Size, Value, and Momentum Effects in Portfolio Returns : Evidence from India

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Abstract

Purpose : The study attempted to evaluate the applicability of the capital asset pricing model (CAPM), the Fama–French three-factor model (FF3FM), and the Carhart four-factor model (C4FM) in the Indian stock market. The increasing complexity of financial markets and the need for more accurate models to capture risk-return relationships motivated this comparative analysis over 12 years.

Methodology : The study was based on secondary data covering 12 years, from March 2012 to March 2024. This investigation used monthly time series data. Market capitalization (size), book-to-market equity ratio (value), and monthly average returns (momentum) are used to build 15 univariate sorting portfolios. These portfolios served as the dependent variables. Additionally, three independent risk factors, i.e., small minus big (SMB), high minus low (HML), and winners minus losers (WML) were constructed using a 2 × 3 sorting strategy along with excess market return (EMR). The analysis was conducted using these portfolios to evaluate the asset pricing models with RStudio version 2024.04.2 + 764.

Findings : In terms of explaining variances in portfolio returns, the study concluded that the 3FM performed better than the CAPM. Additionally, compared to the 3FM, the 4FM offered a more thorough explanation that captured the risk-return relationship in the Indian stock market, demonstrating its efficacy in assessing investment success.

Practical Implications : It was recommended that investors and financial analysts consider the C4FM for a more accurate assessment of stock returns in the Indian market. The study acknowledged its limits and recommended that further research look into other recently developed characteristics that may have an impact on the risk-return connection in various market scenarios, such as profitability and investment.

Originality : Unlike previous research that mainly focused on developed markets, the study provided a comparative analysis of the CAPM, FF3FM, and C4FM in the context of the Indian stock market. It offered new insights into their applicability and performance in emerging markets.

Keywords : **market capitalization, book-to-market equity, momentum, and GRS test**

JEL Classification Codes : G11, G12, G14

Paper Submission Date : June 5, 2024 ; Paper sent back for Revision : July 24, 2024 ; Paper Acceptance Date : August 10, 2024

Risk and return are fundamental concepts in finance and investment decision-making. To make wise decisions, investors and financial analysts constantly assess the possible risks and associated returns of investment opportunities. Risk encompasses various aspects, including market volatility, fundamental hazards, industry-specific risks, and company-specific risks. Risk is defined as the variability of returns.

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DOI : https://doi.org/10.17010/ijrcm/2024/v11i3/174624

Investments with a higher degree of risk are usually anticipated to have larger potential returns but also a higher chance of losing money.

On the other hand, lower-risk investments tend to offer modest returns with a higher degree of certainty. Return on investment is the amount of money gained or lost over a specific period, expressed as a percentage of the initial investment and taking income and capital gains or losses into account. In order to understand and measure the link between risk and return, asset pricing models are fundamental theoretical frameworks in finance. These models support the decision-making process for asset allocation, risk assessment, and portfolio management for analysts, investors, and researchers. The dynamic and intricate world of finance depends on accurate asset return forecasting. In finance, traditional models such as the capital asset pricing model (CAPM) have long been essential, elucidating asset returns through systematic risk (beta) and the correlation between market risk and predicted returns. In order to establish the link between an asset's risk and expected return, Sharpe (1964) proposed that an asset's beta, or sensitivity to market movements, determines its expected return. Lintner (1965) further contributed by exploring how investors select risky assets for their portfolios and examining the impact of risk on capital budgeting decisions. The Fama–French three-factor model (FF3FM) and Carhart four-factor model (C4FM) are two examples of more complicated models that have been developed as a result of the CAPM's incapacity to completely explain fluctuations in returns. Fama and French (1993) introduced the 3FM, which incorporates market risk, size, and value factors in explaining portfolio returns. They found that the single-factor paradigm of the CAPM is challenged by the fact that these factors significantly affect predicted portfolio returns.

Carhart (1997) examined the persistence of mutual fund performance and introduced the four-factor model that includes the momentum factor. The study found evidence of persistence in mutual fund performance beyond what can be explained by traditional risk factors. Pástor and Stambaugh (2003) investigated the relationship between liquidity risk and expected stock returns. They noticed that stocks with higher liquidity risk tend to have lower expected returns, suggesting that liquidity risk is priced in the stock market. The CAPM and FF3FM perform poorly in comparison to FF5FM (Tejesh & Basha, 2023). The study by Fama and French (2015b) contributes significantly to the field of asset pricing by addressing the limitations of explanatory variables in cross-sectional asset pricing models. They argue that variables that exhibit strong explanatory power in marginal regressions may not necessarily explain significant improvements in the average portfolio returns.

The study attempts to provide a comparative analysis of various asset pricing models, such as the CAPM, the FF3FM, and C4FM, in predicting returns. Although these models have been the subject of much research, studies assessing their predictive capacities, particularly in the context of India, are conspicuously lacking. In order to close this knowledge gap, our research will provide insights into the suitability and efficacy of these models in developing countries, such as India, where financial dynamics may diverge greatly from those in industrialized economies. There is a growing interest in understanding and improving financial models to better capture the specific characteristics of emerging markets. This trend indicates a strong demand for research that can provide actionable insights into the effectiveness of established models in these regions.

Review of Literature

Arora and Gakhar (2019) observed asset pricing models by creating portfolios from explanatory variables using the Fama–French approach (1993, 2015a) on listed companies in the CNX Nifty 500 index from 2001 to 2016. The analysis exposed an inverse relationship between returns and MC, OP, and INV, although the pattern of returns and investment is not very evident, whereas returns and value have a direct relationship. In addition, they found that the three factor model outperformed other asset pricing models. Atodaria (2020) used the daily closing price data to look into the adaptability of 3FM in order to capture the influence of the three risk variables associated with FF. The study revealed that merely 47% of total stock returns are captured by the 3FM. The results also suggest that in addition to market returns, market cap and B/M ratio affect stock returns. Consequently, investors can maximize their investments by utilizing the size and value premium.

Balakrishnan and Maiti (2017) an attempt was made to examine the cross-sectional link between company market-cap and B/M ratio with expected return and risks in the Indian stock market. To test the sensitivity of the results, the researchers employed different breakpoints for market capitalization and B/M ratio. Fama-MacBeth cross-sectional test, GRS, residual graphs, goodness of fit, and average stock return patterns were among the tests used in the study. Both the CAPM and the 3FM were unable to reflect the risk-return connection more accurately. The findings also revealed that there was a weak value effect and a strong size effect. Coşkun and Torun (2021) tested several asset pricing models using monthly data for the equities that were actively traded in the BIST-100 Index between 2009 and 2018. Six regression models for 3FM and 14 regression models for 5FM are evaluated using multiple regression analysis. The results show that the 3FM and 5FM can be applied to the BIST-100 Index. They also found that the FF3FM outperformed the FF5FM in explaining the stock returns.

Cueto et al. (2020) used the block-bootstrap method to propose multifactor models for 2,000 European companies. In order to verify the validity of the model and the relevance of the parameters involved, a non-parametric resampling approach has been recommended. The findings indicate that the block-bootstrap method appears to be more conservative with the (Gibbons, Ross, and Shanken) GRS test. Dirkx and Peter (2020) applied the FF3FM and FF6FM to the German market. The results are the same as Fama–MacBeth, indicating that the recently added profitability and investment components don't really yield significant long/short term results. They also revealed that the six-factor model's average adjusted R^2 increases slightly when compared to the 3FM.

Fama et al. (2015a) found that the 3FM is insufficient to predict stock returns. As a result, FF developed the 5FM, which added OP and INV to the previous 3FM. The study found that these two variables seem to have an impact on stock returns. They also found that companies with higher investments typically have lower returns, and more profitable companies have higher returns. Fama and French (2018) modified their 5FM by incorporating Carhart's (1997) momentum component, converting their model into the FF6FM.

Fama and French (2017) extended their influential work on asset pricing by applying their five-factor model to international markets, covering regions like North America, Europe, Asia Pacific, and Japan. They found that stock returns are significantly influenced by factors such as book-to-market ratio, profitability, and investment across these regions. Despite its broader scope and improved explanatory power, the model encounters difficulties in fully accounting for the performance of small-cap stocks, especially those with low profitability and high levels of investment. Although the five-factor model represents an advancement over earlier approaches, it still falls short of providing a complete explanation of stock returns for certain market segments.

Goel and Garg (2020) investigated the implications of the FF6FM on asset returns in the Indian market. The outcomes are apparent that the new 6FM is too frail/weak to adequately explain the changes in stock portfolios. The data provided evidence of the incapacitated presence of the size factor when combined with other risk variables. The GRS test rejected the null hypothesis since the 6FM is unable to capture factor variation, and further metric tests on alpha also corroborate the existence of significant factor variables that the FF6FM is unable to explain. Gökgöz and Seyhan (2024) aimed to examine the efficiency of single and multifactor asset pricing models on the Turkish Stock Exchange from 2009 to 2020. Their analysis was conducted on 18 portfolios consisting of stocks listed on the Istanbul Stock Exchange 100 (BIST-100). The findings indicated that the CAPM model provided a stronger explanation of the average excess weekly returns across the portfolios. The study also pointed out that the multifactor models also showed potential; their effectiveness could be enhanced with the availability of more comprehensive data.

Habibah et al. (2021) added a new factor, i.e., sentiment, to FF5FM to predict asset returns using monthly data from 1965 to 2015 in the US context. A sentiment proxy is a composite index developed by Baker and Wurgler (2006). They adopted Granger casualty, VAR, and Fama–Macbeth regression models to determine the impact of sentiments on FF5F and vice versa. The findings revealed that investor sentiments also have a major effect on market capitalization and profitability premiums. Moreover, the findings also show that the sentiment factor improves the explanatory power. Hanauer (2020) compared the results of different factor models for 50 non-US markets. The results found that the six-factor model (FF6FM) with cash-based profitability and momentum factors outpaces other models. The findings also make it clear that the dominating factor models do not explain the monthly updated value factor. It follows that the value factor is not redundant.

Irejeh and Aninoritse (2024) examined the effectiveness of the FF3FM for a sample of 68 stocks from the entire list of companies listed on the Nigerian Stock Exchange (NSE) over a period spanning from 2013 to 2022. They identified the significant correlations between the returns and each of the three factors. The study also concluded that these variables can effectively capture the variations in stock returns within the Nigerian market. Khan and Fahim (2021) attempted to assess the validity of C4FM in predicting the abnormal returns of chosen stocks from the Dhaka Stock Exchange (DSE). They also compared CAPM, 3FM, and 4FM to draw superior explanatory power using monthly data for a period of 11 years from 2009 to 2019. They confirmed the existence of all four risk factors in DSE during the study period. They also noticed that in contrast to the CAPM and 3FM, the 4FM has the lowest GRS value, highest adj. R^2, and the lowest Sharpe ratio, indicating the superior explanatory power.

Khudoykulov and McMillan (2020) aimed to evaluate and compare different asset pricing models in the Indian market. The finding revealed that the market factor alone is inefficient in determining the fluctuations in average asset returns. Furthermore, when the size and value factors are added to the market factor, there is a significant improvement in determining the fluctuations in average asset returns. Mohanti and Jain (2020) explored the role of market cap and value effects in predicting returns for 222 companies from Nifty-500 from 2007 to 2017. They noticed that the 3FM illuminates the fluctuations in stock returns relatively higher than the CAPM and validated the existence of size and value effects in the Indian market. They also incorporated an alternate measure (price-to-earnings ratio) for the value component to assess the efficiency of the 3FM, which was found to be a useful measure for capturing the value effect.

Munawaroh and Sunarsih (2020) evaluated the effect of FF5FM and MOM factor on the excess portfolio returns of Islamic stock listed in the Indonesia Sharia Stock Index (ISSI). According to the findings, the market risk premium, high minus low (HML), conservative minus aggressive (CMA), and up minus down (UMD) have a positive impact on the excess return of stock portfolios. However, the predicted stock return is unaffected by the size and profitability factor. Özer et al. (2021) studied the validity of the FF5FM and inflation model in emerging and less developed nations from 2012 to 2020. The study chose the top 30 companies from the KLC Index of Malaysia, the JKI Index of Indonesia, the KM Index of Pakistan, and the KATLM Index of Turkey. The findings indicated that the inflation model and the FF5FM are essentially equivalent and appear to have little advantage over one another. They argued that interest-sensitive investors can use the inflation rate as a model and that the 5FM is helpful in developing countries.

Mollaahmetoğlu (2020) conducted a panel data analysis to evaluate the Fama–French five-factor model, using data from the DAX30 index in Germany and the BIST30 index in Istanbul. The results demonstrated that there is no sufficient evidence to suggest the robustness of 5FM that is valid for companies in the DAX30 index, but they do support the 2FM. Additionally, they also found sufficient proof to showcase that the 4FM, rather than the 5FM, holds good for equities listed in the BIST30. Raghuram and Erickson (2017) used the FF3FM to describe asset pricing behavior in the Indian stock market. They found that 3FM was shown to be an effective descriptor of returns in India. In the post-break point period, the coefficient of value factor premium was found to be statistically significant for all six portfolios, whereas it was only four out of the six portfolios were statistically significant in the pre-break point period.

Raju (2022) compared the performance of FF3Fm and FF5FM using data from the Indian market from 2006 to 2022 and samples of 4,100 companies. He found that the value component appears to be redundant when factor-spanning tests are used and shows an inverse value effect. The findings revealed that the 5FM outperforms the 3FM in elucidating the average portfolio returns. Shahid et al. (2024) applied the FF3FM and the C4FM on the KSE-100 Index spanning from 2004 to 2019. According to their research, out of the 25 portfolios examined, 15 of them are able to adequately explain variations in stock returns; this suggests that the 4FM has an efficiency rate of 60%, while the 3FM's efficiency rate is 56%, explaining variations in just 14 portfolios. Notably, the momentum factor emerges as significant from the results, while the value factor is deemed redundant.

Silfia and Husodo (2024) delved into the applicability of the 3FM in explaining excess returns within the stock markets of Hong Kong, Indonesia, and Singapore during the period spanning 2018 to 2022. Their findings revealed distinct patterns across the markets studied. In the Hong Kong market, the small and medium (S–M) portfolios emerge as the most efficient, while in Indonesia, the big portfolio exhibits the highest efficiency. Notably, all portfolios in the Singapore market demonstrate efficiency. They also identified potential redundant factors in each market: Small minus big (SMB) in Hong Kong, HML in Indonesia, and no identified redundant factors in Singapore. Tazi et al. (2022) tested the validity of 3FM and C4FM in Morocco using the monthly returns of companies listed on the Casablanca Stock Exchange. The findings suggested that while the momentum effect was minimal, the size and value effects were somewhat maintained. The study also confirmed that the C4FM did not outperform the FF3FM in terms of explanatory power, as their R^2 values are nearly identical. Therefore, neither 3FM nor 4FM were successful in predicting cross-sections of returns.

Tejesh and Basha (2023) conducted a comparative analysis of the performance of the CAPM, Fama-French three-factor model, and five-factor model for companies listed on the Nifty index. They used a bivariate sorting strategy to construct eighteen distinct portfolios based on three independent stock characteristics. The results showed that, with the exception of large profitable portfolios, the average excess returns for both small and large portfolios tended to decrease as the book-to-market ratio, operating profitability, and investment increased. Additionally, except for the market risk premium, the average returns for all factor-mimicking portfolios were negative. The study concluded that the FF5FM outperformed both CAPM and FF3FM in explaining portfolio returns, highlighting the importance of additional factors in improving the predictive accuracy of traditional asset pricing models.

Zaremba and Konieczka (2014) investigated the characteristics of inter-country premiums on equities listed in sixty-six countries based on market cap, B/M ratio, and MOM. The study found evidence of market-cap, B/M ratio, and MOM premiums in the stock returns of the countries. The findings also revealed that the country-level value, market-cap, and MOM premiums reinforce each other in double-sorted portfolios and are resistant to changes in representative indices of the countries.

Research Methodology

This study, which is quantitative in nature, compares several asset pricing models. The sample is made up of 82 companies that were chosen from the NSE Nifty-100 and have been actively trading since 2012. Secondary sources provided the data that was needed for this investigation. This study used monthly time series data from March 2012 to March 2024, a period of 12 years. The CMIE ProwessIQ database is the source of information about the adjusted closing prices, market capitalization, and book-to-market equity ratio of selected shares. The adjusted closing prices of securities are used to calculate returns. The return on 365-day T-bills, used as a proxy for the risk-free rate (R_f), was collected from the RBI bulletin. The returns of the Nifty-100 Index are used as a proxy for market return (R_m). The study employed a univariate sorting strategy to construct 15 portfolios. The stocks are arranged to create portfolios based on market capitalization, value, and momentum at the end of March (year *t*). The factors' ability to completely explain the predicted returns of the portfolios was tested using the RStudio GRS.test program. The GRS test, introduced by Gibbons, Ross, and Shanken (1989), is a time-series approach used to evaluate asset pricing models by testing whether the model can explain the time-series behavior of portfolio returns (Fama, 2015).

Empirical Analysis and Results

Table 1 shows that the mean value for the market factor (EMR) is positive at 0.587% per month. However, both the size (SMB) and value (HML) factors are negative. A negative size premium indicates that, on average, larger-sized equities have done better than smaller-sized ones. Similarly, a negative value premium indicates that growth stocks have yielded higher average returns than value stocks. Compared to the market, size, and momentum (WML) factors, the value factor exhibits greater volatility. Every variable exhibits negative skewness, with the exception of the value factor. The kurtosis values of the market and momentum variables are greater than 3, indicating that they are leptokurtic. The market and size factors exhibit a weak positive association with the value factor. In contrast, there exists a weak negative correlation between the market factor and the size component. The market and momentum components have the highest correlation, at 89.31%.

The FF3FM and C4FM models exhibit low to moderate levels of multicollinearity among their factors, as shown in Table 2. On the other hand, the C4FM model exhibits substantial multicollinearity among the EMR and WML parameters. But given the VIF values are less than 10, multicollinearity is probably not going to be a big problem.

According to Table 3, the constant term is significantly positive in all five-size portfolios, 60% of value

Table 1. ***Descriptive Statistics of Risk Factors***

	Mean	Std. Dev.	Skewness	Kurtosis	Correlations			
					EMR	SMB	HML	MOM
EMR	0.59%	4.76%	–1.13	6.31	100%	–	–	–
SMB	–0.13%	1.82%	–0.05	–0.35	–12.04%	100%	–	–
HML	–1.18%	5.53%	0.21	0.28	44.13%	2.32%	100%	–
WML	1.04%	4.92%	–0.83	4.73	89.31%	–	44.22%	100%

Table 2. ***Multicollinearity Test***

Factor	FF3FM		C4FM	
	Tolerance	VIF	Tolerance	VIF
EMR	0.789168	1.267158	0.190618	5.246097
SMB	0.978315	1.022165	0.951262	1.051235
HML	0.799925	1.250117	0.790885	1.264407
WML	–	–	0.194079	5.152550

Table 3. ***OLS Regression Estimates for CAPM***

Portfolio	Intercept	EMR	R^2	Adj. R^2
Part A : Size-Sorted Portfolios				
P_1	0.01**	0.84***	0.70	0.70
P_2	0.01**	0.10***	0.82	0.81
P_3	0.01*	1.09***	0.85	0.84
P_4	0.00	1.08***	0.80	0.80
P_5	0.01***	0.90***	0.91	0.91
Part B : BM Sorted Portfolios				
P_1	0.01***	0.67***	0.59	0.59
P_2	0.01 **	0.88***	0.73	0.73

P_3	0.01***	0.91***	0.85	0.85
P_4	0.00	1.15***	0.88	0.88
P_5	0.00	1.31***	0.67	0.67
Part C : MOM Sorted Portfolios				
P_1	0.01**	0.92***	0.74	0.74
P_2	0.01***	1.04***	0.87	0.87
P_3	0.01***	1.05***	0.84	0.83
P_4	0.01**	1.05***	0.87	0.87
P_5	0.00	0.85***	0.76	0.76
GRS : 2.55957				
P-value : 0.002492465				

Note. ***, **, and * denote statistical significance at 0.01%, 1%, and 5% level, respectively.

portfolios, and 80% of momentum portfolios. The market factor has a significant positive impact on the response variable across all 15 portfolios. Except for P_4 in the size portfolios, the R^2 and Adjusted R^2 values increase with larger market capitalizations, with P_5 having the highest explanatory power at 91%. For value portfolios, except for P_5, the R^2 and Adjusted R^2 values generally increase with a higher BM ratio, but there is no clear pattern for momentum portfolios. The results of the GRS test for the combined intercept term are higher (2.55957), leading to the rejection of the null hypothesis.

Table 4. ***OLS Regression Estimates for FF3FM***

Portfolio	Intercept	EMR	SMB	HML	R^2	Adj. R^2
Part A : Size-Sorted Portfolios						
P_1	0.01***	0.87***	0.90***	0.02	0.81	0.80
P_2	0.01***	1.05***	0.78***	–0.02	0.88	0.88
P_3	0.01***	1.05***	0.45***	0.11**	0.88	0.87
P_4	0.01***	0.92***	–0.42***	0.26***	0.86	0.86
P_5	0.00***	0.98***	–0.13 *	–0.16***	0.94	0.94
Part B : BM Sorted Portfolios						
P_1	0.01**	0.91***	0.43***	–0.41***	0.83	0.83
P_2	0.01***	1.01***	0.19	–0.23***	0.78	0.77
P_3	0.01**	0.97***	0.35***	–0.07*	0.87	0.87
P_4	0.01**	1.07***	0.31**	0.18***	0.91	0.91
P_5	0.01***	0.90***	0.33**	0.78***	0.91	0.91
Part C : MOM Sorted Portfolios						
P_1	0.01**	1.01***	0.72***	–0.11*	0.81	0.80
P_2	0.01***	1.07***	0.46***	–0.02	0.89	0.89
P_3	0.01***	1.09***	0.20	–0.05	0.84	0.84
P_4	0.01***	0.99***	0.28**	0.13***	0.89	0.89
P_5	0.01*	0.70***	–0.09	0.26***	0.83	0.83
GRS : 1.764358						
P-value : 0.0484029						

Note. ***, **, and * denote statistical significance at 0.01%, 1%, and 5% level, respectively.

According to the FF3FM model, all 15 portfolios exhibit calculated market factor coefficients with positive and significant intercepts, as presented in Table 4. Most of the estimated size and value factor coefficients significantly impact portfolio returns, regardless of their signs. Portfolios with higher values in the areas of market capitalization, value, and momentum perform better than those with lower values. The FF3FM model outperforms the CAPM model in terms of explanatory power for all portfolios, but the GRS statistic declines. As a result, FF3FM performs better than CAPM.

With the exception of size-sorted portfolios P_4 and P_5, the constant term is insignificantly positive for all 13 portfolios, as shown in Table 5. None of the momentum-sorted portfolios show a significant impact from the market factor. However, the market factor has a considerable influence on the response variable for the majority of size and value-grouped stocks. The size factor significantly influences at least two portfolios from each sorting combination. Except for size-sorted P_1 and P_5, all other portfolios are significantly affected by both value and momentum factors. For size-sorted stocks, except for P_5, the R^2 and Adjusted R^2 values increase with market capitalization, with P_4 having the highest explanatory power at 96%. The R^2 and Adjusted R^2 values for all value-sorted portfolios increase with the BM ratio, while no clear pattern is observed for momentum-sorted portfolios. Since the combined test for the intercept terms (GRS statistic) is lower (1.164365), the null hypothesis is accepted, as the p-value is greater than the level of significance.

Table 6 illustrates that both the CAPM and FF3FM predict higher expected returns for all portfolios compared to the actual excess returns. A similar tendency can be seen in about two thirds of the portfolios in C4FM over three different types. With the addition of each risk factor, portfolios with the lion's share are predicted to have a

Table 5. ***OLS Regression Estimates for C4FM***

Portfolio	Intercept	EMR	SMB	HML	MOM	R^2	Adj. R^2
Part A : Size-Sorted Portfolios							
P_1	0.00	–0.36**	0.49***	–0.04	1.27***	0.89	0.89
P_2	0.00	0.08	0.46***	–0.06*	0.10***	0.93	0.92
P_3	0.00	–0.12	0.07	0.06*	1.21***	0.93	0.93
P_4	–0.00*	–0.65***	–0.94***	0.19***	1.62***	0.96	0.95
P_5	0.01***	1.12***	–0.08	–0.15***	–0.14	0.94	0.94
Part B : BM Sorted Portfolios							
P_1	0.00	0.13	0.17*	–0.44***	0.81***	0.88	0.87
P_2	0.00	–0.43**	–0.28**	–0.30***	1.48***	0.89	0.88
P_3	0.00	0.32*	0.13	–0.10**	0.67***	0.90	0.89
P_4	0.00	0.39**	0.09	0.15***	0.70***	0.93	0.93
P_5	0.00	–0.41**	–0.10	0.72***	1.35***	0.95	0.95
Part C : MOM Sorted Portfolios							
P_1	0.00	–0.23	0.31**	–0.16***	1.27***	0.88	0.88
P_2	0.00	0.08	0.13	–0.06*	1.02***	0.94	0.94
P_3	0.00	–0.18	–0.21*	–0.11**	1.31***	0.91	0.91
P_4	0.00	0.17	0.02	0.10**	0.84***	0.92	0.92
P_5	0.00	0.17	–0.27*	0.24***	0.55***	0.85	0.84
GRS: 1.164365							
P-value: 0.3098375							

Note. ***, **, and * denote statistical significance at 0.01%, 1%, and 5% level, respectively.

Table 6. ***Predicted Monthly Excess Return Using Asset Pricing Models***

Portfolio	Actual (R_i)	CAPM (Er_i)	FF3FM (ER_i)	C4FM (ER_i)
Part A: Size-Sorted Portfolios				
P_1	0.0105379	0.0120052	0.0114636	0.0101158
P_2	0.0110606	0.0125511	0.0120491	0.0109927
P_3	0.0101553	0.0111827	0.0110008	0.0097192
P_4	0.0092051	0.0104737	0.0109674	0.0092439
P_5	0.0112948	0.0122871	0.0122229	0.0123764
Part B : BM Sorted Portfolios				
P_1	0.0130512	0.0153644	0.0147198	0.0138630
P_2	0.0164848	0.0179870	0.0176593	0.0160865
P_3	0.0102781	0.0112619	0.0109847	0.0102728
P_4	0.0085016	0.0090389	0.0090124	0.0082730
P_5	0.0034859	0.0044268	0.0049314	0.0034966
Part C : MOM Sorted Portfolios				
P_1	0.0118727	0.0134615	0.0129201	0.0115637
P_2	0.0116480	0.0128083	0.0125092	0.0114261
P_3	0.0134735	0.0144916	0.0143190	0.0129287
P_4	0.0098098	0.0115663	0.0115111	0.0106212
P_5	0.0052917	0.0058547	0.0061470	0.0055591

fall in returns, with the exception of P_5 in all three combinations and P_4 in the size sort. CAPM predicts the highest expected returns in 67% of the portfolios, as it considers only a single risk factor. In contrast, with three and four risk factors considered, FF3FM and C4FM achieve the highest expected returns in 20% and 13% of the portfolios, respectively. Among all models, the value-sorted P_2 is anticipated to generate higher returns than other portfolios.

Conclusion

This study attempts to evaluate the applicability of the CAPM, FF3FM, and C4FM models in explaining the time series variation in excess portfolio returns within the Indian stock market. For sorting portfolios, monthly data spanning 12 years from March 2012 to March 2024 is used, sourced from ProwessIQ. Additionally, 12-month treasury bill rate data from 2012 to 2024 are obtained from the RBI bulletin. A total of 15 univariate sorted portfolios are created based on size, value, and momentum, with three risk factors (SMB, HML, and WML) alongside EMR being constructed. The findings indicate that portfolios consisting of large-size stocks outperform those with small-size stocks, portfolios with low-value stocks outperform those with high-value stocks, and portfolios with winner stocks outperform those with loser stocks.

Consequently, the study reveals an *absence of size and value effects* but confirms the presence of a *momentum effect*. These results contrast with the findings of Fama and French (1993; 2015a; 2018). The study also found that the FF3FM is better at explaining variations in excess portfolio returns compared to the CAPM. However, the C4FM is found to explain variations better than the FF3FM, thereby capturing the risk–return relationship more comprehensively in the Indian stock market. Although the model with a momentum factor is an appropriate asset pricing model, there still appears to be a gap that is not explained by the model, since the explanatory power for most of the portfolios is under 90% in this study. Therefore, there may be opportunities for further improvement by incorporating additional factors such as profitability, investment, and liquidity.

Managerial and Theoretical Implications

The outcomes of this study on asset pricing models in the Indian stock market have several significant implications for investors, portfolio managers, and other capital market participants. Portfolio managers should consider adopting the C4FM over traditional models like the CAPM and the Fama–French FF3FM for more accurate predictions of portfolio returns. The C4FM's ability to incorporate additional factors, such as momentum alongside size, value, and market risk, makes it better suited to capture the complexities of the Indian market. Investors and financial analysts are advised to use the insights from this study to refine their investment strategies. The superior explanatory power of the C4FM allows them to make more informed decisions when constructing diversified portfolios.

Limitations of the Study and Scope for Future Research

The research focused on securities within the Nifty-100 Index restricts its generalizability to the global market. Additionally, evaluating only three asset pricing models may limit insights that could arise from exploring alternative or emerging models, such as the FF5FM and FF6FM. There is also scope for further research to enhance comprehensiveness by including additional factors and extending the study period.

Authors' Contribution

Tejesh H. R. conceived the idea and developed both the qualitative and quantitative designs for the empirical study. Khajabee M. extracted high-repute research papers, filtered them based on relevant keywords, and generated concepts and codes related to the study design. Both the authors performed the numerical computations using RStudio version 2024.04.2 + 764 and MS Excel. They had lengthy conversations about each idea as they worked together to write the manuscript.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgment

The authors received no financial support for the research, authorship, and/or for the publication of this article.

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