2. Review of Literature

Harry Markowitz proposed an approach to portfolio formation which made the use of mean-variance analysis to optimize investor returns. Thereafter, Sharpe (1964) worked towards establishing a mathematical association between the returns of a security and the overall risk of a security, especially focusing on the non-diversifiable portion of the risk. He postulated that, assuming equilibrium, the relationship between the risk and the expected returns for a mean-variance efficient portfolio can be captured by a straight line. Lintner (1965) then established that the premium to be paid for a security is an outcome of the covariance amongst the security returns and returns on the market portfolio. Thus, as long as markets continued to remain in equilibrium, the excess returns of an asset over the risk-free rate will increase as risk exposure increases. And thus, the world was introduced to the single-index asset-pricing model.

Later, the validity of the said model was examined by Black (1972) by empirically testing it. The sample time duration was from January of 1926 to March of 1966. The study found the results were inconsistent with the conventional form of the CAPM, but rather more aligned with a two-factor model as suggested by Blume (1970) which found that if investors did not have access to riskless borrowing opportunities, the return on a security can be modelled on a function which is linear and comprises two factors: the return for overall market and Beta co-efficient. However, Fama & MacBeth (1973) empirically tested the CAPM and found evidence which strongly supported the validity of the CAPM. Their findings seemed to suggest that the market risk was being priced too low. Their results created doubts about the validity of the CAPM and opened up a Pandora's Box that led to a plethora of further tests aimed at the critical evaluation of the single-index model. Basu (1977), followed the performance of stocks listed on the NYSE for a period of sixteen years, and observed that the security returns, after appropriately adjusting for risk, were higher for firms that had a low P/E ratio. Further,

Reinganum (1981) tested the CAPM against stocks trading on the AMEX and the NYSE, and found no systematic relationship that could be established between average security returns and their corresponding Betas which were estimated on the market indices. Banz (1981) used a sample period of fifty years, from 1926 to 1975, to examine stocks on the NYSE. His study found that stocks of smaller firms earned a higher return compared to stocks of larger firms. However, he was unable to find a proper explanation for this phenomenon. Roll (1981) attributed the aforementioned size effect to infrequent trading in the stocks of small-sized companies and the resultant autocorrelation that was induced into a portfolio comprising of such companies. Lakonishok & Shapiro (1986) found that firm size had the ability to explain stock returns, however, the effect seemed to lose explanatory power once the January returns were excluded from the sample. Chan & Chen (1988) concluded that the size effect was observed for shorter time frames, but for longer time frames, firm size failed to capture the variations observed in returns. Jegadeesh (1992) argued for the size effect. He indicated that the size effect arose from non-market risk, because market risk, as measured by betas with respect to an index, could only explain the returns for portfolios that were formed in such a way that the betas were correlated with firm size. However, when portfolios were constructed in a manner that caused low cross-sectional correlation among these variables, the market beta fails to explain the size effect.

Chan et al. (1991) company-specific factors. The objective of their study was to find whether any of the factors could capture the variations of returns for Japanese firms. While they found returns to be directly influenced by BE/ME, they found the size effect to be unreliable and dependent on the time period. Fama & French (1992) studied the concurrent effect of various variables such as past returns, size, leverage, dividend yields, Earnings/Price ratio, BE/ME ratio on the mean-excess returns of all firms, barring financials, which were listed either on the AMEX, NYSE or the NASDAQ, between 1963 to 1990. Their study revealed that market beta

could not sufficiently capture the excess returns; however, when combined with size and value effects, sufficiently captured stock returns for the cross-section. Capaul, Rowley & Sharpe (1993) studied the value effect across six developed-country markets-the US, UK, Japan, Switzerland, Germany and France- and found significant value effects across all the markets examined. They found that value stocks earned higher returns, both absolute as well as higher risk-adjusted, than growth stocks in each of these countries for the entirety of the study period.

The exposition of shortcomings in the CAPM caused a fork in the road and subsequently, led to the emergence of two broad-based theories: one that claimed that the inadequacy of the CAPM could be overcome by identifying and then adding other factors that might help in explaining variations in cross-sectional returns, while the other claimed that assuming investors to be rational decision-makers, which is fundamental to the CAPM, was not consistent with observed human behavior. The first of the two aforementioned arguments unleashed a plethora of research dedicated to the identification of appropriate multi-factor models.

On the basis of their earlier study, as well studies conducted by other academicians, Fama & French (1993) stated that the single-index CAPM was incapable of sufficiently explaining the mean-excess returns and thus, proposed a model that incorporated two more risk proxies, one to incorporate the effect of market capitalisation and the other to explain the value effect, along with the more established market beta. Lakonishok, Shleifer & Vishy (Lakonishok, Shleifer, & Vishny, 1994) studied the US market from April 1968 to April 1990 and found a significant value premium in stock returns. However, instead of considering the value effect as a risk-based premium, they felt that the value premium was the consequence of investors over-estimating the future earnings growth and cash flows for the large-sized, more glamorous companies relative to small-size, low key firms. Thereafter, a study conducted by Fama & French (1995) postulated both the size factor and value effect must have some common risk factors. Towards this effect, they could only find partial evidence to support their claims. They

stated that the trends observed in earnings could be used to explain the effect of the two risk proxies on returns. They found low profitability to be a common risk factor among both the value effect and the size effect. Additionally, they also observed the earnings to have a persistence of market, size and value factors, the same way the aforementioned factors are able to capture stock returns. However, they were unable to identify a significant association between the value effect and earnings, or returns. Kothari, Shanken & Sloan (1995) examined the returns for companies, and found that market beta and firm size displayed significant explanatory power but the value effect could not sufficiently explain cross-section variations among stock returns. Thus, doubts around the value effect still persisted.

Around the time when a lot academic research was coming out and challenging the validity of the single-index CAPM by giving evidence which testified to the failures of the CAPM and identified other factors that could better capture average stock returns, De Bondt & Thaler (1985) examined returns from January 1926 to December 1982 and found that portfolios of loser stocks listed on the NYSE gave better returns than the market while portfolios of winner stocks underperformed. The observations from their study suggested that the outperformance of the loser portfolios was an outcome of the tendency of investors to overreact to certain kind of information, especially if it is unexpected. That overreaction first cause loser stocks to have steep falls in price and the same behavioral tendencies then cause the loser stocks to outperform the broader markets. The study also found the momentum effect to be asymmetrically favorable towards the losers than the winners, with the effect gaining in significance one year after portfolio formation, and then peaking somewhere between the second and third year. Jegadeesh & Titman (1993) found an investment approach based on a momentum strategy that makes use of relative strength, i.e., buying previous winners and selling the previous losers, generates statistically significant returns for the subsequent 3-12 month holding period. However, most of the momentum profits tend to dissipate post the twelve-month period, with results showing

that these profits completely disappeared over the subsequent two years. Even though the evidence from this research study showed that momentum profits could not be considered as an outcome of the systematic risk, it failed to provide any explanation for this phenomenon. The study by De Bondt & Thaler (1985) also suffers from the same lack of a convincing argument that could explain its observations. Subsequent to the research by Fama & French (1993), Carhart (1997) proposed a pricing model comprising of four factors, adding the one-year momentum effect. His study found that the added factor improved the model's power. Fama & French (1996) tested their model and found it sufficiently able to capture portfolio return anomalies that the CAPM could not. They also found that the model could also explain the returns on homogenous portfolios formulated using factors such as sales growth, among others. Even though the model could not properly explain the persistence of short-term momentum in security returns, it was still successful in capturing the long-term reversal trend. Thereafter, Fama & French (1997) aimed at testing the Fama-French three factors and their corresponding risk premiums for time-variance sensitivity. They found that although the factors are assumed to be constant in terms of sensitivity, the tests results showed otherwise. However, they were able to empirically test and prove that their model outperformed the CAPM. The validity of the model was subsequently tested on a sample of financial firms in the US by Barber & Lyon (1997). They found the model to be capable of explaining the excess returns of such companies as well. Fama & French (1998) studied sixteen emerging markets and twelve major markets outside the US, from 1975 to 1995, testing for the persistence of the value effect, and found the factor to be economically and statistically significant. They also found high value companies gave better returns than growth stocks. This trend was observed in the emerging markets as well as all, but one, of the major markets. Further evidence for the robustness of the aforementioned model was provided by Chui & Wei (1998), who tested the model in the Pacific-Basin region. They included five emerging markets in the region- namely

South Korea, Taiwan, Hong Kong, Malaysia and Thailand. Their study found market beta having a weak relationship with returns in all the five markets. However, size effect was found to be significant in all the countries, while the value effect was found statistically significant in South Korea, Hong Kong and Malaysia. Drew & Veeraraghavan (2003) study emerging markets and document evidence in favor of the Three-Factor model. Their study, which included four countries-Philippines, Malaysia, Korea and Hong Kong, observed that the market beta alone could not sufficiently capture returns, but adding proxies for the size and value factors brought about significantly improvements to the forecasting abilities of the model. Kapur (2007) found the model sufficient in capturing returns on portfolios formed using the industry-sort. He also found that the addition of a macro-economic variable, which in this case happened to be GDP growth, did not add any significant value to the asset-pricing model. L'Her, Masmoudi & Suret (2004) examined monthly data from the Canadian stock market from 1960 to 2001 and found strong evidence to show that the Carhart model outperformed the Fama-French model. Similar conclusions were drawn by Nartea, Ward & Djajadikerta (2009) who tested both the aforementioned asset-pricing models for the New Zealand market for a ten-year period, from 1996 to 2005. However, an out-of-sample test, conducted by Chen & Fang (2009) in the stock markets across seven countries was unsuccessful at establishing the superiority of the Carhart Four-Factor model. Lam & Wei (2011) tested Hong Kong stock market by using monthly data and found the Carhart Four-Factor model to perform equally well in both bear market conditions and bull market conditions. Al-Mwalla (2012) tested the Three-factor model on a sample of listed Jordanian companies. He observed that while the Three-Factor model did a satisfactory job, adding momentum as a factor didn't result in a significant improvement in the model's forecasting abilities. Research conducted by Fama & French (2012) found the existence of a value effect across all the major geographical regions

except Africa, which was not included in the sample, whereas the momentum effect was statistically significant everywhere except Japan.

In pursuit of evidence to testify to the persistent nature of momentum effect and offer an acceptable explanation for the existence of such effects, Chan et al. (1996) research observed that stock returns generated in the past six months and the company's most recent earnings reports have a significant contribution in future returns. However, they also found that stocks trading at high prices which had significant earnings momentum exhibited a reversal in trend, thus suggesting that positive feedback trading could not be considered as a valid explanation for the persistence of momentum profits. Their research also offered evidence which showed the the model as deficient in adequately accounting for the aforementioned mean-excess portfolio returns. They also found a delayed reaction to news related to earnings surprises.

Rouwenhorst (1998) identified the prevalence of momentum in twelve countries. His study also found the momentum effect to be stronger for smaller firms in comparison to the larger ones. Later on, he studied twenty emerging markets and found compelling proof for the size effect and the value effect (1999). His study also found market beta to have no explanatory power. Moreover, he also found a strong association between average returns and liquidity, thereby rejecting claims that momentum returns were mainly premiums for illiquidity.

Moskowitz & Grinblatt (1999) documented the presence of strong momentum effects in certain industries. They found that after controlling for the industry effect, momentum strategies that involved buying winners and selling past losers were less profitable. The observations of their study suggested that momentum appears rooted in investor behavior, thus supporting the explanation provided by Jegadeesh & Titman (1993) wherein they postulated that individual momentum anomalies could be attributed to behavior. Jegadeesh & Titman (2001) did a follow-up to their initial study in which they examine the persistence of momentum returns in

the United States (1993) and found the one-year momentum effect persistent. These findings were used to refute the claims that the momentum effect was an outcome of data-snooping bias. Lewellen (2002) found the momentum effect in size-value sorted portfolios to be as strong as those observed at the firm level and the industry level in previous literature. His observations suggest that macroeconomic variables, and not factors related to the firm or industry level, are responsible for the persistence of the momentum effect. His study also found a strong co-variance among stock returns, thus ruling out the belief that momentum found in stock prices for size-value sorted portfolios are a function of investor under-reaction. The study then used two alternatives to explain the results observed: either the investor holds an erroneous belief that news coming out from one firm contains significant information about other firms, or that stock prices tend to respond to any adjustments in the total risk.

In order to support their previous findings, a subsequent study by Davis, Fama & French (2000) found proof that Value holds a statistically significant bearing on stock returns for the thirty-four-year period preceding the period observed in their previous study (Fama & French, 1992). Their results and conclusions served to refute the claims of Daniel & Titman (1997), that the value premium was an outcome of firm-specific characteristics rather than a compensation for risk, and was caused by the short-study period of the latter.

Titman, Wei & Xei (2004) studied US corporations and identified the existence of an inverse relationship between an uncharacteristic amount investment in assets and the subsequent stock returns. Moreover, the nature of this association could neither be attributed to risks like low liquidity or high levels of leverage, nor to firm-specific characteristics like momentum reversals owing to high returns in the immediate past. Nor could the relationship be said to have been caused by a follow-on issue of equity. Their study claimed that when companies usually decide to amplify their investments by abnormal levels, they generally end up overinvesting, and this tendency leads such firms to undertake projects that have a negative

NPV. As a result, investors overestimate future cash flows for such firms, and this causes the firm to be overvalued. The low returns observed, subsequent to the growth in the firm, is merely a market correction to the initial buoyant mis-reaction following the increased capital investment. Xing (2008) showed that capital investment is inversely related to future returns. The study found that portfolios that consist of firms that have low investment growth rates have higher returns when compared to portfolios comprising of companies that have high investment growth rates. His findings confirm the Q-theory of capital investment. This theory postulates that highly profitable firms that have access to low-cost capital usually are the most aggressive at investing in assets. Therefore, if one were to control for profitability, investments should have an inverse impact on returns. Xing found that the investment growth factor, as explained earlier, contains risk-related information same as the HML, and is able to capture the value effect the same as the HML. Research conducted by Cooper, Gulen & Schill (2008) analyzed capital investment being done by companies and study the US market from 1968 to 2003 to find that firms that invest conservatively earn significantly higher returns than those which display an aggressive attitude towards investments. These observations were found to be robust, even after adjusting for firm size. They also claim that markets have a tendency to extrapolate a firm's past growth rate in assets and value them accordingly. As a result, firms which have had high asset growth in the past usually tend to be overvalued, and thus, the subsequent poor returns. There have been several other theories and arguments which have been used to explain the investment effect since. Lyandres, Sun & Zhang (2008) attribute the observed inverse association between investment and expected security returns to the law of diminishing marginal utility, i.e., the productivity of every additional unit of capital tends to decrease with every unit of increase in investment. Li, Livdan & Zhang (2009) found similar results in their study. However, Titman, Wei & Xie (2009) did not find any evidence of a significant investment effect after studying the Japanese market. A subsequent study conducted

by Titman, Wei & Xie (2013) conducted an out-of-sample test of the investment effect. They collected data from 40 countries, spanning a duration of 26 years, from 1981 to 2005. They found expected returns and asset growth display a negative relationship in the 26 developed countries that formed the sample, whereas the investment effect was found to be missing in the 14 developing countries that also formed part of the study. Their observations led them to conclude that countries where access to equity markets was easier had a more profound investment effect when judged against countries where access to equity markets was limited. Yao et al. (2010) documented the impact of asset growth on the subsequent stock returns of listed firms in nine countries from the Asia-Pacific region. The study identified an inverse association between returns and the rate of asset growth in all the nine countries from 1981-2004.Interestingly, the asset growth was also found to be weaker in these countries when compared to the US. However, the study concluded that the magnitude of investment and asset growth rate between the US and the Pacific-Basin region varied strongly and could primarily be attributed to the stark difference in the corporate financing practices in the two regions. They note that firms in the Pacific-Basin display an over-reliance on debt and internal financing to fuel capital requirements, whereas firms in the US usually turn to the capital markets for the same purpose. The observed differences were also attributable to the cultural differences between the two regions, wherein the pervasive culture found throughout the Pacific-Basin region leans more on the side of conservatism and less risk-taking, while the US culture almost borders on over-confidence, and thus the tendency to overinvest. Their study confirms the observations of previous studies (Titman, Wei, & Xie, 2009). Singh & Yadav (2015) study the Indian market from October 1999 to September 2014 and also found asset growth to be negatively tied to future stock returns, thus concurring with previous literature on the subject. Cakici (2015) found the investment effect to negatively impact subsequent stock returns across all the major geographical regions except for the African continent, which was not included in

the sample. However, Chiah et al. (2015) study the Australian markets and find the investment effect and stock returns to be, surprisingly, positively correlated. Tong (2016) documents a similar relationship in China.

Over the years, a great amount of academic research has been focused on identifying various factors that have a significant impact on future returns. Haugen and Baker (1996) were among the first to document a direct relationship between a firm's profitability, using a measure of the return on equity, and expected return by examining the US markets from 1979 to 1993. This relationship was also found to exist in Germany, France, Japan and the UK during the period starting from 1985 and ending in June 1994. In order to come up with a rational explanation for this observation, Cochrane (1991) (1996) proposed a different theory. Subsequent work and further development of this theory was then carried by Zhang (2005) and Hou, Xue and Zhang (2015). As per this theory, the expected return for a firm's stock is equal to the ratio of the future marginal benefit of investments to the current cost of capital needed for such investments. As firm profitability increases, so should the marginal benefit of investment. Thus, the Q-theory postulated that higher the profitability of a firm, the more can be expected in the form of returns. Fama and French (2006) also how profitability might impact stock returns and observed a significant direct relationship between the two. They conclude that higher a firm's profitability, higher were the corresponding returns that an investor could expect if she were to invest in the stock of such a firm. However, Fama and French (2008)observed the aforementioned effect to exist only for firms which are small by way of market capitalization. Novy-Marx (2010) found that more profitable firms, even those that may be considered as having low value and being larger in size, as measured by market capitalization, earned higher returns than firms having lower profitability, on average. These results further proved that market beta, a value effect adjusted for industry, gross profitability and a momentum effect explain a variety of anomalies found in the stock market.

Surprisingly, Sehgal and Subramaniam (2012) examined the presence of the profitability effect by studying a sample of roughly 500 companies listed on the BSE from January 1996 and December 2010. They found an inverse relationship between profitability and stock returns, thus contradicting results from elsewhere. Moreover, there results also proved robust for alternative measures of profitability as well. Wang and Yu (2013) found that old-school microeconomics could not be used to explain the profitability effect. Rather, they came to the conclusion that a short-term mis-pricing, an outcome of an under-reaction induced by inattention, can be used to explain the profitability premium, although only partially. However, Ball, Gerakos, Linnainma and Nikolaev (2015) found that for the aforementioned explanation to hold true, the mispricing must continue uncorrected for at least four years, and for a relatively efficient market like the US, that is highly unlikely. Sun, Wei and Xie (2014) study 25 developed countries and 16 developing ones, from 1980 through to 2010, and find profitability directly affecting on stock returns in most. Moreover, they attribute the persistence of the profitability effect to the risk-based explanation as proposed by the Q-theory. Singh and Yadav (2015) find profitability negatively concomitant with expected returns, same as the results observed by Sehgal and Subramaniam (2012).

Driven by the research since the year 2000 onwards, Eugene Fama and Kenneth French (2015)came up with a five-factor model. The study found most of the deviations in returns to be satisfactorily captured by the model. However, the model did suffer from a few shortcomings. One of those shortcomings pertain to the low average returns generated by stocks of small size companies that are aggressively investing despite low profitability remain unexplained. Additionally, it was also observed that adding the factors that could incorporate the aforementioned effects seemed to render the value factor as redundant. Chiah et al. (2015) conducted a study which involved testing the two Fama-French models for a comprehensive time duration of thirty one years, covering the last eighteen years of the previous century and

the first thirteen years of the twenty first. The Three-Factor model was incapable at capturing the premiums for the investment-sort and profitability-sort portfolios, which were successfully captured by the new model. The new model was also found to be better at explaining some of the other common anomalies observed in stock returns.

A similar study was conducted by Nguyen et al. (2015). However, the study could not arrive at definitive conclusions regarding the superiority of either of the two models over the other. However, confirming the results of Chiah et al. (2015), the study found that the Value factor remained statistically significant despite the inclusion the profitability and investment factors. Cakici (2015) studied a sample of developed countries, covering the duration from December 1989 to December 2014. The research could not find any evidence neither in favor of the superiority of the later model over the previous one, nor in favor of the redundancy of the value factor. Overall, the study concluded that the Five-Factor model has limited applicability in markets outside the US. A follow-up study by Fama and French (2017), along similar lines as the study conducted by Cakici (2015), for a similar time period, more or less confirmed the findings of the latter. However, other studies found the Fama-French model could adequately explain any variations observed in returns which are attributable to investment and profitability effects ((Sundqvist, 2017, Zaremba & Czapkiewicz, 2017, Lin, 2017).

Connor and Sehgal (2003) were the first ones to empirically test the CAPM and the FFTF model in the Indian markets. Testing the two models for 364 companies included in the CRISIL-500for a period of ten years, from June 1989 to March 1999, they find both size and value effects to have a strong presence in the Indian market. Mohanty (2002) also found that size and value effects, along with earnings and financial leverage, exerted significant influence on cross-section variations in average returns. Tripathi (2008) explores the relationship that stock returns may have with variables such as market size, debt equity ratio and other such company-specific factors. Taneja (2010) conducted a study for the period from 2004-2009 and

found the FFTF model to be a better forecaster of returns in comparison to the CAPM. Kumar and Tavishi (2011) found the Carhart Four-Factor model incapable of explaining excess returns and found momentum returns to be statistically insignificant. Another study conducted by Agarwalla, Jacob and Varma (2014) further documented the results obtained from testing the model specified by Fama & French, augmented with an additional momentum factor, which found all the four factors to have a significant strength in explaining excess returns. Thereafter, Dash and Mahakud (2014) use panel data and time series methodology for the period of sixteen years, from 1995-2011, and establish that a liquidity factor, when added to a multi-factor model, helps the model do better. Harshita & Yadav (2015) run comparative analysis from October 1999 to September 2014 and find the three-factor model to be better. Similarly, Balakrishnan, Maiti & Panda (2018) find that three-factor model remains robust in accounting for excess stock returns.

This research is a step in a similar direction. This study aims at examining the extent to which the Five-Factor model is suitable for application in India. The study will be using a sample period of twenty years, from 1999 to 2019 and comparing the results obtained after testing the various asset-pricing models. This study also focuses on testing a Momentum-augmented Five-factor model, so as to establish if the resulting six-factor model is more robust than previous asset-pricing models in capturing excess returns. Moreover, since Fama-French (2015) themselves admit that adding a profitability factor to the existing FFTF model leads to the obsolescence of the Value factor, this study also evaluates the results obtained from testing an altered five-factor model wherein the value factor has been excluded but a momentum factor has been included.