

## 6. Conclusions

The study intended to explore the applicability of the Fama-French Five-Factor model in India. The performance of any asset-pricing model is judged by how well it is able to explain the variations in the returns of the underlying asset over a significant period of time. Using the aforementioned statement as a guiding principle, the study finds that the Fama-French Five-Factor model is able to explain the excess returns on almost all the single-sort portfolios except for the portfolio comprising of the smallest-sized companies. The portfolio comprising of companies having the highest asset growth also outperforms the model, although at the ten percent confidence interval. The Fama-French Five-Factor model is also unable to explain the returns for the momentum portfolios, but then, even the Fama-French Three-Factor model suffers from the same fate. However, when tested against double-sorted portfolios, the Fama-French Five-Factor model only errors in explaining momentum returns. Thus, one can safely conclude that the Fama-French Five-Factor model can be used as a reliable pricing model in the landscape of the Indian securities market.

Upon comparing the performance of the various asset-pricing models that this study sets out to evaluate, it is found that the Fama-French Three-Factor model performs better than the CAPM for all the portfolios that are tested. It is also observed that the Carhart Four-Factor model is as good a fit as the Fama-French Three-Factor model. However, the Carhart Four-Factor model sufficiently explains the momentum effect while the Fama-French Three-Factor model falls short in this key aspect. The Fama-French Five-Factor model is better at explaining returns on portfolios formed on profitability, an area where both the Fama-French Three-Factor model and the Carhart Four-Factor model fail. However, the Fama-French Five-Factor model is unable to explain returns of a portfolio comprising of companies which have had the highest investment growth. Portfolios formulated on the momentum effect, and comprising of

companies which have the strongest momentum effects, also outperform the Fama-French Five Factor model at statistically significant levels. The model also fails to explain the excess returns of a portfolio comprising of the smallest-sized companies. The modified Five-Factor model and the Six-Factor model fare poorly in comparison to the other asset-pricing models that have been tested. As a result, this section will exclusively focus on the results observed for the Fama-French Three-factor and the Fama-French Five-Factor models, and the Carhart Four-Factor model.

The inability of the different asset-pricing models to adequately explain the mean-excess returns for portfolios formed on the investment-sort and the profitability-sort is also quite informative. Even though the results initially suggest the persistence of the investment factor as well as the profitability factor in the Indian stock market, a deep dive into the observations do provide more useful insights into the probable causes of the said persistence. Despite the fact that single-sort portfolios comprising of the most profitable companies do exhibit statistically significant Alpha-intercepts when tested against the Fama-French Three-Factor model and the Carhart Four-Factor model, the observed values for the Beta Co-efficient of the different constituent factors in the aforementioned models are highly informative. For a portfolio which either comprises entirely of loss-making companies or of the least profitable companies, the Co-efficient for the market premium effect is comparatively lower, while that for the size effect and the value effect are comparatively higher than the values observed for the same factors when the two models are tested against returns of a portfolios consisting of highly profitable companies. The trend seems to persist even when the single-sort Investment effect portfolios are tested against the Fama-French Five-Factor model. These observations lead one to conclude that the lesser profitable companies tend to be small-size, high value companies while the larger-sized growth stocks generally tend to be among the highly profitable firms.

Similar inferences can be drawn for the portfolios sorted on the Investment effect. For portfolios which comprise of companies displaying aggressive investment behavior, the Beta Co-efficient for the market risk premium and the size effect are high and statistically significant. However, the Beta Co-efficient of the value effect for the portfolio that consists of companies having the most aggressive growth in assets, and that has displayed significant outperformance in every instance, is insignificant in all of the multi-factor models tested. On the other hand, the Beta Co-efficient for the value effect is comparatively higher for portfolios comprising of companies that show a conservative approach toward asset growth. The sum of these observations leads to the conclusion that companies that aggressively invest in assets also tend to be larger-sized growth stocks. It would appear that since larger-sized companies are more profitable, therefore, they find it comparatively much easier to invest in assets and as a consequence, these companies are more aggressive in growing their asset size.

The study then further tests the various asset-pricing models by regressing the excess returns of double-sorted portfolios against each of the models. When the study examines the Fama-French Three-Factor model, it is found insufficient in explaining the excess returns of a portfolio comprising of small-sized, high profitability companies. It also fails in explaining the returns of a portfolio comprising of small-sized winners. The Carhart Four-Factor model is found wanting when tested against the excess returns of portfolios comprising of the most aggressively investing and the most profitable companies, both small-sized and big-sized. The Fama-French Five-Factor model is only unable to explain the returns for the winner portfolio comprising solely of small-sized firms and the winner portfolio comprising of large companies. However, the instances where portfolios sorted on the investment factor do show statistically significant Alpha-intercepts, those are found to be within the ten percent confidence intervals. Therefore, the study concludes that though there is a strong persistence of the profitability

factor in the Indian market, the same cannot be said with a similar amount of conviction for the investment effect.

The ambiguities observed in case of the Investment effect are not found when confronted with questions surrounding the existence and persistence of the momentum effect in stock returns. Whether the tests involve single-sort portfolios or double-sorted portfolios formed on the momentum effect, the Alpha-intercepts are statistically significant and considerably higher, especially in the case of a portfolio comprising of small-sized companies having strong momentum effects. Moreover, in a majority of the cases, none of the asset-pricing models seem to be a good fit for explaining momentum returns. These observations tend to reinforce the prevailing belief that the momentum effect is an anomaly that cannot be attributed to any tangible measure of performance. Rather, it appears that the momentum effect exists purely because one of the key assumptions of any asset-pricing model, that investors are rational, does not always hold true. It seems that investors tend to buy into securities that have risen in price during the preceding short to medium-term time period, driven by the FOMO effect, i.e. the “fear of missing out” effect. Buying a security on the hope that prices, which have already risen substantially, will continue to do the same in the future as well, definitely qualifies as irrational expectations. Because more investors buy into a security that has already risen in price, this continued buying behavior cause the prices to appreciate further, thus turning into a self-fulfilling exercise. Since momentum seems to be an emotional response to market actions, and as it is extremely difficult to quantify human behavior, thus it appears impossible to factor the momentum effect into any asset-pricing model with any semblance of propriety.

To summarise, the key findings of this study can be articulated as follows:

- The Fama-French Three-Factor model is better than the CAPM.

- The Carhart Four-Factor model performs better than the Fama-French Three-Factor model only on account of the fact that it is at least able to sufficiently explain returns attributed to the momentum effect.
- There is no significant evidence to conclude that the Fama-French Five-Factor model is better than the Fama-French Three-Factor model.
- Size and Value effect still persist in the Indian markets.
- There is significant evidence to prove that the Profitability effect persists in the Indian market, but the Investment effect is found to be weak.
- There is sufficient evidence in favor of the persistence of momentum profits in the Indian markets.

## ***6.1 Future Scope***

Since it has been observed that Profitability and Momentum factors also affect stock returns, it would be of great interest to observe how a new Five-Factor model, comprising of the Fama-French Three factors plus the Profitability and Momentum factors, would fare against the other, more conventional, asset-pricing models in capturing excess market returns of various portfolios. Additionally, although this study utilizes an exhaustive time period of twenty years in duration, it would be interesting to break down the same duration into various sub-periods to observe how different asset-pricing models behave during particular times such as the pre- and post-dot com busts, the period leading up to the global financial crisis and in the aftermath of the crisis, etc. Such studies would allow us greater insights into how the market reacts to different factors affecting stock returns.