98)***	(3.92)***	-0.7	(-10.49)***		
BR	1.93	0.27	0.36	0.61	-0.01	-0.01	0.53	0.52
t-value	(5.21)***	(10.48)***	(3.7)***	(3.55)***	-0.1	-0.12		
BM	2.08	0.33	0.29	0.53	0.07	-0.47	0.7	0.69
t-value	(5.78)***	(13.03)***	(3.06)***	(3.15)***	0.51	(-5.02)***		
BW	2.68	0.31	0.48	0.34	0.15	-1.02	0.77	0.76
t-value	(6.96)***	(11.52)***	(4.72)***	(1.88)*	1.01	(-10.24)***		

Source: Author's computation
Note: *The table reports the estimation results of the five factor FFFF of the variable basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.20a, 4.20b and 4.20c show FFFF linear regression result of the size-profitability sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent except BM portfolio from non-financial basket which is significant at 5 percent. The study found small size firms produce higher coefficient values than big size firms for all the baskets. For the value coefficient for the fixed basket only BR portfolio is found to be significant at 10. For the non-financial basket all portfolios are significant 5 percent except BM which is significant at 10 percent. For the variable basket all portfolios are significant at 1 percent except SR & BW which is significant at 10 percent for value factor. The investment coefficient for all the portfolios is found to be insignificant and mostly negative. The profitability coefficient for fixed basket portfolio is found to be significant at 1 percent except BR portfolio which is significant at 10 percent but SM & BM are insignificant. The profitability coefficient of non-financial basket portfolios of SR, SW & BW is significant at 1 percent and BM is significant at 10 percent but SM & BR are insignificant. For variable basket all portfolios are significant at 1 percent except BR which is insignificant. All the profitability coefficient are found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.65, non-financial basket is 0.63 and variable basket is 0.72 approximately which means that it performs better than CAPM, FFTF & Carhart due to addition of extra variables in the model. The regression results show that intercept term for the double sorted mimicking portfolios of all the basket is found to be significant at 1 percent except BR portfolio from non-financial basket which is significant at 5 percent which suggests that still there’s something unexplained by the model.

4.4.4.4 FFFF Regression Analysis of the Size-Momentum Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent

Table 4.21a: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Fixed Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SU	3.42	0.38	1.59	0.18	0.24	0.12	0.69	0.69
t-value	(8.79)***	(12.73)***	(12.76)***	0.96	1.35	0.94		
SM	1.56	0.35	1.31	0.19	0.03	-0.33	0.72	0.72
t-value	(4.72)***	(13.91)***	(12.4)***	1.19	0.2	(-3.04)***		
SD	-0.13	0.37	1.29	0.09	0.06	-0.29	0.7	0.69
t-value	-0.37	(13.43)***	(11.37)***	0.51	0.37	(-2.52)**		
BU	2.91	0.36	0.37	0.32	0.12	-0.16	0.56	0.55
t-value	(8.15)***	(13.17)***	(3.25)***	(1.84)*	0.76	-1.39		
BM	1.51	0.37	0.48	0.11	0.21	-0.12	0.62	0.61
t-value	(4.57)***	(14.53)***	(4.53)***	0.67	1.41	-1.15		
BD	0.41	0.38	0.53	0.23	0.18	-0.14	0.56	0.55
t-value	1.06	(12.7)***	(4.28)***	1.24	1.04	-1.09		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the fixed basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.21b: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Non-Financial Basket)

	α	**β**	**s**	**l**	**c**	**r**	R^2	**Adj.** R^2
SU	5.42	0.31	1.51	0.5	-0.22	-0.25	0.7	0.69
t-value	(12.71)***	(10.43)***	(12.78)***	(2.41)**	-1.29	(-1.92)*		
SM	1.88	0.32	1.1	0.22	0.08	-0.34	0.71	0.7
t-value	(5.02)***	(11.98)***	(10.6)***	1.23	0.53	(-2.95)***		
SD	-1.06	0.28	1.04	0.37	0.12	-0.35	0.68	0.67
t-value	(-2.82)***	(10.48)***	(10.01)***	(2.03)**	0.78	(-3.07)***		
BU	4.86	0.35	0.31	0.51	-0.12	-0.28	0.52	0.51
t-value	(10.67)***	(11)***	(2.48)**	(2.31)**	-0.66	(-1.98)**		
BM	1.48	0.32	0.35	0.38	0.07	-0.13	0.56	0.55
t-value	(3.82)***	(11.87)***	(3.29)***	(2.01)**	0.42	-1.12		
BD	-0.94	0.3	0.41	0.26	0.06	-0.28	0.57	0.55
t-value	(-2.44)**	(11.1)***	(3.8)***	1.37	0.37	(-2.36)**		

Source: Author's computation

Note: *The table reports the estimation results of the five factor FFFF of the non-financial basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

Table 4.21c: FFFF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Variable Basket)

	α	β	s	l	c	r	R^2	Adj. R^2
SU	5.3	0.32	1.49	0.42	-0.18	-0.45	0.75	0.74
t-value	(12.51)***	(10.83)***	(13.19)***	(2.14)**	-1.09	(-4.07)***		
SM	2.44	0.26	1.17	0.48	-0.24	-0.7	0.73	0.72
t-value	(6.07)***	(9.34)***	(10.98)***	(2.59)**	-1.58	(-6.72)***		
SD	-0.37	0.26	1.14	0.57	0.23	-0.53	0.75	0.74
t-value	-0.98	(9.88)***	(11.470***	(3.26)***	1.63	(-5.49)***		
BU	4.59	0.32	0.38	0.41	-0.03	-0.5	0.6	0.59
t-value	(10.19)***	(10.32)***	(3.15)***	(1.94)**	-0.18	(-4.3)***		
BM	1.88	0.31	0.37	0.55	0.02	-0.44	0.66	0.65
t-value	(4.99)***	(11.87)***	(3.68)***	(3.12)***	0.13	(-4.53)***		
BD	-0.37	0.3	0.48	0.38	0.2	-0.47	0.65	0.64
t-value	-0.96	(10.92)***	(4.61)***	(2.07)**	1.3	(-4.58)***		

Source: Author's computation
Note: *The table reports the estimation results of the five factor FFFF of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

The Table 4.21a, 4.21b and 4.21c show FFFF linear regression result of the size-momentum sorted portfolios for three baskets of portfolios. The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent except BU portfolio size coefficient from non-financial basket significant at 5 percent. The study also found small size firms found to produce higher coefficient values then big size firms for all the baskets. The value coefficient for the fixed basket only BU portfolio found to be significant at 10. For the non-financial basket all portfolios significant 5 percent except SM & BD insignificant for value coefficient. For the variable basket all portfolios significant at 5 percent except SD & BM significant at 1 percent for value coefficient. The investment coefficient for all the portfolios found to be insignificant and mostly negative. The profitability coefficient for fixed basket SM & SD portfolios found to be significant 1 percent & 5 percent. The non-financial basket SM & SD portfolios significant at 1 percent, BU & BD significant at 5 percent and SU portfolio at 10 percent but BM portfolio insignificant. For variable basket all portfolios are significant at 1 percent except BR portfolio which is insignificant. All the profitability coefficient found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.64, non-financial basket is 0.62 and variable basket is 0.69 approximately which it performs better than CAPM, FFTF & CFFM due to addition extra variables in the model. The regression results show all the baskets portfolios' intercept term found for the double sorted mimicking portfolios to be significant at 1 percent except SD & BD portfolios for fixed insignificant; BD significant at 5 percent for non-financial and SD & BD portfolios for variable are insignificant also negative which suggest still there is left something unexplained by the model.

4.4.5 FFSF Regression analysis of the Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

$$R_{it} - R_f = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + u_i UMD_i + \mathrm{e}_{it}$$

4.4.5.1 FFSF Regression Analysis of the Size-Value Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

Table 4.22a: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Fixed Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SL	1.7	0.36	1.46	0.7	0.16	-0.12	-0.04	0.73	0.72
t-value	(3.69)***	(13.8)***	(13.39)**	(4.25)***	1.03	-1.06	-0.35		
SM	1.6	0.37	1.36	0.19	0.19	-0.12	0	0.71	0.7
t-value	(3.33)***	(13.7)***	(12.01)***	1.11	1.21	-1.03	0.04		
SH	1.85	0.36	1.48	-0.26	0.12	-0.15	-0.06	0.74	0.73
t-value	(4.02)***	(13.95)***	(13.57)***	-1.6	0.77	-1.37	-0.58		
BL	1.77	0.37	0.44	0.75	0.16	-0.2	-0.03	0.61	0.6
t-value	(3.76)***	(13.95)***	(3.94)***	(4.47)***	1.02	-1.78	-0.31		
BM	1.76	0.36	0.45	0.17	0.11	-0.02	-0.05	0.59	0.58
t-value	(3.93)***	(14.07)***	(4.21)***	1.05	0.74	-0.19	-0.49		
BH	1.61	0.37	0.42	-0.29	0.2	-0.17	-0.01	0.6	0.59
t-value	(3.44)***	(13.82)***	(3.75)***	(-1.75)*	1.27	-1.48	-0.09		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the fixed basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.22b: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Non-Financial Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SL	0.62	0.33	1.34	1.09	0.08	-0.19	0.17	0.74	0.73
t-value	0.91	(11.74)***	(12.07)***	(5.65)***	0.51	-1.52	(1.83)*		
SM	0.43	0.31	1.23	0.18	0.02	-0.28	0.24	0.72	0.71
t-value	0.64	(11.29)***	(11.5)***	0.96	0.14	(-2.38)**	(2.73)***		
SH	0.6	0.32	1.28	-0.14	0.08	-0.28	0.24	0.73	0.72
t-value	0.89	(11.56)***	(11.8)***	-0.75	0.49	(-2.39)**	(2.69)***		
BL	0.54	0.32	0.24	0.84	0.05	-0.32	0.25	0.61	0.59
t-value	0.81	(11.52)***	(2.28)**	(4.5)***	0.31	(-2.71)***	(2.86)***		
BM	0.54	0.31	0.31	0.21	0.08	-0.21	0.21	0.58	0.57
t-value	0.83	(11.71)***	(2.92)***	1.16	0.51	(-1.79)*	(2.47)**		
BH	0.57	0.33	0.31	0.07	0.05	-0.22	0.18	0.58	0.56
t-value	0.84	(11.84)***	(2.8)***	0.38	0.34	(-1.85)*	(2.02)**		

Source: Author's computation

Note: *The table reports the estimation results of the single factor FFSF of the non-financial basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.22c: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Value (Variable Basket)

	α	**β**	**s**	**l**	**c**	**r**	**u**	R^2	**Adj.** R^2
SL	1.73	0.29	1.4	1.15	0.04	-0.5	0.06	0.8	0.79
t-value	(3.05)***	(11.15)***	(13.92)***	(6.57)***	0.24	(-5.16)***	0.77		
SM	1.4	0.3	1.24	0.3	0.05	-0.46	0.14	0.78	0.77
t-value	(2.57)**	(11.93)***	(12.87)***	(1.81)*	0.34	(-4.89)***	(1.89)*		
SH	1.66	0.29	1.37	0	0.05	-0.52	0.14	0.78	0.77
t-value	(2.99)***	(11.03)***	(13.84)***	0	0.37	(-5.4)***	(1.77)*		
BL	1.49	0.29	0.29	0.98	0.07	-0.51	0.18	0.7	0.69
t-value	(2.69)***	(11.34)***	(2.98)***	(5.75)***	0.47	(-5.35)***	(2.26)**		
BM	1.56	0.3	0.33	0.14	0.05	-0.5	0.1	0.66	0.65
t-value	(2.8)***	(11.61)***	(3.33)***	0.79	0.35	(-5.18)***	1.26		
BH	1.56	0.3	0.33	0.14	0.05	-0.5	0.1	0.66	0.65
t-value	(2.8)***	(11.61)***	(3.33)***	0.79	0.35	(-5.18)***	1.26		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the variable basket. Stocks are sorted into size-value portfolios* (SL, SM, SH, BL, BM, BH). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.22a, 4.22b and 4.22c show FFSF linear regression result of the size-value sorted portfolios for three baskets of portfolios. The market and size coefficient for all the baskets are found to be significant at 1 percent except SL & BL portfolios which size coefficient for fixed and non-financial basket is significant at 5 percent. The study found that low value stocks produce higher coefficient values than big high value stocks for all the baskets. The value (P/B) coefficient of SL & BL portfolios for the fixed basket is found to be significant at 1 percent and BH is significant at 10 percent. For the non-financial basket SL and BL portfolios is significant 1 percent. The value coefficient for the variable basket SL & BL portfolios is significant at 1 percent and SM is significant at 10 percent. The investment coefficient for all the portfolios is found to be insignificant. The profitability coefficient for fixed basket portfolios is found to be insignificant and all values are negative. The non-financial basket BL portfolio is significant at 1 percent, SM & SH is significant at 5 percent and BM & BH portfolio is significant at 10 percent but all values are negative. For variable basket all portfolios are significant at 1 percent but all values are negative. The momentum coefficient for fixed basket is insignificant with negative values. For non-financial basket SM, SH, & BL portfolios are significant at 1 percent, BM & BH portfolios is significant at 5 percent and SL is significant at 10 percent. For the variable basket BL is significant at 5 percent and SM & SH portfolios is significant at 10 percent. All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.66 and variable basket is 0.73 approximately which means it performs better than CAPM, FFTF & CFFM due to addition of extra variables in the model. However, the model does not improve from the FFFM model as similar R^2 value are found. The regression results shows that the intercept term for the double sorted mimicking portfolios of fixed and variable baskets portfolios is found to be significant at 1 percent except SM portfolios of variable basket which is significant at 5 percent. For non-financial basket all the intercept term are found to be insignificant.

4.4.5.2 FFSF Regression Analysis of the Size-Investment Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

Table 4.23a: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Fixed Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SC	1.71	0.01	1.53	1.53	0.27	0.63	-0.14	0.77	0.76
t-value	(3.79)***	(14.9)***	(14.26)***	(1.66)*	(4.12)***	-1.27	0.06		
SM	1.67	0.35	1.35	0.08	0.13	-0.21	-0.08	0.7	0.69
t-value	(3.48)***	(12.92)***	(11.91)***	0.48	0.78	(-1.84)*	-0.72		
SA	1.64	0.36	1.4	0.26	-0.47	-0.08	-0.03	0.7	0.69
t-value	(3.5)***	(13.68)***	(12.64)***	1.54	(-2.98)***	-0.73	-0.26		
BC	1.55	0.36	0.39	0.19	0.6	-0.1	-0.03	0.58	0.57
t-value	(3.15)***	(13.05)***	(3.31)***	1.09	(3.65)***	-0.86	-0.28		
BM	1.94	0.34	0.41	0.3	0.27	-0.11	-0.07	0.6	0.58
t-value	(4.44)***	(13.74)***	(3.95)***	(1.95)**	(1.85)*	-1.05	-0.76		
BA	1.63	0.38	0.51	0.2	-0.3	-0.16	0	0.6	0.59
t-value	(3.46)***	(14.36)***	(4.6)***	1.2	(-1.89)*	-1.41	0.03		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the fixed basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.23b: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Non-Financial Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SC	0.57	0.31	1.31	0.5	0.51	-0.34	0.23	0.76	0.75
t-value	0.86	(11.41)***	(12.16)***	(2.7)***	(3.29)***	(-2.84)***	(2.64)***		
SM	0.83	0.34	1.18	0.25	0.1	-0.12	0.13	0.69	0.69
t-value	1.2	(12)***	(10.5)***	1.3	0.6	-0.95	1.45		
SA	0.4	0.3	1.33	0.39	-0.6	-0.33	0.26	0.72	0.72
t-value	0.6	(11.04)***	(12.44)***	(2.12)**	(-3.85)***	(-2.84)***	(2.92)***		
BC	0.74	0.32	0.29	0.4	0.54	-0.22	0.18	0.62	0.6
t-value	1.08	(11.57)***	(2.63)***	(2.09)**	(3.36)***	(-1.8)*	(2.04)**		
BM	0.34	0.3	0.28	0.15	0.1	-0.35	0.26	0.59	0.58
t-value	0.53	(11.11)***	(2.67)***	0.84	0.69	(-3.08)***	(3.01)***		
BA	0.92	0.34	0.27	0.51	-0.35	-0.22	0.16	0.56	0.54
t-value	1.33	(11.85)***	(2.4)**	(2.63)***	(-2.18)**	(-1.8)*	(1.77)**		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the non-financial basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.23c: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Investment (Variable Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SC	1.45	0.29	1.39	0.57	0.49	-0.52	0.16	0.81	0.81
t-value	(2.68)***	(11.6)***	(14.44)***	(3.39)***	(3.49)***	(-5.54)***	(2.15)**		
SM	1.61	0.3	1.2	0.35	0.19	-0.41	0.09	0.76	0.75
t-value	(2.88)***	(11.58)***	(11.99)***	(2.02)**	1.32	(-4.21)***	1.16		
SA	1.79	0.27	1.4	0.51	-0.63	-0.53	0.09	0.78	0.77
t-value	(3.31)***	(10.84)***	(14.5)***	(3.02)***	(-4.45)***	(-5.66)***	1.2		
BC	1.84	0.29	0.36	0.53	0.51	-0.48	0.06	0.69	0.68
t-value	(3.27)***	(11.14)***	(3.57)***	(3.05)***	(3.51)***	(-4.97)***	0.79		
BM	1.53	0.28	0.3	0.32	0.05	-0.55	0.13	0.68	0.67
t-value	(2.94)***	(11.39)***	(3.28)***	(1.98)**	0.39	(-6.15)***	(1.72)*		
BA	1.49	0.31	0.35	0.59	-0.37	-0.47	0.13	0.66	0.65
t-value	(2.64)***	(11.78)***	(3.46)***	(3.39)***	(-2.52)**	(-4.81)***	(1.7)*		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the variable basket. Stocks are sorted into size-investment portfolios* (SC, SM, SA, BC, BM, BA). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

The Table 4.23a, 4.23b and 4.23c show FFFF linear regression result of the size-investment sorted portfolios for three baskets of portfolios. The market and size coefficient for all the baskets are found to be significant at 1 percent except BA portfolio under non-financial basket which is significant at 5 percent. The study found small size firms produce higher coefficient values than big size firms for all the baskets. The value coefficient for the fixed basket SC & BM portfolios is found to be significant at 10 percent and 5 percent respectively. the value coefficient for the non-financial basket SC & BA portfolios is found significant at 1 percent and SA & BC is significant at 5 percent. The value coefficient of all the portfolios for the variable basket are significant at 1 percent except SM & BM portfolio which is significant at 5 percent. The investment coefficient for fixed basket SC, SA & BC portfolios are found to be significant at 1 percent and BM & BA portfolios is significant at 10 percent but the coefficient value of SA & BA portfolio is found to be negative. The investment coefficient for non-financial basket SC, SA & BC portfolios is found to be significant at 1 percent and BA portfolios is significant at 5 percent but coefficient of SA & BA portfolio is negative. The investment coefficient for variable basket SC, SA & BC portfolios is found to be significant at 1 percent and BA portfolios is significant at 5 percent but the coefficient of SA & BA is found to be negative. The profitability coefficient of SM portfolio for fixed basket is found to be significant at10 percent and all the values are negative except SA portfolio. The non-financial basket SC, SA & BM portfolios is significant at 1 percent and BC & BA is significant at 10 percent but all the values are negative. For variable basket all portfolios are significant at 1 percent but all the values are negative. The momentum coefficient for fixed basket is insignificant and negative. For non-financial basket SC, SA, & BM portfolios are significant at 1 percent and BC & BA portfolios is significant at 5 percent. For the variable basket SC is significant t 5 percent and BM & BA portfolios is significant at 10 percent. All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.66 and variable basket is 0.73 approximately which means it perform better than CAPM, FFTF & Carhart due to addition of extra variables in the model. However, it has not outperformed FFFF as the R^2 value are similar. The regression results also show that the intercept term of the double sorted mimicking portfolios for both fixed and variable baskets portfolio is found to be significant at 1 percent but all portfolios for non-financial basket is found to be insignificant.

4.4.5.3 FFSF Regression Analysis of the Size-Profitability Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

Table 4.24a: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Fixed Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SR	1.85	0.41	1.43	0.15	0.28	0.47	0.1	0.68	0.67
t-value	(3.45)***	(13.46)***	(11.28)***	0.79	1.53	(3.62)***	0.81		
SM	1.65	0.36	1.28	0.25	0.12	-0.17	-0.04	0.7	0.69
t-value	(3.52)***	(13.71)***	(11.54)***	1.48	0.77	-1.47	-0.42		
SW	1.63	0.35	1.12	0.16	0.2	-0.62	0.03	0.72	0.71
t-value	(3.54)***	(13.45)***	(10.28)***	0.96	1.3	(-5.58)***	0.26		
BR	1.67	0.32	0.3	0.28	0.12	0.18	-0.03	0.55	0.53
t-value	(3.94)***	(13.49)***	(2.95)***	(1.89)*	0.85	(1.74)*	-0.34		
BM	1.67	0.38	0.45	0.09	0.12	-0.08	-0.1	0.62	0.6
t-value	(3.66)***	(14.74)***	(4.15)***	0.56	0.77	-0.74	-0.97		
BW	1.89	0.38	0.61	0.28	0.19	-0.73	0.04	0.66	0.65
t-value	(3.78)***	(13.5)***	(5.15)***	1.57	1.16	(-5.99)***	0.34		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the fixed basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.24b: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Non-Financial Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SR	1.01	0.33	1.17	0.43	0.09	0.44	0.18	0.65	0.64
t-value	1.46	(11.54)***	(10.46)***	(2.23)**	0.56	(3.62)***	(1.91)**		
SM	0.21	0.3	1.06	0.29	-0.03	-0.14	0.25	0.72	0.71
t-value	0.34	(12.08)***	(10.87)***	(1.72)*	-0.21	-1.34	(3.1)***		
SW	1.02	0.26	1.14	0.39	-0.06	-0.74	0.13	0.78	0.77
t-value	(1.78)*	(10.95)***	(12.29)***	(2.41)**	-0.44	(-7.31)***	(1.69)*		
BR	1.04	0.23	0.22	0.3	-0.03	0.05	0.14	0.48	0.46
t-value	(1.94)**	(10.33)***	(2.59)**	(2.02)**	-0.27	0.56	(2.02)**		
BM	0.98	0.3	0.21	0.29	0.01	-0.26	0.11	0.56	0.55
t-value	1.57	(11.55)***	(2.1)**	1.63	0.08	(-2.33)**	1.33		
BW	1.03	0.3	0.25	0.35	0.12	-0.76	0.19	0.66	0.65
t-value	1.58	(11.1)***	(2.41)**	(1.91)**	0.76	(-6.53)***	(2.21)**		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the non-financial basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.24c: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Profitability (Variable Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SR	2.3	0.32	1.39	0.41	0.1	-0.03	0.11	0.72	0.72
t-value	(3.84)***	(11.48)***	(13.05)***	(2.21)**	0.62	-0.28	1.25		
SM	1.16	0.28	1.19	0.46	-0.02	-0.44	0.17	0.75	0.75
t-value	(2.12)**	(10.83)***	(12.15)***	(2.71)***	-0.17	(-4.66)***	(2.2)**		
SW	1.58	0.28	1.27	0.68	-0.07	-1.02	0.1	0.82	0.82
t-value	(2.83)***	(10.83)***	(12.82)***	(3.96)***	-0.48	(-10.53)***	1.25		
BR	1.35	0.26	0.35	0.62	0.02	-0.01	0.11	0.53	0.52
t-value	(2.44)**	(10.22)***	(3.55)***	(3.59)***	0.14	-0.15	1.38		
BM	1.62	0.32	0.28	0.53	0.1	-0.47	0.09	0.7	0.69
t-value	(3)***	(12.77)***	(2.94)***	(3.18)***	0.7	(-5.04)***	1.13		
BW	2.07	0.3	0.47	0.34	0.19	-1.03	0.11	0.77	0.76
t-value	(3.59)***	(11.26)***	(4.57)***	(1.92)***	1.24	(-10.29)***	1.41		

Source: Author's computation

***Note:** The table reports the estimation results of the six factor FFSF of the variable basket. Stocks are sorted into size-profitability portfolios* (SR, SM, SW, BR, BM, BW). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.24a, 4.24b and 4.24c show FFSF linear regression result of the size-profit sorted portfolios for three baskets of portfolios. The market and size coefficient for all the baskets are also are found to be significant at 1 percent except BR, BM & BW portfolios size coefficient for non-financial basket which is significant at 5 percent. The study also found small size firms found to produce higher coefficient values then big size firms for all the baskets. The value coefficient for the fixed basket BR portfolio is found to be significant at 10 percent. For the non-financial basket all portfolios are significant 5 percent except SM portfolio which is significant at 10 percent but BM portfolio is insignificant. For the variable basket all the portfolios are significant at 1 percent except SR which is significant at 5 percent for value coefficient. The investment coefficient for all the baskets is found to be insignificant. The profitability coefficient for fixed basket SR, SW & BW portfolios are found to be significant at 1 percent and BR portfolio is significant at 10 percent. The non-financial basket SR, SM & BW portfolios are significant at 1 percent and BM is significant at 10 percent. For variable basket all portfolios are significant at 1 percent except SR & BR which are found to be insignificant but all portfolios coefficient values are negative. The momentum coefficient for fixed basket is insignificant and negative except SR portfolio. For non-financial basket SM portfolio is significant at 1 percent; SR, BR, & BW portfolios are significant at 5 percent and SW portfolio is significant at 10 percent. For the variable basket SM portfolio is significant at 5 percent. All the profitability coefficient values are found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.64 and variable basket is 0.72 approximately which mean it performs better than CAPM, FFTF & CFFM due to addition extra variables in the model. The regression results shows both fixed and variable baskets portfolios' intercept term found for the double sorted mimicking portfolios to be significant at 1 percent except SM & BR portfolios from variable basket are significant at 5 percent but all portfolios for non-financial basket found to be insignificant except SW & BR portfolios are significant at 10 & 5 percent respectively.

4.4.5.4 FFSF Regression Analysis of the Size-Momentum Cross of Six Risk-Based Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

Table 4.25a: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Fixed Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SU	1.63	0.38	1.55	0.13	0.2	0.01	0.59	0.74	0.73
t-value	(3.33)***	(13.69)**	(13.31)***	0.73	1.24	0.04	(5.4)**		
SM	1.86	0.35	1.32	0.2	0.04	-0.31	-0.1	0.72	0.72
t-value	(4.15)***	(13.91)***	(12.44)***	1.24	0.24	(-2.82)***	-0.98		
SD	1.54	0.36	1.33	0.14	0.09	-0.18	-0.55	0.74	0.73
t-value	(3.45)***	(14.45)***	(12.59)***	0.86	0.62	(-1.7)*	(-5.55)***		
BU	1.7	0.36	0.34	0.28	0.1	-0.24	0.4	0.59	0.58
t-value	(3.64)***	(13.67)***	(3.1)***	(1.69)*	0.63	(-2.1)**	3.85		
BM	1.81	0.37	0.49	0.12	0.22	-0.1	-0.1	0.62	0.61
t-value	(4.03)***	(14.52)***	(4.58)***	0.72	1.44	-0.96	-0.96		
BD	1.8	0.38	0.56	0.27	0.21	-0.05	-0.46	0.6	0.58
t-value	(3.56)***	(13.2)***	(4.71)***	1.52	1.24	-0.4	(-4.07)***		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively. The sample period is 2006:02-2021:12 (191 monthly observations)*

Table 4.25b: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Non-Financial Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SU	0.86	0.28	1.37	0.36	-0.03	-0.29	0.74	0.79	0.79
t-value	1.4	(11.12)***	(13.76)***	(2.06)**	-0.2	(-2.66)***	(9.05)***		
SM	0.59	0.31	1.06	0.18	0.13	-0.35	0.21	0.72	0.71
t-value	0.93	(11.68)***	(10.24)***	1.02	0.89	(-3.09)***	(2.46)**		
SD	0.38	0.29	1.09	0.41	0.06	-0.34	-0.23	0.69	0.68
t-value	0.59	(10.94)***	(10.49)***	(2.31)**	0.38	(-3.01)***	(-2.76)***		
BU	0.57	0.32	0.18	0.38	0.06	-0.31	0.7	0.64	0.62
t-value	0.82	(11.4)***	1.63	(1.95)**	0.37	(-2.57)**	(7.62)***		
BM	1.02	0.32	0.34	0.36	0.08	-0.14	0.07	0.56	0.55
t-value	1.52	(11.63)***	(3.12)***	(1.93)*	0.54	-1.15	0.83		
BD	1.05	0.32	0.47	0.32	-0.03	-0.26	-0.32	0.6	0.58
t-value	1.62	(11.9)***	(4.47)***	(1.75)*	-0.17	(-2.29)**	(-3.76)***		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the non-financial basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

Table 4.25c: FFSF Regression on Monthly Excess Returns of Portfolios Formed on Risk Profile of Size-Momentum (Variable Basket)

	α	β	s	l	c	r	u	R^2	Adj. R^2
SU	2	0.29	1.41	0.46	0.02	-0.46	0.62	0.81	0.81
t-value	(3.64)***	(11.36)***	(14.43)***	(2.69)***	0.15	(-4.87)***	(8.05)***		
SM	1.95	0.26	1.16	0.49	-0.22	-0.7	0.09	0.73	0.72
t-value	(3.23)***	(9.11)***	(10.83)***	(2.62)**	-1.37	(-6.74)***	1.08		
SD	1.35	0.27	1.18	0.55	0.13	-0.52	-0.32	0.77	0.76
t-value	(2.52)**	(10.81)***	(12.35)***	(3.3)***	0.94	(-5.66)***	(-4.28)***		
BU	1.11	0.29	0.3	0.44	0.18	-0.52	0.65	0.7	0.69
t-value	(1.9)**	(10.75)***	(2.85)***	(2.44)**	1.17	(-5.12)***	(7.94)***		
BM	1.51	0.31	0.36	0.55	0.04	-0.44	0.07	0.66	0.65
t-value	(2.66)***	(11.64)***	(3.58)***	(3.14)***	0.28	(-4.54)***	0.88		
BD	1.76	0.32	0.53	0.35	0.07	-0.46	-0.4	0.7	0.69
t-value	(3.2)***	(12.25)***	(5.41)***	(2.07)**	0.47	(-4.79)***	(-5.19)***		

Source: Author's computation

Note: *The table reports the estimation results of the six factor FFSF of the variable basket. Stocks are sorted into size-momentum portfolios* (SU, SM, SD, BU, BM, BD). *T-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.)*

The Table 4.25a, 4.25b and 4.25c show FFSF linear regression result of the size-momentum sorted portfolios for three baskets of portfolios. The market and size coefficient for all the baskets are found to be significant at 1 percent except BU portfolio from size coefficient for non-financial basket is insignificant. The study found small size firms are found to produce higher coefficient values then big size firms for all the baskets. The value coefficient for the fixed basket BU portfolio is found to be significant at 10 percent. For the non-financial basket all portfolios are significant at 5 percent except SM & BD portfolios significant at 10 percent but SM portfolio is insignificant. For the variable basket all the portfolios significant at 1 percent except SM, BU & BD portfolios are significant at 5 percent for value coefficient. The investment coefficient for all the baskets insignificant. The profitability coefficient for fixed basket SM, BU & SD portfolios are found to be significant at 1, 5 & 10 percent respectively but all negative except SU portfolio. The non-financial basket SU, SM & SD portfolios are significant at 1 percent and BU & BD are significant at 5 percent and BM is insignificant but values negative. For variable basket all portfolios are significant at 1 percent but all negative. The momentum coefficient for fixed basket SD & BD are significant at 1 percent and SU significant at 5 percent but all negative except SU & BU portfolios. For non-financial basket all portfolios are significant at 1 percent except SM portfolio is significant at 5 percent and BM portfolio is insignificant. For the variable basket all portfolios are significant at 1 percent except SM & BM portfolios are insignificant. The average R^2 value for fixed baskets is 0.67, non-financial basket is 0.67 and variable basket is 0.73 approximately which means it outperform the CAPM, FFTF & CFFM due to addition extra variables in the model. However, it didn’t perform better than the FFFF model. The regression results also show that both fixed and variable baskets portfolios’ intercept term found for the double sorted mimicking portfolios are significant at 1 percent except SD & BU portfolios from variable basket are significant at 5 percent but all portfolios for non-financial basket are found insignificant.

4.4.5.5 Conclusions on Regression Result of the Six Risk-based Portfolio

1) The portfolio form on the basis of size and value regression result of FFSF found that for fixed basket and variable basket intercept terms are significant at 1 or 5 percent which suggests models' capacity to explain the return of the portfolios. Although the intercept term is significant for fixed basket but none of the investment, profitability and momentum coefficient are found to be significant. For the variable basket except investment all other factors are significant but all the coefficient of profitability (r) is negative.
2) For the non-financial basket's all the intercept are insignificant which mean it rejects size-value for this particular basket. Most of the factors are found to be significant except investment factor.
3) The size-investment sorted portfolios regression results shows similar to size-P/B. Both fixed and variable baskets intercept terms are found to be significant at 1 percent but non-financial baskets are found insignificant. Overall variable basket has better results than fixed and non-financial basket
4) Size-profit regression result shows similar results except intercept term for two portfolios SW & BR from non-financial basket are found significant at 10 & 5 percent respectively. Investment factor is found to be insignificant. All the portfolio's value factor for variable basket found to be significant at 1 percent except SR at 5 percent.
5) For size-momentum portfolio similar regression result were found. Most of the intercept of fixed basket and variable basket portfolios are found to be significant either at 1 percent or at 5 percent but the intercept of non-financial basket is found to be insignificant. The variable basket factors result show better results compared to fixed and non-financial basket.

The FFSF regression for the four-size sorted i.e., size-value, size-investment, size-profitability and size-momentum. From the regression result it is clear that FFSF failed to explain the non-financial basket portfolios as none of the portfolios intercept term found insignificant.

4.5 Linear Regression Results of 25 Portfolios for CAPM, FFTF, CFFM, FFFF and FFSF

In this section, the analysis is conducted on the standard CAPM, FFTF, CFFM, FFFF and FFSF by employing linear regression for each size-value, size-investment, size-profitability and size-momentum based 25 portfolios. The objective of this approach is to identify the role of size, value, investment, profitability and momentum factors in capturing the variation in stock returns during the period from January 2006 to December 2021.

4.5.1 CAPM Regression Analysis of 25 Portfolios with Market Risk (R_m-R_f), as the Independent Variable

$$R_{it} - R_{ft} = \alpha_i + \beta_i \left(R_{mt} - R_{ft}\right) + \mathrm{e}_{it}$$

4.5.1.1 CAPM Regression Analysis of the Size-Value Cross 25 Portfolios with Market Risk (R_m-R_f), as the Independent Variable

Table 4.26a: CAPM Intercept and Coefficient for 25 Size-Value Portfolios for the Period January 2006 to December 2021(Fixed Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	0.23	1.43	0.90	1.15	0.71	0.39	2.36	1.68	2.7	1.72
2	1.26	0.69	0.79	1.02	0.95	2.13	1.39	1.79	2.4	2.28
3	0.79	1.49	1.32	0.89	0.72	1.31	2	2.64	2.13	1.84
4	-0.06	1.10	1.18	0.63	1.04	-0.11	2.32	2.37	1.21	2.32
Big	0.75	0.61	1.19	0.17	0.89	1.08	1.08	2.56	0.37	2.43
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.46	0.46	0.40	0.36	0.43	10.23	10	9.99	11.23	13.7
2	0.40	0.43	0.36	0.36	0.40	9.05	11.38	10.61	11.05	12.58
3	0.42	0.40	0.43	0.39	0.34	9.16	7.15	11.41	12.35	11.29
4	0.51	0.41	0.44	0.48	0.43	12.33	11.24	11.51	12.04	12.56
Big	0.48	0.42	0.41	0.45	0.38	9.01	9.8	11.46	12.92	13.62

Source: Author's computation

Table 4.26b: CAPM Intercept and coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	0.14	0.87	0.40	-0.12	0.82	0.23	1.48	0.69	-0.22	1.39
2	1.09	0.96	0.95	1.07	0.90	1.79	1.85	2.00	2.15	1.74
3	1.53	1.02	1.30	1.65	1.17	3.19	2.34	2.67	4.69	2.73
4	1.55	1.28	1.02	1.23	0.29	3.12	3.09	2.41	3.16	0.67
Big	0.82	1.08	0.60	0.63	0.81	2.03	3.04	1.60	1.81	2.13
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.46	0.45	0.44	0.45	0.51	10.51	9.99	10.09	10.70	11.50
2	0.42	0.47	0.40	0.34	0.45	8.95	11.81	11.12	9.08	11.46
3	0.41	0.46	0.37	0.27	0.43	11.14	13.76	10.09	10.11	13.28
4	0.38	0.29	0.43	0.40	0.42	10.10	9.19	13.37	13.52	12.65
Big	0.40	0.34	0.35	0.37	0.33	13.01	12.74	12.45	13.93	11.54

Source: Author's computation

Table 4.26c: CAPM Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Variable Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	0.13	0.72	0.57	0.18	0.40	0.23	1.20	1.06	0.34	0.70
2	1.02	0.97	0.90	1.09	1.03	1.69	1.91	1.91	2.39	2.00
3	0.95	0.81	1.08	1.50	0.98	1.92	2.00	2.31	2.79	2.21
4	1.43	1.30	0.63	1.05	0.48	3.08	3.33	1.65	3.05	1.14
Big	1.10	0.91	0.64	0.67	0.79	2.81	2.62	1.78	1.90	2.24
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.47	0.43	0.45	0.46	0.52	10.96	9.42	10.95	11.33	11.85
2	0.45	0.50	0.42	0.37	0.43	9.69	13.00	11.74	10.55	11.04
3	0.45	0.44	0.42	0.35	0.43	11.92	14.09	11.81	8.57	12.88
4	0.43	0.33	0.38	0.37	0.47	12.13	11.22	13.01	14.28	14.63
Big	0.41	0.35	0.38	0.40	0.35	13.72	13.45	13.90	14.90	13.12

Source: Author's computation

4.5.1.2 CAPM Regression Analysis of the Size-Investment Cross 25 Portfolios with Market Risk (R_m-R_f), as the Independent Variable

Table 4.27a: CAPM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Fixed Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	0.67	1.54	1.06	0.24	0.88	1.07	2.07	1.95	0.5	1.61
2	0.10	0.38	0.09	0.63	0.64	0.13	0.74	0.2	1.54	1.5
3	0.45	0.95	1.38	0.72	0.84	0.83	1.8	2.64	1.88	2.09
4	0.36	0.92	0.69	1.27	0.87	0.55	1.66	1.52	2.7	2.48
Big	1.06	1.15	1.82	1.11	0.90	1.93	2.23	3.74	2.24	2.23
			$b_{(i)}$					t(b)		
Small	0.45	0.31	0.45	0.39	0.42	9.49	5.5	10.89	10.74	10.23
2	0.52	0.46	0.41	0.38	0.36	9.11	11.83	11.85	12.18	11.15
3	0.44	0.43	0.39	0.32	0.39	10.64	10.81	9.9	10.86	12.84
4	0.43	0.45	0.40	0.37	0.37	8.71	10.69	11.63	10.45	13.88
Big	0.43	0.37	0.38	0.46	0.40	10.38	9.46	10.29	12.12	12.94

Source: Author's computation

Table 4.27b: CAPM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	-0.16	0.24	0.35	0.22	1.32	-0.28	0.44	0.60	0.33	2.33
2	0.50	0.63	0.41	1.49	2.05	0.95	1.26	0.82	2.37	3.90
3	1.69	0.51	1.30	1.35	2.05	2.77	1.04	2.79	2.67	4.60
4	0.89	0.59	1.20	1.11	2.46	1.90	1.34	3.08	2.52	3.78
Big	0.41	1.43	0.67	0.62	1.34	0.75	2.08	1.76	1.79	3.08
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.49	0.50	0.47	0.48	0.36	11.49	11.93	10.72	9.63	8.36
2	0.43	0.43	0.39	0.32	0.29	10.76	11.12	10.35	6.62	7.24
3	0.02	0.49	0.41	0.10	0.37	0.40	13.06	11.69	2.49	10.80
4	0.41	0.47	0.39	0.38	0.30	11.51	13.97	13.37	11.33	6.00
Big	0.44	0.07	0.35	0.30	0.39	10.67	1.39	12.07	11.41	11.82

Source: Author's computation

Table 4.27c: CAPM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Variable Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	-0.29	-0.15	0.48	0.74	1.55	-0.49	-0.27	0.88	1.30	2.72
2	0.16	0.84	1.07	1.58	2.01	0.31	1.57	2.33	2.56	3.72
3	0.22	0.03	1.00	1.18	2.06	0.42	0.07	2.35	2.69	4.30
4	0.41	0.49	1.00	1.18	2.20	0.91	1.19	2.69	2.73	4.77
Big	-0.07	0.65	0.74	0.95	1.26	-0.17	1.69	2.21	2.78	3.32
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.49	0.49	0.44	0.47	0.42	11.04	11.50	10.57	10.98	9.70
2	0.46	0.37	0.44	0.42	0.41	11.49	9.13	12.52	8.97	10.05
3	0.50	0.43	0.44	0.36	0.41	12.51	13.65	13.50	10.74	11.22
4	0.39	0.38	0.39	0.40	0.42	11.42	12.21	13.83	12.11	11.86
Big	0.39	0.39	0.37	0.34	0.40	11.95	13.41	14.54	12.96	14.03

Source: Author's computation

4.5.1.3 CAPM Regression Analysis of the Size-Profitability Cross 25 Portfolios with Market Risk ((R_m-R_f), as the Independent Variable

Table 4.28a: CAPM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Fixed Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	1.80	2.75	1.61	1.10	1.28	2.74	3.49	3.68	2.85	3.72
2	0.44	0.99	1.12	1.01	0.43	1.17	2.02	2.3	2.53	1.13
3	0.78	1.51	0.80	0.18	1.01	1.25	3.12	1.71	0.44	2.61
4	0.48	0.41	0.77	0.42	0.16	0.85	0.82	1.6	0.94	0.38
Big	0.23	0.02	1.36	0.64	0.27	0.38	0.03	2.36	1.17	0.5
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.46	0.48	0.34	0.33	0.33	9.12	8.07	10.26	11.3	12.55
2	0.37	0.40	0.41	0.36	0.38	12.68	10.57	11.09	12.03	13.22
3	0.39	0.45	0.46	0.38	0.40	8.24	12.11	13.07	12.07	13.68
4	0.43	0.41	0.41	0.43	0.49	10.11	11.04	11.34	12.5	14.91
Big	0.52	0.42	0.43	0.50	0.48	11.14	10.78	9.89	12	11.78

Source: Author's computation

Table 4.28b: CAPM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	2.04	1.23	0.88	0.40	-0.42	3.15	2.10	1.51	0.72	-0.74
2	2.59	2.09	1.26	0.96	-0.26	4.54	4.01	2.70	1.54	-0.43
3	2.72	1.76	0.85	0.75	1.31	5.74	3.94	1.96	1.50	1.83
4	1.62	1.41	0.86	0.49	0.33	4.37	3.50	2.11	1.21	0.61
Big	0.93	0.66	0.69	0.34	0.79	2.64	1.67	1.74	0.64	1.57
			$b_{(i)}$					**t(b)**		
Small	0.44	0.36	0.46	0.45	0.47	8.89	8.12	10.55	10.60	10.86
2	0.42	0.38	0.41	0.42	0.48	9.72	9.69	11.63	8.82	10.38
3	0.38	0.34	0.37	0.50	0.49	10.54	10.13	11.35	13.01	9.03
4	0.33	0.38	0.39	0.43	0.48	11.77	12.29	12.76	13.86	11.68
Big	0.30	0.36	0.40	0.44	0.45	11.36	11.82	13.31	11.16	11.72

Source: Author's computation

Table 4.28c: CAPM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Variable Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	2.53	0.96	0.74	0.36	-0.71	4.15	3.12	1.37	0.69	-1.14
2	2.28	1.75	0.91	0.80	-0.27	4.53	3.52	1.98	1.43	-0.48
3	2.74	1.68	0.81	0.33	0.30	5.70	3.80	1.90	0.67	0.55
4	1.61	1.51	0.62	0.65	-0.12	4.81	3.97	1.75	1.50	-0.21
Big	1.10	0.87	0.70	0.02	0.37	3.48	2.83	1.98	0.05	0.78
			$b_{(i)}$					**t(b)**		
Small	0.45	0.38	0.45	0.40	0.54	9.78	16.17	10.83	10.10	11.47
2	0.39	0.39	0.45	0.42	0.49	10.19	10.33	12.88	9.91	11.53
3	0.31	0.35	0.42	0.49	0.49	8.60	10.43	13.01	13.05	11.71
4	0.31	0.34	0.41	0.48	0.50	12.23	11.93	15.24	14.72	11.94
Big	0.26	0.38	0.39	0.46	0.49	10.77	16.02	14.57	15.47	13.41

Source: Author's computation

4.5.1.4 CAPM Regression Analysis of the Size-Momentum Cross 25 Portfolios with Market Risk (R_m-R_f), as the Independent Variable

Table 4.29a: CAPM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Fixed Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					t(α)		
Small	3.43	3.52	3.67	2.77	2.93	5.2	5.26	7.04	5.94	5.33
2	1.16	1.50	1.55	1.70	1.50	3.12	2.92	3.47	4.07	3.78
3	0.69	0.91	0.70	0.67	0.19	1.27	2.02	1.55	1.53	0.45
4	-0.16	-0.07	0.11	-0.05	0.43	-0.27	-0.15	0.23	-0.12	1.01
Big	-1.80	-1.49	-1.09	-0.82	-0.82	-3.46	-2.7	-2.13	-1.61	-1.76
			$b_{(i)}$					t(b)		
Small	0.47	0.41	0.43	0.36	0.42	9.44	8.05	10.73	10.17	10.03
2	0.39	0.41	0.36	0.38	0.39	13.74	10.54	10.51	11.89	12.87
3	0.41	0.44	0.45	0.44	0.39	9.84	12.76	13.04	13.24	12.31
4	0.47	0.40	0.38	0.41	0.44	10.47	11.65	10.13	12.28	13.45
Big	0.42	0.48	0.44	0.44	0.38	10.53	11.33	11.42	11.51	10.81

Source: Author's computation

Table 4.29b: CAPM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					t(α)		
Small	5.23	1.73	0.73	-0.42	-2.54	7.82	4.23	1.34	-0.85	-5.03
2	5.56	2.39	0.76	-0.27	-2.32	8.23	4.33	1.51	-0.63	-4.14
3	5.69	2.27	0.82	-0.44	-2.20	9.90	5.04	1.89	-0.99	-5.35
4	5.29	2.24	0.96	-0.40	-2.23	8.94	5.26	2.33	-0.94	-4.92
Big	4.73	2.31	0.77	-0.43	-2.13	8.36	4.18	1.83	-1.10	-4.71
			$b_{(i)}$					t(b)		
Small	0.45	0.28	0.43	0.41	0.41	8.81	9.00	10.43	10.93	10.67
2	0.38	0.38	0.47	0.36	0.49	7.50	9.15	12.17	10.94	11.53
3	0.49	0.34	0.39	0.43	0.34	11.14	10.08	11.73	12.70	10.75
4	0.46	0.44	0.39	0.42	0.38	10.32	13.76	12.62	13.15	11.15
Big	0.44	0.42	0.44	0.35	0.42	10.20	9.89	13.84	11.83	12.09

Source: Author's computation

Table 4.29c: CAPM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Variable Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
					CAPM Coefficients: (Rm-Rf)					
			$\alpha_{(i)}$					**t(α)**		
Small	5.22	2.04	0.42	-0.54	-2.89	8.10	5.16	0.83	-1.02	-5.44
2	5.12	2.18	1.10	-0.83	-2.51	8.70	4.57	1.92	-1.92	-5.07
3	5.48	2.15	0.72	-0.52	-2.77	9.00	4.82	1.62	-1.27	-6.35
4	4.82	2.41	0.62	-0.74	-2.65	9.94	5.68	1.60	-1.91	-6.19
Big	4.07	1.94	0.57	-0.54	-2.41	9.44	5.06	1.47	-1.48	-5.40
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.47	0.43	0.43	0.44	0.46	9.62	14.28	11.05	10.91	11.37
2	0.47	0.41	0.41	0.39	0.40	10.55	11.30	9.34	11.92	10.57
3	0.47	0.38	0.39	0.38	0.43	10.07	11.33	11.70	12.18	13.05
4	0.46	0.38	0.40	0.40	0.39	12.52	11.88	13.49	13.71	12.10
Big	0.36	0.41	0.45	0.38	0.40	11.05	14.14	15.13	13.82	11.77

Source: Author's computation

4.5.1.5 Average R-Square Values of CAPM for 25 Portfolios

Table 4.30a: Average R-Square Values of CAPM for 25 Portfolios of Fixed Basket

Fixed	**Size-Value**					**Size-Investment**				
	Low	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
Small	0.36	0.30	0.31	0.45	0.30	0.32	0.31	0.37	0.29	0.36
2	0.35	0.41	0.21	0.40	0.34	0.14	0.43	0.38	0.38	0.32
3	0.35	0.37	0.41	0.41	0.41	0.39	0.43	0.34	0.42	0.36
4	0.40	0.39	0.45	0.43	0.47	0.38	0.44	0.38	0.37	0.44
Big	0.50	0.46	0.40	0.45	0.50	0.36	0.40	0.47	0.50	0.47

Fixed	**Size-Profitability**					**Size-Momentum**				
	Low	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
Small	0.31	0.46	0.26	0.35	0.40	0.32	0.50	0.34	0.37	0.37
2	0.26	0.37	0.44	0.39	0.38	0.26	0.37	0.46	0.42	0.40
3	0.36	0.39	0.47	0.40	0.34	0.38	0.37	0.47	0.35	0.41
4	0.40	0.43	0.44	0.45	0.43	0.35	0.43	0.48	0.44	0.41
Big	0.45	0.48	0.50	0.54	0.42	0.35	0.47	0.45	0.49	0.38

Table 4.30b: Average R-Square Values of CAPM for 25 Portfolios of Non-Financial Basket

Non-Fin	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.37	0.35	0.35	0.38	0.41	0.41	0.43	0.38	0.33	0.27
2	0.30	0.42	0.40	0.30	0.41	0.38	0.40	0.36	0.19	0.22
3	0.40	0.50	0.35	0.35	0.48	0.00	0.47	0.42	0.03	0.38
4	0.35	0.31	0.49	0.49	0.46	0.41	0.51	0.49	0.40	0.16
Big	0.47	0.46	0.45	0.51	0.41	0.38	0.01	0.44	0.41	0.42

Non-Fin	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.29	0.26	0.37	0.37	0.38	0.29	0.30	0.37	0.39	0.38
2	0.33	0.33	0.42	0.29	0.36	0.23	0.31	0.44	0.39	0.41
3	0.37	0.35	0.41	0.47	0.30	0.40	0.35	0.42	0.46	0.38
4	0.42	0.44	0.46	0.50	0.42	0.36	0.50	0.46	0.48	0.40
Big	0.41	0.43	0.48	0.40	0.42	0.36	0.34	0.50	0.43	0.44

Table 4.30c: Average R-Square Values of CAPM for 25 Portfolios of Variable Basket

Variable	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.39	0.32	0.39	0.40	0.43	0.39	0.41	0.37	0.39	0.33
2	0.33	0.47	0.42	0.37	0.39	0.41	0.31	0.45	0.30	0.35
3	0.43	0.51	0.42	0.28	0.47	0.45	0.50	0.49	0.38	0.40
4	0.44	0.40	0.47	0.52	0.53	0.41	0.44	0.50	0.44	0.43
Big	0.50	0.49	0.51	0.54	0.48	0.43	0.49	0.53	0.47	0.51

Variable	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.34	0.58	0.38	0.35	0.41	0.33	0.52	0.39	0.39	0.41
2	0.35	0.36	0.47	0.34	0.41	0.37	0.40	0.32	0.43	0.37
3	0.28	0.37	0.47	0.47	0.42	0.35	0.40	0.42	0.44	0.47
4	0.44	0.43	0.55	0.53	0.43	0.45	0.43	0.49	0.50	0.44
Big	0.38	0.58	0.53	0.56	0.49	0.39	0.51	0.55	0.50	0.42

4.5.1.6 Summary of Factor Regression for CAPM of 25 Portfolios

Table 4.31: Summary of Factor Regression for CAPM of 25 Portfolios

	Number of Significant Intercept				R-Square			
	Size-Value	Size-INV	Size-PRO	Size-MOM	Size-Value	Size-INV	Size-PRO	Size-MOM
CAPM	Fixed				Fixed			
	12	9	11	14	39	38	41	40
	Non-Financial				Non-Financial			
	14	12	11	16	41	33	39	39
	Variable				Variable			
	12	13	11	15	44	42	44	43

Source: Author's computation

The Table 4.26a to 4.30c show the CAPM linear regression results of the four size-based portfolios i.e., size-value, size-investment, size-profitability and size-momentum for all the three baskets of portfolios. The summary of the factor regression for CAPM of 25 portfolios are given in the Table 4.31. For the fixed basket in the size-value sorted portfolio 12 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 9 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; lastly for size-momentum cross portfolios 14 portfolios out of 25 portfolios are statistically significant. For the non-financial basket in the size-value sorted portfolio 14 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 12 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 16 portfolios out of 25 portfolios are statistically significant. For the variable basket in the size-value sorted portfolio 12 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 13 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 15 portfolios out of 25 portfolios are statistically significant.

When t(a) is greater than 1.96, statistical significance indicates that alpha value is distinct from zero which mean the model is unable to predict the return of the portfolios.

For the CAPM the average R^2 value for the fixed basket in the size-value cross portfolios is 39, size-investment cross portfolios is 38, size-profitability cross portfolios is 41, and size-momentum cross portfolios is 40; the average R^2 value for the non-financial basket in the size-value cross portfolios is 41, size-investment cross portfolios is 33, size-profitability cross portfolios is 39, and size-momentum cross portfolios is 39; and the average R^2 value for the variable basket in the size-value cross portfolios is 44, size-investment cross portfolios is 42, size-profitability cross portfolios is 44, and size-momentum cross portfolios is 43. From the average R^2 values it is found that variable basket portfolios produced higher R^2 values in comparison two other baskets of portfolios. Another important find from the average r2 values is that among size cross portfolios size-investment cross portfolios produced the least R^2 values.

4.5.2 Fama-French Three Factor Model (FFTF) Regression Analysis of the 25 Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + l_i LMH_t + \mathrm{e}_{it}$$

4.5.2.1 FFTF Regression Analysis of the Size-Value (P/B) Cross 25 Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variable

Table 4.32a: FFTF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Fixed Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					t(α)		
Small	0.30	1.33	0.97	0.09	0.98	0.73	2.88	2.11	0.22	1.84
2	1.51	0.82	1.58	1.22	0.79	3.13	2.06	2.50	3.05	1.76
3	0.85	0.81	1.37	1.30	1.35	1.71	1.98	2.84	2.74	3.30
4	1.14	0.95	0.98	0.61	0.26	2.86	2.33	2.48	1.17	0.60
Big	0.68	0.93	0.77	1.09	0.93	1.77	2.28	2.03	2.44	2.57
			$b_{(i)}$					t(b)		
Small	0.39	0.35	0.35	0.44	0.39	12.11	9.65	9.69	13.84	9.42
2	0.40	0.37	0.34	0.36	0.35	10.71	12.17	6.92	11.51	10.07
3	0.39	0.33	0.41	0.40	0.36	10.09	10.42	10.93	10.94	11.30
4	0.35	0.35	0.36	0.47	0.42	11.26	11.25	11.87	11.72	12.34
Big	0.42	0.39	0.32	0.41	0.37	13.98	12.44	10.77	11.99	13.00
			$s_{(i)}$					t(s)		
Small	1.79	1.60	1.80	1.62	2.07	13.00	10.49	11.82	11.88	11.78
2	1.61	1.38	1.74	1.19	1.54	10.10	10.54	8.34	9.02	10.41
3	0.69	0.72	0.64	0.73	1.00	4.18	5.32	4.05	4.68	7.42
4	0.62	0.28	0.66	0.22	0.60	4.72	2.06	5.06	1.26	4.09
Big	0.55	0.38	0.52	0.40	0.24	4.30	2.81	4.13	2.75	1.99
			$l_{(i)}$					t(l)		
Small	0.83	0.67	0.03	0.10	-0.15	4.00	2.91	0.13	0.48	-0.57
2	0.65	0.11	0.66	0.02	-0.19	2.70	0.56	2.08	0.11	-0.85
3	0.92	0.41	0.15	-0.33	-0.44	3.72	1.98	0.60	-1.38	-2.13
4	0.60	0.77	-0.15	0.34	-0.25	3.06	3.80	-0.79	1.30	-1.14
Big	0.69	0.51	0.04	0.00	-0.17	3.56	2.53	0.22	-0.02	-0.94

Source: Author's computation

Table 4.32b: FFTF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
					FFTF Coefficients: (Rm-Rf), SMB, LMH					
			$\alpha_{(i)}$					**t(α)**		
Small	0.47	1.20	0.63	0.16	1.13	1.16	2.92	1.43	0.4	2.65
2	1.35	1.18	1.13	1.30	1.13	2.59	2.69	2.94	3.25	2.69
3	1.68	1.15	1.42	1.75	1.30	3.84	2.81	3.04	5.29	3.26
4	1.63	1.34	1.06	1.31	0.40	3.38	3.27	2.52	3.44	0.97
Big	0.85	1.08	0.67	0.65	0.81	2.11	3.03	1.83	1.87	2.13
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.36	0.34	0.35	0.35	0.41	11.37	10.56	10.2	11.01	12.26
2	0.33	0.39	0.33	0.27	0.37	8.17	11.48	11.13	8.54	11.32
3	0.35	0.42	0.33	0.24	0.39	10.37	13.03	9.2	9.23	12.58
4	0.35	0.27	0.42	0.38	0.38	9.26	8.46	12.74	12.66	11.82
Big	0.39	0.34	0.33	0.36	0.33	12.45	12.29	11.69	13.26	11.16
			$\mathbf{s}_{(\mathbf{i})}$					**t(s)**		
Small	0.56	1.40	3.45	1.46	1.22	1.24	3	6.86	3.13	2.51
2	1.00	1.10	2.58	1.24	0.38	1.7	2.2	5.9	2.74	0.81
3	1.05	0.23	0.28	0.76	0.98	2.11	0.5	0.53	2.02	2.17
4	0.84	0.89	-0.63	0.14	0.74	1.53	1.92	-1.31	0.34	1.57
Big	1.05	-0.11	-0.41	-0.13	0.70	2.31	-0.26	-0.99	-0.33	1.63
			$\mathbf{l}_{(\mathbf{i})}$					**t(l)**		
Small	1.23	0.47	-1.89	0.18	0.56	2.91	1.09	-4.03	0.41	1.23
2	0.43	0.15	-1.36	0.09	0.89	0.78	0.33	-3.36	0.21	2.01
3	-0.15	0.46	0.37	-0.19	-0.23	-0.33	1.06	0.75	-0.54	-0.54
4	-0.29	-0.51	0.78	0.27	-0.10	-0.57	-1.19	1.75	0.68	-0.22
Big	-0.84	0.11	0.73	0.24	-0.64	-1.98	0.29	1.89	0.64	-1.6

Source: Author's computation

Table 4.32c: FFTF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Variable Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					**t(α)**		
Small	0.15	0.80	0.68	0.31	0.60	0.42	1.96	1.76	0.82	1.51
2	0.90	0.98	0.98	1.17	1.17	2.03	2.31	2.6	3.2	2.86
3	0.88	0.76	1.07	1.54	1.02	2.04	2.14	2.52	3.15	2.63
4	1.31	1.23	0.62	1.11	0.47	3.17	3.31	1.78	3.31	1.19
Big	0.96	0.76	0.63	0.63	0.76	2.6	2.36	1.77	1.83	2.19
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.37	0.32	0.36	0.37	0.42	13.18	10.22	11.92	12.52	13.61
2	0.35	0.43	0.35	0.30	0.36	10.13	13.16	12.12	10.57	11.3
3	0.39	0.39	0.37	0.29	0.38	11.66	14	11.22	7.75	12.59
4	0.38	0.30	0.34	0.35	0.43	11.77	10.54	12.5	13.6	14.03
Big	0.39	0.33	0.36	0.38	0.34	13.4	13.36	13.13	14.15	12.4
			$\mathbf{s}_{(\mathbf{i})}$					**t(s)**		
Small	1.78	1.87	1.63	1.64	1.85	15.1	13.87	12.79	13.06	14.08
2	1.40	1.14	1.26	1.20	1.41	9.61	8.19	10.18	9.91	10.43
3	0.86	0.70	0.77	0.97	0.90	6.06	5.94	5.55	6.01	7.05
4	0.59	0.35	0.63	0.44	0.59	4.35	2.89	5.49	4.03	4.52
Big	0.12	0.06	0.26	0.21	0.18	1	0.54	2.21	1.83	1.6
			$\mathbf{l}_{(\mathbf{i})}$					**t(l)**		
Small	1.12	0.78	0.41	0.28	-0.02	5.44	3.29	1.84	1.28	-0.1
2	1.82	0.74	0.39	0.30	0.02	7.16	3.04	1.79	1.4	0.07
3	1.08	0.83	0.61	0.39	0.32	4.33	4.02	2.49	1.39	1.42
4	1.16	0.72	0.48	-0.03	0.47	4.86	3.39	2.41	-0.16	2.05
Big	0.98	1.01	0.27	0.37	0.27	4.6	5.41	1.3	1.84	1.33

Source: Author’s computation

4.5.2.2 FFTF Regression Analysis of the Size-Investment Cross 25 Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variable

Table 4.33a: FFTF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Fixed Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
					FFTF Coefficients: (Rm-Rf), SMB, LMH					
			$\alpha_{(i)}$					**t(α)**		
Small	0.82	0.19	0.62	0.52	1.15	1.89	0.30	1.49	0.97	2.61
2	1.62	0.50	1.05	1.04	1.28	2.48	1.17	2.39	2.15	2.91
3	1.14	0.10	1.43	0.76	1.90	2.23	0.24	2.83	1.80	4.10
4	0.25	0.67	0.75	1.28	1.11	0.54	1.65	2.00	2.79	2.29
Big	0.85	0.65	0.85	0.86	0.92	1.63	1.56	2.21	2.50	2.27
			$b_{(i)}$					**t(b)**		
Small	0.37	0.45	0.37	0.36	0.38	11.09	9.31	11.45	8.71	11.00
2	0.25	0.41	0.38	0.40	0.32	5.01	12.22	11.18	10.71	9.40
3	0.41	0.39	0.37	0.37	0.35	10.41	11.75	9.40	11.21	9.76
4	0.37	0.37	0.30	0.36	0.44	10.32	11.59	10.42	10.06	11.84
Big	0.41	0.35	0.37	0.36	0.39	10.12	10.70	12.59	13.62	12.44
			$s_{(i)}$					**t(s)**		
Small	2.03	1.81	1.58	1.71	1.46	14.26	8.82	11.47	9.68	10.06
2	1.61	1.28	1.33	1.29	1.27	7.49	9.06	9.18	8.12	8.78
3	0.85	0.71	0.65	0.75	0.73	5.05	5.10	3.92	5.35	4.77
4	0.51	0.29	0.46	0.50	0.51	3.31	2.18	3.72	3.33	3.22
Big	0.62	0.39	0.52	0.30	0.27	3.61	2.83	4.13	2.64	2.07
			$l_{(i)}$					**t(l)**		
Small	0.47	0.73	-0.07	0.12	0.41	2.18	2.35	-0.33	0.45	1.88
2	0.68	0.05	0.27	0.13	0.05	2.09	0.25	1.23	0.53	0.25
3	0.02	0.46	0.16	0.01	-0.03	0.07	2.19	0.63	0.04	-0.12
4	0.29	-0.08	0.18	0.32	0.46	1.27	-0.40	0.99	1.41	1.92
Big	0.75	0.20	0.34	0.34	0.11	2.87	0.96	1.76	2.00	0.56

Source: Author's computation

Table 4.33b: FFTF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					**t(α)**		
Small	0.15	0.54	0.66	0.52	1.60	0.36	1.37	1.53	0.96	3.65
2	0.76	0.86	0.60	1.74	2.25	1.84	2.10	1.41	3.23	5.05
3	1.68	0.66	1.38	1.35	2.18	2.74	1.45	3.05	2.67	5.34
4	1.00	0.73	1.28	1.21	2.56	2.25	1.83	3.51	2.85	3.98
Big	0.45	1.38	0.73	0.64	1.40	0.84	2.00	1.97	1.84	3.26
			$b_{(i)}$					**t(b)**		
Small	0.39	0.40	0.37	0.38	0.27	12.48	12.98	11.08	9.13	7.80
2	0.35	0.35	0.33	0.23	0.22	10.75	10.91	9.82	5.51	6.29
3	0.02	0.44	0.38	0.09	0.32	0.41	12.36	10.93	2.33	10.05
4	0.37	0.42	0.36	0.35	0.26	10.64	13.37	12.78	10.45	5.27
Big	0.42	0.09	0.33	0.29	0.37	10.01	1.62	11.27	10.85	11.03
			$s_{(i)}$					**t(s)**		
Small	1.87	1.51	0.96	0.54	1.03	4.10	3.40	1.98	0.88	2.08
2	1.44	1.17	1.85	1.32	2.09	3.06	2.52	3.85	2.16	4.15
3	0.26	0.18	1.31	0.59	1.43	0.38	0.34	2.56	1.03	3.11
4	0.30	0.45	1.53	0.62	-0.02	0.59	0.99	3.69	1.30	-0.03
Big	-0.01	0.46	-0.21	-0.23	-0.11	-0.01	0.59	-0.50	-0.60	-0.23
			$l_{(i)}$					**t(l)**		
Small	-0.09	0.19	0.74	1.09	0.55	-0.20	0.45	1.63	1.92	1.19
2	0.04	0.13	-0.68	0.13	-0.83	0.10	0.31	-1.52	0.22	-1.78
3	-0.27	0.65	-0.78	-0.51	-0.62	-0.42	1.34	-1.63	-0.95	-1.43
4	0.34	0.35	-0.95	-0.04	0.55	0.72	0.83	-2.47	-0.09	0.82
Big	0.26	-0.68	0.54	0.32	0.43	0.46	-0.94	1.38	0.88	0.95

Source: Author's computation

Table 4.33c: FFTF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Variable Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					t(α)		
Small	-0.17	-0.11	0.59	0.89	1.65	-0.42	-0.28	1.43	2.39	4.23
2	0.20	0.81	1.11	1.63	2.04	0.51	1.66	3.06	3.2	4.6
3	0.20	0.04	0.99	1.18	2.04	0.45	0.12	2.55	3.04	4.83
4	0.41	0.48	0.94	1.16	2.14	0.98	1.25	2.68	2.77	4.99
Big	-0.18	0.56	0.69	0.90	1.18	-0.43	1.49	2.08	2.67	3.21
			$b_{(i)}$					t(b)		
Small	0.39	0.39	0.36	0.37	0.32	12.58	13.26	11.02	12.85	10.64
2	0.38	0.32	0.37	0.33	0.34	12.01	8.34	13.15	8.48	9.78
3	0.43	0.39	0.39	0.31	0.35	12.35	13.36	13.03	10.18	10.73
4	0.35	0.34	0.36	0.37	0.37	10.7	11.54	13.28	11.35	11.24
Big	0.37	0.38	0.36	0.32	0.38	11.42	12.84	13.88	12.29	13.42
			$s_{(i)}$					t(s)		
Small	1.85	1.71	1.58	1.88	1.80	14.2	13.69	11.53	15.29	14.01
2	1.39	0.83	1.20	1.47	1.28	10.5	5.2	10.05	8.78	8.79
3	1.05	0.79	0.70	0.83	0.89	7.09	6.49	5.44	6.5	6.38
4	0.65	0.60	0.40	0.45	0.58	4.78	4.77	3.46	3.26	4.12
Big	0.11	0.14	0.11	0.18	0.22	0.82	1.13	0.97	1.6	1.79
			$l_{(i)}$					t(l)		
Small	0.52	0.93	0.38	0.31	0.65	2.29	4.23	1.59	1.46	2.9
2	0.71	0.77	0.62	0.74	0.68	3.08	2.76	2.97	2.52	2.67
3	0.86	0.46	0.57	0.55	0.71	3.32	2.14	2.54	2.48	2.93
4	0.46	0.48	0.71	0.48	0.84	1.93	2.2	3.53	1.99	3.4
Big	0.80	0.70	0.40	0.51	0.69	3.33	3.22	2.11	2.63	3.28

Source: Author's computation

4.5.2.3 FFTF Regression Analysis of the Size-Profitability Cross 25 Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variable

Table 4.34a: FFTF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Fixed Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					FFTF Coefficients: (Rm-Rf), SMB, LMH					
			$\alpha_{(i)}$					t(α)		
Small	1.99	0.49	0.85	0.63	0.39	3.53	1.37	1.66	1.50	0.89
2	2.86	1.09	1.60	0.53	0.14	4.25	2.64	3.79	1.30	0.33
3	1.63	1.22	0.85	0.80	1.45	3.86	2.67	1.93	1.79	2.69
4	1.07	1.02	0.23	0.45	0.69	2.84	2.61	0.58	1.04	1.30
Big	1.24	0.48	1.06	0.19	0.30	3.63	1.34	2.82	0.47	0.58
			$b_{(i)}$					t(b)		
Small	0.39	0.34	0.33	0.36	0.44	8.83	12.32	8.40	11.21	13.06
2	0.41	0.35	0.40	0.36	0.37	7.93	10.88	12.28	11.57	11.11
3	0.32	0.37	0.43	0.39	0.39	9.87	10.56	12.66	11.09	9.40
4	0.32	0.35	0.36	0.41	0.47	11.14	11.66	11.49	12.12	11.49
Big	0.33	0.35	0.38	0.46	0.45	12.47	12.84	13.16	14.86	11.43
			$s_{(i)}$					t(s)		
Small	1.55	0.59	1.56	1.72	1.95	8.30	5.01	9.21	12.46	13.55
2	1.84	1.23	1.09	1.31	1.33	8.31	9.09	7.87	9.90	9.45
3	0.54	0.77	0.69	0.77	0.95	3.86	5.14	4.70	5.23	5.36
4	0.28	0.40	0.46	0.58	0.62	2.25	3.12	3.48	4.05	3.57
Big	0.08	0.58	0.47	0.68	0.70	0.74	4.92	3.80	5.16	4.18
			$l_{(i)}$					t(l)		
Small	-0.27	0.10	0.68	0.22	0.35	-0.94	0.58	2.65	1.04	1.59
2	0.60	0.24	0.14	0.13	0.08	1.80	1.19	0.69	0.63	0.38
3	0.29	-0.21	0.09	0.34	0.03	1.37	-0.90	0.40	1.53	0.12
4	0.46	0.29	-0.04	0.25	0.11	2.44	1.48	-0.22	1.13	0.40
Big	0.38	0.06	0.01	0.33	0.36	2.22	0.36	0.06	1.67	1.39

Source: Author's computation

Table 4.34b: FFTF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					**t(α)**		
Small	0.35	0.27	0.36	0.36	0.38	8.06	7.35	10.97	10.52	11.13
2	0.35	0.32	0.35	0.33	0.39	8.98	8.91	11.45	8.15	9.90
3	0.33	0.29	0.34	0.45	0.43	9.77	9.30	10.50	12.38	8.10
4	0.31	0.35	0.36	0.39	0.45	10.96	11.43	11.90	13.16	10.92
Big	0.29	0.35	0.39	0.41	0.42	10.62	11.20	12.50	10.35	10.91
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	1.28	1.86	1.44	1.27	1.72	2.01	3.44	3.01	2.58	3.51
2	1.75	1.29	1.12	0.95	1.40	3.09	2.47	2.55	1.63	2.45
3	0.49	0.91	0.70	1.54	0.73	1.01	1.99	1.51	2.93	0.95
4	0.93	0.08	0.19	0.51	1.35	2.30	0.18	0.43	1.18	2.23
Big	-0.14	-0.41	0.50	-0.34	0.98	-0.36	-0.91	1.12	-0.59	1.74
FFTF			$\mathbf{s}_{(\mathbf{i})}$					**t(s)**		
Small	0.18	-0.34	0.32	0.26	-0.03	0.30	-0.68	0.72	0.57	-0.07
2	-0.50	-0.18	0.08	0.64	0.10	-0.95	-0.37	0.19	1.18	0.18
3	0.43	-0.06	-0.03	-0.61	0.35	0.97	-0.14	-0.06	-1.25	0.49
4	-0.44	0.37	0.32	0.19	-0.80	-1.17	0.89	0.78	0.47	-1.43
Big	0.37	0.55	-0.19	0.87	-0.46	0.99	1.33	-0.47	1.62	-0.88
			$\mathbf{l}_{(\mathbf{i})}$					**t(l)**		
Small	2.30	1.48	1.18	0.67	-0.13	4.08	3.11	2.81	1.53	-0.31
2	2.80	2.28	1.47	1.25	0.00	5.60	4.94	3.81	2.44	0.00
3	2.89	1.91	0.96	0.90	1.50	6.77	4.70	2.35	1.96	2.22
4	1.70	1.50	0.95	0.62	0.41	4.77	3.81	2.43	1.62	0.78
Big	0.97	0.70	0.74	0.44	0.87	2.79	1.76	1.89	0.87	1.76

Source: Author's computation

Table 4.34c: FFTF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Variable Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					FFTF Coefficients: (Rm-Rf), SMB, LMH					
			$\alpha_{(i)}$					**t(α)**		
Small	2.59	0.90	0.85	0.47	-0.61	5.38	3.01	2.3	1.21	-1.5
2	2.35	1.78	0.90	0.81	-0.25	5.8	4.36	2.28	1.83	-0.54
3	2.78	1.67	0.77	0.28	0.33	6.35	4.16	2	0.64	0.69
4	1.56	1.48	0.61	0.60	-0.09	4.89	4.15	1.78	1.49	-0.18
Big	1.03	0.81	0.65	-0.05	0.32	3.3	2.7	1.85	-0.13	0.69
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.36	0.36	0.35	0.32	0.43	9.69	15.58	12.25	10.59	13.44
2	0.32	0.32	0.39	0.34	0.41	10.09	10.11	12.86	9.83	11.5
3	0.26	0.30	0.37	0.43	0.42	7.79	9.76	12.52	12.67	11.34
4	0.29	0.31	0.38	0.44	0.45	11.57	11.24	14.58	14.18	11.22
Big	0.25	0.36	0.38	0.43	0.46	10.25	15.4	13.87	14.95	12.67
			$\mathbf{s}_{(i)}$					**t(s)**		
Small	1.59	0.18	1.72	1.55	1.96	10.03	1.85	14.1	12.17	14.57
2	1.29	1.18	0.95	1.39	1.28	9.69	8.8	7.34	9.49	8.52
3	0.88	0.75	0.66	0.79	1.12	6.09	5.69	5.18	5.46	7.12
4	0.33	0.51	0.43	0.55	0.79	3.14	4.31	3.85	4.14	4.66
Big	0.05	0.17	0.16	0.41	0.37	0.51	1.72	1.41	3.34	2.39
			$\mathbf{l}_{(i)}$					**t(l)**		
Small	0.70	0.55	0.51	0.38	0.78	2.54	3.22	2.39	1.69	3.33
2	0.42	0.62	0.79	0.91	0.79	1.8	2.64	3.5	3.56	2.99
3	0.33	0.60	0.69	0.89	0.59	1.31	2.61	3.09	3.51	2.15
4	0.60	0.53	0.42	0.69	0.41	3.26	2.58	2.13	2.97	1.37
Big	0.50	0.53	0.45	0.72	0.60	2.78	3.06	2.24	3.38	2.23

Source: Author's computation

4.5.2.4 FFTF Regression Analysis of the Size-Momentum Cross 25 Portfolios with Market Risk (R_m-R_f), Size and Value as the Independent Variable

Table 4.35a: FFTF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Fixed Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
				FFTF Coefficients: (Rm-Rf), SMB, LMH						
			$\alpha_{(i)}$					t(α)		
Small	3.61	1.16	0.81	-0.04	-1.67	6.87	3.14	1.95	-0.08	-3.92
2	3.65	1.58	1.02	0.04	-1.37	6.70	3.62	2.74	0.11	-3.03
3	3.76	1.57	0.77	0.22	-1.05	7.56	3.63	1.82	0.48	-2.13
4	2.76	1.71	0.70	0.03	-0.77	6.01	4.25	1.67	0.07	-1.56
Big	2.91	1.48	0.27	0.43	-0.81	5.46	3.80	0.69	1.01	-1.77
			$b_{(i)}$					t(b)		
Small	0.40	0.38	0.34	0.41	0.36	9.73	13.35	10.65	11.17	10.91
2	0.34	0.36	0.39	0.36	0.42	8.08	10.78	13.53	11.66	11.90
3	0.39	0.34	0.42	0.34	0.42	10.18	10.14	12.82	9.68	10.97
4	0.35	0.36	0.42	0.38	0.42	9.86	11.56	12.95	11.73	11.01
Big	0.40	0.38	0.36	0.43	0.37	9.80	12.56	11.86	13.09	10.4
			$s_{(i)}$					t(s)		
Small	1.83	0.25	1.58	1.65	1.38	10.55	2.10	11.52	10.55	9.87
2	1.77	1.22	1.18	1.03	1.45	9.86	8.52	9.61	7.82	9.71
3	0.76	0.54	0.79	0.91	0.64	4.67	3.77	5.70	6.02	3.96
4	0.38	0.50	0.62	0.61	0.61	2.51	3.78	4.50	4.42	3.78
Big	0.56	0.31	0.68	0.32	0.51	3.16	2.40	5.21	2.31	3.42
			$l_{(i)}$					t(l)		
Small	0.01	0.24	0.31	0.33	0.07	0.03	1.30	1.52	1.39	0.34
2	0.42	0.35	0.10	-0.04	0.22	1.55	1.60	0.54	-0.22	0.95
3	-0.08	0.32	0.15	-0.09	0.21	-0.33	1.51	0.70	-0.38	0.86
4	0.40	0.31	0.27	-0.17	0.13	1.74	1.54	1.29	-0.81	0.51
Big	0.61	0.34	-0.11	0.32	0.29	2.31	1.76	-0.57	1.50	1.27

Source: Author's computation

Table 4.35b: FFTF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
					FFTF Coefficients: (Rm-Rf), SMB, LMH					
			$\alpha_{(i)}$					**t(α)**		
Small	5.57	1.74	1.01	-0.18	-2.28	11.36	4.27	2.4	-0.46	-5.97
2	5.84	2.65	0.98	-0.10	-2.07	10.39	6	2.33	-0.26	-4.48
3	5.88	2.40	0.98	-0.31	-2.08	11.28	5.72	2.54	-0.75	-5.46
4	5.44	2.33	1.10	-0.29	-2.14	9.69	5.64	3	-0.72	-4.86
Big	4.80	2.42	0.84	-0.36	-2.04	8.56	4.57	2.06	-0.94	-4.63
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.33	0.27	0.34	0.33	0.32	8.68	8.59	10.45	11.01	10.86
2	0.29	0.30	0.40	0.30	0.41	6.6	8.65	12	10.51	11.34
3	0.42	0.30	0.33	0.39	0.30	10.41	9.19	11.13	11.91	9.95
4	0.41	0.42	0.35	0.39	0.35	9.44	12.89	12.04	12.33	10.29
Big	0.42	0.38	0.42	0.33	0.39	9.49	9.27	12.99	11.06	11.26
			$\mathbf{s}_{(\mathbf{i})}$					**t(s)**		
Small	2.81	0.85	1.03	1.06	1.35	5.07	1.84	2.16	2.45	3.11
2	2.54	1.24	0.38	1.26	0.52	3.98	2.48	0.79	3.07	0.99
3	1.66	0.34	1.07	0.45	1.19	2.81	0.72	2.46	0.95	2.75
4	0.21	0.38	0.61	0.29	0.72	0.34	0.8	1.47	0.64	1.45
Big	-0.30	-1.30	-0.03	-0.37	-0.10	-0.47	-2.16	-0.05	-0.85	-0.21
			$\mathbf{l}_{(\mathbf{i})}$					**t(l)**		
Small	-0.77	-0.71	0.52	0.32	0.12	-1.48	-1.64	1.17	0.79	0.31
2	-0.84	0.24	0.82	-0.22	0.86	-1.42	0.52	1.84	-0.58	1.77
3	-0.54	0.39	-0.15	0.26	-0.49	-0.99	0.88	-0.38	0.59	-1.21
4	0.62	0.13	0.22	0.31	-0.18	1.05	0.31	0.56	0.73	-0.38
Big	0.66	1.77	0.43	0.71	0.55	1.11	3.15	0.99	1.76	1.18

Source: Author's computation

Table 4.35c: FFTF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Variable Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
FFTF Coefficients: (Rm-Rf), SMB, LMH										
			$\alpha_{(i)}$					t(α)		
Small	5.32	1.98	0.56	-0.47	-2.84	10.71	5.15	1.52	-1.19	-7.44
2	5.21	2.26	1.09	-0.79	-2.51	10.88	5.54	2.4	-2.26	-6.36
3	5.47	2.16	0.69	-0.53	-2.77	9.98	5.44	1.72	-1.46	-7.09
4	4.79	2.38	0.64	-0.76	-2.63	10.55	5.84	1.79	-2.16	-6.49
Big	3.99	1.89	0.47	-0.59	-2.46	9.32	5.06	1.24	-1.71	-5.64
			$b_{(i)}$					t(b)		
Small	0.37	0.41	0.35	0.36	0.37	9.67	13.6	12.18	11.65	12.5
2	0.39	0.35	0.32	0.33	0.32	10.49	11.07	9.09	12.07	10.59
3	0.40	0.33	0.35	0.33	0.38	9.38	10.82	11.1	11.85	12.67
4	0.42	0.35	0.36	0.36	0.36	11.87	11.14	12.96	13.28	11.39
Big	0.35	0.39	0.43	0.36	0.37	10.52	13.45	14.64	13.17	11.03
			$s_{(i)}$					t(s)		
Small	1.78	0.29	1.59	1.55	1.56	10.9	2.29	13.22	11.96	12.42
2	1.50	1.11	1.37	1.05	1.20	9.52	8.27	9.18	9.06	9.2
3	1.07	0.85	0.70	0.80	0.78	5.94	6.47	5.3	6.68	6.09
4	0.66	0.46	0.65	0.63	0.64	4.4	3.44	5.52	5.4	4.8
Big	0.07	0.29	0.15	0.33	0.34	0.49	2.41	1.2	2.93	2.35
			$l_{(i)}$					t(l)		
Small	0.61	0.61	0.23	0.59	0.75	2.12	2.75	1.11	2.61	3.41
2	0.50	0.26	1.03	0.53	0.86	1.83	1.11	3.92	2.6	3.76
3	0.80	0.53	0.66	0.62	0.58	2.55	2.33	2.86	2.94	2.59
4	0.69	0.58	0.35	0.59	0.29	2.65	2.47	1.7	2.9	1.25
Big	0.59	0.56	0.80	0.61	0.58	2.38	2.63	3.69	3.03	2.31

Source: Author's computation

4.5.2.5 Average R-Square Values of FFTF for 25 Portfolios of Fixed Basket, Non-Financial Basket and Variable Basket

Table 4.36a: Average R-Square Values of FFTF for 25 Portfolios of Fixed Basket

Fixed	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.68	0.57	0.60	0.68	0.60	0.68	0.52	0.63	0.53	0.59
2	0.59	0.63	0.44	0.58	0.58	0.60	0.35	0.58	0.54	0.52
3	0.44	0.47	0.46	0.48	0.55	0.46	0.51	0.39	0.49	0.43
4	0.49	0.45	0.51	0.44	0.52	0.42	0.45	0.43	0.41	0.48
Big	0.57	0.50	0.45	0.48	0.51	0.42	0.42	0.52	0.53	0.48

Fixed	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.49	0.52	0.51	0.65	0.70	0.57	0.52	0.62	0.61	0.59
2	0.46	0.57	0.58	0.60	0.58	0.52	0.55	0.64	0.56	0.61
3	0.41	0.47	0.58	0.49	0.43	0.44	0.42	0.55	0.46	0.46
4	0.44	0.47	0.53	0.50	0.47	0.39	0.48	0.54	0.50	0.45
Big	0.47	0.54	0.53	0.60	0.48	0.40	0.49	0.52	0.51	0.42

Table 4.36b: Average R-Square Values of FFTF for 25 Portfolios of Non-Financial Basket

Non-Fin	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.70	0.69	0.61	0.66	0.69	0.71	0.63	0.00	0.47	0.38
2	0.50	0.59	0.61	0.56	0.61	0.71	0.60	0.56	0.59	0.02
3	0.50	0.57	0.50	0.52	0.52	0.66	0.54	0.46	0.55	0.47
4	0.39	0.34	0.50	0.52	0.52	0.56	0.41	0.04	0.46	0.41
Big	0.49	0.46	0.48	0.51	0.42	0.57	0.45	0.49	0.19	0.44

Non-Fin	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.51	0.48	0.61	0.67	0.50	0.62	0.31	0.63	0.64	0.65
2	0.62	0.53	0.56	0.58	0.44	0.47	0.56	0.61	0.57	0.61
3	0.45	0.45	0.38	0.56	0.65	0.51	0.44	0.55	0.53	0.47
4	0.51	0.49	0.47	0.48	0.44	0.43	0.54	0.57	0.53	0.44
Big	0.42	0.48	0.50	0.49	0.48	0.37	0.40	0.53	0.46	0.47

Table 4.36c: Average R-Square Values of FFTF for 25 Portfolios of Variable Basket

Variable	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.76	0.69	0.69	0.70	0.72	0.72	0.74	0.65	0.74	0.70
2	0.65	0.64	0.64	0.60	0.62	0.66	0.43	0.67	0.53	0.57
3	0.58	0.63	0.53	0.41	0.59	0.60	0.61	0.58	0.52	0.54
4	0.56	0.47	0.57	0.56	0.59	0.49	0.52	0.57	0.48	0.52
Big	0.56	0.56	0.53	0.56	0.49	0.47	0.52	0.54	0.55	0.50

Variable	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.59	0.61	0.72	0.65	0.75	0.61	0.56	0.70	0.67	0.70
2	0.59	0.58	0.62	0.60	0.61	0.59	0.57	0.58	0.63	0.61
3	0.41	0.49	0.57	0.58	0.56	0.48	0.54	0.53	0.58	0.59
4	0.51	0.51	0.60	0.60	0.50	0.53	0.49	0.58	0.59	0.51
Big	0.41	0.61	0.55	0.61	0.52	0.41	0.55	0.59	0.55	0.46

4.5.2.6 Summary of Factor Regression for FFTF of 25 Portfolios

Table 4.37: Summary of Factor Regression for FFTF of 25 Portfolios

	Number of Significant Intercept				R-Square			
	Size-Value	Size-INV	Size-PRO	Size-MOM	Size-Value	Size-INV	Size-PRO	Size-MOM
	Fixed				**Fixed**			
FF TF	17	14	11	14	53	50	52	53
	Non-Financial				**Non-Financial**			
	19	15	15	20	54	51	51	52
	Variable				Variable			
	16	14	13	18	60	58	59	60

Source: Author's computation

The Table 4.32a to 4.36c show the FFTF linear regression results of the four size-based portfolios i.e., size-value, size-investment, size-profitability and size-momentum for all the three baskets of portfolios. The summary of the factor regression for FFTF of 25 portfolios are given in the Table 4.37. For the fixed basket in the size-value sorted portfolio 17 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 14 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 14 portfolios out of 25 portfolios are statistically significant. For the non-financial basket in the size-value sorted portfolio 19 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 15 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 15 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are statistically significant. For the variable basket in the size-value sorted portfolio 16 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 14 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 13 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 18 portfolios out of 25 portfolios are statistically significant. When t(a) is greater than 1.96, statistical significance indicates that alpha value is distinct from zero which mean the model is unable to predict the return of the portfolios.

For the FFTF the average R^2 value for the fixed basket in the size-value cross portfolios is 53, size-investment cross portfolios is 50, size-profitability cross portfolios is 52, and size-momentum cross portfolios is 53; the average R^2 value for the non-financial basket in the size-value cross portfolios is 54, size-investment cross portfolios is 51, size-profitability cross portfolios is 51, and size-momentum cross portfolios is 52; and the average R^2 value for the variable basket in the size-value cross portfolios is 60, size-investment cross portfolios is 58, size-profitability cross portfolios is 59, and size-momentum cross portfolios is 60. From the average R^2 values it is found that variable basket portfolios produced higher R^2 values in comparison two other baskets of portfolios. Another important find from the average R^2 values is that among size cross portfolios size-investment cross portfolios produced the least R^2 values.

4.5.3 Carhart Four Factor Model (CFFM) Regression Analysis of the 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + u_i UMD_t + e_{it}$$

4.5.3.1 CFFM Regression Analysis of the Size-Value Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.38a: CFFM Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December (Fixed Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	0.63	1.40	0.92	0.74	0.96	1.08	2.16	1.43	1.29	1.29
2	1.65	0.77	0.83	0.94	1.34	2.44	1.39	0.94	1.67	2.14
3	1.34	1.43	1.50	2.24	1.19	1.92	2.50	2.21	3.41	2.08
4	0.95	1.37	0.99	1.13	0.39	1.72	2.42	1.80	1.54	0.64
Big	0.86	1.34	0.82	1.32	1.14	1.58	2.38	1.55	2.13	2.25
			$b_{(i)}$					t(b)		
Small	0.39	0.35	0.35	0.44	0.39	12.05	9.61	9.66	13.81	9.39
2	0.40	0.37	0.34	0.36	0.35	10.66	12.13	6.98	11.51	10.01
3	0.39	0.33	0.41	0.40	0.36	10.04	10.37	10.88	10.93	11.28
4	0.35	0.35	0.36	0.47	0.42	11.25	11.19	11.83	11.66	12.28
Big	0.42	0.39	0.32	0.41	0.36	13.91	12.38	10.72	11.93	12.93
			$s_{(i)}$					t(s)		
Small	1.80	1.60	1.80	1.63	2.07	13.01	10.45	11.75	12.02	11.71
2	1.61	1.38	1.72	1.18	1.56	10.07	10.47	8.23	8.93	10.50
3	0.70	0.74	0.65	0.76	1.00	4.25	5.44	4.05	4.86	7.36
4	0.61	0.29	0.66	0.23	0.60	4.66	2.14	5.04	1.33	4.10
Big	0.55	0.39	0.52	0.41	0.24	4.32	2.88	4.11	2.78	2.03
			$l_{(i)}$					t(l)		
Small	0.84	0.68	0.03	0.12	-0.15	4.04	2.91	0.12	0.59	-0.57
2	0.66	0.11	0.63	0.01	-0.17	2.71	0.55	1.99	0.05	-0.76
3	0.94	0.43	0.15	-0.29	-0.44	3.78	2.09	0.62	-1.25	-2.15
4	0.60	0.79	-0.15	0.36	-0.25	3.01	3.87	-0.78	1.37	-1.12
Big	0.69	0.53	0.04	0.00	-0.16	3.58	2.60	0.23	0.02	-0.89
			$u_{(i)}$					t(u)		
Small	-0.10	-0.02	0.02	-0.21	0.01	-0.80	-0.15	0.11	-1.62	0.05
2	-0.04	0.02	0.24	0.09	-0.18	-0.29	0.13	1.22	0.73	-1.26
3	-0.15	-0.20	-0.04	-0.30	0.05	-1.00	-1.54	-0.27	-2.05	0.40
4	0.06	-0.13	0.00	-0.16	-0.04	0.47	-1.07	-0.04	-1.01	-0.30
Big	-0.06	-0.13	-0.02	-0.08	-0.07	-0.46	-1.06	-0.14	-0.55	-0.60

Source: Author's computation

Table 4.38b: CFFM Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	-0.40	0.20	-0.72	-0.94	-0.59	-0.48	0.24	-0.79	-1.12	-0.69
2	-0.76	-0.05	-0.15	-0.20	0.13	-0.72	-0.06	-0.19	-0.25	0.16
3	-0.32	0.15	-1.47	-0.48	1.78	-0.37	0.18	-1.60	-0.48	2.19
4	-0.33	0.88	0.28	-1.30	-1.19	-0.34	1.06	0.33	-1.75	-1.42
Big	-1.09	-0.70	-0.69	0.19	-0.82	-1.35	-0.97	-0.94	0.27	-1.08
			$b_{(i)}$					t(b)		
Small	0.35	0.33	0.35	0.35	0.40	11.25	10.44	10.08	10.89	12.18
2	0.33	0.39	0.33	0.26	0.37	8.06	11.37	11.02	8.42	11.20
3	0.35	0.41	0.32	0.23	0.39	10.28	12.91	9.17	0.23	12.57
4	0.34	0.27	0.42	0.37	0.38	9.15	8.37	12.62	12.80	11.72
Big	0.38	0.34	0.33	0.36	0.32	12.41	12.26	11.59	13.15	11.08
			$s_{(i)}$					t(s)		
Small	0.51	1.34	3.38	1.40	1.12	1.13	2.87	6.71	2.99	2.32
2	0.88	1.02	2.50	1.15	0.33	1.50	2.06	5.75	2.56	0.68
3	0.93	0.18	0.11	0.63	1.01	1.90	0.38	0.21	0.63	2.22
4	0.72	0.86	-0.67	-0.01	0.65	1.33	1.85	-1.40	-0.02	1.38
Big	0.94	-0.21	-0.49	-0.16	0.61	2.09	-0.52	-1.19	-0.40	1.43
			$l_{(i)}$					t(l)		
Small	1.26	0.50	-1.85	0.21	0.61	2.97	1.16	-3.97	0.48	1.36
2	0.49	0.19	-1.33	0.13	0.92	0.90	0.41	-3.28	0.32	2.08
3	-0.09	0.49	0.45	-0.12	-0.24	-0.21	1.13	0.95	-0.12	-0.57
4	-0.23	-0.50	0.80	0.35	-0.05	-0.46	-1.16	1.80	0.90	-0.11
Big	-0.78	0.16	0.77	0.25	-0.59	-1.87	0.44	2.01	0.68	-1.50
			$u_{(i)}$					t(u)		
Small	0.13	0.15	0.20	0.17	0.26	1.21	1.37	1.72	1.51	2.29
2	0.32	0.19	0.19	0.23	0.15	2.29	1.58	1.88	2.13	1.33
3	0.30	0.15	0.44	0.34	-0.07	2.61	1.38	3.59	0.34	-0.68
4	0.30	0.07	0.12	0.39	0.24	2.31	0.62	1.04	4.01	2.18
Big	0.29	0.27	0.20	0.07	0.25	2.76	2.85	2.11	0.74	2.45

Source: Author's computation

Table 4.38c: CFFM Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Variable Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	-0.44	0.58	-0.48	-0.08	-0.08	-0.67	0.78	-0.7	-0.11	-0.11
2	1.36	0.26	0.75	0.83	1.30	1.7	0.34	1.1	1.25	1.75
3	0.55	0.38	0.28	0.34	1.59	0.7	0.58	0.36	0.38	2.25
4	1.22	1.36	0.94	0.59	-0.15	1.62	2.03	1.49	0.98	-0.21
Big	-1.06	-0.10	0.34	0.15	0.63	-1.63	-0.17	0.52	0.24	0.99
			$\mathbf{b}_{(i)}$					t(b)		
Small	0.36	0.32	0.35	0.37	0.42	13	10.1	11.74	12.36	13.42
2	0.35	0.43	0.35	0.30	0.36	10.13	12.97	11.98	10.43	11.23
3	0.39	0.39	0.37	0.29	0.38	11.51	13.83	11.05	7.57	12.62
4	0.38	0.30	0.34	0.35	0.43	11.66	10.48	12.47	13.42	13.84
Big	0.38	0.33	0.36	0.38	0.34	13.39	13.17	12.98	13.97	12.27
			$\mathbf{s}_{(i)}$					t(s)		
Small	1.77	1.86	1.60	1.63	1.84	14.96	13.75	12.67	12.93	13.94
2	1.41	1.13	1.25	1.19	1.41	9.63	8.07	10.09	9.8	10.38
3	0.85	0.69	0.76	0.94	0.92	5.98	5.85	5.43	5.87	7.11
4	0.59	0.35	0.63	0.43	0.58	4.3	2.89	5.51	3.93	4.41
Big	0.08	0.04	0.25	0.20	0.18	0.71	0.39	2.15	1.75	1.56
			$\mathbf{l}_{(i)}$					t(l)		
Small	1.13	0.78	0.42	0.29	-0.02	5.47	3.29	1.9	1.3	-0.08
2	1.82	0.75	0.39	0.30	0.01	7.13	3.06	1.79	1.41	0.06
3	1.08	0.83	0.61	0.40	0.31	4.34	4.04	2.52	1.43	1.39
4	1.16	0.72	0.48	-0.03	0.47	4.85	3.38	2.39	-0.13	2.08
Big	1.00	1.01	0.27	0.37	0.27	4.84	5.48	1.31	1.86	1.33
			$u_{(i)}$					t(u)		
Small	0.10	0.04	0.20	0.07	0.12	1.09	0.36	2.01	0.68	1.14
2	-0.08	0.12	0.04	0.06	-0.02	-0.7	1.12	0.4	0.62	-0.2
3	0.06	0.07	0.14	0.21	-0.10	0.51	0.72	1.24	1.64	-0.96
4	0.02	-0.02	-0.05	0.09	0.11	0.16	-0.24	-0.61	1.03	1.05
Big	0.35	0.15	0.05	0.08	0.02	3.75	1.78	0.55	0.93	0.25

Source: Author’s computation

4.5.3.2 CFFM Regression Analysis of the Size-Investment Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.39a: CFFM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Fixed Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	1.07	0.98	1.41	0.66	1.02	1.77	1.12	2.43	0.87	1.65
2	0.29	1.20	1.09	1.14	1.55	0.32	2.00	1.76	1.69	2.52
3	0.72	0.55	1.43	1.38	1.71	1.00	0.93	2.03	2.34	2.63
4	0.17	1.27	0.56	1.72	1.11	0.26	2.25	1.08	2.68	1.65
Big	1.64	1.55	1.60	0.66	0.74	2.27	2.67	3.01	1.37	1.31
			$b_{(i)}$					t(b)		
Small	0.37	0.45	0.37	0.36	0.38	11.03	9.25	11.43	8.67	10.98
2	0.26	0.40	0.38	0.40	0.32	5.15	12.19	11.14	10.66	9.35
3	0.41	0.38	0.37	0.37	0.35	10.43	11.69	9.36	11.16	9.74
4	0.37	0.36	0.30	0.36	0.44	10.29	11.55	10.41	10.00	11.79
Big	0.41	0.34	0.37	0.36	0.39	10.08	10.69	12.58	13.61	12.42
			$s_{(i)}$					t(s)		
Small	2.03	1.83	1.60	1.72	1.46	14.24	8.91	11.67	9.65	9.99
2	1.58	1.30	1.33	1.29	1.28	7.38	9.20	9.14	8.09	8.79
3	0.84	0.72	0.65	0.76	0.72	4.97	5.17	3.90	5.46	4.72
4	0.51	0.31	0.45	0.51	0.51	3.28	2.30	3.67	3.39	3.21
Big	0.64	0.41	0.54	0.30	0.27	3.73	3.02	4.30	2.59	2.03
			$l_{(i)}$					t(l)		
Small	0.48	0.76	-0.04	0.13	0.41	2.22	2.44	-0.20	0.47	1.85
2	0.63	0.08	0.27	0.13	0.06	1.95	0.36	1.23	0.54	0.29
3	0.00	0.48	0.16	0.03	-0.04	0.01	2.26	0.63	0.14	-0.15
4	0.29	-0.06	0.18	0.34	0.46	1.25	-0.29	0.95	1.47	1.91
Big	0.77	0.23	0.36	0.34	0.11	2.98	1.12	1.91	1.95	0.53
			$u_{(i)}$					t(u)		
Small	-0.08	-0.25	-0.25	-0.04	0.04	-0.60	-1.30	-1.95	-0.26	0.31
2	0.42	-0.22	-0.01	-0.03	-0.09	2.11	-1.66	-0.08	-0.21	-0.63
3	0.13	-0.14	0.00	-0.20	0.06	0.85	-1.08	-0.01	-1.50	0.42
4	0.03	-0.19	0.06	-0.14	0.00	0.17	-1.52	0.50	-0.97	-0.02
Big	-0.25	-0.28	-0.24	0.06	0.06	-1.57	-2.21	-2.02	0.60	0.46

Source: Author's computation

Table 4.39b: CFFM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
				CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD						
			$\alpha_{(i)}$					t(α)		
Small	-0.94	0.25	-0.77	-1.76	0.48	-1.14	0.31	-0.88	-1.63	0.54
2	-1.02	0.05	0.54	0.44	-0.08	-1.23	0.06	0.63	0.40	-0.09
3	1.65	-1.51	0.23	2.70	1.42	1.32	-1.65	0.25	2.62	1.70
4	0.05	-1.14	-0.11	0.46	3.51	0.05	-1.41	-0.14	0.54	2.67
Big	1.69	0.23	-0.88	0.35	-0.95	1.54	0.16	-1.18	0.49	-1.10
			$b_{(i)}$					t(b)		
Small	0.39	0.40	0.37	0.37	0.26	12.36	12.87	10.97	9.03	7.68
2	0.34	0.35	0.33	0.23	0.21	10.67	10.79	9.76	5.40	6.17
3	0.02	0.43	0.38	0.10	0.32	0.41	12.31	10.81	2.45	9.94
4	0.37	0.41	0.36	0.34	0.27	10.52	13.33	12.69	10.34	5.32
Big	0.42	0.08	0.32	0.29	0.36	10.10	1.54	11.19	10.75	11.00
			$s_{(i)}$					t(s)		
Small	1.81	1.49	0.88	0.40	0.97	3.96	3.34	1.82	0.67	1.95
2	1.34	1.13	1.85	1.25	1.96	2.87	2.41	3.82	2.03	3.95
3	0.26	0.05	1.24	0.67	1.39	0.37	0.10	2.43	1.17	3.00
4	0.25	0.34	1.45	0.58	0.03	0.48	0.76	3.51	1.20	0.04
Big	0.06	0.39	-0.30	-0.25	-0.25	0.10	0.50	-0.73	-0.63	-0.52
			$l_{(i)}$					t(l)		
Small	-0.05	0.20	0.78	1.15	0.58	-0.13	0.47	1.73	2.06	1.26
2	0.09	0.16	-0.68	0.16	-0.77	0.22	0.36	-1.51	0.29	-1.66
3	-0.27	0.71	-0.74	-0.55	-0.59	-0.41	1.49	-1.56	-1.03	-1.38
4	0.37	0.40	-0.91	-0.02	0.53	0.78	0.97	-2.39	-0.04	0.78
Big	0.23	-0.65	0.59	0.33	0.50	0.40	-0.89	1.52	0.90	1.12
			$u_{(i)}$					t(u)		
Small	0.16	0.04	0.22	0.34	0.17	1.51	0.41	1.88	2.42	1.44
2	0.27	0.12	0.01	0.20	0.35	2.45	1.11	0.07	1.36	3.01
3	0.00	0.33	0.17	-0.20	0.11	0.02	2.72	1.43	-1.50	1.04
4	0.14	0.28	0.21	0.11	-0.14	1.20	2.66	2.15	0.99	-0.83
Big	-0.19	0.17	0.24	0.04	0.35	-1.30	0.94	2.47	0.47	3.14

Source: Author's computation

Table 4.39c: CFFM Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Variable Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	-0.96	-0.31	0.52	0.10	0.82	-1.34	-0.45	0.7	0.15	1.17
2	0.09	2.35	0.63	1.56	1.45	0.13	2.69	0.96	1.7	1.81
3	-0.42	-0.01	1.09	1.22	0.99	-0.52	-0.01	1.55	1.74	1.31
4	0.63	0.12	0.63	0.50	1.55	0.84	0.18	1	0.66	1.99
Big	0.41	-0.75	-0.57	0.82	0.22	0.54	-1.12	-0.96	1.34	0.33
			$b_{(i)}$					t(b)		
Small	0.38	0.39	0.36	0.37	0.32	12.4	13.12	10.92	12.66	10.46
2	0.37	0.32	0.37	0.33	0.33	11.89	8.6	12.97	8.41	9.62
3	0.43	0.39	0.39	0.31	0.35	12.18	13.24	12.94	10.1	10.55
4	0.35	0.34	0.36	0.37	0.37	10.66	11.39	13.12	11.18	11.07
Big	0.37	0.37	0.35	0.32	0.38	11.45	12.68	13.74	12.18	13.24
			$s_{(i)}$					t(s)		
Small	1.83	1.71	1.58	1.86	1.78	14.06	13.58	11.44	15.15	13.87
2	1.39	0.86	1.19	1.47	1.27	10.42	5.41	9.93	8.72	8.67
3	1.04	0.79	0.70	0.83	0.87	6.99	6.45	5.42	6.47	6.25
4	0.66	0.59	0.39	0.44	0.57	4.78	4.69	3.4	3.16	4.03
Big	0.12	0.12	0.08	0.18	0.20	0.89	0.94	0.76	1.57	1.64
			$l_{(i)}$					t(l)		
Small	0.53	0.93	0.38	0.32	0.66	2.32	4.22	1.59	1.49	2.95
2	0.71	0.76	0.62	0.74	0.69	3.07	2.73	2.98	2.51	2.69
3	0.87	0.46	0.57	0.55	0.72	3.34	2.13	2.53	2.47	2.98
4	0.46	0.49	0.71	0.49	0.85	1.92	2.21	3.54	2.02	3.42
Big	0.80	0.71	0.41	0.51	0.70	3.31	3.31	2.2	2.63	3.34
			$u_{(i)}$					t(u)		
Small	0.14	0.04	0.01	0.14	0.14	1.33	0.36	0.11	1.41	1.41
2	0.02	-0.26	0.08	0.01	0.10	0.18	-2.11	0.88	0.08	0.89
3	0.11	0.01	-0.02	-0.01	0.18	0.93	0.09	-0.17	-0.07	1.65
4	-0.04	0.06	0.05	0.11	0.10	-0.36	0.62	0.58	1.05	0.92
Big	-0.10	0.23	0.21	0.01	0.16	-0.94	2.34	2.56	0.16	1.75

Source: Author's computation

4.5.3.3 CFFM Regression Analysis of the Size-Profitability Cross Three Basket Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.40a: CFFM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Fixed Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
				CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD						
			$\alpha_{(i)}$					t(α)		
Small	1.01	0.28	1.47	0.47	1.43	1.29	0.55	2.05	0.79	2.38
2	1.57	1.16	1.17	0.55	1.17	1.69	2.02	1.99	0.98	1.99
3	1.07	1.85	1.60	1.34	1.52	1.82	2.90	2.61	2.14	2.01
4	0.99	0.89	0.41	1.20	1.00	1.87	1.64	0.74	1.99	1.35
Big	1.20	0.42	1.30	0.60	0.08	2.50	0.85	2.48	1.06	0.11
			$b_{(i)}$					t(b)		
Small	0.39	0.34	0.33	0.36	0.44	8.96	12.32	8.34	11.19	13.11
2	0.42	0.35	0.40	0.36	0.36	8.08	10.84	12.32	11.53	11.14
3	0.33	0.37	0.43	0.38	0.39	9.95	10.51	12.63	11.04	9.35
4	0.32	0.35	0.36	0.40	0.47	11.11	11.63	11.43	12.09	11.43
Big	0.33	0.35	0.38	0.46	0.45	12.43	12.80	13.09	14.80	11.41
			$s_{(i)}$					t(s)		
Small	1.52	0.59	1.58	1.72	1.98	8.20	4.94	9.29	12.37	13.88
2	1.81	1.23	1.08	1.32	1.36	8.20	9.06	7.77	9.85	9.74
3	0.52	0.79	0.70	0.79	0.95	3.76	5.25	4.84	5.31	5.34
4	0.28	0.40	0.46	0.60	0.63	2.22	3.08	3.49	4.20	3.60
Big	0.08	0.58	0.48	0.69	0.70	0.73	4.88	3.83	5.23	4.13
			$l_{(i)}$					t(l)		
Small	-0.30	0.10	0.70	0.21	0.38	-1.07	0.54	2.73	1.01	1.78
2	0.56	0.25	0.13	0.13	0.12	1.68	1.20	0.61	0.63	0.56
3	0.27	-0.18	0.12	0.36	0.04	1.28	-0.81	0.52	1.61	0.13
4	0.45	0.28	-0.04	0.27	0.12	2.41	1.45	-0.19	1.26	0.44
Big	0.38	0.06	0.02	0.35	0.35	2.20	0.34	0.11	1.74	1.36
			$u_{(i)}$					t(u)		
Small	0.31	0.07	-0.20	0.05	-0.33	1.80	0.62	-1.24	0.40	-2.49
2	0.41	-0.02	0.14	-0.01	-0.33	1.98	-0.18	1.05	-0.07	-2.50
3	0.18	-0.20	-0.24	-0.17	-0.02	1.36	-1.41	-1.74	-1.22	-0.12
4	0.03	0.04	-0.06	-0.24	-0.10	0.22	0.32	-0.46	-1.78	-0.60
Big	0.01	0.02	-0.08	-0.13	0.07	0.13	0.15	-0.67	-1.04	0.44

Source: Author's computation

Table 4.40b: CFFM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
					CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD					
			$\alpha_{(i)}$					**t(α)**		
Small	0.79	0.85	-0.09	-1.73	-0.09	0.69	0.87	-0.10	-2.00	-0.10
2	1.85	-0.42	-0.85	-1.21	-0.75	1.82	-0.46	-1.11	-1.18	-0.73
3	1.56	0.98	0.59	-0.11	-2.77	1.80	1.19	0.71	-0.11	-2.08
4	0.56	0.57	-0.17	-0.19	0.19	0.77	0.71	-0.22	-0.24	0.18
Big	-0.18	-1.14	-0.43	-1.85	-1.11	-0.25	-1.44	-0.53	-1.81	-1.11
			$b_{(i)}$					**t(b)**		
Small	0.35	0.27	0.36	0.35	0.38	7.94	7.25	10.86	10.49	11.07
2	0.35	0.31	0.34	0.32	0.39	8.87	8.85	11.47	8.05	9.79
3	0.32	0.29	0.33	0.44	0.41	9.65	9.18	10.40	12.26	8.05
4	0.30	0.35	0.36	0.39	0.45	10.84	11.32	11.79	13.04	10.84
Big	0.29	0.34	0.38	0.40	0.41	10.51	11.13	12.39	10.26	10.81
			$s_{(i)}$					**t(s)**		
Small	1.19	1.82	1.37	1.13	1.73	1.87	3.36	2.86	2.34	3.49
2	1.70	1.14	0.98	0.80	1.36	2.98	2.22	2.30	1.40	2.36
3	0.41	0.86	0.68	1.48	0.48	0.85	1.87	1.45	2.81	0.65
4	0.87	0.03	0.12	0.46	1.33	2.14	0.06	0.28	1.07	2.20
Big	-0.21	-0.51	0.43	-0.47	0.86	-0.53	-1.16	0.97	-0.83	1.55
			$l_{(i)}$					**t(l)**		
Small	0.22	-0.32	0.36	0.33	-0.04	0.38	-0.64	0.80	0.73	-0.08
2	-0.47	-0.10	0.14	0.71	0.12	-0.90	-0.22	0.36	1.34	0.22
3	0.47	-0.03	-0.02	-0.58	0.47	1.06	-0.07	-0.04	-1.20	0.69
4	-0.41	0.40	0.36	0.21	-0.79	-1.09	0.96	0.86	0.53	-1.41
Big	0.40	0.61	-0.16	0.93	-0.40	1.09	1.48	-0.39	1.76	-0.77
			$u_{(i)}$					**t(u)**		
Small	0.23	0.10	0.19	0.36	-0.01	1.51	0.75	1.70	3.18	-0.06
2	0.14	0.41	0.35	0.37	0.11	1.06	3.38	3.47	2.74	0.84
3	0.20	0.14	0.06	0.15	0.64	1.75	1.28	0.51	1.23	3.67
4	0.17	0.14	0.17	0.12	0.03	1.81	1.33	1.62	1.19	0.24
Big	0.17	0.28	0.18	0.35	0.30	1.87	2.66	1.67	2.57	2.28

Source: Author's computation

Table 4.40c: CFFM Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Variable Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	1.89	0.03	0.35	-0.29	-1.12	2.17	0.05	0.52	-0.41	-1.51
2	2.06	1.19	-0.75	1.25	0.06	2.81	1.62	-1.08	1.55	0.07
3	2.01	1.25	0.32	0.99	-0.39	2.54	1.71	0.46	1.24	-0.45
4	0.56	1.62	0.22	0.06	0.53	0.97	2.51	0.36	0.09	0.57
Big	0.38	-0.15	0.41	-0.31	-0.34	0.68	-0.28	0.64	-0.46	-0.41
			$b_{(i)}$					t(b)		
Small	0.36	0.36	0.35	0.31	0.42	9.53	15.4	12.08	10.41	13.26
2	0.32	0.32	0.38	0.34	0.41	9.97	9.95	12.73	9.82	11.46
3	0.26	0.30	0.37	0.44	0.42	7.63	9.62	12.36	12.72	11.17
4	0.28	0.31	0.38	0.44	0.45	11.39	11.18	14.4	14	11.23
Big	0.24	0.35	0.38	0.43	0.46	10.07	15.24	13.72	14.78	12.5
			$s_{(i)}$					t(s)		
Small	1.58	0.17	1.71	1.54	1.95	9.91	1.68	13.97	12.03	14.43
2	1.29	1.17	0.92	1.40	1.29	9.59	8.69	7.21	9.5	8.5
3	0.86	0.74	0.65	0.80	1.11	5.97	5.6	5.09	5.54	7.01
4	0.31	0.51	0.42	0.54	0.80	2.97	4.31	3.77	4.05	4.71
Big	0.04	0.15	0.16	0.40	0.36	0.39	1.54	1.36	3.28	2.3
			$l_{(i)}$					t(l)		
Small	0.71	0.56	0.51	0.38	0.79	2.56	3.29	2.41	1.73	3.34
2	0.42	0.63	0.81	0.91	0.79	1.81	2.66	3.63	3.54	2.97
3	0.34	0.61	0.69	0.88	0.60	1.34	2.62	3.11	3.48	2.17
4	0.61	0.53	0.42	0.70	0.40	3.34	2.57	2.14	2.99	1.35
Big	0.50	0.54	0.46	0.72	0.61	2.82	3.14	2.25	3.39	2.26
			$u_{(i)}$					t(u)		
Small	0.12	0.15	0.09	0.13	0.09	0.96	1.96	0.9	1.3	0.81
2	0.05	0.10	0.28	-0.07	-0.05	0.47	0.95	2.84	-0.65	-0.44
3	0.13	0.07	0.08	-0.12	0.12	1.17	0.7	0.78	-1.06	0.99
4	0.17	-0.02	0.07	0.09	-0.11	2.11	-0.26	0.75	0.89	-0.8
Big	0.11	0.17	0.04	0.05	0.11	1.39	2.15	0.46	0.47	0.94

Source: Author's computation

4.5.3.4 CFFM Regression Analysis of the Size-Momentum Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.41a: CFFM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Fixed Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
				CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD						
			$\alpha_{(i)}$					t(α)		
Small	1.43	0.92	1.26	1.53	0.07	2.05	1.79	2.17	2.37	0.13
2	1.22	1.27	1.27	0.76	0.29	1.70	2.09	2.45	1.38	0.48
3	2.46	0.93	0.71	1.27	1.26	3.60	1.55	1.20	2.02	1.95
4	0.61	1.51	1.29	0.68	0.60	1.01	2.69	2.22	1.16	0.90
Big	1.76	1.36	-0.12	0.90	0.48	2.39	2.49	-0.22	1.52	0.77
			$b_{(i)}$					t(b)		
Small	0.40	0.38	0.34	0.40	0.35	10.41	13.34	10.60	11.32	11.22
2	0.35	0.36	0.39	0.36	0.41	8.78	10.79	13.46	11.63	12.15
3	0.40	0.34	0.42	0.34	0.41	10.48	10.24	12.78	9.67	11.43
4	0.36	0.36	0.42	0.38	0.41	10.74	11.54	12.91	11.69	11.08
Big	0.41	0.38	0.36	0.43	0.36	10.00	12.53	11.90	13.03	10.46
			$s_{(i)}$					t(s)		
Small	1.77	0.25	1.59	1.68	1.42	10.71	2.04	11.58	11.09	10.64
2	1.71	1.22	1.18	1.04	1.49	10.05	8.43	9.62	7.99	10.34
3	0.73	0.52	0.79	0.93	0.70	4.54	3.66	5.66	6.25	4.58
4	0.33	0.50	0.63	0.63	0.65	2.29	3.73	4.61	4.55	4.06
Big	0.53	0.31	0.67	0.33	0.55	3.02	2.36	5.12	2.39	3.70
			$l_{(i)}$					t(l)		
Small	-0.07	0.23	0.33	0.38	0.13	-0.27	1.25	1.59	1.67	0.66
2	0.33	0.34	0.11	-0.02	0.27	1.30	1.55	0.58	-0.09	1.26
3	-0.13	0.30	0.15	-0.05	0.29	-0.52	1.40	0.69	-0.22	1.26
4	0.32	0.30	0.29	-0.15	0.17	1.49	1.50	1.39	-0.71	0.72
Big	0.57	0.34	-0.13	0.33	0.33	2.17	1.73	-0.64	1.58	1.50
			$u_{(i)}$					t(u)		
Small	0.69	0.07	-0.14	-0.50	-0.55	4.47	0.65	-1.11	-3.48	-4.41
2	0.77	0.10	-0.08	-0.23	-0.53	4.85	0.72	-0.70	-1.86	-3.92
3	0.41	0.20	0.02	-0.33	-0.73	2.74	1.52	0.14	-2.40	-5.11
4	0.68	0.06	-0.19	-0.21	-0.44	5.14	0.50	-1.47	-1.59	-2.92
Big	0.36	0.04	0.13	-0.15	-0.41	2.24	0.33	1.03	-1.14	-2.97

Source: Author's computation

Table 4.41b: CFFM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					**t(α)**		
Small	2.37	0.90	-1.99	-0.43	-1.33	2.46	1.09	-2.42	-0.55	-1.71
2	1.34	-0.36	-0.63	-0.07	-2.35	1.24	-0.42	-0.74	-0.09	-2.48
3	0.95	-1.34	-0.25	0.94	-1.35	0.97	-1.68	-0.33	1.11	-1.73
4	-0.72	-0.62	-0.01	0.20	0.34	-0.7	-0.77	-0.01	0.24	0.39
Big	-1.43	-2.51	-1.55	0.09	-2.06	-1.4	-2.5	-1.91	0.11	-2.28
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.32	0.27	0.33	0.33	0.33	8.66	8.47	10.53	10.92	10.96
2	0.27	0.29	0.39	0.30	0.41	6.57	8.64	11.9	10.45	11.25
3	0.41	0.29	0.33	0.39	0.30	10.78	9.4	11.02	12.06	10.01
4	0.39	0.40	0.34	0.39	0.36	9.96	13.08	11.93	12.32	10.77
Big	0.39	0.37	0.41	0.33	0.39	10.05	9.52	13.04	11.06	11.19
			$\mathbf{s}_{(i)}$					**t(s)**		
Small	2.63	0.80	0.86	1.05	1.40	4.88	1.73	1.87	2.4	3.24
2	2.28	1.07	0.28	1.27	0.50	3.76	2.21	0.6	3.06	0.95
3	1.37	0.12	1.00	0.53	1.23	2.51	0.28	2.3	1.11	2.84
4	-0.14	0.20	0.55	0.32	0.87	-0.25	0.45	1.31	0.69	1.77
Big	-0.66	-1.59	-0.16	-0.34	-0.11	-1.16	-2.84	-0.36	-0.78	-0.21
			$\mathbf{l}_{(i)}$					**t(l)**		
Small	-0.67	-0.68	0.60	0.33	0.10	-1.35	-1.59	1.42	0.81	0.24
2	-0.71	0.33	0.87	-0.22	0.87	-1.27	0.73	1.97	-0.58	1.78
3	-0.40	0.50	-0.12	0.23	-0.51	-0.79	1.2	-0.29	0.51	-1.26
4	0.80	0.22	0.25	0.30	-0.25	1.51	0.52	0.65	0.69	-0.55
Big	0.84	1.91	0.50	0.70	0.55	1.58	3.68	1.18	1.72	1.18
			$u_{(i)}$					**t(u)**		
Small	0.48	0.13	0.45	0.04	-0.14	3.79	1.15	4.18	0.37	-1.4
2	0.68	0.45	0.24	0.00	0.04	4.74	3.98	2.18	-0.05	0.34
3	0.74	0.56	0.19	-0.19	-0.11	5.74	5.36	1.81	-1.7	-1.08
4	0.93	0.45	0.17	-0.07	-0.37	6.88	4.2	1.71	-0.68	-3.25
Big	0.94	0.74	0.36	-0.07	0.00	6.99	5.63	3.38	-0.65	0.02

Source: Author's computation

Table 4.41c: CFFM Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Variable Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
			CFFM Coefficients: (Rm-Rf), SMB, LMH, UMD							
			$\alpha_{(i)}$					t(α)		
Small	2.50	-0.01	-0.28	-1.02	-0.81	2.89	-0.01	-0.43	-1.43	-1.22
2	1.24	0.48	2.35	-0.12	0.61	1.56	0.66	2.87	-0.18	0.92
3	0.71	0.04	0.52	1.08	0.16	0.78	0.05	0.71	1.67	0.24
4	0.57	1.16	0.58	0.10	0.83	0.77	1.6	0.9	0.15	1.25
Big	0.35	0.25	-0.04	-0.20	0.49	0.49	0.38	-0.05	-0.33	0.65
			$b_{(i)}$					t(b)		
Small	0.36	0.40	0.34	0.35	0.38	9.56	13.56	12	11.48	13.22
2	0.37	0.34	0.33	0.33	0.34	10.73	10.92	9.3	12.16	11.97
3	0.37	0.32	0.35	0.34	0.40	9.59	10.72	10.98	12.35	14.05
4	0.40	0.34	0.36	0.37	0.38	12.46	10.95	12.85	13.44	13.08
Big	0.33	0.38	0.42	0.36	0.39	10.8	13.33	14.45	13.16	12.08
			$s_{(i)}$					t(s)		
Small	1.73	0.25	1.58	1.54	1.59	10.93	2.04	13.09	11.83	13.08
2	1.42	1.07	1.40	1.06	1.25	9.82	8.15	9.37	9.15	10.38
3	0.98	0.81	0.70	0.83	0.84	5.96	6.35	5.25	7.05	6.96
4	0.58	0.44	0.65	0.64	0.70	4.31	3.28	5.48	5.54	5.77
Big	0.00	0.26	0.14	0.34	0.39	0	2.19	1.12	2.98	2.88
			$l_{(i)}$					t(l)		
Small	0.63	0.63	0.24	0.60	0.73	2.3	2.92	1.15	2.63	3.43
2	0.54	0.28	1.01	0.52	0.83	2.14	1.2	3.9	2.57	3.93
3	0.85	0.55	0.67	0.60	0.56	2.95	2.5	2.86	2.93	2.64
4	0.73	0.59	0.35	0.58	0.26	3.13	2.54	1.7	2.87	1.22
Big	0.62	0.58	0.80	0.60	0.55	2.76	2.75	3.71	3.01	2.33
			$u_{(i)}$					t(u)		
Small	0.48	0.34	0.14	0.09	-0.35	3.91	3.54	1.53	0.93	-3.64
2	0.68	0.30	-0.21	-0.12	-0.53	6	2.96	-1.85	-1.28	-5.66
3	0.82	0.36	0.03	-0.28	-0.50	6.35	3.67	0.28	-3	-5.33
4	0.72	0.21	0.01	-0.15	-0.59	6.9	2	0.11	-1.62	-6.23
Big	0.62	0.28	0.09	-0.07	-0.51	6.19	2.97	0.89	-0.74	-4.74

Source: Author's computation

4.5.3.5 Average R-Square Values of CFFM for 25 Portfolios of Fixed Basket, Non-Financial Basket and Variable Basket

Table 4.42a: Average R-Square Values of CFFM for 25 Portfolios of Fixed Basket

Fixed	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.68	0.57	0.60	0.69	0.60	0.68	0.53	0.64	0.53	0.59
2	0.59	0.63	0.44	0.58	0.58	0.37	0.61	0.58	0.54	0.52
3	0.44	0.47	0.46	0.49	0.55	0.46	0.51	0.39	0.50	0.43
4	0.49	0.45	0.51	0.45	0.52	0.42	0.46	0.43	0.41	0.48
Big	0.57	0.50	0.45	0.48	0.51	0.43	0.44	0.53	0.53	0.48

Fixed	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.50	0.53	0.51	0.65	0.71	0.62	0.52	0.62	0.63	0.63
2	0.48	0.57	0.58	0.60	0.60	0.57	0.55	0.64	0.57	0.64
3	0.42	0.48	0.54	0.49	0.43	0.47	0.43	0.55	0.47	0.52
4	0.44	0.47	0.47	0.51	0.47	0.46	0.48	0.54	0.50	0.48
Big	0.47	0.54	0.53	0.61	0.48	0.41	0.49	0.52	0.51	0.45

Table 4.42b: Average R-Square Values of CFFM for 25 Portfolios of Non-Financial Basket

Non-Fin	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.70	0.69	0.62	0.66	0.70	0.71	0.71	0.67	0.57	0.57
2	0.51	0.60	0.61	0.57	0.61	0.64	0.61	0.54	0.41	0.47
3	0.52	0.57	0.45	0.48	0.56	0.00	0.57	0.47	0.05	0.49
4	0.41	0.34	0.50	0.56	0.53	0.48	0.61	0.56	0.46	0.20
Big	0.51	0.48	0.50	0.51	0.44	0.39	0.03	0.48	0.41	0.47

Non-Fin	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.48	0.51	0.68	0.64	0.65	0.65	0.32	0.66	0.64	0.65
2	0.50	0.51	0.63	0.55	0.56	0.53	0.60	0.62	0.57	0.61
3	0.51	0.48	0.48	0.57	0.43	0.58	0.52	0.56	0.54	0.48
4	0.48	0.49	0.52	0.58	0.45	0.55	0.58	0.58	0.54	0.47
Big	0.43	0.46	0.51	0.46	0.47	0.50	0.49	0.56	0.46	0.47

Table 4.42c: Average R-Square Values of CFFM for 25 Portfolios of Variable Basket

Variable	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.76	0.69	0.69	0.70	0.73	0.73	0.74	0.65	0.74	0.70
2	0.65	0.64	0.64	0.60	0.62	0.66	0.44	0.67	0.53	0.57
3	0.58	0.63	0.54	0.42	0.59	0.61	0.61	0.58	0.52	0.55
4	0.56	0.47	0.57	0.56	0.60	0.49	0.52	0.57	0.49	0.52
Big	0.59	0.57	0.53	0.56	0.49	0.47	0.54	0.56	0.50	0.56

Variable	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.60	0.62	0.72	0.65	0.75	0.64	0.58	0.70	0.67	0.72
2	0.59	0.58	0.64	0.60	0.61	0.66	0.59	0.58	0.63	0.67
3	0.42	0.49	0.57	0.59	0.57	0.57	0.57	0.53	0.60	0.64
4	0.52	0.51	0.60	0.60	0.50	0.63	0.50	0.58	0.60	0.59
Big	0.41	0.62	0.55	0.61	0.52	0.51	0.57	0.59	0.55	0.52

4.5.3.6 Summary of Factor Regression for CFFM of 25 Portfolios

Table 4.43: Summary of Factor Regression for CFFM of 25 Portfolios

	Number of Significant Intercept				R-Square			
	Size-Value	Size-INV	Size-PRO	Size-MOM	Size-Value	Size-INV	Size-PRO	Size-MOM
	Fixed				Fixed			
CFFM	11	10	12	11	53	50	52	53
	Non-Financial				Non-Financial			
	1	3	2	5	55	51	54	55
	Variable				Variable			
	2	2	4	2	60	58	59	61

Source: Author's computation

The Table 4.38a to 4.42c show the CFFM linear regression results of the four size-based portfolios i.e., size-value, size-investment, size-profitability and size-momentum for all the three baskets of portfolios. The summary of the factor regression for CFFM of 25 portfolios are given in the Table 4.43. For the fixed basket in the size-value sorted portfolio 11 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 10 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 12 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 11 portfolios out of 25 portfolios are statistically significant. For the non-financial basket in the size-value sorted portfolio 1 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 3 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 2 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 5 portfolios out of 25 portfolios are statistically significant. For the variable basket in the size-value sorted portfolio 2 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 2 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 4 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 2 portfolios out of 25 portfolios are statistically significant. When t(a) is greater than 1.96, statistical significance indicates that alpha value is distinct from zero which mean the model is unable to predict the return of the portfolios.

For the CFFM the average R^2 value for the fixed basket in the size-value cross portfolios is 53, size-investment cross portfolios is 50, size-profitability cross portfolios is 52, and size-momentum cross portfolios is 53; the average R^2 value for the non-financial basket in the size-value cross portfolios is 55, size-investment cross portfolios is 51, size-profitability cross portfolios is 54, and size-momentum cross portfolios is 55; and the average R^2 value for the variable basket in the size-value cross portfolios is 60, size-investment cross portfolios is 58, size-profitability cross portfolios is 59, and size-momentum cross portfolios is 61. From the average R^2 values it is found that variable basket portfolios produced higher R^2 values in comparison two other baskets of portfolios. Another important find from the average R^2 values is that among size cross portfolios size-investment cross portfolios produced the least R^2 values.

4.5.4 FFFF Regression Analysis of the 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + \mathrm{e}_{it}$$

4.5.4.1 FFFF Regression Analysis of the Size-Value Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.44a: FFFF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Fixed Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW										
			$\alpha_{(i)}$					t(α)		
Small	0.61	1.53	1.20	0.44	1.04	1.43	3.23	2.51	1.06	1.88
2	1.64	0.92	1.60	1.60	0.95	3.25	2.23	2.48	3.93	2.02
3	1.23	0.89	1.49	1.30	1.77	2.40	2.07	2.96	2.64	4.26
4	1.23	1.32	1.00	1.05	0.41	2.98	3.18	2.45	1.97	0.90
Big	0.93	1.03	0.86	1.13	1.12	2.34	2.44	2.16	2.42	2.96
			$b_{(i)}$					t(b)		
Small	0.38	0.33	0.33	0.42	0.39	11.46	8.94	8.97	12.89	9.10
2	0.39	0.36	0.35	0.33	0.34	10.07	11.52	7.14	10.69	9.55
3	0.37	0.33	0.40	0.40	0.33	9.37	9.89	10.46	10.48	10.42
4	0.34	0.33	0.36	0.45	0.41	10.72	10.32	11.33	11.10	11.65
Big	0.40	0.38	0.31	0.41	0.35	13.15	11.74	10.30	11.42	12.22
			$s_{(i)}$					t(s)		
Small	1.74	1.64	1.79	1.61	2.04	12.76	10.77	11.68	11.96	11.47
2	1.62	1.41	1.65	1.16	1.51	10.07	10.77	7.99	8.88	10.12
3	0.64	0.72	0.61	0.77	0.97	3.94	5.21	3.82	4.88	7.34
4	0.60	0.27	0.67	0.15	0.59	4.53	2.05	5.14	0.87	3.99
Big	0.52	0.39	0.50	0.42	0.23	4.12	2.86	3.92	2.83	1.87
			$l_{(i)}$					t(l)		
Small	0.80	0.73	0.04	0.12	-0.18	3.90	3.21	0.19	0.61	-0.68
2	0.68	0.16	0.54	0.01	-0.21	2.80	0.81	1.75	0.06	-0.94
3	0.90	0.41	0.12	-0.28	-0.43	3.67	1.96	0.49	-1.19	-2.17
4	0.59	0.80	-0.13	0.30	-0.25	2.98	4.01	-0.66	1.16	-1.12

Big	0.68	0.53	0.02	0.02	-0.17	3.55	2.63	0.13	0.09	-0.93
			$c_{(i)}$					**t(c)**		
Small	0.50	-0.29	0.11	0.12	0.29	2.57	-1.34	0.50	0.64	1.13
2	-0.10	-0.29	0.90	0.40	0.31	-0.42	-1.54	3.07	2.17	1.43
3	0.48	0.07	0.30	-0.34	0.35	2.06	0.34	1.33	-1.52	1.87
4	0.17	0.12	-0.16	0.73	0.11	0.90	0.62	-0.87	3.04	0.51
Big	0.26	-0.08	0.20	-0.15	0.16	1.44	-0.41	1.13	-0.70	0.93
			$r_{(i)}$					**t(r)**		
Small	-0.11	-0.41	-0.23	-0.38	0.08	-0.79	-2.70	-1.49	-2.80	0.46
2	-0.22	-0.28	0.48	-0.26	-0.03	-1.32	-2.11	2.32	-1.97	-0.19
3	-0.21	-0.06	0.02	-0.19	-0.33	-1.29	-0.46	0.10	-1.21	-2.48
4	-0.03	-0.40	-0.13	-0.15	-0.13	-0.22	-3.03	-0.95	-0.87	-0.89
Big	-0.18	-0.18	0.00	-0.13	-0.15	-1.37	-1.32	0.03	-0.89	-1.19

Source: Author's computation

Table 4.44b: FFFF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
			FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW							
			$\alpha_{(i)}$					t(α)		
Small	1.01	1.66	1.19	0.57	1.42	2.13	3.43	2.32	1.19	2.88
2	1.09	1.43	1.31	1.69	1.81	1.81	2.75	2.85	3.57	3.67
3	2.09	0.97	1.79	2.10	1.57	4.02	1.99	3.23	5.38	3.30
4	2.29	1.46	1.70	1.18	1.17	4.03	3.01	3.42	2.59	2.42
Big	0.87	1.21	1.09	1.28	0.82	1.82	2.87	2.53	3.15	1.83
			$b_{(i)}$					t(b)		
Small	0.33	0.31	0.31	0.33	0.38	9.81	9.10	8.68	9.55	10.91
2	0.33	0.37	0.32	0.24	0.34	7.64	10.20	9.94	7.29	9.72
3	0.33	0.42	0.31	0.22	0.38	9.02	12.23	7.99	7.89	11.22
4	0.31	0.26	0.39	0.38	0.34	7.79	7.50	11.21	11.90	10.03
Big	0.39	0.33	0.31	0.33	0.32	11.42	11.05	10.15	11.42	10.16
			$s_{(i)}$					t(s)		
Small	0.47	1.27	3.19	1.29	0.96	1.03	2.73	6.47	2.77	2.02
2	0.75	0.96	2.48	1.14	0.31	1.29	1.91	5.62	2.50	0.66
3	0.94	0.21	0.17	0.66	0.92	1.87	0.45	0.31	1.76	2.01
4	0.68	0.76	-0.63	0.16	0.58	1.24	1.63	-1.32	0.37	1.26
Big	1.02	-0.25	-0.52	-0.27	0.59	2.21	-0.61	-1.26	-0.69	1.37
			$l_{(i)}$					t(l)		
Small	1.28	0.54	-1.72	0.28	0.72	3.04	1.26	-3.78	0.66	1.64
2	0.61	0.24	-1.30	0.15	0.92	1.13	0.52	-3.19	0.35	2.10
3	-0.09	0.48	0.44	-0.13	-0.19	-0.19	1.10	0.89	-0.38	-0.45
4	-0.20	-0.43	0.77	0.26	-0.01	-0.40	-1.00	1.74	0.65	-0.02
Big	-0.81	0.20	0.79	0.32	-0.56	-1.91	0.54	2.06	0.87	-1.41
			$c_{(i)}$					t(c)		
Small	0.14	0.03	-0.22	-0.12	-0.38	0.75	0.14	-1.09	-0.60	-1.92
2	-0.73	-0.15	-0.10	0.03	0.29	-3.02	-0.70	-0.57	0.14	1.45
3	0.02	-0.16	-0.01	0.02	0.04	0.08	-0.84	-0.04	0.11	0.19
4	0.08	-0.21	0.40	-0.05	0.15	0.34	-1.07	1.99	-0.26	0.80
Big	-0.05	-0.23	0.03	0.10	-0.23	-0.28	-1.39	0.17	0.61	-1.29
			$r_{(i)}$					t(r)		
Small	-0.23	-0.29	-0.59	-0.38	-0.56	-1.57	-1.91	-3.70	-2.57	-3.64
2	-0.52	-0.31	-0.22	-0.24	-0.19	-2.79	-1.90	-1.52	-1.62	-1.23
3	-0.26	-0.04	-0.26	-0.22	-0.15	-1.60	-0.24	-1.52	-1.84	-1.00
4	-0.37	-0.28	-0.05	0.04	-0.37	-2.09	-1.85	-0.34	0.31	-2.47
Big	-0.07	-0.31	-0.26	-0.33	-0.23	-0.47	-2.37	-1.93	-2.60	-1.65

Source: Author's computation

Table 4.44c: FFFF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Variable Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW										
			α					**t(α)**		
Small	1.22	1.70	1.66	1.37	1.04	2.86	3.51	3.62	3.1	2.21
2	1.44	1.60	1.57	1.94	2.40	2.81	3.08	3.53	4.38	4.95
3	2.24	0.85	1.95	2.44	1.99	4.72	1.92	3.82	4.18	4.3
4	2.27	1.88	1.62	1.30	1.69	4.6	4.18	3.98	3.15	3.72
Big	1.56	1.39	1.47	1.65	1.37	3.47	3.68	3.45	4.18	3.28
			b					**t(b)**		
Small	0.32	0.26	0.29	0.29	0.36	10.7	7.58	9.24	9.61	10.93
2	0.27	0.40	0.29	0.25	0.30	7.52	10.92	9.45	8.24	8.8
3	0.28	0.37	0.31	0.22	0.32	8.57	11.88	8.72	5.35	9.89
4	0.31	0.26	0.27	0.33	0.35	9.1	8.26	9.67	11.43	11.06
Big	0.34	0.27	0.31	0.31	0.28	10.83	10.49	10.36	11.15	9.71
			s					**t(s)**		
Small	1.73	1.80	1.56	1.56	1.79	15.24	13.96	12.81	13.32	14.28
2	1.33	1.11	1.20	1.15	1.34	9.7	7.96	10.1	9.72	10.39
3	0.76	0.68	0.72	0.89	0.84	5.99	5.75	5.27	5.75	6.83
4	0.53	0.31	0.57	0.42	0.51	4.02	2.57	5.22	3.82	4.2
Big	0.08	0.00	0.20	0.14	0.13	0.64	-0.01	1.79	1.3	1.17
			l					**t(l)**		
Small	1.07	0.67	0.33	0.17	-0.14	5.42	2.99	1.53	0.85	-0.65
2	1.68	0.70	0.29	0.24	-0.05	7.02	2.87	1.39	1.15	-0.22
3	0.92	0.78	0.53	0.27	0.24	4.15	3.79	2.21	0.99	1.09
4	1.07	0.66	0.40	-0.07	0.36	4.64	3.16	2.11	-0.38	1.69
Big	0.91	0.91	0.19	0.26	0.18	4.35	5.18	0.94	1.42	0.92
			c					**t(c)**		
Small	0.38	0.00	0.14	0.06	-0.35	2.3	-0.03	0.78	0.35	-1.92
2	-0.43	0.14	-0.16	0.15	0.37	-2.19	0.7	-0.92	0.87	1.96
3	-0.05	-0.19	0.09	-0.11	0.14	-0.25	-1.13	0.46	-0.47	0.81
4	0.07	0.08	0.14	-0.10	0.14	0.39	0.43	0.89	-0.63	0.8
Big	0.00	-0.14	0.06	0.05	-0.10	-0.01	-0.97	0.39	0.32	-0.65
			r					**t(r)**		
Small	-0.30	-0.55	-0.47	-0.59	-0.59	-2.7	-4.37	-3.92	-5.11	-4.82
2	-0.73	-0.25	-0.51	-0.33	-0.41	-5.5	-1.84	-4.4	-2.86	-3.21
3	-0.86	-0.23	-0.45	-0.64	-0.46	-7.03	-2	-3.4	-4.24	-3.78
4	-0.51	-0.33	-0.48	-0.21	-0.61	-3.99	-2.81	-4.51	-1.99	-5.17
Big	-0.37	-0.51	-0.45	-0.57	-0.46	-3.14	-5.22	-4.05	-5.58	-4.28

Source: Author's computation

4.5.4.2 FFFF Regression Analysis of the Size-Investment Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.45a: FFFF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Fixed Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW										
			$\alpha_{(i)}$					t(α)		
Small	1.43	0.74	0.72	0.48	1.21	3.42	1.16	1.65	0.88	2.64
2	1.67	0.79	1.30	1.09	1.25	2.54	1.78	2.88	2.16	2.77
3	1.48	0.47	1.62	0.87	1.73	2.83	1.09	3.08	1.98	3.59
4	0.48	1.05	0.82	1.38	1.52	1.01	2.53	2.10	2.89	3.24
Big	1.20	0.85	1.19	0.77	0.93	2.24	1.96	3.12	2.14	2.22
			$b_{(i)}$					t(b)		
Small	0.33	0.42	0.36	0.35	0.37	10.32	8.50	10.84	8.39	10.43
2	0.27	0.39	0.37	0.39	0.31	5.24	11.42	10.60	10.19	9.05
3	0.40	0.36	0.35	0.36	0.36	9.96	11.01	8.76	10.56	9.73
4	0.37	0.34	0.30	0.35	0.40	10.09	10.83	9.89	9.46	11.18
Big	0.38	0.34	0.36	0.37	0.38	9.30	10.06	12.19	13.32	11.90
			$s_{(i)}$					t(s)		
Small	1.97	1.77	1.58	1.78	1.49	14.67	8.68	11.29	10.10	10.12
2	1.50	1.26	1.29	1.30	1.32	7.13	8.89	8.88	8.09	9.12
3	0.78	0.67	0.65	0.78	0.74	4.67	4.84	3.84	5.54	4.78
4	0.43	0.25	0.45	0.52	0.58	2.87	1.90	3.63	3.41	3.85
Big	0.61	0.36	0.45	0.32	0.30	3.55	2.63	3.70	2.81	2.23
			$l_{(i)}$					t(l)		
Small	0.46	0.73	-0.06	0.20	0.45	2.25	2.37	-0.30	0.75	2.03
2	0.55	0.05	0.24	0.15	0.11	1.74	0.24	1.09	0.61	0.51
3	-0.04	0.44	0.17	0.05	-0.03	-0.17	2.12	0.66	0.26	-0.14
4	0.22	-0.10	0.18	0.35	0.58	0.98	-0.49	0.98	1.53	2.56
Big	0.77	0.19	0.28	0.36	0.14	2.96	0.90	1.55	2.10	0.71
			$c_{(i)}$					t(c)		
Small	0.66	0.54	0.04	-0.63	-0.21	3.45	1.86	0.21	-2.49	-1.01
2	1.03	0.27	0.47	-0.11	-0.46	3.43	1.32	2.27	-0.49	-2.24
3	0.75	0.49	0.11	-0.26	-0.12	3.16	2.50	0.44	-1.30	-0.56
4	0.75	0.46	0.06	-0.14	-0.52	3.46	2.46	0.34	-0.66	-2.45
Big	0.16	0.28	0.71	-0.23	-0.23	0.65	1.41	4.07	-1.41	-1.19
			$r_{(i)}$					t(r)		
Small	-0.42	-0.40	-0.10	-0.30	-0.19	-3.11	-1.95	-0.74	-1.69	-1.31
2	0.51	-0.21	-0.06	-0.13	-0.23	2.38	-1.50	-0.42	-0.78	-1.54
3	-0.01	-0.20	-0.19	-0.28	0.14	-0.05	-1.41	-1.10	-1.97	0.91
4	0.12	-0.22	-0.06	-0.21	-0.81	0.80	-1.65	-0.45	-1.34	-5.37
Big	-0.36	-0.10	-0.05	-0.01	-0.14	-2.10	-0.72	-0.38	-0.10	-1.07

Source: Author’s computation

Table 4.45b: FFFF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
					FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW					
			$\alpha_{(i)}$					**t(α)**		
Small	1.24	1.22	0.99	0.97	1.23	2.73	2.67	1.93	1.56	2.41
2	1.97	1.70	0.89	0.67	1.93	4.24	3.55	1.78	1.11	3.74
3	1.89	1.19	1.39	1.10	2.18	2.57	2.20	2.58	1.82	4.48
4	1.98	1.69	1.47	1.07	2.95	3.83	3.66	3.39	2.13	3.89
Big	1.64	1.51	1.19	0.62	1.25	2.64	1.86	2.71	1.50	2.45
			$b_{(i)}$					**t(b)**		
Small	0.34	0.36	0.35	0.34	0.27	10.4 6	11.16	9.81	7.86	7.51
2	0.29	0.31	0.30	0.26	0.22	8.73	9.17	8.58	6.09	5.99
3	0.01	0.42	0.38	0.10	0.32	0.17	10.90	10.07	2.32	9.19
4	0.33	0.38	0.36	0.34	0.23	8.99	11.54	11.80	9.71	4.37
Big	0.37	0.07	0.30	0.29	0.37	8.32	1.17	9.72	9.92	10.26
			$s_{(i)}$					**t(s)**		
Small	1.70	1.38	0.91	0.20	0.88	3.86	3.12	1.84	0.33	1.78
2	1.24	1.08	1.70	1.07	1.90	2.78	2.34	3.53	1.84	3.81
3	0.22	0.14	1.30	0.54	1.38	0.32	0.28	2.50	0.92	2.94
4	0.26	0.40	1.60	0.53	-0.24	0.51	0.90	3.84	1.09	-0.33
Big	-0.11	0.24	-0.35	-0.36	-0.23	-0.18	0.31	-0.82	-0.91	-0.47
			$l_{(i)}$					**t(l)**		
Small	0.01	0.26	0.77	1.31	0.66	0.02	0.64	1.68	2.38	1.45
2	0.15	0.18	-0.58	0.33	-0.69	0.36	0.42	-1.31	0.61	-1.51
3	-0.25	0.65	-0.77	-0.46	-0.58	-0.38	1.36	-1.60	-0.86	-1.33
4	0.34	0.36	-1.01	0.03	0.69	0.75	0.88	-2.61	0.06	1.02
Big	0.30	-0.54	0.63	0.41	0.52	0.54	-0.74	1.60	1.11	1.14
			$c_{(i)}$					**t(c)**		
Small	0.32	0.15	0.09	-0.47	-0.59	1.76	0.80	0.44	-1.90	-2.85
2	0.34	0.32	-0.14	-1.27	-0.64	1.83	1.69	-0.71	-5.26	-3.08
3	0.05	0.27	-0.01	-0.29	-0.13	0.17	1.26	-0.05	-1.20	-0.66
4	0.54	0.51	0.29	-0.31	-0.23	2.59	2.76	1.67	-1.52	-0.76
Big	0.56	-0.41	-0.01	-0.30	-0.37	2.23	-1.24	-0.05	-1.81	-1.83
			$r_{(i)}$					**t(r)**		
Small	-0.43	-0.32	-0.14	-0.75	-0.31	-3.06	-2.28	-0.87	-3.91	-1.94
2	-0.49	-0.26	-0.33	-0.48	-0.39	-3.39	-1.73	-2.15	-2.58	-2.45
3	-0.09	-0.10	-0.02	-0.11	-0.12	-0.41	-0.58	-0.12	-0.56	-0.83
4	-0.15	-0.16	0.15	-0.20	-0.48	-0.93	-1.12	1.09	-1.28	-2.06
Big	-0.27	-0.48	-0.31	-0.26	-0.25	-1.42	-1.89	-2.31	-2.09	-1.59

Source: Author's computation

Table 4.45c: FFFF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Variable Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
			FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW							
			$\alpha_{(i)}$					t(α)		
Small	1.50	1.27	1.41	1.30	1.49	3.4	2.96	2.8	2.91	3.25
2	1.71	1.70	1.71	1.33	2.32	3.71	2.87	3.87	2.19	4.4
3	2.05	1.18	2.10	1.50	2.38	4.02	2.74	4.62	3.24	4.76
4	1.73	2.14	1.78	1.56	1.63	3.51	5.08	4.36	3.1	3.09
Big	1.71	1.76	1.42	1.17	1.58	3.65	4.1	3.75	2.87	3.73
			$b_{(i)}$					t(b)		
Small	0.30	0.31	0.31	0.32	0.28	9.86	10.32	8.71	10.27	8.69
2	0.30	0.26	0.33	0.29	0.27	9.26	6.24	10.72	6.83	7.49
3	0.35	0.31	0.32	0.25	0.29	9.74	10.47	10.15	7.84	8.31
4	0.29	0.25	0.29	0.31	0.37	8.35	8.7	10.38	8.96	10.04
Big	0.30	0.30	0.29	0.28	0.32	9.23	9.89	10.93	9.92	10.73
			$s_{(i)}$					t(s)		
Small	1.76	1.63	1.53	1.83	1.76	14.98	14.27	11.35	15.36	14.36
2	1.31	0.78	1.16	1.43	1.23	10.71	4.92	9.83	8.83	8.74
3	0.96	0.72	0.63	0.78	0.83	7.1	6.31	5.17	6.32	6.23
4	0.59	0.51	0.33	0.40	0.58	4.53	4.57	3.08	2.96	4.13
Big	0.04	0.06	0.04	0.14	0.15	0.31	0.54	0.38	1.28	1.36
			$l_{(i)}$					t(l)		
Small	0.43	0.82	0.32	0.22	0.54	2.11	4.11	1.36	1.05	2.54
2	0.63	0.70	0.57	0.62	0.56	2.92	2.52	2.74	2.18	2.27
3	0.78	0.37	0.47	0.45	0.59	3.28	1.82	2.23	2.09	2.53
4	0.41	0.39	0.61	0.38	0.80	1.78	1.98	3.23	1.62	3.24
Big	0.76	0.59	0.29	0.44	0.57	3.47	2.94	1.65	2.3	2.88
			$c_{(i)}$					t(c)		
Small	0.52	0.26	0.16	-0.25	-0.65	3.07	1.58	0.81	-1.43	-3.66
2	0.42	0.12	0.08	-0.79	-0.48	2.37	0.52	0.48	-3.36	-2.35
3	0.64	0.18	0.14	-0.35	-0.44	3.26	1.11	0.77	-1.94	-2.29
4	0.48	0.46	-0.01	-0.27	-0.52	2.51	2.85	-0.06	-1.39	-2.58
Big	0.85	0.14	-0.15	-0.22	-0.39	4.75	0.83	-1.05	-1.38	-2.4
			$r_{(i)}$					t(r)		
Small	-0.53	-0.60	-0.35	-0.48	-0.51	-4.6	-5.34	-2.68	-4.11	-4.24
2	-0.52	-0.43	-0.29	-0.55	-0.61	-4.38	-2.8	-2.54	-3.5	-4.44
3	-0.53	-0.52	-0.55	-0.51	-0.61	-3.98	-4.65	-4.63	-4.27	-4.71
4	-0.36	-0.58	-0.52	-0.50	-0.17	-2.83	-5.31	-4.92	-3.79	-1.28
Big	-0.35	-0.60	-0.58	-0.37	-0.61	-2.9	-5.38	-5.95	-3.47	-5.54

Source: Author's computation

4.5.4.3 FFFF Regression Analysis of the Size-Profitability Cross 25 Portfolios with Market Risk ((R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.46a: FFFF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Fixed Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW										
			$\alpha_{(i)}$					**t(α)**		
Small	1.53	0.38	1.00	1.02	0.89	2.66	1.02	1.86	2.41	2.06
2	2.41	1.16	1.76	0.79	0.58	3.63	2.72	4.01	1.90	1.37
3	1.39	1.22	1.01	1.42	2.08	3.25	2.55	2.19	3.31	3.86
4	0.93	1.10	0.34	0.72	1.37	2.38	2.69	0.80	1.61	2.61
Big	1.22	0.39	1.31	0.65	0.74	3.42	1.06	3.39	1.61	1.41
			$b_{(i)}$					**t(b)**		
Small	0.42	0.35	0.33	0.34	0.40	9.54	12.25	7.91	10.32	12.13
2	0.46	0.35	0.39	0.34	0.33	9.05	10.58	11.52	10.71	10.20
3	0.35	0.37	0.42	0.34	0.35	10.63	10.13	11.98	10.23	8.42
4	0.34	0.35	0.35	0.39	0.42	11.23	11.05	11.04	11.32	10.53
Big	0.33	0.36	0.36	0.43	0.42	12.21	12.80	12.26	13.96	10.51
			$s_{(i)}$					**t(s)**		
Small	1.54	0.58	1.54	1.70	1.96	8.36	4.89	9.00	12.47	14.12
2	1.75	1.20	1.11	1.32	1.35	8.25	8.76	7.88	9.91	9.98
3	0.49	0.79	0.67	0.80	0.93	3.62	5.21	4.55	5.82	5.43
4	0.26	0.40	0.43	0.56	0.61	2.12	3.09	3.22	3.89	3.66
Big	0.07	0.56	0.47	0.66	0.70	0.58	4.71	3.80	5.12	4.17
			$l_{(i)}$					**t(l)**		
Small	-0.31	0.09	0.67	0.23	0.40	-1.13	0.47	2.60	1.10	1.91
2	0.45	0.21	0.17	0.15	0.15	1.41	1.00	0.82	0.75	0.73
3	0.21	-0.18	0.08	0.43	0.07	1.04	-0.79	0.38	2.06	0.26
4	0.43	0.30	-0.07	0.24	0.15	2.28	1.51	-0.36	1.13	0.61
Big	0.36	0.03	0.03	0.35	0.39	2.07	0.17	0.18	1.79	1.53
			$c_{(i)}$					**t(c)**		
Small	-0.03	0.05	0.18	0.28	0.05	-0.13	0.29	0.76	1.46	0.27
2	0.77	0.36	-0.07	0.05	-0.12	2.57	1.83	-0.36	0.25	-0.62
3	0.36	-0.19	0.17	-	0.29	1.88	-0.89	0.81	-0.50	1.21

				0.10						
4	0.10	0.00	0.30	0.26	0.25	0.58	0.01	1.59	1.25	1.06
Big	0.16	0.17	0.06	0.32	0.16	0.98	1.03	0.33	1.72	0.69
			$r_{(i)}$					t(r)		
Small	0.57	0.17	-0.08	-0.35	-0.61	3.06	1.38	-0.48	-2.52	-4.39
2	1.01	0.10	-0.24	-0.31	-0.62	4.70	0.75	-1.70	-2.30	-4.55
3	0.51	-0.10	-0.10	-0.84	-0.64	3.72	-0.67	-0.70	-6.04	-3.66
4	0.23	-0.10	0.04	-0.20	-0.73	1.83	-0.77	0.27	-1.41	-4.30
Big	0.12	0.20	-0.29	-0.41	-0.47	1.00	1.69	-2.31	-3.14	-2.80

Source: Author's computation

Table 4.46b: FFFF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

PRO	**Low**	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
				FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW						
			$\alpha_{(i)}$					t(α)		
Small	1.48	1.44	1.56	1.30	1.08	2.23	2.53	3.11	2.57	2.28
2	2.17	2.45	1.40	1.51	1.42	3.73	4.46	3.04	2.58	2.55
3	2.39	1.76	0.92	1.47	2.70	4.73	3.64	1.89	2.72	3.42
4	1.24	1.52	1.34	1.51	1.75	2.94	3.23	2.87	3.49	2.86
Big	0.66	0.65	1.32	1.52	2.17	1.61	1.37	2.89	2.65	3.98
			$b_{(i)}$					t(b)		
Small	0.39	0.27	0.34	0.32	0.30	8.36	6.75	9.66	8.91	9.16
2	0.39	0.32	0.34	0.29	0.31	9.51	8.16	10.58	7.09	7.87
3	0.35	0.30	0.33	0.41	0.38	9.83	8.72	9.64	10.75	6.73
4	0.33	0.35	0.35	0.34	0.39	11.21	10.56	10.56	11.18	9.06
Big	0.30	0.34	0.35	0.35	0.35	10.23	10.34	10.78	8.52	8.94
			$s_{(i)}$					t(s)		
Small	1.36	1.81	1.38	1.09	1.37	2.12	3.29	2.87	2.23	3.03
2	1.99	1.35	1.05	0.60	1.06	3.55	2.54	2.38	1.06	1.98
3	0.57	0.88	0.62	1.34	0.69	1.17	1.89	1.33	2.57	0.91
4	1.06	0.09	0.17	0.32	1.20	2.61	0.20	0.38	0.76	2.05

Big	-0.20	-0.46	0.31	-0.68	0.62	-0.50	-1.01	0.70	-1.22	1.17
			$l_{(i)}$					**t(l)**		
Small	0.15	-0.30	0.35	0.37	0.18	0.25	-0.60	0.78	0.81	0.42
2	-0.65	-0.22	0.12	0.87	0.29	-1.25	-0.45	0.30	1.67	0.59
3	0.39	-0.03	0.02	-0.49	0.34	0.87	-0.08	0.06	-1.02	0.49
4	-0.51	0.36	0.33	0.30	-0.73	-1.37	0.87	0.79	0.78	-1.35
Big	0.41	0.59	-0.08	1.07	-0.24	1.12	1.40	-0.19	2.09	-0.50
			$c_{(i)}$					**t(c)**		
Small	-0.36	-0.15	0.12	0.01	0.00	-1.36	-0.65	0.60	0.05	0.00
2	0.13	0.24	-0.19	-0.61	0.16	0.58	1.07	-1.02	-2.59	0.74
3	-0.15	-0.16	-0.19	-0.07	0.71	-0.72	-0.83	-0.98	-0.32	2.24
4	-0.03	0.03	0.21	0.15	0.54	-0.17	0.17	1.12	0.88	2.23
Big	-0.33	-0.14	-0.05	-0.05	0.04	-1.98	-0.77	-0.29	-0.22	0.20
			$r_{(i)}$					**t(r)**		
Small	0.21	-0.11	-0.14	-0.42	-0.81	1.01	-0.65	-0.90	-2.67	-5.59
2	0.54	0.11	-0.13	-0.75	-0.80	3.02	0.63	-0.93	-4.15	-4.63
3	0.20	-0.06	-0.16	-0.45	-0.14	1.26	-0.37	-1.03	-2.68	-0.57
4	0.29	0.02	-0.06	-0.46	-0.38	2.20	0.12	-0.42	-3.40	-2.01
Big	-0.10	-0.10	-0.44	-0.77	-0.83	-0.79	-0.70	-3.10	-4.36	-4.93

Source: Author's computation

Table 4.46c: FFFF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Variable Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
			FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW							
			$\alpha_{(i)}$					t(α)		
Small	2.78	1.40	1.69	1.55	1.05	4.66	3.87	3.82	3.43	2.45
2	2.19	2.33	1.04	1.52	1.71	4.31	4.67	2.14	2.91	3.55
3	2.80	1.97	1.33	1.58	2.26	5.13	3.99	2.92	3.05	4.51
4	1.37	2.18	1.27	2.06	1.84	3.46	5.09	3.1	4.6	3.25
Big	0.84	1.29	1.66	1.17	2.15	2.21	3.54	3.98	2.85	4.2
			$b_{(i)}$					t(b)		
Small	0.33	0.32	0.29	0.25	0.31	7.96	12.81	9.58	7.85	10.41
2	0.32	0.27	0.37	0.26	0.28	9.12	7.92	10.82	7.22	8.38
3	0.25	0.27	0.31	0.36	0.28	6.66	7.81	9.84	9.96	8.17
4	0.28	0.26	0.34	0.35	0.32	10.24	8.7	11.85	11.16	8.16
Big	0.23	0.32	0.32	0.34	0.34	8.75	12.66	11.17	11.91	9.65
			$s_{(i)}$					t(s)		
Small	1.56	0.14	1.66	1.48	1.85	9.82	1.49	14.13	12.29	16.2
2	1.30	1.14	0.92	1.32	1.16	9.62	8.57	7.14	9.45	9.04
3	0.87	0.72	0.60	0.72	0.99	5.96	5.45	4.92	5.2	7.4
4	0.33	0.46	0.38	0.46	0.67	3.09	3.99	3.53	3.82	4.41
Big	0.04	0.13	0.11	0.32	0.25	0.38	1.36	0.98	2.92	1.85
			$l_{(i)}$					t(l)		
Small	0.64	0.50	0.43	0.28	0.62	2.31	2.95	2.09	1.34	3.11
2	0.42	0.55	0.74	0.78	0.61	1.78	2.37	3.27	3.22	2.75
3	0.31	0.54	0.58	0.80	0.40	1.2	2.35	2.73	3.32	1.72
4	0.58	0.45	0.35	0.56	0.23	3.14	2.28	1.84	2.69	0.89
Big	0.45	0.47	0.39	0.60	0.45	2.54	2.78	2.01	3.11	1.89
			$c_{(i)}$					t(c)		
Small	-0.21	0.00	0.08	0.14	0.12	-0.91	0.01	0.45	0.79	0.76
2	-0.10	-0.04	-0.17	-0.25	0.24	-0.54	-0.2	-0.92	-1.26	1.3
3	-0.12	-0.15	-0.22	0.30	0.14	-0.55	-0.79	-1.27	1.5	0.72
4	-0.21	0.02	0.05	0.18	0.24	-1.38	0.11	0.31	1.04	1.09
Big	-0.34	-0.02	0.26	0.07	0.28	-2.29	-0.14	1.62	0.44	1.4
			$r_{(i)}$					t(r)		
Small	-0.30	-0.30	-0.44	-0.53	-0.89	-1.97	-3.23	-3.82	-4.53	-8.03
2	0.00	-0.37	-0.25	-0.67	-0.96	0.03	-2.85	-1.95	-4.9	-7.71
3	-0.12	-0.32	-0.55	-0.51	-1.04	-0.85	-2.49	-4.61	-3.81	-8.01
4	-0.08	-0.41	-0.36	-0.72	-0.95	-0.78	-3.65	-3.37	-6.17	-6.48
Big	-0.20	-0.31	-0.37	-0.68	-0.86	-2.02	-3.28	-3.42	-6.33	-6.43

Source: Author's computation

4.5.4.4 FFFF Regression Analysis of the Size-Momentum Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment and Profitability as the Independent Variables

Table 4.47a: FFFF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Fixed Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
				FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW						
			$\alpha_{(i)}$					t(α)		
Small	3.61	1.31	1.16	0.43	-1.33	6.62	3.44	2.73	0.89	-3.07
2	3.60	1.94	1.18	0.24	-1.17	6.42	4.35	3.05	0.58	-2.48
3	3.83	1.78	1.03	0.33	-0.98	7.38	3.97	2.36	0.69	-1.90
4	3.09	1.93	0.87	0.25	-0.59	6.55	4.64	2.00	0.58	-1.15
Big	3.05	1.66	0.26	0.69	-0.67	5.50	4.11	0.64	1.58	-1.41
			$b_{(i)}$					t(b)		
Small	0.40	0.37	0.32	0.38	0.33	9.62	12.74	9.75	10.22	10.02
2	0.35	0.34	0.38	0.35	0.40	8.18	9.98	12.71	10.91	11.12
3	0.39	0.33	0.40	0.33	0.41	9.78	9.46	11.98	9.10	10.45
4	0.33	0.34	0.41	0.37	0.41	9.06	10.75	12.31	10.94	10.40
Big	0.39	0.37	0.36	0.41	0.36	9.19	11.94	11.41	12.26	9.86
			$s_{(i)}$					t(s)		
Small	1.78	0.22	1.58	1.64	1.38	10.22	1.84	11.64	10.71	9.94
2	1.71	1.19	1.18	1.01	1.45	9.55	8.35	9.58	7.66	9.66
3	0.74	0.52	0.78	0.91	0.64	4.47	3.62	5.58	5.96	3.88
4	0.36	0.50	0.59	0.61	0.59	2.38	3.72	4.26	4.34	3.61
Big	0.57	0.28	0.69	0.30	0.49	3.22	2.15	5.20	2.16	3.23
			$l_{(i)}$					t(l)		
Small	-0.05	0.22	0.35	0.36	0.10	-0.17	1.18	1.69	1.58	0.49
2	0.35	0.34	0.12	-0.04	0.24	1.29	1.59	0.65	-0.20	1.05
3	-0.10	0.32	0.15	-0.07	0.21	-0.41	1.49	0.74	-0.31	0.86
4	0.40	0.32	0.25	-0.16	0.12	1.77	1.61	1.19	-0.76	0.47
Big	0.64	0.32	-0.10	0.32	0.27	2.41	1.65	-0.52	1.51	1.19
			$c_{(i)}$					t(c)		
Small	0.42	0.31	0.07	0.14	0.06	1.68	1.81	0.36	0.66	0.31
2	0.51	0.37	-0.02	0.16	0.01	2.00	1.83	-0.12	0.83	0.05
3	0.23	0.21	0.17	-0.01	0.04	0.98	1.02	0.88	-0.05	0.16
4	0.25	0.10	0.30	0.12	0.23	1.17	0.52	1.51	0.60	0.98
Big	-0.12	0.32	-0.08	0.23	0.24	-0.46	1.76	-0.43	1.15	1.12
			$r_{(i)}$					t(r)		
Small	0.24	-0.02	-0.40	-0.51	-0.39	1.34	-0.20	-2.94	-3.29	-2.76
2	0.35	-0.25	-0.21	-0.16	-0.26	1.91	-1.74	-1.70	-1.22	-1.69
3	0.03	-0.16	-0.24	-0.15	-0.07	0.20	-1.09	-1.68	-0.97	-0.41
4	-0.28	-0.23	-0.05	-0.22	-0.10	-1.85	-1.71	-0.37	-1.55	-0.61
Big	-0.25	-0.05	-0.03	-0.21	-0.05	-1.38	-0.35	-0.24	-1.48	-0.30

Source: Author's computation

Table 4.47b: FFFF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
			FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW							
			$\alpha_{(i)}$					t(α)		
Small	5.49	2.02	1.62	0.42	-1.42	9.41	4.17	3.31	0.93	-3.31
2	5.46	2.90	1.97	0.19	-1.24	8.39	5.49	4.08	0.45	-2.32
3	6.08	2.45	1.43	0.28	-1.65	9.76	4.88	3.14	0.58	-3.65
4	5.75	2.50	1.25	0.36	-1.68	8.61	5.1	2.85	0.75	-3.22
Big	4.79	2.75	1.29	-0.13	-1.45	7.29	4.39	2.66	-0.29	-2.8
			$b_{(i)}$					t(b)		
Small	0.33	0.25	0.31	0.30	0.27	7.98	7.46	8.84	9.36	8.98
2	0.29	0.29	0.34	0.28	0.36	6.25	7.69	10.06	9.23	9.57
3	0.42	0.30	0.31	0.36	0.28	9.49	8.45	9.65	10.26	8.64
4	0.39	0.41	0.34	0.36	0.33	8.32	11.92	10.94	10.74	8.97
Big	0.40	0.36	0.39	0.32	0.35	8.62	8.09	11.4	9.88	9.65
			$s_{(i)}$					t(s)		
Small	2.71	0.74	0.84	0.92	1.09	4.83	1.59	1.78	2.14	2.64
2	2.27	1.22	0.19	1.19	0.29	3.62	2.4	0.42	2.87	0.56
3	1.68	0.35	0.98	0.33	1.15	2.81	0.72	2.23	0.69	2.63
4	0.08	0.45	0.61	0.26	0.67	0.12	0.95	1.44	0.57	1.32
Big	-0.56	-1.51	-0.15	-0.41	-0.28	-0.88	-2.5	-0.33	-0.93	-0.56
			$l_{(i)}$					t(l)		
Small	-0.70	-0.64	0.63	0.40	0.28	-1.34	-1.49	1.45	1.01	0.72
2	-0.65	0.25	0.92	-0.18	1.00	-1.13	0.54	2.15	-0.46	2.1
3	-0.56	0.38	-0.10	0.33	-0.47	-1.02	0.86	-0.25	0.76	-1.16
4	0.71	0.08	0.21	0.32	-0.15	1.19	0.18	0.55	0.75	-0.32
Big	0.83	1.90	0.50	0.73	0.66	1.42	3.41	1.17	1.8	1.43
			$c_{(i)}$					t(c)		
Small	-0.28	-0.06	-0.03	0.07	-0.01	-1.21	-0.29	-0.17	0.39	-0.06
2	-0.84	0.10	0.23	0.03	0.03	-3.24	0.48	1.17	0.16	0.13
3	0.18	0.04	0.09	0.11	0.18	0.72	0.22	0.48	0.55	1.01
4	-0.10	0.28	0.09	0.35	0.17	-0.38	1.43	0.53	1.84	0.81
Big	-0.59	-0.25	0.00	0.05	-0.01	-2.23	-1.01	0	0.29	-0.03
			$r_{(i)}$					t(r)		
Small	-0.21	-0.24	-0.44	-0.33	-0.59	-1.18	-1.61	-2.92	-2.4	-4.41
2	-0.55	-0.07	-0.45	-0.17	-0.53	-2.72	-0.43	-3	-1.27	-3.22
3	0.04	0.01	-0.22	-0.30	-0.12	0.19	0.06	-1.56	-1.96	-0.83
4	-0.30	0.15	-0.01	-0.10	-0.15	-1.47	0.99	-0.08	-0.7	-0.91
Big	-0.55	-0.46	-0.30	-0.10	-0.41	-2.69	-2.36	-1.99	-0.72	-2.55

Source: Author's computation

Table 4.47c: FFFF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Variable Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
FFFF Coefficients: (Rm-Rf), SMB, LMH, CMA & RMW										
			$\alpha_{(i)}$					**t(α)**		
Small	5.54	2.88	1.24	0.66	-1.30	8.95	6.26	2.9	1.47	-3.08
2	5.82	2.70	1.44	0.22	-1.11	10.1	5.59	2.63	0.52	-2.45
3	6.22	3.07	1.51	0.42	-1.65	9.46	6.53	3.13	0.97	-3.61
4	5.23	2.97	1.45	0.24	-1.58	9.42	5.99	3.38	0.57	-3.29
Big	4.25	2.67	1.16	-0.03	-1.29	8.17	5.98	2.61	-0.06	-2.48
			$b_{(i)}$					**t(b)**		
Small	0.36	0.35	0.28	0.27	0.28	8.33	10.85	9.4	8.7	9.56
2	0.32	0.29	0.26	0.27	0.25	8.1	8.58	6.89	9.35	7.82
3	0.32	0.27	0.28	0.27	0.31	7.01	8.14	8.49	9.16	9.85
4	0.37	0.30	0.31	0.31	0.29	9.59	8.84	10.3	10.54	8.75
Big	0.30	0.33	0.36	0.30	0.31	8.37	10.71	11.76	10.43	8.5
			$s_{(i)}$					**t(s)**		
Small	1.77	0.23	1.53	1.46	1.47	10.71	1.89	13.39	12.27	13.09
2	1.44	1.05	1.32	0.99	1.12	9.36	8.14	9.07	8.97	9.27
3	0.99	0.78	0.64	0.74	0.71	5.68	6.24	5.01	6.45	5.86
4	0.61	0.41	0.60	0.57	0.57	4.14	3.14	5.24	5.13	4.49
Big	0.02	0.24	0.09	0.28	0.27	0.18	2.02	0.74	2.56	1.97
			$l_{(i)}$					**t(l)**		
Small	0.59	0.53	0.13	0.47	0.64	2.05	2.48	0.64	2.24	3.26
2	0.39	0.15	0.91	0.45	0.76	1.47	0.66	3.6	2.34	3.62
3	0.67	0.44	0.57	0.54	0.49	2.19	2	2.54	2.69	2.31
4	0.61	0.51	0.28	0.52	0.21	2.37	2.2	1.4	2.67	0.93
Big	0.50	0.48	0.70	0.51	0.50	2.05	2.33	3.37	2.67	2.08
			$c_{(i)}$					**t(c)**		
Small	0.05	0.11	-0.15	0.03	0.33	0.19	0.61	-0.91	0.15	2.03
2	-	-0.31	-0.37	0.20	0.34	-0.91	-1.68	-1.77	1.25	1.94

	0.20									
3	-0.24	0.03	-0.01	0.15	0.18	-0.96	0.15	-0.05	0.91	1.01
4	-0.16	-0.01	0.11	0.22	0.18	-0.76	-0.05	0.66	1.35	0.95
Big	-0.31	0.04	-0.12	-0.15	0.27	-1.53	0.21	-0.68	-0.92	1.36
			$r_{(i)}$					**t(r)**		
Small	-0.09	-0.44	-0.56	-0.66	-0.63	-0.58	-3.7	-5	-5.68	-5.77
2	-0.56	-0.56	-0.56	-0.43	-0.54	-3.75	-4.46	-3.92	-3.98	-4.59
3	-0.68	-0.53	-0.50	-0.44	-0.52	-3.98	-4.31	-4.04	-3.9	-4.35
4	-0.42	-0.37	-0.39	-0.41	-0.48	-2.9	-2.86	-3.51	-3.76	-3.82
Big	-0.44	-0.44	-0.53	-0.48	-0.46	-3.28	-3.8	-4.59	-4.48	-3.41

Source: Author's computation

4.5.4.5 Average R-Square Values of FFFF for 25 Portfolios of Fixed Basket, Non-Financial Basket and Variable Basket

Table 4.48a: Average R-Square Values of FFFF for 25 Portfolios of Fixed Basket

Fixed	**Size-Value**					**Size-Investment**				
	Low	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
Small	0.69	0.59	0.61	0.60	0.60	0.72	0.55	0.63	0.54	0.60
2	0.59	0.64	0.47	0.61	0.59	0.40	0.61	0.59	0.54	0.53
3	0.46	0.47	0.46	0.49	0.58	0.49	0.54	0.40	0.51	0.43
4	0.49	0.48	0.52	0.48	0.52	0.45	0.49	0.43	0.41	0.55
Big	0.58	0.50	0.46	0.48	0.52	0.44	0.43	0.56	0.54	0.49

Fixed	**Size-Profitability**					**Size-Momentum**				
	Low	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
Small	0.52	0.53	0.51	0.67	0.73	0.58	0.53	0.64	0.63	0.60
2	0.53	0.58	0.58	0.61	0.62	0.53	0.57	0.65	0.57	0.61
3	0.45	0.47	0.53	0.57	0.48	0.45	0.43	0.56	0.46	0.46
4	0.45	0.47	0.48	0.51	0.53	0.41	0.49	0.54	0.51	0.46
Big	0.47	0.55	0.55	0.64	0.50	0.40	0.50	0.52	0.52	0.43

Table 4.48b: Average R-Square Values of FFFF for 25 Portfolios of Non-Financial Basket

Non-Fin	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.71	0.70	0.64	0.67	0.71	0.74	0.72	0.67	0.59	0.59
2	0.53	0.60	0.61	0.57	0.62	0.67	0.63	0.55	0.49	0.48
3	0.51	0.57	0.42	0.45	0.57	0.00	0.56	0.46	0.04	0.49
4	0.41	0.35	0.51	0.52	0.54	0.50	0.62	0.56	0.47	0.21
Big	0.49	0.48	0.50	0.54	0.43	0.42	0.04	0.48	0.43	0.46

Non-Fin	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.49	0.51	0.67	0.64	0.72	0.63	0.32	0.65	0.65	0.69
2	0.52	0.49	0.61	0.57	0.63	0.51	0.57	0.65	0.57	0.63
3	0.51	0.47	0.48	0.58	0.41	0.51	0.44	0.56	0.55	0.48
4	0.49	0.48	0.52	0.62	0.50	0.44	0.54	0.57	0.55	0.45
Big	0.43	0.44	0.53	0.50	0.53	0.40	0.42	0.54	0.46	0.49

Table 4.48c: Average R-Square Values of FFFF for 25 Portfolios of Variable Basket

Variable	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.78	0.72	0.72	0.74	0.76	0.78	0.79	0.67	0.76	0.73
2	0.70	0.65	0.68	0.63	0.66	0.71	0.46	0.68	0.57	0.61
3	0.67	0.64	0.57	0.47	0.63	0.67	0.66	0.64	0.56	0.59
4	0.60	0.50	0.62	0.57	0.66	0.55	0.63	0.63	0.52	0.53
Big	0.58	0.62	0.57	0.63	0.54	0.57	0.60	0.62	0.53	0.61

Variable	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.60	0.64	0.74	0.70	0.82	0.61	0.59	0.73	0.73	0.77
2	0.59	0.59	0.63	0.64	0.72	0.62	0.61	0.61	0.67	0.67
3	0.42	0.51	0.62	0.63	0.69	0.52	0.59	0.57	0.62	0.64
4	0.51	0.55	0.63	0.68	0.61	0.64	0.55	0.51	0.61	0.64
Big	0.43	0.63	0.59	0.69	0.63	0.45	0.59	0.63	0.60	0.51

4.5.4.6 Summary of Factor Regression for FFFF of 25 Portfolios

Table 4.49: Summary of Factor Regression for FFFF of 25 Portfolios

	Number of Significant Intercept				R-Square			
	Size-Value	Size-INV	Size-PRO	Size-MOM	Size-Value	Size-INV	Size-PRO	Size-MOM
	Fixed				Fixed			
FFFF	19	18	16	16	54	52	54	52
	Non-Financial				Non-Financial			
	21	19	22	20	55	48	53	53
	Variable				Variable			
	24	25	25	20	64	63	62	61

Source: Author's computation

The Table 4.44a to 4.48c show the FFFF linear regression results of the four size-based portfolios i.e., size-value, size-investment, size-profitability and size-momentum for all the three baskets of portfolios. The summary of the factor regression for FFFF of 25 portfolios are given in the Table 4.49. For the fixed basket in the size-value sorted portfolio 19 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 18 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 16 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 16 portfolios out of 25 portfolios are statistically significant. For the non-financial basket in the size-value sorted portfolio 21 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 19 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 22 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are statistically significant. For the variable basket in the size-value sorted portfolio 24 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 25 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 25 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are statistically significant. When t(a) is greater than 1.96, statistical significance indicates that alpha value is distinct from zero which mean the model is unable to predict the return of the portfolios.

For the FFTF the average R^2 value for the fixed basket in the size-value cross portfolios is 54, size-investment cross portfolios is 52, size-profitability cross portfolios is 54, and size-momentum cross portfolios is 52; the average R^2 value for the non-financial basket in the size-value cross portfolios is 55, size-investment cross portfolios is 48, size-profitability cross portfolios is 53, and size-momentum cross portfolios is 53; and the average R^2 value for the variable basket in the size-value cross portfolios is 64, size-investment cross portfolios is 63, size-profitability cross portfolios is 62, and size-momentum cross portfolios is 61. From the average R^2 values it is found that variable basket portfolios produced higher R^2 values in comparison two other baskets of portfolios. Another important find from the average R^2 values is that among size cross portfolios size-investment cross portfolios produced the least R^2 values.

4.5.5 FFSF Regression Analysis of the 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variables

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + u_i UMD_t + \mathrm{e}_{it}$$

4.5.5.1 FFSF Regression Analysis of the Size-Value Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value, Investment, Profitability and Momentum as the Independent Variable

Table 4.50a: FFSF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Fixed Basket)

P/B	Low	2	3	4	High	Low	2	3	4	High
					FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD					
			α					**t(α)**		
Small	0.87	1.39	1.03	0.89	1.06	1.50	2.16	1.59	1.56	1.40
2	1.67	0.73	1.08	1.18	1.47	2.44	1.31	1.24	2.14	2.33
3	1.59	1.47	1.62	2.15	1.43	2.30	2.53	2.37	3.23	2.55
4	1.03	1.53	0.96	1.47	0.47	1.84	2.73	1.72	2.04	0.76
Big	1.01	1.36	0.91	1.30	1.25	1.87	2.37	1.68	2.06	2.44
			b					**t(b)**		
Small	0.38	0.33	0.33	0.42	0.39	11.44	8.92	8.95	12.90	9.08
2	0.39	0.36	0.35	0.33	0.34	10.04	11.50	7.14	10.70	9.56
3	0.37	0.33	0.40	0.40	0.33	9.36	9.92	10.43	10.54	10.42
4	0.34	0.33	0.36	0.45	0.41	10.71	10.30	11.30	11.09	11.62
Big	0.40	0.38	0.31	0.41	0.35	13.11	11.73	10.27	11.40	12.19
			s					**t(s)**		
Small	1.75	1.63	1.79	1.62	2.04	12.75	10.70	11.61	12.02	11.42
2	1.62	1.41	1.63	1.15	1.53	10.02	10.70	7.91	8.79	10.19
3	0.65	0.73	0.62	0.79	0.96	3.98	5.31	3.82	5.03	7.26
4	0.60	0.28	0.67	0.16	0.59	4.48	2.08	5.10	0.92	3.98
Big	0.53	0.39	0.50	0.42	0.23	4.11	2.90	3.91	2.84	1.88
			l					**t(l)**		
Small	0.81	0.73	0.04	0.14	-0.18	3.93	3.17	0.16	0.67	-0.68
2	0.68	0.15	0.53	0.00	-0.20	2.79	0.78	1.70	0.00	-0.87
3	0.91	0.42	0.12	-0.26	-0.44	3.71	2.05	0.51	-1.09	-2.21
4	0.59	0.81	-0.13	0.31	-0.25	2.94	4.03	-0.66	1.20	-1.10
Big	0.68	0.54	0.03	0.03	-0.17	3.54	2.67	0.14	0.11	-0.91
			c					**t(c)**		
Small	0.50	-0.29	0.11	0.13	0.29	2.59	-1.35	0.49	0.68	1.13
2	-0.10	-0.29	0.89	0.39	0.32	-0.41	-1.56	3.03	2.12	1.48
3	0.48	0.08	0.31	-0.32	0.35	2.08	0.40	1.34	-1.46	1.83

4	0.17	0.12	-0.16	0.74	0.11	0.88	0.64	-0.87	3.07	0.51
Big	0.26	-0.07	0.20	-0.14	0.16	1.44	-0.38	1.13	-0.68	0.94
			r					**t(r)**		
Small	-0.09	-0.42	-0.24	-0.35	0.08	-0.67	-2.71	-1.53	-2.56	0.45
2	-0.21	-0.29	0.45	-0.28	0.00	-1.29	-2.17	2.13	-2.14	0.03
3	-0.19	-0.03	0.02	-0.14	-0.35	-1.13	-0.19	0.15	-0.87	-2.59
4	-0.04	-0.39	-0.13	-0.12	-0.13	-0.30	-2.88	-0.96	-0.70	-0.85
Big	-0.17	-0.16	0.01	-0.12	-0.14	-1.30	-1.15	0.06	-0.81	-1.10
			u					**t(u)**		
Small	-0.08	0.05	0.06	-0.15	0.00	-0.66	0.32	0.39	-1.16	-0.03
2	-0.01	0.06	0.17	0.14	-0.17	-0.06	0.50	0.87	1.14	-1.24
3	-0.12	-0.19	-0.04	-0.28	0.11	-0.78	-1.47	-0.28	-1.88	0.88
4	0.07	-0.07	0.02	-0.14	-0.02	0.52	-0.56	0.13	-0.87	-0.14
Big	-0.03	-0.11	-0.02	-0.06	-0.04	-0.21	-0.84	-0.14	-0.40	-0.38

Source: Author's computation

Table 4.50b: FFSF Intercept and Coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

P/B	**Low**	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
	FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD									
			α					**t(α)**		
Small	-0.09	0.49	-0.32	-0.65	-0.31	-0.10	0.59	-0.36	-0.78	-0.36
2	-0.71	0.15	0.01	0.06	0.50	-0.68	0.17	0.01	0.08	0.59
3	-0.03	0.11	-1.17	-0.21	1.91	-0.04	0.13	-1.26	-0.33	2.32
4	0.09	1.00	0.60	-1.28	-0.73	0.09	1.19	0.70	-1.69	-0.89
Big	-1.00	-0.53	-0.41	0.54	-0.72	-1.23	-0.74	-0.56	0.77	-0.94
			b					**t(b)**		
Small	0.32	0.30	0.30	0.32	0.37	9.54	8.83	8.39	9.27	10.61
2	0.31	0.37	0.31	0.23	0.33	7.35	9.91	9.64	6.98	9.43
3	0.32	0.41	0.29	0.20	0.38	8.71	11.96	7.67	7.58	11.16
4	0.30	0.25	0.39	0.36	0.33	7.47	7.33	10.93	11.70	9.73
Big	0.37	0.32	0.30	0.32	0.31	11.13	10.76	9.85	11.15	9.86
			s					**t(s)**		
Small	0.40	1.20	3.09	1.21	0.85	0.88	2.57	6.30	2.61	1.81
2	0.64	0.88	2.40	1.03	0.23	1.10	1.75	5.45	2.29	0.48
3	0.80	0.16	-0.03	0.51	0.94	1.62	0.33	-0.05	1.42	2.05
4	0.54	0.73	-0.70	0.00	0.46	0.99	1.56	-1.47	0.01	1.01
Big	0.90	-0.36	-0.62	-0.32	0.49	1.97	-0.90	-1.50	-0.81	1.15

			l					**t(l)**		
Small	1.32	0.58	-1.68	0.32	0.78	3.13	1.35	-3.71	0.75	1.78
2	0.66	0.28	-1.26	0.20	0.96	1.24	0.61	-3.11	0.48	2.20
3	-0.02	0.50	0.53	-0.06	-0.20	-0.05	1.16	1.11	-0.18	-0.48
4	-0.13	-0.42	0.80	0.34	0.05	-0.27	-0.96	1.82	0.87	0.12
Big	-0.76	0.26	0.84	0.34	-0.52	-1.80	0.70	2.21	0.94	-1.31
			c					**t(c)**		
Small	0.19	0.08	-0.16	-0.06	-0.30	0.99	0.41	-0.76	-0.31	-1.54
2	-0.65	-0.09	-0.05	0.10	0.34	-2.69	-0.43	-0.26	0.52	1.73
3	0.11	-0.13	0.12	0.12	0.02	0.53	-0.64	0.56	0.79	0.11
4	0.17	-0.19	0.44	0.06	0.24	0.77	-0.95	2.22	0.35	1.24
Big	0.03	-0.16	0.09	0.13	-0.16	0.15	-0.95	0.55	0.80	-0.91
			r					**t(r)**		
Small	-0.24	-0.30	-0.60	-0.39	-0.57	-1.64	-1.99	-3.81	-2.66	-3.79
2	-0.54	-0.32	-0.23	-0.25	-0.20	-2.90	-1.98	-1.61	-1.74	-1.32
3	-0.28	-0.04	-0.29	-0.24	-0.14	-1.75	-0.29	-1.73	-2.11	-0.98
4	-0.39	-0.28	-0.06	0.02	-0.39	-2.24	-1.87	-0.40	0.16	-2.63
Big	-0.09	-0.32	-0.27	-0.33	-0.24	-0.59	-2.54	-2.05	-2.65	-1.77
			u					**t(u)**		
Small	0.18	0.19	0.25	0.20	0.28	1.63	1.71	2.10	1.80	2.51
2	0.29	0.21	0.21	0.26	0.21	2.12	1.74	2.01	2.46	1.88
3	0.34	0.14	0.48	0.38	-0.06	2.93	1.25	3.91	4.38	-0.51
4	0.36	0.07	0.18	0.40	0.31	2.78	0.66	1.56	3.97	2.83
Big	0.30	0.28	0.24	0.12	0.25	2.81	2.97	2.49	1.28	2.46

Source: Author's computation

Table 4.50c: FFSF Intercept and coefficient for 25 Size-Value Portfolios for the period January 2006 to December 2021 (Variable Basket)

P/B	**Low**	**2**	**3**	**4**	**High**	**Low**	**2**	**3**	**4**	**High**
				FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD						
			α					**t(α)**		
Small	0.32	1.27	0.29	0.73	0.37	0.50	1.75	0.43	1.10	0.53
2	1.86	0.74	1.25	1.40	2.14	2.40	0.95	1.87	2.09	2.92
3	1.61	0.51	0.97	1.11	2.26	2.26	0.76	1.27	1.28	3.24
4	1.93	1.84	1.65	0.79	0.78	2.60	2.70	2.69	1.28	1.14
Big	-0.49	0.46	0.97	0.94	1.12	-0.76	0.82	1.52	1.59	1.79
			b					**t(b)**		
Small	0.31	0.25	0.28	0.29	0.35	10.42	7.40	8.94	9.37	10.68
2	0.27	0.39	0.29	0.25	0.30	7.54	10.66	9.27	8.02	8.64
3	0.28	0.36	0.30	0.21	0.32	8.34	11.66	8.46	5.07	9.85
4	0.31	0.26	0.27	0.32	0.34	8.92	8.16	9.56	11.19	10.78
Big	0.32	0.27	0.30	0.30	0.28	10.6	10.2	10.1	10.8	9.54

						5	1	3	8	
			s					**t(s)**		
Small	1.71	1.79	1.53	1.55	1.78	15.09	13.80	12.70	13.16	14.11
2	1.33	1.09	1.19	1.14	1.34	9.71	7.80	9.98	9.57	10.27
3	0.74	0.67	0.69	0.86	0.85	5.85	5.65	5.10	5.57	6.84
4	0.52	0.31	0.57	0.41	0.49	3.93	2.54	5.19	3.69	4.03
Big	0.03	-0.02	0.19	0.12	0.12	0.25	-0.22	1.68	1.14	1.12
			l					**t(l)**		
Small	1.08	0.68	0.34	0.18	-0.13	5.50	3.00	1.62	0.88	-0.61
2	1.67	0.71	0.29	0.24	-0.05	6.99	2.91	1.40	1.18	-0.21
3	0.92	0.78	0.54	0.28	0.23	4.18	3.81	2.27	1.05	1.08
4	1.07	0.66	0.40	-0.07	0.37	4.65	3.15	2.10	-0.35	1.75
Big	0.94	0.92	0.19	0.27	0.18	4.66	5.29	0.97	1.47	0.94
			c					**t(c)**		
Small	0.43	0.02	0.22	0.10	-0.31	2.61	0.11	1.25	0.57	-1.68
2	-0.46	0.19	-0.14	0.18	0.38	-2.28	0.95	-0.79	1.05	2.01
3	-0.01	-0.17	0.15	-0.03	0.13	-0.04	-1.00	0.75	-0.12	0.71
4	0.10	0.08	0.14	-0.07	0.19	0.49	0.44	0.86	-0.43	1.10
Big	0.12	-0.08	0.09	0.09	-0.09	0.72	-0.58	0.57	0.60	-0.55
			r					**t(r)**		
Small	-0.30	-0.55	-0.47	-0.59	-0.59	-2.75	-4.38	-4.04	-5.14	-4.85
2	-0.73	-0.25	-0.51	-0.33	-0.41	-5.48	-1.87	-4.40	-2.88	-3.22
3	-0.87	-0.23	-0.46	-0.65	-0.45	-7.06	-2.01	-3.45	-4.31	-3.76
4	-0.51	-0.33	-0.48	-0.22	-0.61	-3.99	-2.80	-4.50	-2.01	-5.24
Big	-0.38	-0.51	-0.45	-0.58	-0.46	-3.35	-5.31	-4.06	-5.64	-4.28
			u					**t(u)**		
Small	0.17	0.08	0.26	0.12	0.13	1.89	0.78	2.70	1.29	1.26
2	-0.08	0.16	0.06	0.10	0.05	-0.72	1.47	0.64	1.10	0.48
3	0.12	0.06	0.18	0.25	-0.05	1.18	0.68	1.72	2.04	-0.51
4	0.06	0.01	-0.01	0.10	0.17	0.61	0.09	-0.06	1.10	1.80
Big	0.39	0.17	0.09	0.13	0.05	4.24	2.22	1.04	1.62	0.52

Source: Author's computation

4.5.5.2 FFSF Regression Analysis of the Size-Investment Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.51a: FFSF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Fixed Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
			FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD							
			α					**t(α)**		
Small	1.46	1.31	1.45	0.47	0.98	2.56	1.51	2.47	0.63	1.58
2	0.59	1.36	1.30	1.12	1.41	0.67	2.27	2.11	1.65	2.30
3	1.04	0.81	1.53	1.34	1.62	1.47	1.38	2.14	2.26	2.47
4	0.45	1.52	0.61	1.71	1.12	0.70	2.72	1.15	2.64	1.76
Big	1.80	1.68	1.90	0.57	0.68	2.48	2.89	3.70	1.17	1.20
			b					**t(b)**		
Small	0.33	0.42	0.36	0.35	0.37	10.30	8.50	10.90	8.37	10.41
2	0.27	0.39	0.37	0.39	0.31	5.28	11.44	10.57	10.16	9.02
3	0.40	0.36	0.35	0.35	0.36	9.96	11.00	8.74	10.57	9.70
4	0.37	0.34	0.30	0.35	0.40	10.07	10.84	9.88	9.45	11.18
Big	0.38	0.33	0.36	0.37	0.38	9.31	10.14	12.28	13.30	11.89
			s					**t(s)**		
Small	1.97	1.78	1.60	1.78	1.48	14.60	8.73	11.46	10.05	10.05
2	1.48	1.27	1.29	1.30	1.32	7.04	8.98	8.83	8.05	9.11
3	0.77	0.68	0.64	0.79	0.74	4.60	4.88	3.81	5.61	4.74
4	0.43	0.26	0.45	0.53	0.57	2.85	1.98	3.58	3.45	3.78
Big	0.62	0.38	0.47	0.32	0.29	3.63	2.78	3.86	2.76	2.18
			l					**t(l)**		
Small	0.46	0.74	-0.04	0.20	0.44	2.25	2.42	-0.20	0.74	1.99
2	0.52	0.07	0.24	0.15	0.12	1.64	0.32	1.09	0.61	0.53
3	-0.05	0.45	0.16	0.07	-0.04	-0.22	2.16	0.64	0.32	-0.15
4	0.22	-0.08	0.18	0.36	0.56	0.97	-0.42	0.95	1.57	2.50
Big	0.78	0.21	0.31	0.36	0.14	3.03	1.02	1.67	2.06	0.67
			c					**t(c)**		
Small	0.66	0.55	0.06	-0.63	-0.21	3.45	1.90	0.29	-2.49	-1.02
2	1.01	0.28	0.47	-0.11	-0.46	3.38	1.38	2.26	-0.49	-2.22
3	0.74	0.50	0.10	-0.25	-0.13	3.12	2.52	0.43	-1.26	-0.57
4	0.75	0.47	0.06	-0.14	-0.53	3.44	2.52	0.32	-0.63	-2.48
Big	0.17	0.29	0.72	-0.23	-0.23	0.70	1.50	4.18	-1.43	-1.21
			r					**t(r)**		
Small	-0.42	-0.36	-0.06	-0.30	-0.21	-3.04	-1.75	-0.41	-1.67	-1.38
2	0.44	-0.18	-0.06	-0.12	-0.22	2.03	-1.23	-0.42	-0.75	-1.45
3	-0.04	-0.18	-0.19	-0.25	0.13	-0.21	-1.24	-1.11	-1.73	0.85
4	0.12	-0.19	-0.07	-0.19	-0.84	0.77	-1.40	-0.54	-1.18	-5.44
Big	-0.33	-0.05	0.00	-0.02	-0.16	-1.86	-0.34	-0.02	-0.21	-1.16
			u					**t(u)**		
Small	-0.01	-0.19	-0.24	0.00	0.08	-0.06	-0.97	-1.84	0.02	0.55
2	0.36	-0.19	0.00	-0.01	-0.05	1.80	-1.42	0.01	-0.08	-0.39
3	0.14	-0.11	0.03	-0.16	0.04	0.92	-0.85	0.19	-1.18	0.26
4	0.01	-0.16	0.07	-0.11	0.13	0.07	-1.26	0.59	-0.75	0.93
Big	-0.20	-0.27	-0.23	0.07	0.08	-1.22	-2.11	-2.04	0.61	0.65

Source: Author's computation

Table 4.51b: FFSF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
			FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD							
			α					**t(α)**		
Small	-0.34	0.62	-0.55	-1.36	0.40	-0.43	0.79	-0.63	-1.29	0.46
2	-0.34	0.49	0.74	0.09	-0.08	-0.44	0.60	0.84	0.09	-0.09
3	1.76	-1.19	0.28	2.56	1.47	1.38	-1.29	0.30	2.46	1.74
4	0.54	-0.62	0.00	0.46	3.74	0.61	-0.80	0.00	0.53	2.83
Big	2.23	0.41	-0.57	0.39	-0.90	2.06	0.29	-0.77	0.55	-1.04
			b					**t(b)**		
Small	0.33	0.36	0.34	0.33	0.27	10.16	10.92	9.51	7.54	7.28
2	0.27	0.30	0.30	0.26	0.20	8.42	8.89	8.45	5.93	5.65
3	0.01	0.40	0.38	0.11	0.31	0.15	10.62	9.80	2.54	8.96
4	0.32	0.36	0.35	0.34	0.24	8.70	11.30	11.51	9.49	4.42
Big	0.37	0.06	0.29	0.29	0.35	8.31	1.02	9.41	9.75	9.96
			s					**t(s)**		
Small	1.59	1.34	0.81	0.05	0.82	3.66	3.02	1.65	0.08	1.66
2	1.09	1.00	1.69	1.03	1.77	2.51	2.17	3.48	1.77	3.60
3	0.22	-0.01	1.23	0.63	1.33	0.30	-0.02	2.36	1.09	2.83
4	0.16	0.25	1.50	0.49	-0.19	0.33	0.58	3.64	1.00	-0.26
Big	-0.07	0.17	-0.46	-0.37	-0.37	-0.11	0.21	-1.11	-0.94	-0.77
			l					**t(l)**		
Small	0.06	0.28	0.82	1.38	0.69	0.14	0.69	1.8	2.55	1.51
2	0.22	0.22	-0.58	0.34	-0.63	0.55	0.51	-1.29	0.64	-1.39
3	-0.25	0.73	-0.74	-0.51	-0.55	-0.37	1.54	-1.53	-0.95	-1.28
4	0.39	0.43	-0.96	0.05	0.67	0.85	1.08	-2.52	0.11	0.98
Big	0.28	-0.50	0.68	0.41	0.58	0.51	-0.69	1.77	1.13	1.31
			c					t(c)		
Small	0.39	0.17	0.16	-0.37	-0.55	2.15	0.94	0.77	-1.5	-2.65
2	0.44	0.38	-0.14	-1.24	-0.55	2.43	1.96	-0.67	-5.08	-2.66
3	0.05	0.38	0.04	-0.35	-0.10	0.18	1.77	0.17	-1.46	-0.49
4	0.60	0.61	0.35	-0.28	-0.27	2.89	3.38	2.05	-1.37	-0.86
Big	0.53	-0.36	0.07	-0.29	-0.28	2.10	-1.08	0.39	-1.72	-1.38
			r					**t(r)**		
Small	-0.45	-0.33	-0.15	-0.77	-0.32	-3.21	-2.32	-0.97	-4.08	-1.99
2	-0.51	-0.27	-0.33	-0.49	-0.41	-3.65	-1.81	-2.15	-2.60	-2.61
3	-0.09	-0.12	-0.03	-0.09	-0.13	-0.41	-0.72	-0.18	-0.50	-0.87
4	-0.16	-0.18	0.13	-0.20	-0.48	-1.01	-1.31	1.00	-1.31	-2.02
Big	-0.27	-0.49	-0.33	-0.27	-0.27	-1.39	-1.92	-2.47	-2.09	-1.74
			u					**t(u)**		
Small	0.26	0.10	0.25	0.38	0.13	2.48	0.92	2.14	2.7	1.14
2	0.37	0.20	0.03	0.09	0.33	3.62	1.79	0.22	0.68	2.79
3	0.02	0.39	0.18	-0.24	0.12	0.12	3.17	1.45	-1.71	1.03
4	0.23	0.38	0.24	0.10	-0.13	1.98	3.64	2.42	0.85	-0.73
Big	-0.10	0.18	0.29	0.04	0.35	-0.66	0.95	2.89	0.38	3.03

Source: Author's computation

Table 4.51c: FFSF Intercept and Coefficient for 25 Size-Investment Portfolios for the period January 2006 to December 2021(Variable Basket)

INV	Low	2	3	4	High	Low	2	3	4	High
		FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD								
			α					t(α)		
Small	0.23	0.68	1.12	0.52	0.90	0.35	1.06	1.46	0.77	1.31
2	1.14	2.91	1.10	1.53	1.80	1.65	3.29	1.65	1.67	2.28
3	0.86	0.82	1.90	1.54	1.41	1.13	1.26	2.77	2.22	1.89
4	1.51	1.30	1.29	0.90	1.31	2.04	2.06	2.11	1.19	1.66
Big	1.61	0.20	0.09	1.08	0.67	2.29	0.32	0.17	1.76	1.06
			b					t(b)		
Small	0.29	0.30	0.30	0.31	0.27	9.57	10.08	8.55	10.01	8.46
2	0.29	0.27	0.32	0.29	0.27	9.03	6.47	10.47	6.79	7.30
3	0.34	0.31	0.32	0.25	0.28	9.46	10.26	9.99	7.76	8.04
4	0.28	0.25	0.29	0.31	0.37	8.20	8.43	10.15	8.73	9.86
Big	0.30	0.28	0.28	0.28	0.31	9.10	9.61	10.67	9.78	10.45
			s					t(s)		
Small	1.73	1.62	1.52	1.81	1.74	14.88	14.10	11.22	15.19	14.19
2	1.30	0.80	1.14	1.43	1.21	10.56	5.11	9.68	8.79	8.60
3	0.94	0.72	0.62	0.78	0.81	6.92	6.20	5.10	6.29	6.07
4	0.59	0.49	0.32	0.38	0.57	4.46	4.40	2.96	2.83	4.05
Big	0.04	0.03	0.01	0.14	0.13	0.29	0.23	0.08	1.25	1.18
			l					t(l)		
Small	0.45	0.83	0.32	0.23	0.55	2.21	4.14	1.37	1.10	2.57
2	0.63	0.68	0.57	0.61	0.56	2.95	2.49	2.78	2.16	2.29
3	0.79	0.37	0.47	0.45	0.60	3.36	1.84	2.23	2.08	2.59
4	0.41	0.40	0.62	0.39	0.80	1.78	2.04	3.26	1.66	3.25
Big	0.76	0.61	0.30	0.44	0.58	3.47	3.11	1.77	2.30	2.95
			c					t(c)		
Small	0.60	0.30	0.18	-0.20	-0.61	3.52	1.77	0.89	-1.14	-3.41
2	0.45	0.05	0.12	-0.80	-0.45	2.52	0.20	0.69	-3.35	-2.16
3	0.71	0.21	0.15	-0.35	-0.38	3.60	1.22	0.83	-1.92	-1.97
4	0.49	0.51	0.02	-0.23	-0.51	2.54	3.14	0.12	-1.17	-2.45
Big	0.86	0.23	-0.07	-0.21	-0.34	4.70	1.41	-0.50	-1.32	-2.05
			r					t(r)		
Small	-0.53	-0.60	-0.35	-0.48	-0.51	-4.72	-5.37	-2.69	-4.16	-4.26
2	-0.53	-0.43	-0.29	-0.55	-0.61	-4.41	-2.78	-2.57	-3.49	-4.46
3	-0.53	-0.52	-0.55	-0.51	-0.62	-4.05	-4.66	-4.63	-4.26	-4.77
4	-0.36	-0.58	-0.52	-0.50	-0.18	-2.83	-5.37	-4.94	-3.81	-1.28
Big	-0.35	-0.61	-0.59	-0.37	-0.62	-2.90	-5.58	-6.15	-3.46	-5.62
			u					t(u)		
Small	0.24	0.11	0.06	0.15	0.11	2.60	1.22	0.53	1.57	1.14
2	0.11	-0.23	0.12	-0.04	0.10	1.09	-1.83	1.24	-0.29	0.87
3	0.22	0.07	0.04	-0.01	0.18	2.09	0.75	0.39	-0.09	1.73
4	0.04	0.16	0.09	0.12	0.06	0.39	1.80	1.06	1.16	0.53
Big	0.02	0.29	0.25	0.02	0.17	0.18	3.32	3.19	0.19	1.93

Source: Author's computation

4.5.5.3 FFSF Regression Analysis of the Size-Profitability Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.52a: FFSF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Fixed Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
			FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD							
			α					**t(α)**		
Small	0.85	0.25	1.57	0.68	1.62	1.09	0.50	2.16	1.18	2.77
2	1.63	1.28	1.21	0.66	1.28	1.83	2.21	2.05	1.16	2.25
3	1.09	1.79	1.69	1.52	1.81	1.88	2.77	2.73	2.62	2.49
4	0.97	0.92	0.53	1.36	1.30	1.82	1.67	0.93	2.24	1.83
Big	1.23	0.44	1.41	0.84	0.28	2.55	0.88	2.67	1.53	0.39
			b					t(b)		
Small	0.42	0.35	0.33	0.34	0.40	9.56	12.22	7.91	10.32	12.20
2	0.46	0.35	0.39	0.34	0.33	9.07	10.55	11.56	10.69	10.25
3	0.35	0.37	0.42	0.34	0.35	10.62	10.14	12.02	10.21	8.41
4	0.34	0.35	0.35	0.39	0.42	11.20	11.03	11.02	11.36	10.51
Big	0.33	0.36	0.36	0.43	0.42	12.17	12.77	12.22	13.93	10.52
			s					**t(s)**		
Small	1.52	0.58	1.56	1.69	1.97	8.27	4.85	9.06	12.38	14.30
2	1.73	1.20	1.09	1.31	1.37	8.16	8.74	7.80	9.84	10.14
3	0.49	0.81	0.69	0.80	0.93	3.56	5.29	4.66	5.81	5.37
4	0.27	0.40	0.43	0.57	0.61	2.12	3.05	3.24	4.00	3.63
Big	0.07	0.56	0.47	0.66	0.69	0.58	4.70	3.80	5.13	4.10
			l					**t(l)**		
Small	-0.33	0.08	0.69	0.22	0.42	-1.21	0.45	2.66	1.05	2.02
2	0.43	0.21	0.16	0.15	0.17	1.34	1.02	0.74	0.73	0.83
3	0.21	-0.16	0.10	0.43	0.06	1.00	-0.71	0.47	2.07	0.23
4	0.43	0.29	-0.07	0.26	0.15	2.28	1.48	-0.33	1.22	0.59
Big	0.36	0.03	0.04	0.35	0.37	2.06	0.18	0.19	1.81	1.48
			c					**t(c)**		
Small	-0.05	0.05	0.20	0.28	0.07	-0.18	0.28	0.80	1.42	0.34
2	0.76	0.36	-0.08	0.04	-0.11	2.52	1.84	-0.41	0.24	-0.56
3	0.36	-0.18	0.18	-0.10	0.29	1.84	-0.84	0.88	-0.49	1.18
4	0.10	0.00	0.31	0.27	0.25	0.58	-0.01	1.60	1.32	1.05
Big	0.16	0.17	0.06	0.32	0.15	0.98	1.03	0.34	1.74	0.65
			r					**t(r)**		
Small	0.53	0.16	-0.05	-0.37	-0.57	2.79	1.29	-0.27	-2.64	-4.02
2	0.96	0.11	-0.28	-0.32	-0.58	4.41	0.79	-1.92	-2.32	-4.19
3	0.49	-0.07	-0.06	-0.83	-0.65	3.53	-0.43	-0.41	-5.88	-3.69
4	0.23	-0.11	0.05	-0.16	-0.73	1.82	-0.84	0.36	-1.12	-4.24
Big	0.12	0.21	-0.28	-0.40	-0.50	0.99	1.69	-2.23	-2.99	-2.93
			u					**t(u)**		
Small	0.23	0.04	-0.19	0.11	-0.24	1.30	0.38	-1.16	0.88	-1.84
2	0.25	-0.04	0.18	0.04	-0.23	1.28	-0.31	1.38	0.35	-1.82
3	0.10	-0.19	-0.23	-0.03	0.09	0.77	-1.31	-1.63	-0.26	0.54
4	-0.01	0.06	-0.06	-0.21	0.02	-0.10	0.46	-0.50	-1.56	0.14
Big	0.00	-0.02	-0.03	-0.06	0.15	-0.04	-0.14	-0.26	-0.51	0.97

Source: Author's computation

Table 4.52b: FFSF Intercept and coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD										
			$\alpha_{(i)}$					**t(α)**		
Small	0.44	0.87	0.15	-1.30	0.59	0.38	0.88	0.17	-1.52	0.72
2	1.51	-0.27	-0.78	-0.88	0.04	1.50	-0.29	-1.01	-0.88	0.04
3	1.35	0.96	0.61	0.26	-2.07	1.54	1.14	0.72	0.28	-1.59
4	0.34	0.61	0.05	0.32	0.86	0.47	0.75	0.06	0.42	0.81
Big	-0.26	-1.09	-0.05	-1.16	-0.32	-0.37	-1.35	-0.07	-1.19	-0.35
			$\mathbf{b}_{(i)}$					**t(b)**		
Small	0.38	0.27	0.33	0.30	0.30	8.13	6.58	9.37	8.61	8.96
2	0.39	0.30	0.33	0.28	0.30	9.30	7.84	10.30	6.75	7.60
3	0.34	0.29	0.33	0.40	0.34	9.56	8.48	9.47	10.47	6.38
4	0.33	0.34	0.34	0.33	0.38	10.93	10.29	10.26	10.89	8.83
Big	0.29	0.33	0.34	0.33	0.33	9.95	10.03	10.49	8.20	8.63
			$\mathbf{s}_{(i)}$					**t(s)**		
Small	1.29	1.77	1.29	0.92	1.34	2.01	3.21	2.69	1.94	2.94
2	1.95	1.17	0.91	0.44	0.97	3.46	2.27	2.11	0.80	1.81
3	0.50	0.83	0.60	1.26	0.39	1.03	1.78	1.28	2.42	0.53
4	1.00	0.03	0.09	0.24	1.14	2.46	0.07	0.20	0.57	1.94
Big	-0.26	-0.57	0.22	-0.85	0.46	-0.65	-1.27	0.50	-1.57	0.88
			$l_{(i)}$					t(l)		
Small	0.18	-0.29	0.39	0.45	0.19	0.30	-0.56	0.88	1.02	0.45
2	-0.63	-0.14	0.19	0.94	0.33	-1.21	-0.29	0.47	1.84	0.68
3	0.42	-0.01	0.03	-0.45	0.49	0.95	-0.02	0.08	-0.94	0.73
4	-0.49	0.39	0.37	0.34	-0.71	-1.30	0.93	0.89	0.88	-1.30
Big	0.44	0.64	-0.03	1.15	-0.17	1.20	1.55	-0.08	2.31	-0.35
			$c_{(i)}$					**t(c)**		
Small	-0.32	-0.12	0.18	0.12	0.02	-1.18	-0.54	0.90	0.63	0.11
2	0.16	0.36	-0.09	-0.50	0.23	0.69	1.65	-0.51	-2.15	1.00
3	-0.10	-0.13	-0.18	-0.02	0.92	-0.49	-0.64	-0.90	-0.07	3.01
4	0.01	0.07	0.27	0.21	0.58	0.06	0.38	1.42	1.17	2.36
Big	-0.29	-0.07	0.01	0.07	0.15	-1.72	-0.36	0.04	0.30	0.71
			$r_{(i)}$					**t(r)**		
Small	0.20	-0.12	-0.15	-0.44	-0.82	0.96	-0.68	-0.99	-2.91	-5.60
2	0.54	0.08	-0.15	-0.77	-0.81	2.98	0.50	-1.09	-4.35	-4.72
3	0.19	-0.06	-0.16	-0.46	-0.18	1.20	-0.42	-1.05	-2.75	-0.78
4	0.28	0.01	-0.07	-0.47	-0.39	2.14	0.06	-0.51	-3.51	-2.05
Big	-0.11	-0.12	-0.45	-0.80	-0.86	-0.86	-0.82	-3.22	-4.61	-5.19
			$u_{(i)}$					**t(u)**		
Small	0.17	0.09	0.23	0.42	0.08	1.10	0.71	2.00	3.74	0.72
2	0.11	0.44	0.35	0.39	0.22	0.80	3.60	3.44	2.94	1.75
3	0.17	0.13	0.05	0.20	0.77	1.45	1.17	0.45	1.59	4.47
4	0.15	0.15	0.21	0.19	0.14	1.51	1.37	1.97	1.96	1.03
Big	0.15	0.28	0.22	0.44	0.40	1.59	2.63	2.14	3.38	3.30

Source: Author's computation

Table 4.52c: FFSF Intercept and Coefficient for 25 Size-Profitability Portfolios for the period January 2006 to December 2021 (Variable Basket)

PRO	Low	2	3	4	High	Low	2	3	4	High
			FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD							
			$\alpha_{(i)}$					t(α)		
Small	2.12	0.46	1.00	0.55	0.15	2.37	0.85	1.51	0.81	0.23
2	1.98	1.65	-0.51	1.83	1.47	2.59	2.21	-0.71	2.32	2.03
3	2.10	1.53	0.82	1.87	1.09	2.56	2.06	1.20	2.39	1.46
4	0.52	2.14	0.74	1.16	1.91	0.88	3.31	1.20	1.73	2.24
Big	0.35	0.27	1.12	0.62	1.02	0.62	0.50	1.79	1.00	1.33
			$b_{(i)}$					t(b)		
Small	0.32	0.32	0.29	0.24	0.30	7.76	12.54	9.33	7.57	10.13
2	0.32	0.27	0.35	0.27	0.28	8.97	7.70	10.55	7.21	8.22
3	0.25	0.26	0.31	0.36	0.27	6.45	7.63	9.62	9.91	7.89
4	0.27	0.26	0.33	0.34	0.32	9.97	8.58	11.60	10.89	8.07
Big	0.23	0.31	0.32	0.34	0.33	8.52	12.38	10.92	11.65	9.37
			$s_{(i)}$					t(s)		
Small	1.54	0.12	1.65	1.46	1.82	9.68	1.27	13.96	12.13	16.05
2	1.29	1.12	0.89	1.32	1.15	9.51	8.42	6.97	9.44	8.93
3	0.85	0.71	0.59	0.72	0.96	5.82	5.35	4.80	5.21	7.23
4	0.31	0.45	0.37	0.43	0.67	2.91	3.95	3.40	3.65	4.39
Big	0.03	0.11	0.10	0.31	0.23	0.27	1.13	0.86	2.79	1.66
			$l_{(i)}$					t(l)		
Small	0.65	0.51	0.44	0.29	0.63	2.34	3.05	2.13	1.40	3.18
2	0.42	0.56	0.76	0.78	0.62	1.78	2.41	3.41	3.19	2.75
3	0.31	0.55	0.59	0.80	0.41	1.23	2.37	2.75	3.30	1.79
4	0.59	0.45	0.36	0.57	0.23	3.21	2.27	1.87	2.76	0.88
Big	0.46	0.48	0.40	0.60	0.46	2.57	2.88	2.04	3.14	1.95
			$c_{(i)}$					t(c)		
Small	-0.17	0.06	0.12	0.20	0.18	-0.73	0.42	0.68	1.12	1.08
2	-0.09	0.00	-0.08	-0.27	0.26	-0.46	0.01	-0.43	-1.32	1.36
3	-0.07	-0.12	-0.19	0.28	0.21	-0.35	-0.64	-1.08	1.39	1.08
4	-0.16	0.02	0.08	0.23	0.23	-1.03	0.12	0.51	1.34	1.05
Big	-0.31	0.04	0.29	0.10	0.34	-2.06	0.30	1.79	0.64	1.73
			$r_{(i)}$					t(r)		
Small	-0.31	-0.31	-0.44	-0.54	-0.90	-1.99	-3.31	-3.86	-4.60	-8.12
2	0.00	-0.37	-0.25	-0.66	-0.96	0.02	-2.87	-2.05	-4.88	-7.70
3	-0.12	-0.32	-0.55	-0.51	-1.05	-0.87	-2.50	-4.63	-3.79	-8.12
4	-0.08	-0.41	-0.36	-0.72	-0.95	-0.82	-3.65	-3.39	-6.24	-6.46
Big	-0.20	-0.31	-0.37	-0.68	-0.86	-2.04	-3.37	-3.44	-6.36	-6.51
			$u_{(i)}$					t(u)		
Small	0.12	0.18	0.13	0.19	0.17	0.98	2.36	1.40	1.99	1.89
2	0.04	0.13	0.29	-0.06	0.04	0.37	1.21	2.90	-0.51	0.43
3	0.13	0.08	0.10	-0.05	0.22	1.15	0.79	0.99	-0.49	2.10
4	0.16	0.01	0.10	0.17	-0.01	1.93	0.08	1.16	1.80	-0.11
Big	0.09	0.19	0.10	0.10	0.21	1.14	2.53	1.14	1.21	1.98

Source: Author's computation

4.5.5.4 FFSF Regression Analysis of the Size-Momentum Cross 25 Portfolios with Market Risk (R_m-R_f), Size, Value and Momentum as the Independent Variable

Table 4.53a: FFSF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Fixed Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
						FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD				
			$\alpha_{(i)}$					t(α)		
Small	1.56	1.06	1.40	1.71	0.19	2.22	2.05	2.43	2.70	0.34
2	1.36	1.50	1.32	0.86	0.35	1.89	2.49	2.52	1.55	0.58
3	2.56	1.06	0.85	1.30	1.27	3.70	1.76	1.43	2.03	1.94
4	0.81	1.62	1.42	0.79	0.72	1.37	2.87	2.43	1.33	1.05
Big	1.79	1.51	-0.14	1.05	0.58	2.42	2.75	-0.26	1.77	0.93
			$\mathbf{b}_{(i)}$					t(b)		
Small	0.40	0.37	0.32	0.38	0.33	10.09	12.73	9.73	10.43	10.39
2	0.35	0.34	0.38	0.35	0.40	8.64	9.99	12.68	10.95	11.47
3	0.39	0.33	0.40	0.33	0.41	9.96	9.52	11.96	9.19	11.10
4	0.33	0.34	0.41	0.37	0.41	9.84	10.75	12.34	10.96	10.58
Big	0.39	0.37	0.36	0.41	0.36	9.33	11.92	11.42	12.25	10.05
			$\mathbf{s}_{(i)}$					t(s)		
Small	1.73	0.22	1.58	1.67	1.42	10.39	1.78	11.64	11.12	10.58
2	1.66	1.18	1.19	1.03	1.49	9.73	8.26	9.56	7.79	10.19
3	0.71	0.50	0.77	0.93	0.69	4.36	3.52	5.53	6.16	4.46
4	0.31	0.49	0.60	0.62	0.62	2.20	3.65	4.36	4.42	3.86
Big	0.54	0.27	0.68	0.31	0.52	3.09	2.11	5.12	2.22	3.48
			$\mathbf{l}_{(i)}$					t(l)		
Small	-0.11	0.21	0.35	0.40	0.15	-0.42	1.13	1.72	1.78	0.73
2	0.28	0.33	0.12	-0.02	0.28	1.10	1.53	0.67	-0.11	1.29
3	-0.14	0.30	0.15	-0.04	0.28	-0.57	1.40	0.71	-0.19	1.20
4	0.34	0.31	0.27	-0.14	0.16	1.59	1.56	1.27	-0.69	0.64
Big	0.61	0.32	-0.12	0.33	0.31	2.30	1.62	-0.58	1.55	1.38
			$c_{(i)}$					t(c)		
Small	0.38	0.31	0.07	0.17	0.09	1.58	1.78	0.38	0.80	0.48
2	0.47	0.36	-0.02	0.17	0.04	1.92	1.79	-0.11	0.90	0.20
3	0.21	0.19	0.17	0.01	0.08	0.89	0.96	0.86	0.04	0.37
4	0.21	0.09	0.31	0.13	0.25	1.04	0.49	1.56	0.65	1.11
Big	-0.14	0.32	-0.09	0.24	0.27	-0.56	1.73	-0.48	1.19	1.25
			$r_{(i)}$					t(r)		
Small	0.11	-0.04	-0.39	-0.43	-0.29	0.62	-0.32	-2.78	-2.78	-2.12
2	0.20	-0.28	-0.20	-0.12	-0.16	1.17	-1.91	-1.60	-0.92	-1.07
3	-0.05	-0.20	-0.25	-0.09	0.07	-0.29	-1.39	-1.73	-0.57	0.47
4	-0.43	-0.25	-0.02	-0.19	-0.02	-2.98	-1.82	-0.11	-1.29	-0.11
Big	-0.33	-0.06	-0.06	-0.19	0.03	-1.82	-0.42	-0.43	-1.30	0.22
			$u_{(i)}$					t(u)		
Small	0.68	0.08	-0.08	-0.42	-0.50	4.30	0.72	-0.62	-3.00	-4.00
2	0.74	0.14	-0.05	-0.21	-0.50	4.61	1.08	-0.40	-1.66	-3.66
3	0.42	0.24	0.06	-0.32	-0.74	2.74	1.76	0.46	-2.25	-5.09
4	0.75	0.10	-0.18	-0.18	-0.43	5.74	0.83	-1.41	-1.34	-2.84
Big	0.42	0.05	0.13	-0.12	-0.41	2.53	0.42	1.08	-0.89	-2.95

Source: Author's computation

Table 4.53b: FFSF Intercept and Coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Non-Financial Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD										
			$\alpha_{(i)}$					t(α)		
Small	2.48	1.10	-1.54	-0.10	-0.87	2.54	1.31	-1.92	-0.13	-1.17
2	1.42	-0.14	-0.06	0.09	-1.88	1.32	-0.16	-0.08	0.12	-2.02
3	1.20	-1.20	0.03	1.22	-1.16	1.21	-1.48	0.03	1.43	-1.47
4	-0.32	-0.48	0.09	0.49	0.49	-0.31	-0.59	0.13	0.59	0.55
Big	-1.14	-2.12	-1.23	0.19	-1.72	-1.13	-2.13	-1.51	0.24	-1.91
			$b_{(i)}$					t(b)		
Small	0.31	0.25	0.28	0.29	0.28	7.66	7.22	8.60	9.15	9.02
2	0.26	0.27	0.33	0.28	0.36	5.88	7.37	9.76	9.10	9.35
3	0.38	0.27	0.30	0.36	0.28	9.42	8.25	9.35	10.37	8.65
4	0.35	0.39	0.33	0.36	0.35	8.32	11.78	10.65	10.64	9.49
Big	0.36	0.32	0.37	0.32	0.35	8.64	7.90	11.16	9.83	9.48
			$s_{(i)}$					t(s)		
Small	2.52	0.68	0.64	0.89	1.13	4.62	1.46	1.42	2.05	2.72
2	2.01	1.02	0.06	1.19	0.25	3.36	2.09	0.14	2.83	0.48
3	1.37	0.11	0.89	0.39	1.18	2.48	0.25	2.04	0.82	2.68
4	-0.31	0.26	0.53	0.27	0.81	-0.55	0.57	1.27	0.58	1.63
Big	-0.94	-1.82	-0.32	-0.39	-0.30	-1.67	-3.28	-0.70	-0.88	-0.60
			$l_{(i)}$					t(l)		
Small	-0.60	-0.61	0.73	0.42	0.26	-1.20	-1.42	1.77	1.05	0.67
2	-0.53	0.35	0.99	-0.18	1.02	-0.96	0.77	2.34	-0.45	2.13
3	-0.41	0.50	-0.06	0.30	-0.48	-0.81	1.19	-0.14	0.69	-1.19
4	0.90	0.17	0.25	0.31	-0.21	1.70	0.41	0.64	0.73	-0.47
Big	1.02	2.05	0.58	0.72	0.67	1.96	4.00	1.39	1.77	1.44
			$c_{(i)}$					t(c)		
Small	-0.15	-0.02	0.11	0.09	-0.03	-0.65	-0.08	0.57	0.51	-0.20
2	-0.67	0.23	0.32	0.03	0.06	-2.66	1.15	1.65	0.18	0.26

3	0.40	0.20	0.15	0.07	0.16	1.71	1.08	0.82	0.34	0.88
4	0.16	0.41	0.14	0.34	0.07	0.69	2.18	0.81	1.79	0.36
Big	-0.33	-0.04	0.11	0.04	0.01	-1.38	-0.16	0.59	0.21	0.02
FFSF			$r_{(i)}$					**t(r)**		
Small	-0.24	-0.25	-0.47	-0.34	-0.58	-1.38	-1.67	-3.29	-2.43	-4.37
2	-0.58	-0.10	-0.47	-0.17	-0.54	-3.05	-0.62	-3.19	-1.27	-3.25
3	-0.01	-0.02	-0.23	-0.29	-0.11	-0.04	-0.16	-1.67	-1.91	-0.79
4	-0.36	0.12	-0.02	-0.10	-0.13	-1.96	0.85	-0.16	-0.69	-0.80
Big	-0.60	-0.50	-0.32	-0.10	-0.41	-3.33	-2.81	-2.22	-0.70	-2.56
			$u_{(i)}$					**t(u)**		
Small	0.49	0.15	0.51	0.08	-0.09	3.76	1.34	4.82	0.81	-0.90
2	0.66	0.49	0.33	0.02	0.10	4.61	4.24	3.03	0.17	0.85
3	0.79	0.59	0.23	-0.15	-0.08	6.03	5.51	2.19	-1.34	-0.77
4	0.99	0.48	0.19	-0.02	-0.35	7.25	4.50	1.87	-0.19	-2.99
Big	0.96	0.79	0.41	-0.05	0.04	7.18	5.98	3.79	-0.50	0.37

Source: Author's computation

Table 4.53c: FFSF Intercept and coefficient for 25 Size-Momentum Portfolios for the period January 2006 to December 2021 (Variable Basket)

MOM	Low	2	3	4	High	Low	2	3	4	High
			FFSF Coefficients: (Rm-Rf), SMB, LMH, CMA, RMW & UMD							
			$\alpha_{(i)}$					t(α)		
Small	2.82	0.76	0.32	-0.13	0.17	3.15	1.14	0.50	-0.20	0.27
2	1.97	0.99	2.63	0.57	1.42	2.53	1.39	3.23	0.91	2.24
3	1.60	0.84	1.15	1.67	0.80	1.81	1.24	1.59	2.62	1.25
4	1.17	1.68	1.17	0.76	1.40	1.60	2.28	1.82	1.21	2.12
Big	0.82	0.93	0.54	0.24	1.15	1.16	1.43	0.82	0.39	1.54
			$b_{(i)}$					t(b)		
Small	0.34	0.33	0.27	0.26	0.29	8.05	10.68	9.12	8.44	10.13
2	0.29	0.27	0.27	0.27	0.27	8.01	8.28	7.15	9.36	9.03
3	0.28	0.25	0.28	0.29	0.33	6.86	7.87	8.31	9.58	11.09
4	0.34	0.29	0.30	0.31	0.32	9.80	8.55	10.11	10.60	10.28
Big	0.27	0.32	0.36	0.30	0.33	8.30	10.47	11.51	10.39	9.41
			$s_{(i)}$					t(s)		
Small	1.70	0.18	1.51	1.45	1.50	10.70	1.55	13.24	12.10	13.66
2	1.35	1.01	1.34	1.00	1.18	9.69	7.99	9.29	8.99	10.41
3	0.89	0.73	0.63	0.77	0.77	5.67	6.08	4.92	6.78	6.71
4	0.52	0.38	0.59	0.58	0.64	3.95	2.93	5.15	5.22	5.46
Big	-0.06	0.20	0.07	0.29	0.33	-0.44	1.72	0.62	2.60	2.48
			$l_{(i)}$					t(l)		
Small	0.62	0.55	0.14	0.48	0.62	2.24	2.70	0.69	2.29	3.25
2	0.44	0.17	0.90	0.45	0.74	1.80	0.76	3.57	2.32	3.74
3	0.72	0.46	0.57	0.53	0.46	2.64	2.21	2.56	2.66	2.32
4	0.66	0.52	0.28	0.51	0.17	2.88	2.29	1.42	2.64	0.85
Big	0.53	0.50	0.70	0.51	0.48	2.44	2.49	3.41	2.65	2.06
FFSF			$c_{(i)}$					t(c)		
Small	0.21	0.24	-0.10	0.07	0.24	0.90	1.37	-0.57	0.42	1.50
2	0.03	-0.21	-0.44	0.18	0.19	0.14	-1.13	-2.09	1.1	1.13
3	0.03	0.16	0.01	0.08	0.03	0.15	0.92	0.06	0.46	0.18
4	0.08	0.07	0.13	0.19	0.00	0.43	0.35	0.75	1.14	-0.02
Big	-0.10	0.14	-0.08	-0.16	0.13	-0.55	0.83	-0.45	-1.00	0.65
			$r_{(i)}$					t(r)		
Small	-0.11	-0.45	-0.56	-0.66	-0.62	-0.68	-3.95	-5.08	-5.73	-5.85
2	-0.58	-0.57	-0.55	-0.43	-0.53	-4.27	-4.63	-3.91	-3.96	-4.83
3	-0.70	-0.54	-0.51	-0.43	-0.51	-4.60	-4.60	-4.04	-3.91	-4.54
4	-0.43	-0.37	-0.39	-0.41	-0.46	-3.43	-2.94	-3.52	-3.75	-4.06
Big	-0.46	-0.45	-0.53	-0.48	-0.45	-3.74	-3.99	-4.61	-4.46	-3.50
			$u_{(i)}$					t(u)		
Small	0.51	0.40	0.17	0.15	-0.28	4.08	4.30	1.93	1.58	-3.18
2	0.72	0.32	-0.22	-0.07	-0.48	6.59	3.23	-1.96	-0.76	-5.34
3	0.87	0.42	0.07	-0.24	-0.46	7.03	4.44	0.66	-2.64	-5.10
4	0.76	0.24	0.05	-0.10	-0.56	7.39	2.34	0.57	-1.11	-6.03
Big	0.64	0.33	0.12	-0.05	-0.46	6.49	3.58	1.23	-0.57	-4.39

Source: Author's computation

4.5.5.5 Average R-Square Values of FFSF for 25 Portfolios of Fixed Basket, Non-Financial Basket and Variable Basket

Table 4.54a: Average R-Square Values of FFSF for 25 Portfolios of Fixed Basket

Fixed	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.69	0.59	0.61	0.70	0.60	0.72	0.55	0.64	0.54	0.60
2	0.59	0.64	0.47	0.61	0.59	0.41	0.62	0.59	0.54	0.54
3	0.47	0.47	0.46	0.50	0.58	0.49	0.54	0.40	0.51	0.43
4	0.49	0.48	0.52	0.48	0.52	0.45	0.49	0.43	0.42	0.55
Big	0.58	0.50	0.46	0.48	0.52	0.45	0.45	0.57	0.54	0.49

Fixed	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.52	0.53	0.51	0.67	0.73	0.62	0.53	0.64	0.65	0.64
2	0.53	0.58	0.59	0.62	0.63	0.58	0.57	0.65	0.57	0.64
3	0.46	0.48	0.54	0.57	0.48	0.47	0.44	0.56	0.47	0.52
4	0.45	0.47	0.48	0.52	0.53	0.50	0.49	0.55	0.51	0.48
Big	0.47	0.55	0.55	0.64	0.51	0.42	0.50	0.52	0.52	0.45

Table 4.54b: Average R-Square Values of FFSF for 25 Portfolios of Non-Financial Basket

Non-Fin	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.71	0.70	0.65	0.68	0.72	0.75	0.73	0.67	0.61	0.59
2	0.54	0.61	0.62	0.58	0.63	0.69	0.63	0.55	0.49	0.50
3	0.53	0.57	0.47	0.50	0.57	0.00	0.59	0.47	0.06	0.49
4	0.43	0.35	0.52	0.56	0.56	0.51	0.65	0.57	0.47	0.21
Big	0.51	0.50	0.51	0.54	0.45	0.42	0.05	0.51	0.43	0.48

Non-Fin	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.50	0.51	0.68	0.66	0.72	0.66	0.33	0.69	0.65	0.69
2	0.52	0.52	0.64	0.59	0.63	0.56	0.60	0.66	0.57	0.64
3	0.51	0.48	0.48	0.59	0.47	0.59	0.52	0.57	0.55	0.48
4	0.50	0.49	0.53	0.63	0.50	0.56	0.59	0.58	0.55	0.47
Big	0.44	0.46	0.54	0.53	0.56	0.53	0.51	0.58	0.46	0.49

Table 4.54c: Average R-Square Values of FFSF for 25 Portfolios of Variable Basket

Variable	Size-Value					Size-Investment				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.79	0.72	0.73	0.74	0.76	0.79	0.79	0.67	0.76	0.73
2	0.70	0.65	0.68	0.63	0.66	0.72	0.47	0.69	0.57	0.61
3	0.68	0.64	0.57	0.48	0.63	0.68	0.66	0.64	0.56	0.60
4	0.60	0.50	0.62	0.57	0.66	0.55	0.64	0.63	0.52	0.53
Big	0.62	0.63	0.57	0.64	0.54	0.57	0.62	0.64	0.53	0.62

Variable	Size-Profitability					Size-Momentum				
	Low	2	3	4	High	Low	2	3	4	High
Small	0.60	0.65	0.75	0.70	0.82	0.64	0.63	0.74	0.73	0.78
2	0.59	0.60	0.65	0.64	0.72	0.69	0.64	0.62	0.67	0.72
3	0.42	0.51	0.62	0.63	0.70	0.62	0.63	0.57	0.64	0.68
4	0.52	0.55	0.63	0.69	0.61	0.65	0.52	0.61	0.64	0.63
Big	0.43	0.64	0.60	0.70	0.64	0.55	0.62	0.63	0.60	0.56

4.5.5.6 Summary of Factor Regression for FFSF of 25 Portfolios

Table 4.55: Summary of Factor Regression for FFSF of 25 Portfolios

	Number of Significant Intercept				R-Square			
	Size-Value	Size-INV	Size-PRO	Size-MOM	Size-Value	Size-INV	Size-PRO	Size-MOM
	Fixed				Fixed			
FFSF	16	12	10	12	55	52	54	54
	Non-Financial				Non-Financial			
	1	3	0	3	56	48	55	56
	Variable				Variable			
	7	8	10	6	64	63	62	64

Source: Author's computation

The Table 4.50a to 4.54c show the FFSF linear regression results of the four size-based portfolios i.e., size-value, size-investment, size-profitability and size-momentum for all the three baskets of portfolios. The summary of the factor regression for FFSF of 25 portfolios are given in the Table 4.55. For the fixed basket in the size-value sorted portfolio 16 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 12 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 10 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 12 portfolios out of 25 portfolios are statistically significant. For the non-financial basket in the size-value sorted portfolio 1 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 3 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 0 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 3 portfolios out of 25 portfolios are statistically significant. For the variable basket in the size-value sorted portfolio 7 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 8 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 10 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 6 portfolios out of 25 portfolios are statistically significant. When t(a) is greater than 1.96, statistical significance indicates that alpha value is distinct from zero which mean the model is unable to predict the return of the portfolios.

For the FFTF the average R^2 value for the fixed basket in the size-value cross portfolios is 55, size-investment cross portfolios is 52, size-profitability cross portfolios is 54, and size-momentum cross portfolios is 54; the average R^2 value for the non-financial basket in the size-value cross portfolios is 56, size-investment cross portfolios is 48, size-profitability cross portfolios is 55, and size-momentum cross portfolios is 56; and the average R^2 value for the variable basket in the size-value cross portfolios is 64, size-investment cross portfolios is 63, size-profitability cross portfolios is 62, and size-momentum cross portfolios is 64. From the average R^2 values it is found that variable basket portfolios produced higher R^2 values in comparison two other baskets of portfolios. Another important find from the average

R^2 values is that among size cross portfolios size-investment cross portfolios produced the least R^2 values.

From the above discussion it is clear that with the addition of extra variables in the multi-factor model it increases the explanation power for portfolio returns. It is found that creating different baskets for portfolio have an impact for explaining the return. It is observed that variable baskets portfolios produced high R^2 values as compared to fixed basket and non-financial basket. The study also found that out of the five models tested CFFM and FFSF perform better for non-financial and variable basket. The study also found size as an important factor while explaining the return of assets or portfolios. It is also observed that size cross with other variables have better explanatory power compared to single factor sorted. All the size-cross portfolios have performed good in the study specially for non-financial basket and variable basket portfolios.

4.6 GRS Test

To find out the validity of all the model in the study, the GRS (Gibbons, Ross & Shanken, 1989) test have been conducted. The test told us whether extra addition of the variables into the existing model improves the performance of the new models or not.

4.6.1 Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Fixed Basket)

Table 4.56a: Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Fixed Basket)

Size Sorted Portfolios	GRS F-Statistics	P-Value	Mean Alpha	Average R2
	CAPM			
Size-Value	1.933***	0.008	0.874	0.39
Size-Investment	1.634**	0.037	0.829	0.38
Size-Profitability	2.745***	0.000	0.862	0.41
Size-Momentum	10.168***	0.000	0.845	0.40
	FFTF			
Size-Value	1.872**	0.011	0.945	0.53
Size-Investment	1.605**	0.043	0.892	0.50
Size-Profitability	2.732***	0.000	0.930	0.52
Size-Momentum	10.019***	0.000	0.911	0.51
	CFFM			
Size-Value	1.000	0.471	1.129	0.53
Size-Investment	1.392	0.115	1.088	0.50
Size-Profitability	1.213	0.235	1.030	0.52
Size-Momentum	2.006***	0.005	1.029	0.53
	FFFF			
Size-Value	1.835**	0.013	1.132	0.54
Size-Investment	1.335	0.146	1.083	0.52
Size-Profitability	2.212***	0.002	1.096	0.54
Size-Momentum	9.418***	0.000	1.100	0.52
	FFSF			
Size-Value	0.933	0.560	1.237	0.55
Size-Investment	1.354	0.135	1.194	0.52
Size-Profitability	1.253	0.203	1.128	0.54
Size-Momentum	2.211***	0.002	1.140	0.54

Source: Author's computation

*Note: The table reports the GRS tests results of the CAPM, FFTF, CFFM, FFFF and FFSF of the fixed basket. GRS F-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

The intercept in a linear regression should be identical to zero for an asset pricing model to be stated as the best fit model amongst other prevalent models. This study uses GRS statistics, p-value, mean alpha and average R^2 metrics to test all the asset pricing models for checking their explanatory power of portfolio returns. The GRS test have a pre-assumed null hypothesis that alpha is zero, the smaller the GRS statistics is the better are the chances not to reject the null hypothesis for a given model. In the Table 4.52a the summary of the GRS test result of fixed basket portfolios clearly shows that the GRS p-value for FFTF is significant which means that the model fails to explain the returns of the portfolios. The GRS F-Statistics also shows the models incapability. The CFFM passed the GRS test for all the size-cross portfolios except for the size-momentum cross portfolios which failed the test. The GRS F-statistic for size-value cross portfolio (1), size-investment cross portfolios (1.39) and size-profit cross portfolio (1.21) and the p-values are not significant. The FFFF failed the GRS test except size-investment cross portfolios which is found to be insignificant with low GRS F-Statistics of 1.33. The FFSF passed the GRS test as the F-Statistics are near to 1 and p-value for the FFSF are found to be insignificant except size-momentum cross portfolios. For the fixed basket out of all the models CFFM and FFSF have performed better which thus support its superiority over other model.

4.6.2 Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Non-Financial Basket)

Table 4.56b: Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Non-Financial Basket)

Size Sorted Portfolios	GRS F-Statistics	P-Value	Mean Alpha	Average R2
	CAPM			
Size-Value	3.511***	0.000	0.922	0.41
Size-Investment	3.879***	0.000	0.985	0.33
Size-Profitability	4.181***	0.000	1.051	0.39
Size-Momentum	28.455***	0.000	1.124	0.39
	FFTF			
Size-Value	3.456***	0.000	1.071	0.53
Size-Investment	3.903***	0.000	1.132	0.46
Size-Profitability	4.457***	0.000	1.214	0.51
Size-Momentum	29.588***	0.000	1.285	0.52
	CFFM			
Size-Value	1.527	0.063	-0.344	0.55
Size-Investment	2.633***	0.000	0.196	0.46
Size-Profitability	1.590**	0.046	-0.206	0.52
Size-Momentum	3.123***	0.000	-0.475	0.55
	FFFF			
Size-Value	2.555***	0.000	1.391	0.55
Size-Investment	2.585***	0.000	1.438	0.48
Size-Profitability	1.972***	0.006	1.550	0.53
Size-Momentum	18.797***	0.000	1.656	0.53
	FFSF			
Size-Value	1.503	0.070	-0.108	0.56
Size-Investment	2.406***	0.000	0.410	0.49
Size-Profitability	1.448	0.090	0.031	0.55
Size-Momentum	2.895***	0.000	-0.207	0.56

Source: Author's computation

Note: *The table reports the GRS tests results of the CAPM, FFTF, CFFM, FFFF and FFSF of the non-financial basket. GRS F-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

For the non-financial basket all the five models failed the GRS test except size-value cross portfolios in CFFM; size-value cross and size-profitability cross portfolios in FFSF. The average R^2 value of portfolios under the non-financial basket is low for all the models which is less than 56 percent but better than fixed basket. The FFTF GRS F-statistics is very high for all the size sorted portfolios and all are found significant at 1 percent. For the Carhart four factor model GRS F-Statistics is high but not as high as FFTF; it's just above 2 except size-value of 1.53 & size-profitability of 1.59. All the p-value are found to be significant except size-value. The FFFF GRS test result shows very high GRS F-statistics and all the portfolios are found to be significant. Finally, for the FFSF two portfolios of size-value and size-profitability are found insignificant and other two portfolios are significant at 1 percent. So, the FFTF and FFFF models completely failed the GRS test whereas CFFM also failed except size-value cross portfolio and FFSF somewhat pass the GRS test as two portfolios are found to be insignificant.

4.6.3 Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Variable Basket)

Table 4.56c: Summary of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Variable Basket)

Size Sorted Portfolios	GRS F-Statistics	P-Value	Mean Alpha	Average R2
	CAPM			
Size-Value	1.610**	0.042	0.852	0.44
Size-Investment	4.785***	0.000	0.852	0.42
Size-Profitability	4.917***	0.000	0.903	0.44
Size-Momentum	22.285***	0.000	0.898	0.43
	FFTF			
Size-Value	1.660**	0.033	0.861	0.60
Size-Investment	4.689***	0.000	0.855	0.58
Size-Profitability	4.787***	0.000	0.902	0.57
Size-Momentum	21.828***	0.000	0.901	0.57
	CFFM			
Size-Value	1.393	0.114	0.442	0.60
Size-Investment	2.302***	0.001	0.508	0.58
Size-Profitability	2.110***	0.003	0.473	0.58
Size-Momentum	2.156***	0.002	0.461	0.60
	FFFF			
Size-Value	1.723**	0.024	1.665	0.64
Size-Investment	1.824**	0.014	1.657	0.63
Size-Profitability	2.438***	0.000	1.721	0.62
Size-Momentum	12.063***	0.000	1.708	0.61

	FFSF			
Size-Value	1.337	0.145	1.073	0.64
Size-Investment	1.836**	0.013	1.138	0.63
Size-Profitability	1.727**	0.024	1.118	0.63
Size-Momentum	1.759**	0.020	1.098	0.64

Source: Author's computation

*Note: The table reports the GRS tests results of the CAPM, FFTF, CFFM, FFFF and FFSF of the variable basket. GRS F-stats are in parenthesis, ***, ** and * indicate significance at 1 percent, 5 percent and 10 percent respectively.*

For the variable basket all the five models failed the GRS test except for size-value cross portfolios in CFFM and FFSFM. The average R^2 values are not very high for all the models which are less than 65 percent but better than fixed basket portfolios. The FFTF GRS F-statistics is very high for all the size sorted portfolios except size-value sorted which has a value of 1.66 and the portfolios are found to be significant at 5 percent. CFFM GRS F-Statistics are high but not as high as FFTF it's just above 2 except for size-value cross portfolios with a value of 1.39. The p-values are found to be significant except for size-value cross portfolios. The FFFF GRS test result show that GRS F-statistics for two portfolios are under 2 but all the portfolios are found to be significant. Lastly, GRS F-statistics value of FFSF test results are found to be more than 2 and significant at 5 percent except for size-value cross portfolios. Thus, it is clear that all the models have failed the GRS test for the portfolio constructed under variable basket irrespective of size cross sorted portfolios

The GRS test has been run for the portfolios under the fixed basket, non-financial basket and variable basket. From the above discussion of the GRS result obtained it is thus observed that fixed basket performed better than non-financial basket and variable basket. However, the variable basket has higher R^2 values than other baskets of portfolios. It is also observed that the portfolios constructed under fixed basket, the three models i.e., CFFM, FFFF and FFSF pass the GRS test. For the non-financial basket all the models did not pass the GRS test other than the size-value cross portfolio for the CFFM; size-value cross portfolios and size-profitability cross portfolios for the FFSF model which passed the GRS test. For the variable basket only size-value cross portfolios pass the GRS test for CFFM and FFSF.

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CHAPTER - 5

CONCLUSIONS AND SUGGESTIONS

This chapter presents the summary of the key findings, implications and scope of future research study. Conclusions and suggestions related to the study are also highlighted in this chapter. The key findings for the Capital asset pricing model, Fama and French three factor model, Carhart four factor model, Fama and French five factor model and Fama and French six factor model are discussed below:

5.1 Major Findings

5.1.1 Independent Variable

1) It is observed that for the all the basket the investment decision based on momentum of the company yield higher average stock returns than investment decision based on other factors (Table 4.1a.b.c).
2) The portfolios constructed using size and investment as a criterion produced negative returns (Table 4.1a.b.c).
3) The portfolios constructed using Beta and profitability as a criterion produced positive returns but not as high as momentum (Table 4.1a.b.c).

5.1.2 Average Returns of 25 Portfolios

5.1.2.1 Fixed Basket

1) There is no clear difference in the value of the mean excess return of the 25 portfolios formed on size and value (Table 4.3a to 4.3d). It shows unclear picture of size and value effect on the stock return.
2) The size-profitability cross portfolios show clear effect of profitability factor as the high profitable firms outperform the lowest one. Likewise, size-momentum cross portfolios provide a clear picture about momentum factor effect in the stocks return (Table 4.3a to 4.3d). There is presence of momentum effect in the Indian stock return.

5.1.2.2 Non-Financial Basket

1) The mean excess return pattern of the 25 portfolios formed on size and value measure for non-financial basket show no size and value effect (Table 4.4a to 4.4d).
2) The smallest size and value sorted portfolios do not give highest return. This finding is contrary to the findings of Fama & French (1993, 2015) in the USA context and Cornor & Sehgal (2003); Sehgal & Balakrishnan (2013), Balakrishnan (2016); Maiti & Balakrishnan (2018) and Goel & Garg (2020) in the Indian stock market context.
3) There is a clear size factor effect in the size-momentum cross portfolios but other size cross portfolios do not provide a clear size factor effect in the stocks return (Table 4.4a to 4.4d).
4) The smallest size firms outperform the large size firms while all the large size firms produce negative returns (Table 4.4a to 4.4d).

5.1.2.3 Variable Basket

1) The mean excess return pattern of the 25 portfolios formed on size and value measure for variable basket show no size and value effect (Table 4.5a to 4.5d).
2) Like fixed and non-financial basket, the smallest size and value sorted portfolio produced least mean excess return.
3) The size-investment cross portfolios' return show that the most aggressively invested firm produce high mean excess return in comparison to least invested firms but no size effect was found.
4) Size-profitability cross portfolio shows high profitable firms produce better mean excess return compared to low profitable firms (similar result was obtained by Novy et al., 2013).
5) There is clear momentum effect instead of size as in the size-momentum cross portfolios the high momentum firms outperform the low momentum firms. All the low momentum firms produce negative returns.

5.1.3 Regression Results for each of the Six Risk-based Portfolios

5.1.3.1 CAPM Size-Value Cross Portfolios

1. The regression results of size-value portfolios show the average R^2 value to be approximately 50 percent for the fixed basket portfolio, 48 percent for non-financial basket portfolio and 50 percent for variable basket portfolio which suggest that CAPM failed to explain the return of the portfolio (Table 4.6a-4.6c).
2. For size-value portfolios, the market factors are found to be significant at 1 percent for all the portfolios of three different baskets. The intercept term is found to be significant for all baskets.

5.1.3.2 CAPM Size-Investment Cross Portfolios

1) The regression result of the size-investment sorted portfolios for three baskets show the average R^2 value to be below 50 (fixed basket 49, non-financial basket 47 and variable basket 50 percent) which suggest that CAPM failed to explain the return of the portfolios (Table 4.7a-4.7c).
2) For size-investment portfolio, it is observed that the aggressively invested firms are found to produce higher alpha values then lower investment firms.

5.1.3.3 CAPM Size-Profitability Cross Portfolios

1) The highly profitable firms produce higher alpha values then low profitable firms (Table 4.8a-4.8c).
2) In size-profitability portfolio, the average R^2 value for all the baskets is found to be below 50 (fixed basket 49, non-financial basket 47 and variable basket 49 percent) which suggest that CAPM failed to explain the portfolios return.

5.1.3.4 CAPM Size-Momentum Cross Portfolios

1) In the size-momentum cross portfolio, the average R^2 value for all the baskets is found to be below 50 (fixed basket 49, non-financial basket 46 and variable basket 48 percent) which suggest that CAPM fails to explain the portfolios return (Table 4.9a-4.9c).
2) The high momentum firms are found to produce higher alpha values compared to low momentum firms.

5.1.3.5 FFTF Size -Value Cross Portfolios

1) The size-value cross portfolios regression result shows that the small size firms produce higher coefficient values than big size firms for all the baskets. The small size firms produce coefficient values of greater than 1 whereas big size firms produce coefficient values less than 0.50 (Table 4.10a - 4.10c).
2) The size-value cross portfolios value factor is found to have mix results but mostly low values firms tend to produce higher coefficient than the high value firms.
3) The average R^2 value for fixed basket, non-financial basket and variable basket are 66, 64 and 68 percent respectively. The value of R^2 found in this model are more than the value found in the CAPM model due to addition of extra variables in the model. The intercept of the all the baskets for the double sorted mimicking portfolios are found to be significant at 1 percent which means that the return of the stocks is failed to be explained by this model and there is still missing variable in the model.

5.1.3.6 FFTF Size -Investment Cross Portfolios

1) The size-investment cross portfolios regression results show that the small size firms produce higher coefficient values than big size firms for all the baskets.
2) The coefficient value of the small size firms is found to be more than 1 whereas the coefficient value of the big size firms is found to be less than 0.50. The value factor is found to have mix results but mostly low values firms tend to produce higher coefficient than high value firms.

5.1.2.7 FFTF Size-Profitability Cross Portfolios

1) The market coefficient for all the portfolios of the three baskets is found to be significant at 1 percent (Table 4.12a-4.12c).
2) The size coefficient for all the portfolios of the three baskets also found to be significant at 1 percent.
3) The regression results found that the small size firms produce higher coefficient values than the big size firms for all the baskets.

4) The coefficient of value factor for fixed basket is found to be low ranging from 0.31 to 0.80. For the non-financial basket, the coefficient value of most of the portfolios for value factor is found to be significant.
5) For the variable basket the coefficient of all the portfolios for value factor is found to be significant.
6) The average R^2 value for portfolios of fixed baskets is 0.62, non-financial basket is 0.59 and variable basket is 0.65 approximately which indicates that this model performs better than CAPM due to the addition of extra variables in the model.
7) The regression results show that the intercept term for the double sorted mimicking portfolios for all the baskets is found to be significant at 1 percent except for variable basket BW portfolio which is significant at 10 percent. The regression result shows that the high profitable firms are having higher alpha value compared to low profit firms.

5.1.3.8 FFTF Size-Momentum Cross Portfolios

1) The market coefficient for all the baskets is found to be significant at 1 percent (Table 4.13a-4.13c).
2) The size coefficient for all the portfolios of three different baskets is also found to be significant at 1 percent. The small size firms produce higher coefficient values then big size firms for all the baskets.
3) The value factor coefficient for variable basket is found to be low with the value ranging from 0.46 to 0.66.
4) The average R^2 value for fixed baskets is 0.63, non-financial basket is 0.60 and variable basket is 0.63 approximately which indicate that FFTM performs better than CAPM due to addition of extra variables in the model.
5) The regression result shows that the intercept term of high momentum firms is having higher value compared to low momentum firms. The value of intercept of all the low momentum portfolios are found to be negative.

5.1.3.9 CFFM Size–Value Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent (Table 4.14a-14.4c).
2) The small size firms are found to produce higher coefficient values then big size firms for all the baskets.
3) The study found only a few value factor coefficient is significant for all the baskets of portfolios which suggest value is not a good variable for portfolio creation.
4) The momentum factor for the portfolios of different baskets is found to be insignificant except five portfolios from non-financial basket which are significant at 5 percent and BH at 10 percent.
5) The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.68 approximately which indicates that this model performs better than CAPM due to the addition of extra variables in the model.
6) The regression results show that the intercept term for the double sorted mimicking portfolios of fixed basket to be significant at 1 percent. But none of the intercept for the non-financial basket is found to be significant. For the variable basket the intercept term is found to be insignificant.

5.1.3.10 CFFM Size–Investment Cross Portfolios

1) The market coefficient and size for all the baskets are also found to be significant (Table 4.15a-4.15c).
2) The study found small size firms produce higher coefficient values then big size firms for all the baskets.
3) The momentum factor for the maximum portfolios is found to be insignificant.
4) The average R^2 value for fixed baskets is 0.64, non-financial basket is 0.63 and variable basket is 0.67 approximately indicting that it performs better than CAPM due to addition of extra variables in the model.

5.1.3.11 CFFM Size–Profitability Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant (Table 4.16a-4.16c).
2) The regression result shows that small size firms produce higher coefficient values then big size firms for all the baskets. Regarding the value coefficient for fixed basket portfolio only BR portfolio is found to be significant at 5 percent; for the non-financial basket only four portfolios SR, SW & BR are found to be significant at 1 percent and portfolio SM is found to be significant at 10 percent; and for variable basket all portfolios are found to be significant at 1 percent except SR & which is significant at 5 percent.
3) The momentum coefficient for all the portfolios of all three baskets is found to be insignificant except three portfolios of SR and BR significant at 5 percent; SM significant at 1 percent from non-financial. SM portfolio from variable basket is significant at 10 percent.
4) The average R^2 value for fixed baskets is 0.63, non-financial basket is 0.60 and variable basket is 0.65 approximately which suggest that the CFFM performs better than CAPM due to addition extra variables in the model; however, it does not show any significant improvement or difference from the FFTF model. The regression results show that for fixed baskets the intercept term for the double sorted mimicking portfolios is found to be significant at 1 percent; for the non-financial basket only SR & BR are found to be significant at 10 percent and 5 percent respectively; lastly for variable basket only three portfolios of SR, BR & BM are found to be significant at 1, 5 & 10 percent respectively.

5.1.3.12 CFFM Size–Momentum Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent (Table 4.17a-4.17c).
2) The regression result shows that small size firms produce higher coefficient values than big size firms for all the baskets.
3) All the value coefficient for the fixed basket portfolios is found to be insignificant. For the non-financial basket SU & SD portfolios are significant at 5 percent and BU, BM & BD are significant at 10 percent for the value

factor. For the variable basket all the portfolios for value factor are found to be significant at 1 percent except BD which is significant at 5 percent.

4) The momentum coefficient for all the portfolios is found to be significant at 1 percent except SM & BM portfolios of fixed portfolios which are insignificant; in non-financial basket SM is significant at 10 percent & BM is insignificant; and for variable basket SM & BM are insignificant.
5) The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.68 approximately which means it performs better than CAPM due to addition extra variables in the model. However, it does not show any significant improvement or difference from the FFTF model.
6) The regression results show that for the double sorted mimicking portfolios the intercept term of only the fixed baskets is found to be significant at 1 percent. But none of the intercept for the non-financial basket is found to be significant. For the variable basket intercept term of only three portfolios are found to be significant at 5 percent.

FFFF Size-Value Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent (Table 4.18a-4.18c).
2) The study also found that small size firms produce higher coefficient values than big size firms for all the baskets.
3) The value coefficient of only three portfolios of fixed basket is found to be significant i.e., SL & BL at 1 percent and BH at 10 percent. For the non-financial basket SL & BL portfolios are significant at1 percent. For the variable basket, SL & BL portfolios are significant at 1 percent and SM & BM are significant at 5 & 10 percent respectively for value factor.
4) The investment coefficient for all the portfolios is found to be insignificant. The profitability coefficient for fixed basket is found to be insignificant. The non-financial basket portfolio's profitability coefficient is significant for SM, SH & BL at 5 percent and BM & BH at 10 percent. For variable basket all portfolios are significant at 1 percent but with negative coefficient value.

5) All the profitability coefficient is found to be negative irrespective of the basket.
6) The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.73 approximately which means that it performs better than CAPM, FFTF & Carhart due to addition of extra variables in the model. The regression results shows that intercept term of all the baskets portfolios' to be significant at 1 percent which suggest that this model fails to explain the return of the stock.

5.1.3.13 FFFF Size-Investment Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent (Table 4.19a-4.19c).
2) The study also found small size firms produce higher coefficient values than big size firms for all the baskets.
3) The value coefficient of only two portfolios for the fixed basket are found to be significant i.e., SC & BM at 10 & 5 percent respectively. For the non-financial basket SC & BA portfolios is significant 1 percent and SA & BC at 5 percent. For value factor of the portfolios under variable basket is found to be significant at 1 percent except SM & BM which is significant at 5 percent.
4) The investment coefficient for all the portfolios of fixed basket is found to be significant at 1 percent except BM & BA which is significant at 10 percent. The investment coefficient for all the portfolios of non-financial basket is found to be significant at 1 percent except BM & BA which are insignificant.
5) The investment coefficient for all the portfolios of variable basket is found to be significant at 1 percent except BM & BA which are insignificant.
6) The profitability coefficient for fixed basket is found to be insignificant except SM which is significant at 5 percent. The profitability coefficient of all portfolios under non-financial basket is significant at 1 percent except BC which is significant at 10 percent but SM is found to be insignificant. For variable basket all portfolios are significant at 1 percent. All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.65 and variable basket is 0.73 approximately which indicates that it performs better than

CAPM, FFTF & CFFM due to addition of extra variables in the model. The regression results shows that the intercept term for the double sorted mimicking portfolios in all the baskets to be significant at 1 percent which suggest that the model is still unfit to explain the return of the stock.

5.1.3.15 FFFF Size-Profitability Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent except BM portfolio from non-financial basket which is significant at 5 percent (Table 4.20a-4.20c).
2) The study found small size firms produce higher coefficient values than big size firms for all the baskets.
3) For the value coefficient for the fixed basket only BR portfolio is found to be significant at 10. For the non-financial basket all portfolios are significant at 5 percent except BM which is significant at 10 percent. For the variable basket all portfolios are significant at 1 percent except SR & BW which is significant at 10 percent for value factor.
4) The investment coefficient for all the portfolios is found to be insignificant and mostly negative. The profitability coefficient for fixed basket portfolio is found to be significant at 1 percent except BR portfolio which is significant at 10 percent but SM & BM are insignificant. The profitability coefficient of non-financial basket portfolios of SR, SW & BW is significant at 1 percent and BM is significant at 10 percent but SM & BR are insignificant.
5) For variable basket all portfolios are significant at 1 percent except BR which is insignificant. All the profitability coefficient are found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.65, non-financial basket is 0.63 and variable basket is 0.72 approximately which means that it performs better than CAPM, FFTF & Carhart due to addition of extra variables in the model.
6) The regression results show that intercept term for the double sorted mimicking portfolios of all the basket is found to be significant at 1 percent

except BR portfolio from non-financial basket which is significant at 5 percent which suggests that still there's something unexplained by the model.

5.1.3.16 FFFF Size-Momentum Cross Portfolios

1) The market coefficient and size coefficient for all the baskets are found to be significant at 1 percent except BU portfolio's size coefficient from non-financial basket is significant at 5 percent (Table 4.21a-4.21c).
2) The small size firms are found to produce higher coefficient values then big size firms for all the baskets.
3) The value coefficient for the fixed basket portfolios is insignificant but only BU portfolio is found to be significant at 10. For the non-financial basket all portfolios are found to be significant at 5 percent except SM & BD which are insignificant. For the variable basket all portfolios are significant at 5 percent except SD & BM which are significant at 1 percent for value coefficient.
4) The investment coefficient for all the portfolios is found to be insignificant and mostly negative. The profitability coefficient for fixed basket SM & SD portfolios are found to be significant at 1 percent & 5 percent respectively. For the non-financial basket SM & SD portfolios are found to be significant at 1 percent, BU & BD significant at 5 percent and SU portfolio at 10 percent but BM portfolio is insignificant. For variable basket all portfolios are significant at 1 percent except BR portfolio which is insignificant.
5) All the profitability coefficient are found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.64, non-financial basket is 0.62 and variable basket is 0.69 approximately which thus the model performs better than CAPM, FFTF & CFFM due to addition of extra variables in the model. The regression results show that all the intercept term for the double sorted mimicking portfolios of all the baskets are found to be significant at 1 percent except SD & BD portfolios under fixed basket which are insignificant; BD is significant at 5 percent for non-financial and SD & BD portfolios for variable are insignificant and also negative which suggests that still there's something unexplained by the model.

5.1.3.17 FFSF Size-Value Cross Portfolios

1) The market and size coefficient for all the baskets are found to be significant at 1 percent except SL & BL portfolios which size coefficient for fixed and non-financial basket is significant at 5 percent (Table 4.22a-4.22c).
2) The low value stocks produce higher coefficient values than big high value stocks for all the baskets.
3) The value (P/B) coefficient of SL & BL portfolios for the fixed basket is found to be significant at 1 percent and BH is significant at 10 percent. For the non-financial basket SL and BL portfolios is significant 1 percent. The value coefficient of SL & BL portfolios for the variable basket are significant at 1 percent and SM is significant at 10 percent.
4) The investment coefficient for all the portfolios is found to be insignificant. The profitability coefficient for fixed basket portfolios is found to be insignificant and all values are negative. Under the non-financial basket, BL portfolio is significant at 1 percent, SM & SH is significant at 5 percent and BM & BH portfolio is significant at 10 percent but all values are negative. For variable basket all portfolios are significant at 1 percent but all values are negative. The momentum coefficient for fixed basket is insignificant with negative values. For non-financial basket SM, SH, & BL portfolios are significant at 1 percent, BM & BH portfolios is significant at 5 percent and SL is significant at 10 percent. For the variable basket BL is significant at 5 percent and SM & SH portfolios are significant at 10 percent.
5) All the profitability coefficient is found to be negative irrespective of the basket. The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.66 and variable basket is 0.73 approximately which means it performs better than CAPM, FFTF & CFFM due to addition of extra variables in the model. However, the model does not improve from the FFFM model as similar R^2 values are found. The regression results shows that the intercept term for the double sorted mimicking portfolios of fixed and variable baskets portfolios is found to be significant at 1 percent except SM portfolios of variable basket which is significant at 5 percent. For non-financial basket all the intercept term are found to be insignificant.

5.1.3.18 FFSF Size-Investment Cross Portfolios

1) The market and size coefficient for all the baskets are found to be significant at 1 percent except BA portfolio under non-financial basket which is significant at 5 percent (Table 4.23a-4.23c).
2) The study found small size firms produce higher coefficient values than big size firms for all the baskets.
3) The value coefficient for the fixed basket of SC & BM portfolios is found to be significant at 10 percent and 5 percent respectively. The value coefficient for the non-financial basket of SC & BA portfolios are found to be significant at 1 percent and SA & BC are significant at 5 percent. The value coefficient of all the portfolios for the variable basket are significant at 1 percent except SM & BM portfolio which are significant at 5 percent.
4) The investment coefficient for fixed basket of SC, SA & BC portfolios are found to be significant at 1 percent and BM & BA portfolios is significant at 10 percent but the coefficient value of SA & BA portfolio is found to be negative. The investment coefficient for non-financial basket of SC, SA & BC portfolios are found to be significant at 1 percent and BA portfolios is significant at 5 percent but coefficient of SA & BA portfolio is negative. The investment coefficient for variable basket of SC, SA & BC portfolios is found to be significant at 1 percent and BA portfolios is significant at 5 percent but the coefficient of SA & BA is found to be negative.
5) The profitability coefficient of SM portfolio for fixed basket is found to be significant at10 percent and all the values are negative except SA portfolio. The non-financial basket of SC, SA & BM portfolios is significant at 1 percent and BC & BA is significant at 10 percent but all the values are negative. For variable basket all portfolios are significant at 1 percent but all the values are negative.
6) The momentum coefficient for fixed basket is insignificant and negative. For non-financial basket of SC, SA, & BM portfolios are significant at 1 percent and BC & BA portfolios is significant at 5 percent. For the variable basket SC is significant at 5 percent and BM & BA portfolios is significant at 10

percent. All the profitability coefficient is found to be negative irrespective of the basket.

7) The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.66 and variable basket is 0.73 approximately which means it performs better than CAPM, FFTF & Carhart due to addition of extra variables in the model. However, it has not outperformed FFFF as the R^2 value are similar. The regression results also show that the intercept term of the double sorted mimicking portfolios for both fixed and variable baskets portfolio is found to be significant at 1 percent but all portfolios for non-financial basket is found to be insignificant

5.1.3.19 FFSF Size-Profitability Cross Portfolios

1) The market and size coefficient for all the baskets are found to be significant (Table 4.24a-4.24c).
2) The study found small size firms produce higher coefficient values then big size firms for all the baskets.
3) The value coefficient for the fixed basket of BR portfolio is found to be significant at 10 percent. For the non-financial basket all portfolios are significant at 5 percent except SM portfolio which is significant at 10 percent but BM portfolio is insignificant. For the variable basket all the portfolios are significant at 1 percent except SR which is significant at 5 percent for value coefficient. The investment coefficient for all the baskets is found to be insignificant. The profitability coefficient for fixed basket of SR, SW & BW portfolios are found to be significant at 1 percent and BR portfolio is significant at 10 percent.
4) The non-financial basket of SR, SM & BW portfolios are significant at 1 percent and BM is significant at 10 percent. For variable basket all portfolios are significant at 1 percent except SR & BR which are found to be insignificant but all portfolios coefficient values are negative. The momentum coefficient for fixed basket is insignificant and negative except for SR portfolio. For non-financial basket SM portfolio is significant at 1 percent; SR, BR, & BW portfolios are significant at 5 percent and SW portfolio is significant at 10 percent. For the variable basket SM portfolio is significant at

5 percent. All the profitability coefficient values are found to be negative irrespective of the basket.

5) The average R^2 value for fixed baskets is 0.66, non-financial basket is 0.64 and variable basket is 0.72 approximately which means it performs better than CAPM, FFTF & CFFM due to addition extra variables in the model. The regression results show the intercept term for the double sorted mimicking portfolios for both fixed and variable baskets portfolios' to be significant at 1 percent except SM & BR portfolios from variable basket which are significant at 5 percent but all portfolios for non-financial basket are found to be insignificant except SW & BR portfolios which are significant at 10 & 5 percent respectively.

5.1.3.20 FFSF Size-Momentum Cross Portfolios

1) The market and size coefficient for all the baskets are found to be significant at 1 percent except BU portfolio from size coefficient for non-financial basket is insignificant (Table 4.25a-4.25c).
2) The study found small size firms produce higher coefficient values then big size firms for all the baskets.
3) The value coefficient for the fixed basket BU portfolio is found to be significant at 10 percent. For the non-financial basket all portfolios are significant at 5 percent except SM & BD portfolios which are significant at 10 percent but SM portfolio is insignificant. For the variable basket all the portfolios are significant at 1 percent except SM, BU & BD portfolios which are significant at 5 percent. The investment coefficient for all the baskets is insignificant.
4) The profitability coefficient for fixed basket of SM, BU & SD portfolios are found to be significant at 1, 5 & 10 percent respectively but all are negative except SU portfolio. The non-financial basket of SU, SM & SD portfolios are significant at 1 percent and BU & BD are significant at 5 percent and BM is insignificant but values are negative. For variable basket all portfolios are significant at 1 percent but all have negative value.
5) The momentum coefficient for fixed basket of SD & BD portfolios are significant at 1 percent and SU is significant at 5 percent but all are negative

except SU & BU portfolios. For non-financial basket all portfolios are significant at 1 percent except SM portfolio which is significant at 5 percent and BM portfolio is insignificant. For the variable basket all portfolios are significant at 1 percent except SM & BM portfolios which are insignificant.

6) The average R^2 value for fixed baskets is 0.67, non-financial basket is 0.67 and variable basket is 0.73 approximately which means it outperform the CAPM, FFTF & CFFM due to addition of extra variables in the model. However, it didn't perform better than the FFFF model.
7) The regression results show that the intercept term for the double sorted mimicking portfolios for both fixed and variable baskets portfolios are found to be significant at 1 percent except SD & BU portfolios from variable basket which are significant at 5 percent but all portfolios for non-financial basket are found to be insignificant.

5.1.5 Regression Findings of the 25 Portfolios for all the Models

5.1.5.1 CAPM

1) The regression result show that for the fixed basket in the size-value sorted portfolio 12 portfolios out of 25 portfolios are found significant; for size-investment sorted portfolios 9 portfolios out of 25 portfolios are found significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are significant; lastly for size-momentum cross portfolios 14 portfolios out of 25 portfolios are found significant (4.26a-4.29c).
2) For the non-financial basket in the size-value sorted portfolio 14 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 12 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are significant; for size-momentum cross portfolios 16 portfolios out of 25 portfolios are significant.
3) For the variable basket in the size-value sorted portfolio 12 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 13 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; lastly

size-momentum cross portfolios 15 portfolios out of 25 portfolios are significant.

4) For all the baskets as well as size cross portfolios produced low R^2 value which confirm the model's failure to explain the portfolio returns.

5.1.5.2 FFTF

1) The regression result show that for the fixed basket in the size-value sorted portfolio 17 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 14 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 11 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 14 portfolios out of 25 portfolios are significant.
2) For the non-financial basket in the size-value sorted portfolio 19 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 15 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 15 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are significant.
3) For the variable basket in the size-value sorted portfolio 16 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 14 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 13 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 18 portfolios out of 25 portfolios are significant (Table 4.31a-4.34c).
4) The average R^2 values for all the baskets have improved compared to the CAPM which means the model perform better than the CAPM. The variable basket portfolios generate higher R^2 values compared to fixed and non-financial basket.

5.1.5.3 CFFM

1) The regression result show that for the fixed basket in the size-value sorted portfolio 11 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 10 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 12 portfolios out of 25 portfolios are statistically significant; lastly size-momentum cross portfolios 11 portfolios out of 25 portfolios are significant (Table 4.36a to 4.39c).
2) For the non-financial basket in the size-value sorted portfolio only one portfolio out of 25 portfolios is significant; for size-investment sorted portfolios 3 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 2 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 5 portfolios out of 25 portfolios are significant.
3) For the variable basket in the size-value sorted portfolio 2 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 2 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 4 portfolios out of 25 portfolios are significant; for size-momentum cross portfolios 2 portfolios out of 25 portfolios are significant.
4) The average R^2 values for all the baskets have improved compared to the CAPM which means the model perform better than the CAPM but have similar R^2 values with the FFTF. The variable basket portfolios generate higher R^2 values compared to fixed and non-financial basket.

5.1.5.4 FFFF

1) The regression result show that the fixed basket in the size-value sorted portfolio 19 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 18 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 16 portfolios out of 25 portfolios are significant; for size-momentum cross portfolios 16 portfolios out of 25 portfolios are significant (Table 4.41a-4.44c).

2) For the non-financial basket in the size-value sorted portfolio 21 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 19 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 22 portfolios out of 25 portfolios are significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are significant.
3) For the variable basket in the size-value sorted portfolio, 24 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 25 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 25 portfolios out of 25 portfolios are significant; for size-momentum cross portfolios 20 portfolios out of 25 portfolios are significant.
4) The average R^2 values for all the baskets have improved over the CAPM but didn't outperform FFTF and CFFM. The variable basket portfolios generate higher R^2 values compared to fixed and non-financial basket.

5.1.5.5 FFSF

1) The regression result show that the fixed basket in the size-value sorted portfolio 16 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 12 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 10 portfolios out of 25 portfolios are significant; lastly size-momentum cross portfolios 12 portfolios out of 25 portfolios are significant (Table 4.46a-4.49c).
2) For the non-financial basket in the size-value sorted portfolio 1 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 3 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 0 portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 3 portfolios out of 25 portfolios are significant.
3) For the variable basket in the size-value sorted portfolio 7 portfolios out of 25 portfolios are significant; for size-investment sorted portfolios 8 portfolios out of 25 portfolios are significant; for size-profitability cross portfolios 10

portfolios out of 25 portfolios are statistically significant; for size-momentum cross portfolios 6 portfolios out of 25 portfolios are significant.

4) The average R^2 values for all the baskets have improved over the CAPM but didn't outperform FFTF, CFFM and FFFF by big margin. The variable basket portfolios generate higher R^2 values compared to fixed and non-financial basket.

5.1.6 Findings of GRS Test Results for CAPM, FFTF, CFFM, FFFF and FFSF (Fixed Basket, Non-Financial and Variable Basket)

5.1.6.1 Fixed Basket

1) The GRS test result of fixed basket portfolios clearly shows that the GRS p-value for CAPM and FFTF is significant which means that the model fails to explain the returns of the portfolios. The GRS F-Statistics also show the models incapability (Table 4.52a).
2) The CFFM passed the GRS test for all the size-cross portfolios except for the size-momentum cross portfolios.
3) The FFFF failed the GRS test except size-investment cross portfolios which is found to be insignificant with low GRS F-Statistics of 1.33.
4) For the fixed basket out of all the models CFFM and FFSF have performed better which thus support its superiority over other model.

5.1.6.2 Non-Financial Basket

1) For the non-financial basket all the five models failed the GRS test except size-value cross portfolios in CFFM; size-value cross and size-profitability cross portfolios in FFSF.
2) The GRS F-statistics is very high for all the size sorted portfolios in FFTF and all are found significant at 1%. Thus, FFTF failed the GRS test.
3) For the Carhart four factor model GRS F-Statistics is high but not as high as FFTF; it's just above 2 except size-value of 1.53 & size-profitability of 1.59.
4) All the p-value are found to be significant except size-value. The FFFF GRS test result shows very high GRS F-statistics and all the portfolios are found to

be significant. Finally, for the FFSF two portfolios of size-value and size-profitability are found insignificant and other two portfolios are significant at 1 percent. So, the FFTF and FFFF models completely failed the GRS test whereas CFFM also failed except size-value cross portfolio and FFSF pass the GRS test as two portfolios are found to be significant.

5.1.6.3 Variable Basket

1) For the variable basket all the five models failed the GRS test except for size-value cross portfolios in CFFM and FFSFM.
2) The average R^2 values are not very high for all the models which are less than 65 percent but better than fixed basket portfolios.
3) The FFTF GRS F-statistics is very high for all the size sorted portfolios except size-value sorted which has a value of 1.66 and the portfolios are found to be significant at 5 percent. CFFM GRS F-Statistics are high but not as high as FFTF it's just above 2 except for size-value cross portfolios with a value of 1.39.
4) The p-values are found to be significant except for size-value cross portfolios. The FFFF GRS test result show that GRS F-statistics for two portfolios are under 2 but all the portfolios are found to be significant. Lastly, GRS F-statistics value of FFSF test results are found to be more than 2 and significant at 5 percent except for size-value cross portfolios. Thus,x it is clear that all the models have failed the GRS test for the portfolio constructed under variable basket irrespective of size cross sorted portfolios.

5.2 Conclusions

The present study has been carried out to test the major asset pricing models in the Indian equity market by considering both financial and non-financial firms. All the previous studies which tested the models use non-financial firms and no studies use financial as well as non-financial firms together. The descriptive statistics results show that six factor model perform better than the previous models. The predictive power of the model increases with the inclusion of both financial and non-financial companies. The non-financial basket and variable basket outperform the fixed basket. The regression result show us that only CFFM and FFSF are able to the explain risk and return relationship. The same is confirmed by the GRS test. The study as revealed by the regression result found that the performance of fixed basket portfolios is weak whereas non-financial and variable basket portfolios perform relatively better. But on the contrary the GRS-test found that fixed basket outperforms the non-financial and variable basket. For fixed basket Carhart four factor model pass the GRS-test except size-momentum cross portfolios; the size-investment cross portfolios of Fama-French five factor model also pass the GRS-Test; and all the size cross portfolios of Fama-French six factor model past the GRS-Test except size-momentum cross portfolio. But for non-financial basket only size-value of four factor model and size-value and size-profit of six factor model pass the GRS test. For variable basket only size-value of four factor and six factor model pass the GRS test. From the regression results and GRS test results it is clear that fixed basket portfolios perform better than the other two baskets of portfolios. Another important finding is that non-financial basket performs the least among the baskets which mean traditional exclusion of financial firms for testing the models is not good. Inclusion of financial firms in the model brings in better result.

The present study found CAPM completely failed in the Indian stock which is confirmed by the GRS test irrespective of different baskets of portfolios. Thirdly, FFTF failed in the Indian stock market as confirmed by GRS test same as Maiti (2018). The FFFF have failed to perform in the Indian stock market as observed from the GRS test which is similar to the findings of Fama-French (2015) and Maiti (2018). The validity of CFFM and FFSF are found to be mixed in the Indian stock market as the models are found valid for sections of portfolios. For fixed basket except size-momentum, the rest of the portfolios have passed the GRS test; for both the non-financial basket and variable basket, two portfolios i.e., size-value cross and size momentum cross have passed the GRS test. Thus, the overall conclusion of the study is that the Indian stock market is largely influenced by factors of size, value and momentum whereas it is weakly influenced by market, investment and profitability factors.

5.3 Suggestions

The present study has used both financial and non-financial companies for testing all the asset pricing models in the Indian context. Only a few studies were conducted using financial companies while testing the asset pricing models (Ali et al., 2018). It has been observed that using the financial stocks increases the explanatory power of the asset pricing models. So, the academicians and researchers should not ignore the financial stocks while testing the asset pricing models. The participants of the stock market should not totally depend on the asset pricing models for adding a particular stock into their portfolio. There is multiple factor which may affect a stock's performance hence before adding a particular stock into their portfolio there is a need to do careful analysis about that particular stock.

5.4 Scope of Future Research

The present study has been carried out to test the models in Indian context using both financial and non-financial firms. In future, studies may be conducted using different data sets such as weekly data, yearly data of the same stocks or by taking different set of stocks such as sectoral stocks. The variable used in the current study is the similar variable used in the earlier studies conducted by the original theorist however, in future a new or alternative variable such as human capital, leverage, etc., may be applied in the model. The period of study may be also be extended to see the impact of the time period. The study may also be conducted by dividing the entire period into different time sub-period to see the effects of the factors considered in considering the validity of the asset pricing models. Consideration may also be given to include other stock markets of the region or stock market from the developed economy in testing the model.

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ABSTRACT

ANALYSIS OF ASSET PRICING MODELS IN THE INDIAN STOCK MARKET

AN ABSTRACT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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ABSTRACT

1.1 Introduction

In the area of financial management asset valuation or asset pricing have an important place. During the early birth of the discipline, it was concerned with only valuation of individual securities and the market environment. In today's scenario, it covers different types of assets and the broader aspects of asset valuation. The modern financial experts and academicians have developed different methodologies like Capital Asset Pricing Model (CAPM), Fama-French Three Factor Model (FTFM), Carhart Four Factor Model (CFFM), etc. for valuation of different types of assets so that investors can assess the risk involved with those assets. The continuous and rigorous studies of the asset pricing model by many academicians leads to evolution of new model for better understanding of the asset's risk-return relationship. For an investor asset valuation is very important because it will ultimately lead to determine the true profit. Asset pricing is an important part of the financial market literatures and discourse. In the modern financial era various models are developed for valuation of different types of assets that are traded in the stock exchanges which helps investors for better decision making. The concept of asset pricing begins with the introduction of market portfolio model or Markowitz model (Harry Markowitz, 1959) on the basis of which the Capital Asset Pricing Model (CAPM), a single factor model was proposed by William Sharpe (1964), John Linter (1965) and Jan Mossin (1966). After the CAPM many other models were evolved but still CAPM is considered as the pioneer in the area of financial management and widely used and tested around the world (Rabha & Singh, 2021). The second model which is also widely used and tested in different market around the world is Fama-French Three Factor Model (FFTF) (Fama & French, 1993). Thirdly, the Carhart Four Factor Model (Cahart, 1997) was developed which is also an important model but not widely used. The fourth one is the Fama and French Five Factor Model (FFFF) proposed by Fama & French (2015). Lastly, Fama and French Six Factor

Model (Fama & French, 2018) which is the most recent addition in the asset pricing models.

The present study tested the standard Fama and French six factor model in the Indian stock market using NSE Nifty 500 index listed stocks from January 2006 to December 2021. Another importance of the present study is that it used both financial and non-financial stocks by creating three baskets of portfolios i.e., fixed basket, non-financial basket and variable basket. Financial institutions were not part of the Fama and French's series of research on the topic of asset pricing. According to them, “financial enterprises tend to have more financial leverage,” whereas “high leverage” has a different meaning and can be termed financial difficulty for non-financial firms (Fama & French, 1992). When empirically evaluating the three-factor model on different stock markets, most studies took the same strategy and omitted financial stocks.

1.2 Significance of the Study

The capital market is considered as the barometer of a country’s economy. The stock market or the capital market also works as indicator for financial performance of a nation’s economy. In the era of globalization where most of the economies around the world are open to trade freely that’s why economies as well as all capital market are interlinked to each. If anything happens to a part of the world’s economy it will also have an impact in the economies of the other part of the world. In addition, as a result of market incorporation, the capital markets are subject to influence from a variety of risk factors. These risk factors originate from a variety of diverse sources. These risk characteristics are not unique to a single market; rather, they are widespread throughout all markets, including mature capital markets and emerging capital markets. The risk-return connection of high-risk financial assets, such as equity shares, is an important feature that needs to be carefully attended to. The dangers associated with investing in common stocks stem from a variety of diverse sources, including socioeconomic and political considerations.

Asset pricing models are a collection of economic models established by scholars in financial economics. These models are used to understand the risk and return relationship of a financial asset so that an investor can have a better decision while making investment. Asset pricing models have been put to the test in stock markets all around the globe by different financial researchers. When it comes to describing the risk-return relation of equity stocks, empirical evidence further substantiates its performance (Saraf & Kayal, 2023). But the empirical results vary market to market, like most of the models are tested in developed markets and found robustness of the models whereas the same model may not be valid in developing and underdeveloped market indicating a deviation in the markets (Ali et al., 2018). Due to its status as a developing market with a large market capitalization, trading volume, liquidity, and investor engagement, the Indian stock market necessitates complex economic or financial modelling in order to quantify the equity stock's risk-reward relationship.

Indian stocks market is one of the largest stock markets in the world and currently the National Stock Exchange of India (NSE) ranked 8th position in terms of market capitalization as on 31st March 2023. In Asia, the Shanghai Stock Exchange, Japan Exchange Group, Inc, Shenzhen Stock Exchange and Hong Kong Exchange Exchanges and Clearing Limited are top exchanges. Japan and Hong Kong are considered to be developed economy. Even the Chinese economy is also considered to be a developed one. The Indian economy is a developing economy which have huge potential to grow further due to geo-political issues like USA-China trade war, Russia-Ukraine war which gives India as a favorable place for foreign investors for its investment destination. The present study tries to determine which risk factors are most important for predicting stocks returns. The current study also explores whether different baskets of portfolios have impact while explaining the risk-return relationship. The present study has been carried out on the Indian equity market but the findings may have high relevance and can be replicated on the developing and developed stock markets.

1.3 Research Gap

Following an exhaustive evaluation procedure, the present study identifies the following research gaps, each of which will be filled by the current study. No research has been discovered that used this construction method for the portfolio. Modigliani & Miller (1958, 1963) explain in theoretical terms that the risk profile (beta) of the firms can be modified by leverage, but that this does not contradict the essential concept of the asset pricing model. These explanations were published in 1958 and 1963 respectively. As a result, it is preferable that the pricing model be implemented across the board rather than of being limited to the use of non-financial businesses solely. Baek & Bilson (2015) evaluated the size and value components to estimate the cross-section of projected stock return in financial and non-financial enterprises that are traded on the US stock market. Their study was motivated by the Modigliani-Miller theory. According to the findings of the empirical study, size and value premiums are quite widespread in all types of businesses, including financial and non-financial ones. For this reason, the present study has included both financial and nonfinancial organizations, since it is believed that it would not be appropriate in the context of India to exclude companies from the financial sector. The data of both financial and non-financial companies are used in the creation of three different types of portfolios: the fixed basket, the non-financial basket, and the variable basket. No previous research has ever attempted to establish a "basket" to investigate the effects of diverse types of investment portfolios except Ali et al. (2017) who studied the impact of creating baskets but tested only on FFTF. The results of the research will provide a clear image about the viability of constructing numerous portfolios utilizing companies including both the financial and non-financial in nature.

The present study argues that special features are important in the Indian market and compares three different factor construction methodologies. These methodologies may significantly affect the performance of the three-factor model, the four-factor model, the five-factor model, and the six-factor model. In addition, the study argues that special features are important in other markets as well. The terms “fixed basket,” “non-financial basket,” and “variable basket” are used to refer to the three distinct types of stock baskets that can be built. The only stocks that are included in the fixed basket are those that make it through the entirety of the sample period. The non-financial basket and the variable basket, on the other hand, add (or remove) companies from the basket on an annual basis depending on whether or not they meet the sample selection and criteria limitations. The non-financial basket is the only one that contains non-financial equities, while the variable basket contains all of the stocks in the market.

Because the sample sizes employed by the vast majority of investigations are very small, the present study make use of a bigger sample size, specifically 16 years. It is anticipated that a dataset that is relatively larger and includes all liquid stocks will improve the power of the tests and capture variation in stock returns to a greater extent than any previous studies in India. This will be accomplished by avoiding the illiquidity factor, which results in zero returns.

1.4 Research Design

1.4.1 Statement of the Problem

Indian stock market is one of the largest stock markets in the world. Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) are the two largest stock exchanges in the country. BSE has the highest numbers of listed companies around the world with 5322 companies as on 6th February 2023 and 2113 companies are listed in NSE as on 31st December 2022. Understanding the risk and return of the investment are important for any investors to find out the expected rate of returns from its investment. It is important to do research into risk factor as the numbers of individual as well as institutional investors are increasing at rapid scale. Investors, both the individuals as well as the institutional investors, invest their funds into risk factor portfolios and different index providers create factor indices based on the size, value, volatility, dividend and momentum. On the basis of these risk factor indices, exchange traded funds and asset managers have a benchmark to construct a portfolio while investing using risk factors (Bender et al., 2013). The investment strategies which are based on risk factor are used not only for stocks but also for other types of assets like fixed income assets i.e., corporate bonds, which use the characteristics of the firms that issue the bonds and the bond market as a way to create risk factor portfolios (Houweling & van Zundert, 2017).

The investment strategies based on factors originates from the Fama and French three factor model (1992) where they included two more variables in the CAPM (Capital Asset Pricing Model) for explaining the cross-sectional variations in returns. Another researcher Carhart (1997) proposed a model which include another variable in the Fama and French three factor model i.e., momentum. He tested the model in the mutual fund sector of the US equity market and found that with the momentum factor the explanation power of the three-factor model increased. Fama & French (2015) again came up with a new model by adding two more variables i.e., profitability and investment in their previous three factor model. They tested the five factors model in the US and European stock market where they compare the model's effectiveness in both the market. The five-factor approach was first well-received, but it quickly became mired in doubts and controversy. The momentum component is too prevalent and crucial to be disregarded, as Blitz et al. (2018) found out that the FFFF model is not significant enough to explain many other anomalies that are strongly tied to profitability and investment, as the same authors pointed out.

There are so many factors which affect the stock market. The present study is an attempt to analyze the validity of the different factors (market risk, size, value, momentum, profitability and investment) in the Indian stock market on the basis of which all the four models are based. The finding of the study is expected to give a clear picture about the validity of the factors and the model associated with to choose the best factor while constructing the portfolio to get the maximum return at minimal risk.

1.4.2 Objectives

The following are the objectives of the present study undertaken:

1. To examine the impact of different baskets on the portfolio returns.
2. To test the validity of the Capital Asset Pricing Model in the Indian capital market

3. To test validity of the Fama and French three factor model in the Indian capital market
4. To test applicability of the Carhart four factor model in the Indian capital market
5. To test the applicability of the five-factor model in the Indian capital market
6. To examine whether six factor model is a better model compare with its predecessor models in the Indian context

1.4.3 Variables used in the Study

The present study uses the following variables:

- NSE-500 monthly closing share prices to calculate the returns
- Market capitalization (MC) as proxy for size
- Price to book value (P/B) as proxy for value
- Total asset growth (TA) as the proxy for investment.
- Return on Equity (ROE) as the proxy for profitability
- NSE-200 index monthly average return as proxy for market returns (R_m)
- 91 Days T-Bill weekly return data as proxy for risk free interest rate (R_f)

All the data for the NSE 500 index stocks are downloaded from Capitaline database. The market return data and risk-free rate of return i.e., 91 Days T-Bill are downloaded from NSE and RBI official websites.

1.4.4 Research Methodology

1.4.4.1 Data Source

The study is based on secondary data. The data have been collected from the Capitaline Database, NSE website, RBI website, etc. The other information relating to the study have been collected from the official websites of the companies, annual reports, books, journals, newspaper and other printed media, etc.

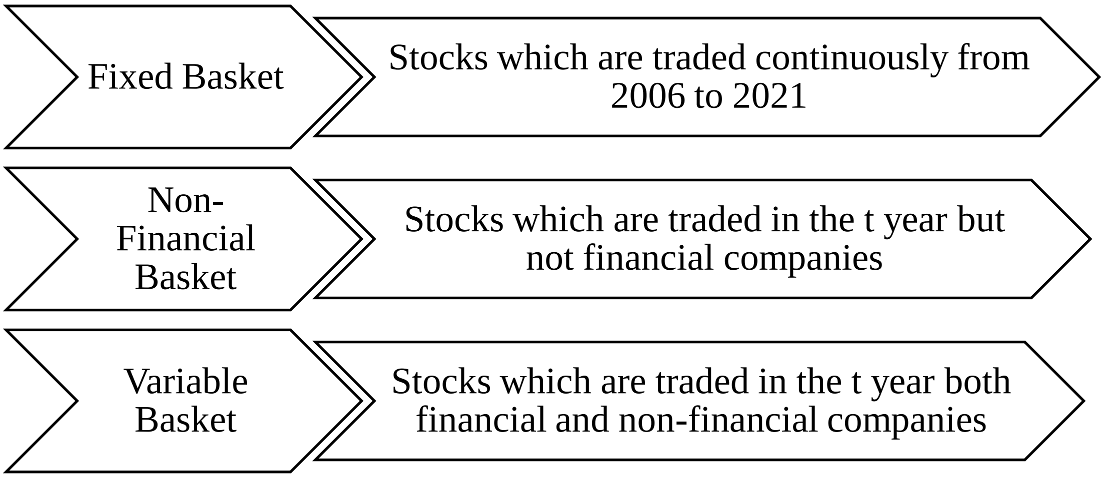
1.4.4.2 Period of the Study

The data covers a period of 16 years starting January 2006 to December 2021.

1.4.4.3 Sample

For the study monthly closing price data of the companies listed in the NSE CNX Nifty 500 index as on 3rd June 2022 have been collected. NSE CNX Nifty 500 index represent about 95 percent of the free float market capitalization of the stocks listed on NSE as on 31st March, 2019.The present study created three baskets of portfolios i.e., fixed basket, non-financial basket and variable basket. The fixed basket contains the stocks which are traded from beginning of the study period till the end i.e., 177 stocks. The non-financial basket includes only those which are not part of financial sector but portfolio vary each year. Lastly, the variable baskets include all the stocks but vary each year. Due to fluctuations in the availability of financial and accounting data, the total number of companies change from year to year in the non-financial and variable basket. The Table 3.1 shows all the stocks that were found to have the data and selected for the present study. The NSE Nifty 200 index is selected as the market proxy for the market return. For the risk-free rate of return the 91 days T-Bill is selected and data have been collected from the RBI database.

Figure 3.1: Baskets of Portfolios



Source: Author's Computation

Table 1.1: Yearly Sample Size from 2006 to 2021

Year	Fixed Basket	Non-Financial	Variable Basket
2006	177	155	180
2007	177	183	210
2008	177	252	292
2009	177	262	304
2010	177	278	319
2011	177	289	332
2012	177	294	338
2013	177	299	342
2014	177	284	325
2015	177	304	347
2016	177	307	350
2017	177	315	361
2018	177	320	375
2019	177	325	380
2020	177	335	390
2021	177	331	386

Source: Author's computation

1.4.4.5 Models

This section outlines the models taken under study.

a) Capital Asset Pricing Model (CAPM)

$$R_{it} - R_{ft} = \alpha_i + \beta_i \left(R_{mt} - R_{ft}\right) + \mathrm{e}_{it}$$

Where,

R_{it}= Return of Stock *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

e_{it}= Error term

b) Fama-French Three Factor Model (FFTF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + l_i LMH_t + \mathrm{e}_{it}$$

Where,

R_{it}= Return of Stock *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

e_{it} = Error term

c) Carhart Four Factor Model (CFFM)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + u_i UMD_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period 't'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

UMD_t= Momentum Factor

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

u_i = Coefficient of Momentum Risk Premium

e_{it} = Error term

d) Fama-French Five Factor Model (FFFF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period 't'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta coefficient for market premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

RMW_t= Operating Profitability Risk Premium

CMA_t= Investment Growth Risk Premium

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

c_i = Coefficient of Investment Risk Premium

r_i = Coefficient of Profitability Risk Premium

e_{it} = Error term

e) Fama-French Six Factor Model (FFSF)

$$R_{it} - R_{ft} = \alpha_i + \beta_i(R_{mt} - R_{ft}) + s_i SMB_t + l_i LMH_t + r_i RMW_t + c_i CMA_t + u_i UMD_t + e_{it}$$

Where,

R_{it}= Return of Portfolio *'i'* for time period '*t*'

R_{ft}= Risk-free Rate of Return i.e., 91 Days T-Bill

α_i= Alpha/Intercept

β_i= Beta Coefficient for Market Premium

R_{mt}= Return of Benchmark Market Index

SMB_t= Size Risk Premium

LMH_t= Value Risk Premium

RMW_t= Operating Profitability Risk Premium

CMA_t= Investment Growth Risk Premium

UMD_t= Momentum Factor

s_i = Coefficient of Size Risk Premium

l_i = Coefficient of Value Risk Premium

c_i = Coefficient of Investment Risk Premium

r_i = Coefficient of Profitability Risk Premium

u_i = Coefficient of Momentum Risk Premium

e_{it} = Error term

Figure 3.2: Models Flow Chart

Factors / Models	$R_m - R_f$	**SMB (Size)**	**LMH (Value)**	**CMA (Investment)**	**RMW (Profitability)**	**UMD (Momentum)**
CAPM	✓					
FFTF	✓	✓	✓			
CFFM	✓	✓	✓			✓
FFFF	✓	✓	✓	✓	✓	
FFSF	✓	✓	✓	✓	✓	✓

Source: Author's Computation

1.4.4.6 Construction of Variables

The first variable of the study is monthly stocks returns variable, R_{it} for every constituent. The monthly adjusted closing price are collected for calculating monthly stock returns. The equation for calculating the monthly stock returns is given in Table 3.2.

The second variable of the study is market capitalization, MC_{it} which are calculated using market data by taking the product of monthly closing stock price and the number of outstanding shares for each constituent 'i' at the end of every month 't'. The market capitalization variable is used as the proxy for the size of the stock/company and are used to construct size-based portfolios. The equation for calculating the market capitalization variable is mentioned in the Table 3.2.

Third variable is the Price-to-Book Value variable, P/B_{it}. The P/B_{it} for the stocks are obtained by dividing the market capitalization $MC_{p,t}$ variable with book value of equity (BE_{it}). The P/B_{it} ratio represents the value risk factor and companies with lower $P/B_{i,t}$ ratio are considered to be undervalued by the market. On the other hand, companies with a relatively high P/B_{it} ratio are considered to be overvalued by the market. The equitation for calculating the P/B_{it} variable is mentioned in the Table 3.2.

The next variable is profitability, P_{it} Return on equity (ROE) is used as the proxy for profitability. The profitability, P_{it} variable is constructed dividing the net income by Shareholder's equity. In this study the variable taken is different from the Fama & French (2015) where they used OP (Operating Profit). They constructed the operating profit variable by taking the annual revenues minus the cost of goods sold, minus general, administrative and selling expenses, minus interest expense and then divide the resulting operating profits by the book value of equity (BE_{it}). The equation for creating the P_{it} variable is given in Table 3.2.

The fifth variable is investment, INV_{it} and this variable is calculated by looking at the change in the value of the total assets held by the company. For calculating the change in the value of the assets we have divided the difference between the total assets of the company in the previous financial year i.e., *t-1* and the total assets of the company in the current financial year i.e., *t* by the total assets of the company in the previous financial year *t-1*. The outcome of the variable shows us the change in the value of the total assets held by the company in relation to the total value of the company's assets. The equation for investment variable is given at Table 3.2.

The last variable of the study is momentum, MOM_{it}. This particular variable is calculated by taking the moving average of returns for the previous financial years i.e., twelve months. The stocks return of the twelve months are equally weighted which are considered to show a trend in recent returns in accordance with the model of Carhart (1997) that shows that on average recent returns with a positive or negative sign are followed by stocks return of the same sign in the short-term future. The equation for calculating the momentum variable is given at Table 3.2.

Table 3.2: Construction of Variables

Variables	Equations
Stocks Return, R_{it}	$R_{it} = \frac{P_{it}-P_{t-1}}{P_{t-1}} *100$
Market Capitalization MC_{it}	$MC_{it} = P_{it} * SO_{it}$
Price-to-Book Value P/B_{it}	$P/B_{it} = MC_{pt}/BE_{pt}$
Profitability P_{it}	$P_{it} = Net\ Income_{it}/Shareholder's\ Equity_{it}$
Investment INV_{it}	$INV_{it} = (TA_{it} - TA_{it-1})/TA_{it-1}$
Momentum MOM_{it}	$MOM_{it} = \sum_{j=1}^{12} R_{it-j} /12$

Source: Author's computation

1.4.4.7 Portfolio Construction

The study uses Fama & French (1993) methodology to construct portfolios. Both the single and double sorting techniques are used to construct the portfolios as explained in the following paragraphs and are presented in the Table 3.3.

1.4.4.7.1 Single Sorting

In the month of January year (t), ranking is done for the sample stocks based on MC and 5 equally weighted portfolios are formed. Portfolio one (M_1) is the small MC portfolio as the bottom 20% of the sample securities are there in M_1 while portfolio five (M_5) is the big MC portfolio as it contains of top 20% of the sample stocks. Next, in the month of January year (t+1), ranking done for the sample stocks based on P/B ratio and 5 equally weighted portfolios are constructed. Portfolio one (P_1) is the portfolio that has low P/B stocks while portfolio five is the (P_5) portfolio that comprises of stocks which are of high P/B stocks.

1.4.4.7.2 Double Sorting

Then, 25 portfolios (MP_{11} to MP_{55}) are constructed from the intersection of 5 MC based portfolios and 5 P/B based portfolios. MP_{11}consists of the small MC stocks and low value P/B stocks whereas MP_{55} consists of big MC stocks and high P/B stocks. Then all portfolios mean excess returns are calculated. Next revision of portfolio formation is done in year (t+1) and the process of portfolio revision continues till the end year.

1.4.4.7.3 Mimicking Portfolios Single Sorting

In the month of January year (t), ranking done for the sample stocks based on MC and 2 equally weighted portfolios are formed. Portfolio one Small(S) is the small MC portfolio as the bottom 50% of the sample securities are there in Small while portfolio Big(B) is the big MC portfolio as it contains of top 50% of the sample stocks. Next, in the month of January year (t), ranking done for the sample stocks based on P/B ratio and 3 equally weighted portfolios are constructed. Portfolio Low(L) is the portfolio that has low value stocks while portfolio High(H) is the portfolio that comprises of stocks which are of high P/B stocks and rest grouped in the Medium(M).

1.4.4.7.4 Mimicking Portfolios Double Sorting

Then, 6 portfolios (S/L, S/M, S/H, B/L, B/M and B/H) are constructed from the intersection of 2 MC based portfolios and 3 P/B ratio-based portfolios. S/L consists of the small MC stocks and low P/B stocks whereas B/H consists of big MC stocks and high P/B stocks. Then mean excess returns of all the portfolios are calculated. Next revision of portfolio formation is done in year (t+1) and the process of portfolio revision continues till the end year.

1.5 Limitations of the Study

The fact that this investigation was only carried out within the Indian context is one of the limitations of the current work. As a result of this, the conclusions and findings may not be generalized to other parts of the world. In addition, the potential applications of the research in the future can be broad enough to be applicable to other emerging and developed markets. A limitation of the present work is that the present study is undertaken only in the Indian context and only NSE Nifty 500 index stocks are covered in the study. Hence, the results and findings may not be generalized.

1.6 Structure of the Thesis

The thesis is divided into 5 chapters as summarized below:

Chapter 1: Introduction: The first chapter gives an introduction to the study which includes overview of the models as well as the significance of the study.

Chapter 2: Literature Review: The literature review of the study is discussed in further detail in chapter two. It provides an in-depth discussion of the significant studies that have been done on both the global stock market and the Indian stock market. This section presents sufficient rationale to motivate the current study, and it also extracts the research topic from the previous section.

Chapter 3: Methodology: In Chapter the detail methodology adopted for the study undertaken has been given. The variables used; the model used are explained in the chapter.

Chapter 4: Data Analysis and Discussion: The analysis of the study is presented and discussed in chapter 4 under the heading empirical results and discussion. The analysis is done for all the three baskets of portfolios. The result of the analysis is presented for all the three baskets for all the different asset pricing models viz. CAPM, FFTM, CFFM, FFFM, FFSFM.

Chapter 5: Conclusions and Suggestions: In this chapter the summary of the findings of the study are given. Suggestions are also given in the chapter.

1.7 Findings and Conclusions

It is observed that for the all the basket the investment decision based on momentum of the company yield higher average stock returns than investment decision based on other factors. The portfolios constructed using size and investment as a criterion produced negative returns. The portfolios constructed using Beta and profitability as a criterion produced positive returns but not as high as momentum.

The present study has been carried out to test the major asset pricing models in the Indian equity market by considering both financial and non-financial firms. All the previous studies which tested the models use non-financial firms and no studies use financial as well as non-financial firms. The descriptive statistics results show that six factor model perform better than the previous models. The predictive power of the model increases with the inclusion of both financial and non-financial companies. The non-financial basket and variable basket outperform the fixed basket. The regression result show us that only CFFM and FFSF are able to the explain risk and return relationship. The same is confirmed by the GRS test. The study as revealed by the regression result found that the performance of fixed basket portfolios is weak whereas non-financial and variable basket portfolios perform relatively better. But on the contrary the GRS-test found that fixed basket outperforms the non-financial and variable basket. For fixed basket Carhart four factor model pass the GRS-test except size-momentum cross portfolios; the size-investment cross portfolios of Fama-French five factor model also pass the GRS-Test; and all the size cross portfolios of Fama-French six factor model past the GRS-Test except size-momentum cross portfolio. But for non-financial basket only size-value of four factor model and size-value and size-profit of six factor model pass the GRS test. For variable basket only size-value of four factor and six factor model pass the GRS test. From the regression results and GRS test results it is clear that fixed basket portfolios perform better than the other two baskets of portfolios. Another important finding is that non-financial basket performs the least among the baskets which mean traditional exclusion of financial firms for testing the models is not good. Inclusion of financial firms in the model brings in better result.

The present study found CAPM completely failed in the Indian stock which is confirmed by the GRS test irrespective of different baskets of portfolios. Thirdly, FFTF failed in the Indian stock market as confirmed by GRS test same as Maiti (2018). The FFFF have failed to perform in the Indian stock market as observed from the GRS test which is similar to the findings of Fama-French (2015) and Maiti (2018). The validity of CFFM and FFSF are found to be mixed in the Indian stock market as the models are found valid for sections of portfolios. For fixed basket except size-momentum, the rest of the portfolios have passed the GRS test; for both the non-financial basket and variable basket, two portfolios i.e., size-value cross and size momentum cross have passed the GRS test. Thus, the overall conclusion of the study is that the Indian stock market is largely influenced by factors of size, value and momentum whereas it is weakly influenced by market, investment and profitability factors.

1.8 Suggestions

The present study has used both financial and non-financial companies for testing all the asset pricing models in the Indian context. Only a few studies were conducted using financial companies while testing the asset pricing models (Ali et al., 2018). It has been observed that using the financial stocks increases the explanatory power of the asset pricing models. So, the academicians and researchers should not ignore the financial stocks while testing the asset pricing models. The participants of the stock market should not totally depend on the asset pricing models for adding a particular stock into their portfolio. There is multiple factor which may affect a stock's performance hence before adding a particular stock into their portfolio there is a need to do careful analysis about that particular stock.

1.9 Scope of Future Research

The present study has been carried out to test the models in Indian context using both financial and non-financial firms. In future studies may be conducted using different data sets such as weekly data, yearly data of the same stocks or by taking different set of stocks such as sectoral stocks. The variable used in the current study is the similar variable used in the earlier studies conducted by the original theorist however, in future a new or alternative variable such as human capital, leverage, etc., may be applied in the model. The period of study may be also be extended to see the impact of the time period. The study may also be conducted by dividing the entire period into different time sub-period to see the effects of the factors considered in considering the validity of the asset pricing models.

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