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Testing the Three Factor Asset Pricing Model in Indian Capital Markets

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ABSTRACT

The present study empirically examines the Fama – French three factor model of stock returns in Indian stock market. We found the effects of size and value factors in Indian markets. We analysed the relationship between the factors and portfolio returns which yield mixed output. The empirical results reflect, in the context of Indian stock market big market cap stocks don't have relevant impact on portfolio returns.

Keywords: Three Factor model, Size effect, value effects.

1. INTRODUCTION

Stock market anomalies are of great interest to investment analysts and portfolio managers. Fama and French (1996) observed that the important prediction of the CAPM, i.e. the linear cross-sectional relationship between mean excess returns and exposures to the market factor, is violated for the US stock market. They introduced two new factors, a size-based factor and a book-to-market based factor, basically known as “value” factor, explain a significant part of the cross-sectional dispersion in mean excess returns. In the case of stocks being priced rationally, then systematic differences in average returns should be due to differences in risk. Thus, obtained rational pricing, the market, size and value exposures must pervasive risk factors in returns. They found that stock returns are in relation with market, size and value factors. They also admit that their findings are weak, mainly when it comes to ‘value factor’.

In the present research we conducted the similar analysis in Indian capital market to know whether the F&F model factors hold good in Indian stock markets. The paper next discusses the literature review.

Section 3 gives the data and its sources, methodology of analysing the data. Section 4 provides results, and Section 5 provides conclusion.

2. LITERATURE REVIEW

This section provides the details of the previous studies related to three factor Fama French model. Taneja (2010) tested the validity of CAPM model and Fama & French Three Factor Model in Indian market and compared the results and to assess the predictive power of both the models in understanding the cross-sectional stock markets in India. Researcher has taken 187 companies from June 2004 to June 2009 and used standard multivariate Regression technique. Results has proved that F&F three factor model better captures common variants in returns than CAPM.

Conor and Sehgal (2001) tried implementing Fama and French three factor model in Indian markets as they have found that CAPM model is violated for the U.S stock. For this purpose, they have considered the data of month-end adjusted share prices of 364 companies from June 1989 to March 1999. By using multivariate regression system analysis, they have proved that F&F model applies to Indian Market.

Al-Mwalla and Karasneh (2011) tested the ability of Fama-French three factor model to explain the variations in stocks rate of return over a period from June 1999 to June 2010 in Amman stock market. Methodology used for the research is a two-stage procedure mimicking the models used by F&F. They have found a strong size and strong positive value effects in ASE.

Mehta and Chander (2010) shed light on the application of the Fama and French three factor model in Indian capital market and tried to explain its superiority over CAPM model. For empirical tests, they have used BSE 500 index from Feb 1999 to December 2007 of a total of 219 companies. To test the application, they used Kruskal Wallis H test, *t*-test and one-way ANOVA (F-test) and concluded that when studied individually Market factor is a better indicator to explain the return behaviour of portfolios.

Jain (2013) has tried to study the financial performance of Indian stocks listed on the benchmark Index-Sensex by implementing the Fama and French three factor model to 30 well-established and financially sound companies listed in BSE Ltd. for a period of May 2008 to May 2013. In research, he has used the linear regressions to find out the sector wise performance.

Santhi and Gurunathan (2014) thought out of the box and tried applying the Fama and French three factor model to Indian Mutual Fund Market. They have used 32 growth-oriented open-ended tax savings Mutual Fund scheme for a period of February 1993-December 2009. By using F&F three factor model they concluded that not all the Mutual fund schemes are safe and secure and there exists a difference between Expected return and Actual return of mutual funds.

Yan et. al., (2015) empirically tested the stock returns in the Asia-Pacific region by using Fama& French three factor model for analysis. The sample period used for the data is July 1990 to March 2015. The LR test (Likelihood ratio test) and the KS test (Kolmogorov-Smirnov test) are used for model diagnostics and used AIC (Akaike Information Criterion) for model comparison. Results suggested that with the EGARCH-type volatility and non-normal error term, the F&F three factor model is still alive in Asia-Pacific region and Surprisingly FF-SSAEPD-EGARCH model has a better-in-sample fit than F&F.

Kumar and Rao (2014) tried to find out whether Fear and Inertia subsumed in F&F three factor model. They investigated the role of size, distress, inertia, fear and market return on fund managers styled

portfolio of NIFTY stocks using multi factor asset pricing models with daily aggregations using database from 2009 to 2013. They found that growth stocks are preferred investment choice.

Acharya and Pedersen (2003) studied equilibrium asset pricing with liquidity risk for a period ranging from July 1962-DECEMBER 1999 for 25 size portfolios. Studies suggested that securities required return depends on its expected illiquidity and on the covariances of its own return and illiquidity with market return and market illiquidity.

Cochrane (2002) done a cross-sectional test of an investment-based asset pricing model for stock returns. He found that this model performs as well as the CAPM model and the Chen, Roll, and Ross factor model, and it performed better than simple-consumption based model.

Chen (1983) have tried to estimate the parameters of Ross's Arbitrage Pricing Theory (APT) by using daily return data during the 1963-1978 period. The method used is that Researcher compared the evidence on the APT and the CAPM and the results suggested that APT performs well.

Pastor and Stambaugh (2001) investigated whether market wide liquidity is important asset pricing. For this purpose, they have considered data over 34-year period, stocks with high sensitivity and adjusted to exposures and results has suggested that expected stock returns are related cross-sectional to the sensitivities of returns to fluctuations in aggregate liquidity.

Fama and French (1995) studied the behaviour of stock prices in relation to size and Book to market equity. They worked on NYSE, AMEX and NASDAQ stock markets using F&F model on the accounting data and stock prices from 1963 to 1992. They found that size and BE/ME are related to profitability as well as these factors in earnings also help in explaining those in returns.

Banz (1980) examined the empirical relationship between return and the total market value of stocks. They worked on NYSE stocks using generalized asset pricing model i.e., CAPM along with one additional factor on stock prices from 1936 to 1975. They found CAPM is mis-specified and the value factor influences returns.

Odera and Muthoni (2013) investigated the claim of the Fama and French three factor model to be a "RISK" model of stock price formation that is consistent with efficient market pricing. The study was performed at the NSE for the period spanning from 2008 -2012. Multivariate regression analysis was applied on the portfolio's created and found that Fama and French three- Factor model has a limited potential to explain variations on returns.

Gaunt (2004) study adds to the Australian literature on the effect of F&F factors and ability of this factor model to account these effects and to improve the ability of CAPM. They worked on ASX (Australian Securities Exchange) stocks using different statistical analysis of portfolios for the period spanning from 1981-2000. They found that three factor model provides significantly improved explanatory power over the CAPM, and BM factor plays a significant role in asset pricing.

Aldaatmi and Abbod (2015) applied CAPM and F&F three factor model in an emerging market with an Islamic Culture. They worked on Saudi Arabia Market using different statistical techniques on the portfolios for the period spanning from 2007-2011. They found that F&F model has an unmistakable evidence for the market return and better explanatory power than CAPM.

Bundoo (2008) examined empirical evidence of size and value factors in emerging African stock markets. They worked on Stock Exchange of Mauritius using augmented F&F three factor model for the period spanning from 1998 to 2004. They found that augmented F&F model shows that time variation in risk is priced, but the size and B/M equity are significant.

Fama and French (1998) made a study to find which stocks will give more returns i.e., value stocks or growth stocks. They worked on twelve major EAFE country stocks using MSCI accounting ratios for the period spanning from 1974 to 1994. They followed F&F three factor model and CAPM to analyze the data. They found that value stocks tend to have higher returns than growth stocks in markets around the world.

Fama and French (March 1996) examined the effect of anomalies like size, earnings per price, cash flows per price, book to market equity on stock returns which were not mentioned in three factor model and CAPM. They worked on NYSE, AMEX and NASDAQ stock exchanges using the descriptive statistics and F&F model for the period spanning from 1963 to 1993. They found that three factor risk return relation is a good model for the returns on size and book to market equity.

Shah et. al., (2011) conducted a research on CAPM and F&F model to find out which one is used for simplicity and which one is used for accuracy. The objective is to test the predictive power of both these models in accurately estimating the expected returns. This paper worked on monthly data of KSE stocks selected from different sectors over the period of January 2003 to December 2007. They were made in to five portfolios and time series regressions were conducted on it. They found that asset pricing models such as CAPM and F&F models give inconsistent results across markets, data sets and time horizons. CAPM still maintain its glory due to its simplicity and convenience which is allowing practitioners want CAPM to be alive.

Cakici et. al., (2013) examined value and momentum effects on stock returns. They worked on 18 emerging stock markets using F&F three factor model on portfolios created using size, book to market and momentum for the period spanning from January 1990 to December 2011. They found that with the developed markets, value and momentums are negatively correlated and these factors perform much better than the U.S. factors.

Davis et. al., (2000) studied relationship between value factor and average returns in U.S stocks. They worked on U.S stock exchanges using F&F three factor model portfolios for the period spanning from 1929 to 1997. They found that all the three factors in model explains the value premium better than the hypothesis that the book-to-market characteristic has been compensated irrespective of risk loadings.

Griffin (2015) examined whether country-specific or global versions of Fama& French three-factor model better explain time - series variation in international stock returns. They worked on domestic and foreign country stocks using world factors and other external factors. They found that application of the three-factor model, such as the cost of capital calculations and performance evaluations were best performed on a country-specific basis.

Kothari et. al., (1995) examined the cross-section of expected returns revealing economic and statistical significant compensation for risk. They worked on COMPUSTAT database using statistical techniques for the period spanning from 1927 to 1990. They found that relation between book-to-market equity and returns is weaker and less consistent than that in Fama and French model.

Wang and Guo (2014) this study aims to verify that the Fama-French three factor model capture more cross-sectional variations in returns for the Chinese Stock Market than the CAPM. The objective of this paper to examine whether F&F model leaves anything significant which can be explained by principal component analysis. They work on the price movement of A-share stocks which are listed on the CSI300 index, using time series regression and after the construction of F&F model portfolio and comparing it with CAPM performance. They deeply explained return matrix and PCA for the period of 10 years. The study found that PCA performance better than F&F model.

Boehme et. al., (2005) study examines the cross-sectional effects of the idiosyncratic risk and dispersion of belief while controlling for short-sale constraints. They worked on New York stock exchange and Nasdaq firms using SIGMA market model regression and DISPERSION.

Firozjaee & Jelodar (2010) has done an investigation on most controversy topic that has emerged in the academic literature over the empirical performance of CAPM and BETA. The researcher tried to investigate the explanatory power of various factors regarding the cross-sectional expected stock returns in Tehran stock exchange. For the examination of stocks, they have gathered data from a period ranging from 1999-2009. Standard Multivariate Regression Framework methodology is used to find out that F&F Three factor model has a well defined explanatory power than the CAPM.

Barillas & Shankem (2015) has tried to explain the various Asset pricing models, and a made a comparison between all the models. In the research, they found out that the recent models of Hou, Xue, & Zang and F&F three-factor model were dominated by five and six factor models. For research, they have used data from 1972-2013.

Clarke et. al., (2014) described the not-so-well-known Three-and-one-half Factor model. For analysis purpose, they have used 600 monthly cross-sectional regressions from January 1963 to December 2012. In this paper, they gave an understanding of the distinction between the Market and Beta factor in this model which helps in avoiding the misperceptions about the sources of portfolio performance.

Bartholdy & Peare (2003) has tried to compare the performance of the CAPM model and Fama and French for individual stocks. Daily adjusted prices were collected from the CRSP tapes from 1970 to 1996. In this paper, they have suggested to bring into use more professional models to estimate beta rather than these models.

Sehgal et. al., (2014) have tested prominent equity market anomalies for six emerging markets. Results showed that the four-factor liquidity augmented FFM is a better descriptor of asset pricing compared to CAPM and FFM only in the Indian context. F&F model is seemed to be an appropriate performance benchmark for other sample emerging markets. Data has taken for the period of Jan 1994-Dec 2011.

Bornholt (2007) this research paper proposes a substitute technique for estimating expected return based on asset pricing theory. Results have shown that CAPM and Fama & French three-factor model has failed in the test but the Reward Beta approach consistently outperformed both these models and has qualified in the test. These tests are carried on the data ranging from July 1963–December 1990.

Connor and Sehgal (2001) has done research on Indian stock market in relation to the F&F Three-factor model. They couldn't find any correlation between the common risk factors in earnings and those in stock returns. In their Research paper, they have deduced that cross-sectional mean returns are explained by

exposure to 3 factors (size, pervasive market and the book-to-market) and not by the market factor alone. The Financial Data used for calculating is from the year 1989 to 1998 and data source is CMIE Provis. The share price data combined with accounting information has been used to construct measures of value and size employed in the study. They have constructed six portfolios namely B/L, B/M, B/H, S/L, S/M, S/H from the intersection of the two sizes and three BE/ME groups [S-small, B-big, L-low, H-high, BE/ME- Book equity to market equity].

Sehgal and Garg (2016) studied the relationship between cross-sectional volatility and stock returns in the context of BRICKS. Data was collected from Bloomberg terminal for different stocks and sample periods are not same for different markets. They have selected actively traded stocks which account for large market capitalization. They found, based on semi-parametric approach, a negative relationship exists between cross-sectional volatility and stock returns. They used SOVL, ROVL & VIX to measure systematic volatility (SV). They further used CAPM and F&F model to measure returns and unsystematic volatility (UV). According to them the high SV portfolios shows low returns and high UV portfolios shows high returns. They also say that F&F three factor model is better than CAPM measures returns. The Overall study contributes to portfolio management of emerging markets.

Fu (2009) in his research showed the relation between idiosyncratic risk and stock returns. He says idiosyncratic volatility is time varying and therefore cannot be used to predict the risk in correlation with return. Data has been collected from the NYSE, the AMX and the NASDAQ during the time from July 1963 to December 2006. He used CAPM and F&F model in data analysis. To calculate idiosyncratic volatility, he used exponential generalized autoregressive conditional heteroskedasticity (EGARCH) model. Beta, B/M value and other factors of F&F are the variables used in his research. Results proved that there exists a positive relation between idiosyncratic volatility and stock returns.

Sehgal and Garg (2016) explored that the cross-sectional moments help in predicting aggregate market returns and provided information for portfolio formation. They have used CSV (cross-sectional variance) and CSK (cross-sectional kurtosis) in explaining market returns at monthly and daily frequencies. A sample of 7 countries is taken for research from 1993 to 2011. It was observed that the relationship between expected return and cross-sectional moments is stronger for daily data. Cross-sectional variance of stock returns was used as a measure of the idiosyncratic risk. The study uses the daily adjusted share prices. The daily prices were converted to percentage returns for further analysis.

The table below provides a small summary of the research papers that have used Fama French three factor model.

3. DATA AND METHODOLOGY

Indian stock markets are emerging gradually in the recent years. About 8000 companies are listed on Indian stock market. The two major Indian stock exchanges are Bombay Stock Exchange (BSE) and national Stock Exchange (NSE). The top listed companies in these two exchanges contribute for major trading activity in Indian economy.

In the present research work we have collected the data for the companies, which are listed in the NSE. The data collected for doing this research work includes month end adjusted close prices of shares of 198

<i>Authors</i>	<i>Year of Publishing</i>	<i>Sample Data</i>	<i>Results</i>	<i>Markets Studied</i>
Rolf W. Banz	1980	Stock prices ranging from 1936 to 1975	CAPM is miss-specified & value factor influences return	NYSE
Nia-Fu-Chen	1983	Analysis is done for data during the 1963-1978 period	Compared between APT and CAPM and proved that APT is better	Chicago Markets
Eugene F. Fama & Kenneth R. French	1995	Stock prices ranging from 1963 to 1975	Using F&F it was found that BE/ME are related to profitability	NYSE, AMEX & NASDAQ
S. P. Kothari, Jay shanken & Richard G. Sloan	1995	Worked on data ranging from 1927 to 1990	Relation between Book-to-market equity returns is weaker than that in F&F model	
Eugene F. Fama & Kenneth R. French	1996	Data ranging from 1963 to 1993	F&F model is good to predict Size and book to market equity	NYSE, AMEX & NASDAQ
Eugene F. Fama & Kenneth R. French	1998	Data ranging from 1974 to 1994	Value stocks tend to have higher returns than growth stocks	EAFE
James L. Davis,	2000	Data ranging from 1929 to 1997	Found that all the three factors in model explains the value premium better than the hypothesis	U.S stock exchange
Gregory Conor & Sanjay Sehgal	2001	364 company's data ranging from June 1989 to March 1999	F&F model got violated in US markets so they tried it in Indian market and found it applicable.	Indian Market
Lubos Pastor & Robert F. Stambaugh	2001	34-year period stocks ranging from July 1962 through December 1999	Expected stock returns are related cross-sectional to the sensitivities of returns	NYSE & AMEX
John H. Cochrane	2002	10 portfolios of NYSE stocks.	Found that CAPM & other models performed well than simple-consumption model	New York Market
Viral V. Acharya & Lasse Heje Pedersen	2003	Data is from July 1962-December 1999 for 25 size portfolios	Results show that securities required return depends on its expected illiquidity	Indian Market
Clive Gaunt	2004	Data is ranging from 1981-2000	F&F model is improved over CAPM model	ASX
Rodney D Boehmw, Bartley R. Daniels, Praveen Kumar & Sorin M. Sorescu	2005	-----	Examines the Cross-sectional effects of Idiosyncratic risk.	New York Stock Exchange
Sunil K bundoo	2008	Data ranging from 1998 to 2004	F&F model Shows that time variation in risk is priced	African Stock Markets
Yash Pal Taneja	2010	187 company's data spanning from June 2004 to June 2009	Assessed the predictive power of CAPM and F&F 3 factor model and found F&F to be efficient.	Indian Market
Kiran Mehta & Ramesh Chander	2010	219 company's data spanning from February 1999 to December 2007	Concluded that F&F is superior to CAPM and market factor is a better indicator	Indian Market

(Contd...)

<i>Authors</i>	<i>Year of Publishing</i>	<i>Sample Data</i>	<i>Results</i>	<i>Markets Studied</i>
Majid Rahmani Firozjaee & Zeinab Salmani Jelodar	2010	Data ranging from 1999-2009	F&F three factor model has strong explanatory power than C.APM	Tehren Stock Exchange
Mona Al-Mwalla & Mahmoud Karasneh	2011	Data collected for a period ranging from June 1999 to June 2010	Results showed a strong size and positive value effects in ASE market	Amman Market
Attaullah shah, Fahad Abdullah, Tauseef Khan & Safi ullah khan	2011	Data ranging from January 2003-December 2007	CAPM and F&F models give inconsistent results across markets, data sets and time horizons	KSE
Sahil Jain	2013	30 companies listed in BSE for a period of May 2008 to May 2013	Implemented F&F model to individual sectors to know their performances	Indian Market
Odera & Josephine Muthoni	2013	Data spanning from 2008-2012	F&F model has a limited potential to explain variations in return	NYSE
Nuret Cakici, Frank j. Fabozzi & Sinam tan	2013	Data ranging from January 1990 to December 2011	In developed markets Value & Momentum are negatively correlated	Developing Markets
N. S. Santhi & Balanaga gurunathan	2014	32 Mutual fund schemes for a period ranging from February 1993-December 2009	By using F&F it was concluded that not all mutual funds are safe.	Indian Mutual Fund Market
Santhosh Kumar & K. S. S. S. Narayana rao	2014	Data is collected for the period ranging from 2009-2013	Tried to find out the Fear and Inertia factors in F&F and gave a preferred investment choice	Indian Market
Kaiwen Wang & Jingjing Guo	2014	Period of 10 years	PCA performances better than the FF model	Chinese Stock Market
Roger Clarke, Harindra de silva, & Steven Thorley	2014	Data for a span of January 1963 to December 2012 of 600 monthly cross-sectional regressions	Distinction between Market and beta factor were explained	
Xingyu yan, Yanjia yang & Liuling li	2015	Sample of data is from July 1990 to March 2015	It was found that F&F model is still alive in Asia-pacific region despite of the existence of superior models	Asia-Pacific Region
Abdulaziz Aldaatmi & Maysamabbod	2015	Data ranging from 1998 to 2004	F&F has better explanatory power CAPM	Saudi Arabia Market
Jhon M. Griffin	2015	Worked on Domestic & Foreign Country stocks	Application of Three-factor model are best performed on a country specific basis	Domestic & Foreign Markets
Francisco Barillas & Jay Shanken	2015	Data for a span of 1972-2013	Recent pricing models were dominated by the Six and Five factors	

companies for the period spanning from January 1997 to January 2017. The data has missing information for some companies as they entered the exchange on a date later than the initial date of study period. These companies form part of the NSE top 200 companies list. NSE is a stock exchange based on free float market capitalisation method in India. The sample companies account for major portion of major trading volume and average market capitalisation for the Indian Equity market.

The adjusted month end share price data has been obtained from CMIE's PROWESSIQ. It is a powerful internet based application for querying CMIE's database on performances of listed and unlisted companies. The share price data that we have collected is adjusted for capitalisation changes such as bonus, rights issues, stock splits and dividends. This adjusted stock price data has been converted to returns data using the arithmetic formula using MS excel.

Risk free data is required for calculations in CAPM and F&F model. So, yield on month end auction of 91-day Treasury bills has been taken as a risk-free proxy for our research. This data has been collected from the Reserve Bank of India website. Data spans from April 1998 to January 2017.

Other Company Attributes

The data from the companies other than stock prices i.e., accounting information is also collected during the periods from 1997 to 2017. Accounting information includes price to book ratio, number of shares outstanding and book value per share. Apart from this information, market capitalisation data has also been collected from the CIME's PROWESSIQ. This data is also collected for 198 companies for a period of 20 years.

This accounting data and the adjusted stock price returns data has been combined to create the portfolios which are used in the later section of this research.

4. TESTING METHODOLOGY

Portfolio Creation Based on Size and Value Factors

The market capitalisation data of 198 companies has been taken for twenty years directly from the prowest software. Average of all the twenty years data is taken. The top 50% of the companies based on the average market capitalisation data are grouped as big (B) and remaining 50% are grouped as small (S). These will help us to measure the size factor.

Book equity-to-market equity values have been obtained by reciprocating the price-to-book values of all the companies over twenty years. The average of all these observations has been calculated. The obtained data has been sorted in to three BE/ME groups as top 30% high, middle 40% medium and bottom 30% low. These will help us to measure the value factor.

Using this size factor and value factor data, six portfolios are created by combining two sizes and three BE/ME groups. They are S/L, S/M, S/H, B/L, B/M, and B/H. For example, the B/M portfolio contains stocks that are in big size group and also the stocks that are in medium BE/ME group. Like the same way S/L portfolio contains the stocks that are in small size group and also the stocks that are in large BE/ME group. Monthly returns are calculated for these six portfolios.

The Factor Portfolios

The Fama - French model uses three factors to explain the common stock returns. They are market factor i.e., risk factor, size factor and value factor. The market factor will be obtained by deducting the risk-free return from T-bills from market index returns. This is the basic factor we use in CAPM. Market index data has been collected from the NSE website and returns are calculated on that data.

We have created two market portfolios using the previous size and value returns data. They are SMB (small minus big) and HML (high minus low). SMB is created by taking difference between the average of returns of the three small stock portfolios (S/M, S/L and S/H) and the average of returns of the three big stock portfolios (B/L, B/M and B/H). This portfolio is created to measure the risk factor in returns with respect to size. This shows us the difference that exists between the returns of small size stocks and big size stocks. We say that these are clear from value factor effects i.e., BE/ME effects and results are focussed on the different outcomes of small and big stocks.

HML portfolio is created by taking the difference between the average of returns of two high value portfolios (S/H and B/H) and the averages of returns of two low value portfolios (S/L and B/L). This is used to mimic the risk factor in terms of returns related to value i.e., BE/ME. This data is free from size effect.

Analysis of the Created Portfolios

As per Fama & French model we have created six portfolios namely S/L, S/H, S/M, B/L, B/H and B/M along with three factor portfolios HMB, SML and MKT. After creating portfolios, we calculated four moments followed by correlation and regression analysis. We used three descriptive variables for explaining the stock returns. The first one is the market excess- returns factor which is obtained from market index return minus risk- free return. The second descriptive variable is SIZE factor which is the return related to size- small minus big i.e., SMB which is calculated as below:

$$SMB = \frac{\frac{S}{L} + \frac{S}{M} + \frac{S}{H}}{3} - \frac{\frac{B}{M} + \frac{B}{L} + \frac{B}{H}}{3}$$

The third descriptive variable is value factor which is the return related to value- high minus low i.e., HML which is calculated as below:

$$HML = \frac{\frac{S}{H} + \frac{B}{H}}{2} - \frac{\frac{S}{L} + \frac{B}{L}}{2}$$

Our test of Fama French model used the standard regression frame work by Campbell, Lo and Mackinlay (1997). The formula is as below:

$$R_p - R_f = a + b(R_m - R_f) + s(SMB) + h(HML) + \epsilon$$

Descriptive Statistics of Return Series

Table 1 shows the mean, standard deviation, skewness and kurtosis of the six size and value sorted portfolio returns and three factor portfolio returns. The mean returns of market portfolio is - 0.246 which is a

negative value, other portfolios are showing positive mean returns. All the portfolio returns have positive excess kurtosis whereas skewness holds negative value for some portfolios like S/L, B/L and B/H.

Table 1
Descriptive Statistics

Portfolio	Mean	S.D.	Skewness	Kurtosis
S/L	0.012	0.004	-0.860	1.787
S/M	0.024	0.002	0.824	1.822
S/H	0.076	0.061	5.737	32.937
B/L	0.024	0.002	-0.845	1.372
B/M	0.075	0.053	6.158	37.948
B/H	0.000	0.002	-1.458	3.420
SMB	0.011	0.034	0.881	6.079
HML	0.041	0.062	0.652	1.168
MKT	-0.246	1.096	-3.078	12.555

Table 2 shows the correlation analysis of six size and value sorted portfolio returns and three factor portfolio returns. The results say that there exists a negative relation between value and average returns. The relation of HML with B/L and S/L is showing -0.003 and -0.028 respectively. On the other side, the relation between size and average return is positive for all the stocks. This is different from US findings (Fama and French (1992, 1993)) of a strong positive relation between value and average returns irrespective of size. It seems Indian markets exhibits a strong value effect and a positive size effect.

Table 2
Correlation Analysis

	B/H	B/M	B/L	S/L	S/H	S/M	Rm-R _f	SMB	HML
B/H	1.000								
B/M	0.999	1.000							
B/L	0.999	0.999	1.000						
S/L	0.998	0.998	0.998	1.000					
S/H	0.998	0.999	0.998	0.996	1.000				
S/M	0.998	0.998	0.999	0.997	0.998	1.000			
Rm-R _f	0.997	0.997	0.998	0.997	0.996	0.997	1.000		
SMB	0.011	0.014	0.014	0.041	0.042	0.049	0.021	1.000	
HML	0.031	0.011	-0.003	-0.028	0.049	0.015	-0.002	-0.018	1.000

Table 3 is bifurcated in to two parts, whereas 3.1 shows regression analysis and 3.2 shows *p*-values of six portfolio returns and three factor portfolio returns. As per our findings, at the 5% significance level the three factor - model performs well on explaining excess portfolio returns except the portfolios B/H and S/M. Looking from Indian stock market context the portfolio with big market cap and high BE/ME ratio and small market cap with medium BE/ME ratio have not performed well. The findings of the adjusted -R square values on the table reflects three risk factors together, which explain the considerable part of the variation on excess portfolio returns for each portfolio.

Table 3.1
Regression Analysis

<i>Excess Return of portfolio</i>	<i>a(intercept)</i>	<i>b(rm-rf)</i>	<i>S (SMB)</i>	<i>H (HML)</i>	<i>Adjusted R</i>
B/H	-0.024	1.014	-0.288	0.583	0.995
B/M	0.073	1.015	-0.198	0.221	0.995
B/L	0.020	1.011	-0.201	-0.033	0.995
S/L	0.014	1.014	0.645	-0.462	0.994
S/H	0.059	1.012	0.731	0.922	0.995
S/M	-0.005	1.014	0.937	0.310	0.995

The findings of *p*-values shows, market risk factor is significantly explaining all excess return of portfolios, while SMB factor is able to explain only three portfolios namely S/L, S/H and S/M and HML factor is significantly explaining all the portfolios except B/L. In the context of Indian stock market big market cap stocks don't have relevant impact on portfolio returns according to Fama French Three factor model.

Table 3.2
***p*-values**

<i>Excess Return of portfolio</i>	<i>a(intercept)</i>	<i>b(rm-rf)</i>	<i>S (SMB)</i>	<i>H (HML)</i>
B/H	0.000	0.000	0.063	0.000
B/M	0.000	0.000	0.186	0.007
B/L	0.001	0.000	0.163	0.673
S/L	0.039	0.000	0.000	0.000
S/H	0.000	0.000	0.000	0.000
S/M	0.476	0.000	0.000	0.000

5. CONCLUSIONS

The present research work analyses the Fama French three factor model in the Indian context. We analysed 20 years adjusted closing stock prices of 200 companies listed in NSE. We found that market factor is able to explain the excess returns of all the portfolios, size effect is able to explain the excess return of small companies, and the value effect is able to explain the excess returns in all the portfolios except B/L. We conclude from the analysis that market effect and value effect (except B/L) are able to explain excess returns for all the portfolios whereas size effect is able to explain excess return only for small size companies.

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