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Market Anomalies and Abnormal Returns

by

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CERTIFICATION OF THESIS PREPARATION

"I hereby declare that this particular thesis has been written by me, in order to obtain the Postgraduate Degree in "Financial Management, and has not been submitted to or approved by any other postgraduate or undergraduate program in Greece or abroad. This thesis presents my personal views on the subject. All the sources I have used for the preparation of this particular thesis are mentioned explicitly with references being made either to their authors, or to the URL's (if found on the internet)."

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Contents

Abstract

In the field of Asset Pricing, CAPM was widely used to predict asset returns. CAPM uses only the market risk to explain the assets' expected returns. However, the market portfolio does not provide enough explanatory performance to explain asset' returns. Thus, the idiosyncratic risk can be priced. Therefore, I use various models towards that direction.

This thesis uses datasets from the Kenneth French library to extract conclusions regarding abnormal returns on various portfolios of assets. I mainly use multifactor models as they are considered the simplest and most accurate models in asset pricing. The six factors for the FF6 model are used from Kenneth French library. These factors represent firm and market characteristics that can make iteration for risk. Apart from this, the 4 factor for the Stambaugh-Yuan mispricing factor model (M4) are downloaded from the authors' site. Furthermore, I use the five factors for Hou-Mo-Xue-Zhang Q5 model. Then, the factors for Daniel, Hirshleifer, Sun, model (DHS) are also from the authors' site. All models are estimated, by using the Fama Macbeth estimation procedure. To correct the biasness of the time series cross-sectionality, I run the gmm estimator, as it is more robust. This thesis reaches the conclusion that the FF6 model, outperforms the rest of the models. The models can explain the variability of the returns. The risk premia do not report a strong explanatory power, and other factors might be proper to be constructed to explain abnormal returns.

1. Introduction

Large theoretical and empirical work in asset pricing has been targeting the equity premium puzzle, presented by Mehra and Prescott (1985). It refers to the excessively high returns that stocks show over bonds historically and the difficulty to explain such inconsistency. The basic concept that characterizes asset prices is the risk-return trade-off. Stocks and bonds correlate with business cycles. Stocks have higher returns than bonds, as stocks are riskier, even if the investors hold them for a longer period. Therefore, it seems that investors show a fear for holding risky assets. The more fear the investors have, the more reward they ask for. This type of fear is derived from the fact that the funds needed, have a specific financial or business purpose.

The usual established framework in asset pricing is a lifetime consumption environment, where the investor must in each period balance the allocation of wealth between today's consumption and the savings and investment that will support future consumption. As the utility function is being optimized, then the value from additional consumption at the current period must be equal to the utility value of the expected future consumption that is financial from additional endowment. The future endowment that will be added will be derived from labor income and from additional returns from funds that are invested in the optimal complete portfolio. In such environment, the investors fear of getting low returns or losing their funds due to the fall of consumption. This" fear" is captured by the pricing formula is:

$$0 = E(M_{t+1} R^e_{t+1}) \tag{1}$$

Which in a continuous time is:

$$E(R^e_{t+1}) = -cov(M_{t+1}, R^e_{t+1}) \tag{2}$$

Where M stands for the stochastic discount factor and R^e for the excess return, which is the difference on the returns of two securities. From (1), the expected returns are high as the stochastic discount factor gets higher and stock prices fall. This practically means that there are risks, which investors do not take into consideration in bad times. So, what are those risks and how they affect asset pricing? One simple first step to understand the investor expectations is the standard power-utility consumption-based model:

$$M_{t+1} = e^{-\delta}\left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} \tag{3}$$

By replacing M_{t+1} with its derivation in (2):

$$E\left(R_{e_{t+1}}\right) = \gamma cov(\Delta_{c_{t+1}}, R^{e}_{t+1})\text{fa} \tag{4}$$

Δc stands for consumption growth and γ for the risk aversion coefficient. So, this model assumes the change of the consumption as the primal driver of asset prices. But the volatile consumption is not enough to explain he variance of asset prices, as we would need large risk aversion coefficients. From (4),

$$\frac{E(R^e)}{\sigma(R^e)} \leq \gamma\sigma\left(\Delta_{C_{t+1}}\right) \tag{5}$$

Under a normal scenario for all variables, we need a high degree of risk aversion, which realistically is unlikely (Hansen and Jagananthan, 1991). By looking the problem at a continuous time:

$$r_t^f dt = \delta dt + \gamma E_t\left(\frac{dC}{C}\right) - \frac{1}{2}\gamma(\gamma+1)\sigma_t^2 \frac{dC}{C} \tag{6}$$

Where $R_{f_t} = \frac{1}{E_t(M_{t+1})}$

The third term, precautionary savings might explain high γ, but it causes imbalances to the rest of the terms. The risk premium can be found from:

$$R^{e}_{t+1} = a + by_t + \varepsilon_{t+1} \tag{7}$$

Where y_t can be either the price/dividend ration or price/earnings, or yield spreads or interest spreads. The volatility of stock and bond prices is a high significant issue. There is an ambiguity of whether high prices simply high dividends or not making it difficult the predictability of prices along with the predictability of returns. So how the equity premium puzzle could be justified? Cochrane (2017) provides a thoughtful and well-detailed picture towards that direction. He analyses the prevailing theory on asset pricing such as habits, recursive utility, long-run risks, idiosyncratic risk, heterogeneous preferences, rare disasters, utility non separable across goods, ambiguity aversion and behavioral finance. The models presented in Cochrane's article base their intuition on the generalization of marginal utility of the form,

$$M_{t+1} = \beta \left(\frac{C_{t+1}}{C_t}\right)^{-\gamma} Y_{t+1} \tag{8}$$

The variable Y_{t+1} is the noticeable difference in most theoretical models. The disturbances in terms of behavior and probability can be modelled as the first order condition

$$p_t u'(C_t) = \beta \sum_s \pi_s(Y) u'\left(C_{t+1,s}\right) x_{t+1,s} \tag{9}$$

where x stands for the payoff and p for the price of the stock. Instead of tweaking the probability, the marginal utility function must be modified. At this case Y is what does the work. So, at this point, I showed what most asset pricing models try to solve.

In this thesis I focus on the empirical side and specifically on multifactor models. It develops as follows: Chapter 2 provides with the literature review on asset pricing in general and specifically on models that try to solve the equity premium puzzle and are included on this thesis. Chapter 3 documents the methodology and thinking behind those asset pricing models. Chapter 4 documents the data used along with summary statistics of the used factor, while Chapter 5 includes the empirical results. Chapter 6 presents the conclusions, while Chapter 7 gives an overview of my work usefulness for practitioners. Finally, Chapter 8 are the references that are used.

2. Literature Review

From the introduction discussed in the previous chapter still the literature has not provided a clear solution to the equity premium puzzle. The fact that new factors are continuously constructed and tested with different test portfolios from different geographic locations and markets of the planet, means that models and factors that would explain asset returns in every market, do not exist. Each model has its strong and weak points.

There has been extensive work on asset pricing and explaining asset returns. To begin with from a consumption-based approach, Sharpe (1964) and Lintner (1965) test the capital asset pricing model (CAPM) to explain the relationship between return and risk. CAPM introduced the factor models in asset pricing, as it has the market portfolio as a sole factor to explain asset returns, which was not enough. Thus, other models came up in the direction of explaining the predictability and volatility of asset prices. Epstein and Zein (1989) establish the recursive preferences, where a time aggregator is disentangled from the risk aggregator. Campbell and Cochrane (1999), on a different perspective, show that consumption data can explain the equity premium puzzle better and they also find the existence of external habit that affects consumers' preferences. In other words, investors fear a lot in recessions, and consumption falls towards habit, while the opposite happens in times of prosperity. Cochrane and Campbell (1999) he compares the models with the habits model and concludes that although they provide similar results, the habit model gives a more precise answer for the equity premium puzzle. He evaluates the models in terms of predictability and volatility of the asset prices. Bansal and Yaron (2004), Bansal,Kiku and Yaron, (2012) study the long run risks model for asset pricing. They find that a rise in macroeconomic volatility is related with a rise in discount rates and a decline in consumption growth.

A more interesting view of asset pricing is the investment-based pricing models. The first step on the literature, was done by Merton and Ross (Merton, 1973; Ross, 1976) who set up the Intertemporal Capital Asset Pricing Model (ICAPM) and Arbitrage Pricing Theory (APT). However, ICAPM was highly complicated making it difficult to be implemented by practitioners. So, at that moment CAPM was widely used.

On the other hand, practitioners have been using the Fama and French 3 Factor (FF3) model and its extensions. To begin with, the FF3 model was proposed by Fama and French (1993). They suggest that to predict stock returns, you must use as factors: the market portfolio minus the risk-free rate, the difference in the performance between small and big stocks (SMB), and the difference in the performance between those with high book-to-market ratio and those with low ratio (HML). Fama and French find that by taking those factors, their model explains 90% of the portfolio returns. In the next years, many different versions of the Fama French factor model were derived. Firstly, Fama and French (2015) use a five-factor model. The model besides the three factors used on the FF3 model (market portfolio, SMB, HML) includes the RMW factor, which is the difference between returns on portfolios that include stocks with high and low profitability and the CMA, which stands for the difference between stocks that have low investments and those with high ones. But their thinking focuses on local markets and do not take into consideration momentum. Thus, Fama and French (2017) add momentum as a factor (UMD, from Jegadeesh and Titman (1993) into their initial FF5 model to structure the six-factor model (FF6). Besides of that, they transform the RMW factor into being a cash-based factor (RMWc).

Stambaugh and Yuan (2015) propose a different multifactor model. Their model includes 4 mispricing factors (M4). The tested factors are: MGMT representing management, the PERF representing performance of the stocks. The rest are the market and size factors. They find that the size factor in their model results with a double small-firm premium than the usual values that the literature usually provides. Furthermore, they show that a four-factor model with two mispricing factor outperforms the rest. Their contribution is that each factor is not related to a single anomaly, but to multiple anomalies.[1] They also, find that their model performs better when Bayesian factor model tests are involved. The most result that they mention, is that their own version of the SMB factor shows a large premium.

Although, the abovementioned models have high explanatory power of abnormal returns, there are anomalies that in most cases violate the three-factor model, making it necessary that either more factors should be included or other factors to deal with those anomalies. Toward this direction, Hou, Xue and Zhang (2015a) suggest a four-factor model that test assets returns with market, size factors and two new factors representing investment and profitability. The model is basically in an investment-based pricing environment, while Fama and French (2015) study their estimation in a present value environment.

Novy-Marx and Velikov (2016) show the way for capitalizing the investor confidence. Specifically, they test the performance of anomalies at an after-trading cost and ho effective are transaction cost procedures to alleviate the weight of the transaction cost. They also study how fresh capital reduces strategy profitability in relation a with funds turnover. They also shed a light to strategies that are based on size value and profitability. Their work paves the way on how factor models can capitalize on gains from anomalies on market microstructure.

[1] The model involves 11 anomalies, which are separated in two clusters.

Barillas and Shanken (2017) construct a Bayesian asset pricing test to compare the performance of asset pricing models. Moreover, they compute model probabilities for gathering all the possible asset pricing models, which are based on the subsets of specific factors. They find that the q5 model and the FF5 model have lower performance compared to those who have a momentum factor included, apart from the value and profitability factors. They also outline that they use monthly data.

Daniel et al., (2019) propose an alternative approach for asset pricing. They suggest a factor model that includes behavioral factors to explain the cross sectionality of asset returns in the USA equity market. The model includes two factors to capture long and short-term mispricing. The model focuses on the long term on the mispricing dimension, while on the short-term it focuses on investors behavior. For the shorter-horizon mispricing, the authors add another factor for the investors' behavior, PEAD, which measures the underreaction of investors to new earnings announcements. Thus, PEAD is a factor that captures investors underreaction on post earnings announcement drift phenomenon. In other words, So, basically its multifactor model with risk and behavioral factors. They also find that a model with the suggested three factors, can explain better asset returns compared with other models.

So, from the above-mentioned literature, one question arises: Which factors to use to explain asset returns. Hou et al, (2018) make the same question on their work. They compare the performance of a q-factor model, Fama French 5 and 6 factor models, q^5 model and M4 factor model. After running the necessary tests, they find that the q-factor model outperforms the fama French 5 and 6 factor models. The M4 model gives out regression results similar to the qth-factor model. In general, the q-factor and q5 model are superior to other models due to their strong economic intuition related to the theory of real investments.

A more recent work was conducted by Roy (2021). He lights the importance of the human capita component. Therefore, he derives a six-factor model by incorporating to the Fama Frenh five factor model the human capital factor. He finds that it outperforms and results in better estimates compared to the Fama–French three-factor, Carhart four-factor, and Fama–French five-factor model. In other words, his model is able to explain better than its peers the variation of the excess returns of various Fama French portfolios.

My thesis contributes to the literature on the asset pricing section. Comparing the FF6, Q5, M4 και DHS3, I find that the FF6 is the model with the greatest explanatory power. I also highlight that the factors for each model are important to understand abnormal returns. Further contribution to the literature is to check the applicability of the models with various datasets. Authors, who invented those models have made a huge contribution to the literature, but they do not test these models with such variety of data. Furthermore, past research has used to test the validity of these models from the perspective of different factors. Therefore, the results that are derived from my work, will give a different overview of the relation with different sets of factors. Ultimately, I want to show that by testing the validity of the models on various datasets, I will extract useful conclusions for policymakers and any other interesting parties.

Finally, I consider running the above-mentioned models with two basic distinct estimators: the Fama MacBeth procedure and the GMM-estimator. The reasons of using these are simple: firstly, the Fama Macbeth procedure has been in use since 1973 to test asset pricing models, while the GMM is necessary as it takes less assumptions for the data's distribution function. Apart from these reasons, the Fama Macbeth regression provides corrected standard errors in terms of cross-sectional correlation.

3. Methodology

3.1 The basic intuition behind multifactor models

The existence of the stochastic discount factor (SDF) shows that there is a factor structure. Sharpe (1964), Lintner (1965) and Roll (1977) state that if investors are mean-variance optimizers in a single period, then the market portfolio is also mean-variance optimized. What they document, is a beta relation between the market portfolio and asset returns. At this point, Ross (1976) added the assumption of no arbitrage and that the market portfolio is the single source of risk that cannot be diversified. Therefore, it can be inferred that if there more sources of undiversifiable risk (factors), then a multifactor model can be derived.

From the above, it can be understood that there is a SDF environment, in which SDF is a combination of common factors that present linear behavior. The factors have a conditional mean and there is orthogonality from to the other. When

$$M_{t+1} = a_t - \sum_{k=1}^{K} b_{kt} f_{k,t+1} \tag{10}$$

When the covariance of any asset's excess return with the SDF is negative and stands as

$$- Cov_t\left(M_{t+1}, R_{i,t+1} - R_{f,t+1}\right) = \sum_{k=1}^{K} b_{kt}\sigma_{ikt} = \sum_{k=1}^{K}(b_{kt}\sigma_{ikt}^2)\left(\frac{\sigma_{ikt}}{\sigma_{ikt}^2}\right) = \sum_{\kappa=1}^{K} \lambda_{kt}\beta_{ikt} \tag{11}$$

Where σ_{ikt} stands for the conditional covariance of asset return i with the factor k-th factor, σ_{ikt}^2 is the conditional variance of the k-th factor and β_{ikt} is the beta (the regression) coefficient of asset return i to the related factor. So, the asset's betas with the same factors multiplied by the risk prices of the factors gives out the risk premia.

3.2 The models

This chapter describes asset pricing models using existing literature. In the first paragraph the FF6 is described which can be seen as the foundation of asset pricing models. The next paragraphs describe other models such as FF6, Q5, M4 και DHS3. The main contribution of my thesis is that no other literature compares those models and with a great variety of datasets. For instance, I use i) 125 Sorts involving Accruals, Market Beta, Net Share Issues, Daily Variance, and Daily Residual Variance, ii) 25 Portfolios Formed on Size and Short-Term Reversal (5 x 5), iii) 25 Portfolios Formed on Size and Long-Term Reversal (5 x 5), iv) Univariate sorts on Size, B/M, OP, and Inv.

3.2.1 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory (APT) model is easier to use than the CAPM. It requires fewer assumptions. The problem is that the researcher might find it difficult on which factors to choose to run the regression. The APT formula requires the expected rate of return of any asset and the risk premia of any macroeconomic factors that is to be included in the model.

The formula of the model is:

$$E_{r_i} = r_{f+\beta_i 1*R_{p1}+\beta_{i_2}*R_{p2}+\cdots..+\beta k_n*RP_n} \quad (12)$$

Where r_f stands for the risk-free rate of return, β measures how sensitive is an asset or portfolio to a specific factor and RP is the risk premium of the factor.

3.2.2 Capital Asset Pricing model (CAPM)

The Capital Asset Pricing Model (CAPM) lays the foundation for describing the cross-sectional variance of average expected returns of stocks or portfolios. It was introduced by Sharpe (1964), Lintner (1965) and Black & Scholes (1972). The model shows the linear relationship between the average expected return of a portfolio filled with stocks and the market risk.

The formula for the expected return is as follows: $E_{ri} = R_f + \beta_i (E_{Rm} - R_f)$

According to this formula expected returns are based on a risk and a time value of money component. The risk-free rate is considered for the latter one. The additional risk investors take is the exposure to the expected market risk premium. Beta measures the systematic risk compared to the market. It shows the sensitivity to market movements, the beta of the market is showing a value of 1. A beta greater than one means the stock has a higher exposure to market movements and is riskier than the market. It requires a higher expected return according to CAPM. Expected market returns are based on historical data.

The CAPM is widely used in the field of Finance, because of the simplicity and the opportunity to compare different investments. Although different empirical studies have shown that expected returns are not only based on the exposure to the market risk factor. The CAPM needs a extension by adding risk factors that affect expected returns of securities.

3.2.3 The 6 Factor Fama French model (FF6)

Fama and French (1992 & 1993) developed an extended version of the CAPM called the Fama and French three-factor model (FF3) and therefore reduces empirical errors of the CAPM. This model indicates that the cross-sectional variance of expected returns is better explained by adding a seize and a value factor. Stocks with exposure to this risk factors requires higher expected returns. Empirical studies show that small cap firms tend to outperform large cap firms. Small cap firms seem to be riskier and therefore demand an additional premium for this risk. Value stocks tend to outperform growth stocks. Value stocks have a high book to market ratio and are priced at a lower price relative to its fundamentals. Investors demand a premium for the exposure to these risk factors.

The FF6 model is an extension of the Fama-French 5 factor model (FF5). Fama and French (2015) extend the three-factor model of Fama and French (1993). Specifically, they include various factors on their model such as the market, size, value-growth factors, profitability, and investment factors. Therefore, the difference of the five-factor model with the six-factor model is the addition of the momentum factor.

Fama and French (2015) extended the FF3 model by adding a profitability and investment factor. This five-factor model seems to explain between 71% and 94% of the cross-sectional variance of expected returns what is an improvement of the FF3 factor model. The profitability factor indicates taking long position in stocks with robust profitability and short position in stocks with weak profitability. The investment factor indicates taking long position in stocks with low investments and short position in stocks with high investments. Rewriting the Gordon growth model helps to understand these extra risk factors: $\frac{P_t}{B_t} = \frac{\sum_{t=1}^{\infty} E(Y_{t+T} - \Delta B_{t+1}) / (1+r)^t}{B_t}$

First fix every component except the expected future earnings, $E\ (Y_{t+T})$ and the expected stock return(r). According to this formula higher expected future earnings imply higher expected returns. Next fix everything except the expected growth in book equity investment and the expected stock return. Higher expected growth in book equity investment implies a lower expected stock return. Although this model explains the cross-sectional variance of expected returns quite well, it still has problems with explaining the expected returns of small stocks. So, the Gordon formula gives us a clear picture of a few factors that affect a stock.

Regarding the FF6 model, on the LHS of the regression are the real portfolio returns minus the risk-free rate, while on the RHS are the market factor, the small minus big factor, the profitability factor and finally the Investment factor and finally the momentum factor. Thus, from equation 1, I see:

$$R_{it} - R_{Ft} = a_i + b_i Mkt_t + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t \quad (13)$$
$$+ m_i MOM_t + e_{it}$$

So, from equation 12, R_{it} is the asset return in dollars for month t, R_{Ft} is the risk free rate (usually the one-moth US Treasury bill rate), Mkt_t is the value weight return of the market portfolio minus the risk free rate. Next, on the right-hand side of the equation follows the SMB_t that represents the returns on diversified portfolios of small and big stocks, the HML_t which is the factor for high and low Book to market stocks, RMW_t is the differences for stocks with robust minus weak profitability, while CMA_t stands for the stocks that conduct investments conservatively minus the stocks that have an aggressive investment behavior. Finally, e_{it} stands for the residuals, while b_i, s_i, h_i, r_i, c_i represent the differences for expected returns for each factor. MOM_t stands for the difference between winners based on past performance. Lastly, a_i is the abnormal return.

3.2.4 The DHS 3 factor model

As I mentioned above the Daniel-Hirshleifer-Sun model is a three-factor model proposed by Daniel et al (2019). The model uses as factors are the market portfolio (MKT), the financing (FIN), and a post-earnings announcement drift (PEAD). In other words, the model deals with how investors cope with overreaction and underreaction on corporate news. In terms of time, the model is testing with a short-term horizon and a long-term horizon. The intuition behind the construction of the factors is that developments on corporate balance sheets are correlated with investor expectations. Then, it may be inferred that investors want to be rewarded for investing in the company. Then, the biasness that flows through the investor climate will be capitalized by arbitragers, who will try to accumulate profits from the placed bets. Daniel et al, (2019) do not follow the usual direction on formulating the financing and post earnings announcement drift factors. The approach they follow, highly affects the model's performance. The financing factor premium is higher with the approach that they follow. The model can explain the equity premium return, but it is unable to provide a reasonable explanation for the size premium.

Regarding the factors, to formulate the FIN factor, the authors use the 1-year net share issuance constructed by Pontiff and Woodgate (2008) and the 5-year composite share issuance made by Daniel and Titman (2006). The PEAD factor on the other hand is constructed by using the 4-day cumulative abnormal return and classified around the recent quarterly earnings announcement dates in line with Chan, Jegadeesh, and Lakonishok (1996). In other words, the PEAD factor is formed by setting the investor to go long to firms that make positive earnings announcements and short the stocks that make negative earnings announcements. The FIN factor is formulated from annual data independent 2x3 sorted on size and financing variables. The FIN factor is created to model the mispricing at long term horizon. To that direction, helps the fact that the institutional dimension in relation to issuance and repurchase. So practically the FIN Factor deals with the long-term aspect, while the PEAD Factor with the short-term aspect. The size sort is formulated using the NYSE median. In the procedure, they also manipulate the net share issuance sort and the composite issuance sort. As far is the PEAD factor concerned, its formulated from monthly 2x3 sorts based on size and abnormal returns. Finally, to construct the size sort, the NYSE media is used, and for the Abnormal returns sort the NYSE breakpoints of the 20 and

80percintiles are used. Value-weighted monthly returns are calculated for the current month, and the portfolios are rebalanced at the beginning of next month.

3.2.5 The M4 model

The M4 model is known as the Stambaugh and Yuan model. Stambaugh and Yuan (2015) present a four-factor model. The model includes market and size factors. The main purpose of the model was to deal with anomalies in the asset prices. In other words, the goal of the model is to capture mispricing effects in the financial markets and systematic components such as the investor sentiment. This is crucial, as it is observed more of a herd behavior in the markets during the last years. Furthermore, the anomalies imply the existence of patterns in asset prices. For instance, investor sentiment helps the investor to predict anomalies to go long or short in profits. High sentiment also leads to lo short-leg asset returns.

Thus, the M4 model accumulates information about 11 anomalies. Afterwards, the model tries to decompose the factors of mispricing. Stambaugh and Yuan suggest two different versions of their model: the first version is a four-factor model, with market, size, and MGMT and PERF as factors. The second version is a three-factor model with market, size and UMO as a mispricing factor. In this thesis, I use the first version of the model.

Stambaugh and Yuan construct their own SMB factor. For the process, they use stocks that are less likely to be mispriced. Firstly, the stocks that they use are from NYSE, AMEX, NASDAQ with a price over 5 dollars. Next, they run a regression to capture the correlations of the 11 anomaly long-short residuals. The regression is of the structure: $R_{it} = a_i + \beta_i MKT_t + s_i SMB_t + e_{it}$. Next, they follow the procedure from Ahn et al, (2009) to create the two mispricing factors. They create two clusters, where the first includes Net stock issues Distress, Composite equity issues, Accruals, Net operating assets, Asset growth, Investment-to-assets, while the second cluster includes distress, o-score, momentum, gross profitability, return on assets. The first cluster is the MGMT factor, and it is management related, while the second cluster is PERF and it is performance-related.

The factor formulation is the following: Each stock's anomaly percentile is averaged within each cluster resulting in the mispricing measures, let's say P1 and P2. Afterwards, you must separate the stocks in respect to their size, using the median NYSE size as a benchmark. Next, in each size group two value-weighted portfolios are formulated: the first group was stocks with P1 below 20th NYSE/AMEX/NASDAQ pctile and the second group was stocks with P1 above 80th NYSE/AMEX/NASDAQ pctile. Thus, the average low-P1 minus the average high-P1 return results in the MGMT factor. To extract the PERF factor, the same procedures is repeated for measure P2.

Regarding the size factor that the authors are suggesting, they recommend that in order to create the SMB factor you have to follow the procedure below: First, you have to use the stocks that were not included during the procedure of formulating the mispricing factors. Then, the factor is the difference of the returns between value-weighted portfolios small stocks that are not included in the four extreme P1 and P2 portfolios and large stocks that are not included in the four extreme P1 and P2 portfolios.

3.2.6 The Q^5 model

The Q^5 model was derived to outperform the rest of the multifactor models. To be more specific, the Q^5 model was built by Hou et al (2017). Firstly, they construct the q-factors and an expected growth factor. The q-factors are from Hou et al, (2015), who create the size, investment and return on equity (ROE) factor. These are sorted on size, investment-to-assets (I/A) and ROE on a triple (2x3x3) sorted matrix. Regarding the expected growth factor, Hou et al, (2017) tweak the q- factor model by constructing the expected growth factor, thus the Q^5 model is formed. The growth factor is formed from a 2x3 matrix sorted on size and the expected investment-to-assets change at *t+1*. The latter is formed by using available data for Tobin's q and operating cash flow -to-assets.

So, the next step is to explore the basic intuition behind the q-factor and the Q^5 model. According to Hou et al, (2017) the models are inspired from the investment based CAPM. Time in both models, is discrete and the horizon is infinite. In the models, there is a representative consumer and heterogeneity among firms exist. Both elements are categorized by *i=1, 2,...,N.*

The consumer maximizes his/her utility function $\sum_{t=0}^{\infty} p^t U(C_t)$, where p stands for the time discount factor, C_t stands for consumption at time *t*. In the model, P_{it} is the ex-dividend equity, while D_{it} is the firm dividend *i* at *t* period. It is known from theory of asset pricing, that consumption reflects the $E_t\left(M_{t+1} r_{it+1}^S\right) = 1$, where $r_{it+1}^S \equiv \frac{P_{it+1}+D_{it+1}}{P_{it}}$ is the *i* stock's return at time *t* *and* $M_{t+1} \equiv pU'(C_{t+1})/U'(C_t)$ is the so called stochastic discount factor (SDF). Thus: $E_t\left(r_{it+1}^S\right) - r_{ft} = \beta_{it}^M \lambda_{Mt}$. From the last equation it can be understood that the excess return is equivalent with the beta coefficient, multiplied with its relative risk factor.

One should have in mind that firms either consume or invest. In any case, firms want to achieve operating profits. Thus, any capital input is used to achieve that goal. In other words, the market equity must be maximized. So, the operating profits are represented by $X_{it} A_{it}$,where A_{it} stands for the productive assets, X_{it} stands for the return on assets (ROA) as a proxy for profitability. The q-factor model:

$$E_t\left(r_{it+1}^S\right) = \frac{E_t(X_{it+1})}{1+a\left(\frac{I_{it}}{A_{it}}\right)} \tag{14}$$

From equation 14, it can be inferred that stocks, which can have low investment and show high expected profitability rate will earn higher expected returns than stocks with low profitability and high investment rates.

Hou et al., (2021) presents a renewed version of the model. To be more specific, they augment the Hou-Xue-Zhang (2015) q-factor model with the expected growth factor thus deriving the q^5 model:

$$E\left(R_i - R_f\right) = \beta_{MKT}^i E(MKT) + \beta_{Me}^i E(R_{Me}) + \beta_{\frac{I}{A}}^i E\left(R_{\frac{I}{A}}\right) + \beta_{Roe}^i E(R_{Roe}) + \beta_{Eg}^i E(R_{Eg}) \tag{15}$$

Where from equation 15, MKT stands for the market portfolio, $\mathrm{R_{Me}}$ stands for the size factor, $R_{\frac{I}{A}}$ stands for the investment factor and R_{Roe} is the return on equity factor. Lastly, R_{Eg} is the expected growth factor.

3.3 Estimation procedure

3.3.1 The Fama -Macbeth procedure

A Fama-Macbeth regression is a two-staged regression The first stage tests if there is a relationship between portfolio excess returns and the risk factors by running a time-series regression. The relationship is based on an OLS regression. Portfolio excess returns will be used as the dependent variable and the risk factors as independent variables. Fama (1976) stated that slopes of Fama-MacBeth regressions can be seen as returns on characteristic-based portfolios. Furthermore, does the R^2 reflects, in large part, how much ex-post volatility these portfolios explain.

The second stage of this Fama-Macbeth regression inform us about the reliability of the estimates from the first regression. Current portfolio excess returns will be used as dependent variable and the slopes from the first stage as independent variables. Performing this time-series regression shows us if these estimates line up with true expected returns. Truly good estimates have a slope of one so it can be seen as an unbiased forecast.

In chapter two different asset pricing models were described to explain average expected stock returns. The Fama and French 6-factor model seem to perform better than previous models in explaining these cross-sectional average returns. In this study models like the Fama and French three-factor model and the Cahart four-factor model are not used, as they are thought to be not adequate. This is done to show the improvement in models trough time and if these models can be applied for the Kenneth French’s test portfolios. Although there is much academically research that proves that there is a momentum factor, the risk factor is not a part of the Q5, M4 and DHS 3 model. In addition, this study proposes that the models that do not use the MOM factor can be extended with that. It offers a better insight of the momentum factor and the possibility of a better empirical model.

According to the Fama Macbeth regression, there are two stages to derive the risk premia. The first stage is to derive the beta factors. To do so, each of n asset returns is to be regressed against the m risk factors. Specifically:

$$R_{1,t} = a_1 + \beta_{1,F_1} F_{1,t} + \beta_{1,F_2} F_{2,t} + .\dots\dots. + \beta_{1,F_m} F_{m,t} + \varepsilon_{1,t}$$

$$R_{2,t} = a_2 + \beta_{2,F_1} F_{1,t} + \beta_{2,F_2} F_{2,t} + .\dots\dots. + \beta_{2,F_m} F_{m,t} + \varepsilon_{2,t}$$

……..

$$R_{n,t} = a_n + \beta_{n,F_1} F_{1,t} + \beta_{1,F_2} F_{2,t} + .\dots\dots. + \beta_{i,F_m} F_{m,t} + \varepsilon_{n,t}$$

Where $R_{n,t}$ is the excessive return of the n asset at period t.

On step 2, asset returns are regressed at each time *T* against the estimated betas from step 1 to extract the risk premia for all factors:

$$R_{i,1} = \gamma_{1,0} + \gamma_{1,1}\beta_{i,F_1} + \gamma_{1,2}\beta_{i,F_2} + .\dots\dots. + \gamma_{1,m}\beta_{i,F_m} + \varepsilon_{i,1}$$

$$R_{i,2} = \gamma_{2,0} + \gamma_{2,1}\beta_{i,F_1} + \gamma_{1,2}\beta_{i,F_2} + .\dots\dots. + \gamma_{2,m}\beta_{i,F_m} + \varepsilon_{i,2}$$

$$R_{i,T} = \gamma_{T,0} + \gamma_{T,1}\beta_{i,F_1} + \gamma_{T,2}\beta_{i,F_2} + .\dots\dots. + \gamma_{1,m}\beta_{i,F_m} + \varepsilon_{i,T}$$

The right side of the equation consists of the risk factors that can be downloaded directly at the Kenneth R. French Database. Below an example of the risk factors used to the FF6 model:

- The market premium (MKT) refers to the monthly excess market return of the index.
- The size factor (SMB) refers to the difference between monthly average returns of portfolio’s with only small stocks and the portfolio returns with only large stocks.
- The book-to-market factor (HML) refers to the difference between the monthly average return of portfolio’s consisting of value stocks and portfolio’s consisting of growth stocks.
- The winners minus losers (WML) refers to the difference between the monthly average returns of portfolio’s consisting of stocks that are labeled as past winners and portfolio’s consisting of past losers.

- The profitability factor (RMW) refers to the difference between the monthly average returns of portfolio's consisting of stocks with high profitability and portfolio's consisting of stocks with low profitability.
- The investment factor (CMA) refers to the difference between the monthly average returns of portfolio's consisting of stocks that invest conservative and portfolio's consisting of stocks that invest aggressive.

The left side of the regression equation is the excess returns of different portfolios. These portfolios are based on different characteristics so it possible to test if portfolios with only large stocks and sorted on an extra characteristic also gives a alpha. Test portfolios are sorted into the four following characteristics: Book-to-market, momentum, profitability, and investments. Fama and French (2015) stated to use the 30th and 70th percentile of big stock as breakpoints to avoid undue weight on tiny stocks. Yet this thesis examines only large stocks, so it is chosen to use the 33rd and 66th percentile as breakpoint. This way I am sure that every test portfolio will contain the same number of stocks at the same time to perform valid analyses.

The four characteristics explained above are calculated as follow:

1. Book-to-market = Book value / market value

   Book value = total assets – total liabilities

   Market value = stock price x amount of shares outstanding

2. Momentum = $(Returnt{-}2 + Returnt{-}3 + Returnt{-}4 + Returnt{-}5 + Returnt{-}6 + Returnt{-}7 + Returnt{-}8 + Returnt{-}9 + Returnt{-}10 + Returnt{-}11 + Returnt{-}12 + Returnt{-}13)$ / 12
3. Profitability = (Earnings before interest – interest expenses) / book value
4. Investments = $(Total\ assets_t - \ total\ assets_{t-1})/\ total\ assets_{t-1}$

3.3.2 The Generalized method of Moment (GMM) procedure

In this thesis, I use the GMM estimation procedure. To operate properly, the estimator needs a specific number of moment conditions to be clarified for the model. These conditions are functions of the model parameters and of the data, therefore the expectation of the moments is zero in order to be as close as possible to the parameters, true values. Next, the estimator proceeds with the minimization of the sample averages of the moment conditions. In other words, the GMM estimator is a consistent, asymptotic and efficient estimator that does not infer assumptions about the data's distribution function.

It is usually indicated when there is a possibility of endogenousness of independent variables (regressors) and probability of inverse causation or when the independent variables are associated with the error term. It is also used when specific features of entities that used in a survey (for example geographical or economic characteristics of a country) may affect the results of an econometric model. , In addition, the generalized torque method is suitable for use when due to the presence of the dependent variable with lag in the independent variables there may be autocorrelation and finally when the number of time periods that used in a research, as for example in the present work, The generalized method is used in its econometric models of the following form:

$$y_{it} = \delta y_{i,t} + \chi'_{it\beta} + \varepsilon_{it} \tag{16}$$

In the mathematical relation 16, δ indicates the degree of correlation of the dependent

variable yit with the value of its lag by a period yi, t − 1, χ το

Or is it a vector of 1 × K independent variables with i = 1,2,…., N and t = 1,2,… ..T, β a vector

K × 1 of the estimation parameters and εit the random error, which includes individual unnoticed effects of mi, and a genuine random uit error term. Therefore, the mathematical expression of the error term in the generalized torque method is depicted as follows:

$$\varepsilon_{it} = \mu_i + u_{it} \tag{17}$$

where uit ~ IID (0, p 2u) the genuine random error term (Arestis, et.al, 2012).

The generalized method of moments was originally developed by Hansen (1982) and has widely used in several branches of finance. It is considered quite pioneering estimation method as it can be used in both data time series data, as well as cross section data, as well as in panel data. Also, the GMM method is considered quite flexible as a method of estimation in econometric models, as it can provides correct standard errors even if autocorrelation exists and heterosexuality in an econometric model (Makri, 2014).

4. Data

The datasets are from Kenneth Frenchs' library: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html. The factors for the FF6 model are also from Kenneth French's library. The factors for the Stambaugh-Yuan model are from Stambaugh's website: https://finance.wharton.upenn.edu/~stambaug. The factors for the q5 factor model are from http://global-q.org/factors.html. Finally, the factors for the dh3 model are from

Finally, I would like to clarify that each dataset with the specific test portfolios is merged with the respected dataset of the factors of each asset pricing model and then I run the estimation procedure. Each of the merged dataset includes 534 observations at a monthly basis. Each dataset is from July 1976 to June 2016.

4.1 Summary statistics

On this part, I provide a general overview of the summary statistics for the factors. I present the summary statistics for the factors that are used to predict the portfolios returns. Mkt-RF stands for the market portfolio minus the risk-free rate (the risk-free rate is proxied by the one-month Treasury bill rate). HML (High Minus Low) is used for the book-to market factor, while SMB (Small minus Big) is the factor for size.

Table 1 provides the summary statistics for q^5 factors.

Table 1: Summary Statistics for q5 factors

	Mkt-RF	R_me	R_IA	R_Roe	R_EG
Mean	0.536680	0.272638	0.405224	0.535913	0.826360
Std	4.545673	3.096012	1.853086	2.584899	1.874550
Skewness	-0.537166	0.618335	0.134445	-0.702872	0.303395
Kurtosis	1.994397	5.762301	1.769143	4.792244	2.336558

Cross-correlation					
Mkt-RF	1	0.24287575	-0.36387697	-0.19535232	0.4314076
R_me	0.24287575	1	-0.11729596	-0.30986765	0.3449434
R_IA	-0.36387697	-0.11729596	1	0.06028443	0.3570611
R_Roe	-0.19535232	-0.30986765	0.06028443	1	0.5392325
R_EG	-0.43140760	-0.34494340	0.35706108	0.53923246	1

It can be observed that in terms of mean the R_me presents the lowest average value (0.27) compared to the other factors, while EG shows the highest average value with 0.82. Regarding volatility, the factor for the market portfolio shows the highest standard deviation with a value of 4.54. In terms of skewness, the me factor shows the highest positive value, while the Mkt-RF, r_Roe show a negative value. For kurtosis, r_me shows the highest value with 5.76. So, there is no normality in all factors. The R_EG is high correlated with the market portfolio and next comes the R_Roe with R_EG.

Table 2 provides the summary statistics for the 6 factors of the FF6 model.

Table 2: Summary statistics for the 6 factors of the FF6 model

	Mkt-RF	SMB	HML	RMW	CMA	MOM
Mean	0.536680	0.199120	0.409401	0.279944	0.349925	0.649494
Std	4.545673	3.024477	2.931392	2.323040	1.976208	4.430920
Skewness	-0.537166	0.364399	0.131533	-0.371908	0.360648	-1.360705
Kurtosis	1.994397	3.733311	1.875705	11.745701	1.783830	10.215883
Cross-correlation						
Mkt-RF	1	0.240870984	-0.27666265	-0.251946193	-0.388025115	-0.147094997
SMB	0.24087098	1	-0.07174065	-0.375794397	-0.049699160	-0.035853845
HML	-0.27666265	-0.071740648	1	0.143333155	0.691628484	-0.178904796
RMW	-0.25194619	-0.375794397	0.14333315	1	0.056370456	0.096778626
CMA	-0.38802511	-0.049699160	0.69162848	0.056370456	1	0.009907495

MOM	-0.14709500	-0.035853845	-0.17890480	0.096778626	0.009907495	1

It can be observed that in terms of mean the SMB factor presents the lowest average value (0.19) compared to the other factors, while the MOM factor shows the highest average value with 0.64. Regarding volatility, the factor for the market portfolio shows the highest standard deviation with a value of 4.54. In terms of skewness, the SMB, and CMA factor show the highest positive value, of 0.364399 and 0.360648, respectively, while the Mkt-RF, RMW and MOM factor show a negative value. For kurtosis, RMW shows the highest value with 11.745701. So, there is no normality in all factors. In terms of correlation, the CMA shows a value of 0.38 correlation with the market portfolio and SMB with CMA correlated practically at the same rate.

In the table 3, there are the summary statistics for the 4 factors of the M4 model.

Table 3: Summary statistics for the 4 factors of the M4 model

	Mkt-RF	RMWc	SMB	MGMT	PERF
Mean	0.536680	0.272638	0.405224	0.535913	0.826360
Std	4.545673	3.096012	1.853086	2.584899	1.874550
Skewness	-0.537166	0.618335	0.134445	-0.702872	0.303395
Kurtosis	1.994397	5.762301	1.769143	4.792244	2.336558
Cross-correlation					
Mkt-Rf	1	0.24287575	-0.36387697	-0.19535232	0.4314076
R_me	0.24287575	1	-0.11729596	-0.30986765	0.3449434
R_IA	-0.36387697	-0.11729596	1	0.06028443	0.3570611
R_Roe	-0.19535232	-0.30986765	0.06028443	1	0.5392325
R_EG	-0.43140760	-0.34494340	0.35706108	0.53923246	1

It can be observed that in terms of mean the performance factor PERF presents the highest average value (0.82) compared to the other factors, while RMWc shows the lowest average value with 0.27. Regarding volatility, the factor for the market portfolio shows the highest standard deviation with a value of 4.54. In terms of skewness, the RMWc factor shows the highest positive value, while the Mkt-RF and the MGMT show a negative value. For kurtosis, RMWc shows the highest value with 5.76. So, there is no normality in all factors. In terms of correlation, R_EG factor and MGMT factor have the highest correlation with a value of 0.53, while R_Roe and PERF have a value of 0.5392325. The lowest correlation is between R_Roe and SMB with a value of 0.06.

In table 4, there are the summary statistics for DHS 3 factors.

Table 4: Summary statistics for DHS 3 factors

	Mkt-RF	PEAD	FIN
Mean	0.536680	0.620318	0.792416
Std	4.545673	1.879124	3.886262
Skewness	-0.537166	0.163316	-0.185168
Kurtosis	1.994397	4.091547	5.946147
Cross-correlation			
Mkt-Rf	1	-0.1028562	-0.36387697
PEAD	-0.10285622	1	-0.11729596
FIN	-0.50533986	-0.0380379	1

It can be observed that in terms of mean the FIN presents the highest average value (0.79) compared to the other factors, while Mkt-RF shows the lowest average value with 0.53. Regarding volatility, the factor for the market portfolio shows the highest standard deviation with a value of 4.54. In terms of skewness, the PEAD factor shows the highest positive value, while the Mkt-rf, FIN show a negative value. For kurtosis, FIN shows the highest value with 5.94, while Mkt-RF has a value of 1.99. So, there is no normality in all factors. Finally, the FIN factor has a high correlation with Mkt-RF with a value of 0.5. It should be outlined that the two factors, PEAD and FIN, have a negative correlation among them.

5. Results

On this part, I present the empirical estimation results. Tables 5-8 present the results for the 4 models that I study by testing the returns of the 25 size and value sorted test portfolios of Fama and French.

Table 5: Fama-MacBeth Estimates for Q5 model with 25 Size- and Value-Sorted Test Portfolios

	Const.	Mkt-RF	R_ME	R_IA	R_ROE	R_EG
Coeff.	19.802	-18.015	-0.356701	1.303	-5.073	0.005
t-value	4.015	- 3.756	-0.436	2.113	-2.226	0.001
GMM-t	2.077	-1.954	1.469	1.135	-0.515	2.459
Adjusted R^2	0.6491					

Table 6: Fama-MacBeth Estimates for the FF6 model with 25 Size- and Value-Sorted Test Portfolios

	Const.	Mkt-RF	SMB	HML	RMW	CMA	MOM
Coeff.	16.3120	-14.3225	0.5601	3.9347	-1.5310	- 0.7948	14.8928
t-value	3.299	-2.896	0.951	6.340	-0.901	-0.341	1.479
GMM-t	1.073	-0.925	0.354	5.342	-0.143	-0.011	0.824
Adjusted R^2	0.7215						

Table 7: Fama-MacBeth Estimates for the M4 model with 25 Size- and Value-Sorted Test Portfolios

	Const.	Mkt-RF	SMB	MGMT	PERF
Coeff.	20.108903	-0.188175	0.002874	0.025164	-0.055335
t-value	3.438	-3.305	0.335	2.274	-1.267
GMM-t	2.578	-1.454	0.05	1.112	-0.321
Adjusted R^2	0.5793				

Table 8: Fama-MacBeth Estimates for the DHS 3 factor model with 25 Size- and Value-Sorted Test Portfolios

	Const.	Mkt-RF	PEAD	FIN
Coeff.	21.5534	-19.4859	-11.5059	-0.3753
t-value	3.650	-3.403	-2.131	-0.229
GMM-t				
Adjusted R^2	0.3814			

5.1 Fit and Coefficients for tables 5-8

For the 25 portfolios of Fama- French in tables 5-8, it can be observed that the Q5 model presents an Adjusted R^2 of 0.6491, which it means that the model can explain asset returns adequately. The factor Investment Assets, the factor ROE, the factor for the market portfolio and the intercept are statistically significant, while the rest are statistically insignificant. The FF6 model displays an Adjusted $R^2$with a value 0.7215, which is relatively high. The interesting point here, is that the MOM factor displays a value of 14.89% which is means that investors ask a high premium based on momentum. In other words, momentum plays a major role on the 25 portfolios returns. Finally, the market portfolio shows a -14.32 value which means that market portfolio factor does not compensate the investor.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.5793. This value is lower that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 20%. The negative market risk premium is lower than that of the FF6 model, approximately -0.18. The SMB and MGMT factor are positive, but slightly over 0. The t-value for the intercept is 3.438 which is relative adequate. The same holds for the rest of the variables.

The DHS 3 model derives a lower Adjusted R^2 of 0.3814. The intercept tells is very high at 21.5534%, while the coefficient estimate for the market portfolio is negative at -19.4859%. The t -values are for all factors are negative, which does not cause any concern, while the t-value for the intercept is 3.65. In conclusion, the FF6 model outperforms the rest of the models.

Next, I present tables 9-12 with the results for the 4 models that I study by testing the returns of the 25 long-term portfolios of Fama and French.

Table 9: Fama-MacBeth Estimates for the Q5 Model with 25 long-term portfolios

	Const.	R_MKT	R_ME	R_IA	R_ROE	R_EG
Coeff.	25.1863	-22.3492	1.5322	-4.2261	-3.1680	-0.9003
t-value	9.679	-9.282	1.575	-4.350	-1.731	-0.350
GMM-t	8.688	-6.721	1.233	-3.594	-1.511	-0.034
Adjusted R^2	0.8499					

Table 10: Fama-MacBeth Estimates for the FF6 Model with 25 long-term portfolios

	Const.	Mkt.RF	SMB	HML	RMW	CMA	MOM
Coeff.	28.2510	-25.5512	2.8270	-7.5940	-0.9616	0.7294	-2.4143
t-value	9.366	-9.062	-2.295	3.248	-0.604	0.408	-0.706
GMM-t	6.894	-7.302	-1.993	3.032	-0.341	0.225	-0.552
Adjusted R^2	0.8925						

Table 11: Fama-MacBeth Estimates for the M4 Model with 25 long-term portfolios

	Const.	Mkt.RF	SMB	MGMT	PERF
Coeff.	26.202319	-0.240738	0.011702	-0.021092	0.003367
t-value	11.29	-10.685	1.108	-2.676	0.091
GMM-t	9.590	-8.891	0.891	-2.284	0.064
Adjusted R^2	0.8514				

Table 12: Fama-MacBeth Estimates for the DHS 3 Model with 25 long-term portfolios

	Const.	Mkt.RF	PEAD	FIN
Coeff.	32.898	-29.753	-4.137	-9.449
t-value	15.367	-14.807	-3.162	-8.935
GMM-t	13.234	-12.093	-2.968	-8.542
Adjusted R^2	0.9155			

5.2 Fit and Coefficients for tables 9-12

For the 25 long-term portfolios of Fama- French in tables 9-12, it can be observed that the Q5 model presents an Adjusted R^2 of 0.8499, which it means that the model can explain asset returns adequately. The factor Investment Assets, the factor for the market portfolio and the intercept are statistically significant, while the rest are statistically insignificant. The market portfolio factor shows a positive intercept of 25.1863%, which means that the investors will have more benefit the invest with a long-term horizon. Finally, the market portfolio shows a negative -22.3492 % risk premium. The factor R_ME, although it is statistically insignificant it shows a coefficient of 1.5322%.

The FF6 model displays an Adjusted $R^2$with a value 0.8925, which is relatively high. The interesting point here, is that the MOM factor displays a value of -2.4143% which is means that premium based on momentum fades, which is reasonable as the dataset involves a long-term horizon. In other words, momentum plays a minor on the 25 long-term portfolios returns. Finally, the market portfolio shows a -25.5512% value which means that market portfolio factor does not compensate the investor. The intercept has a coefficient of 28.2251% with a t-value of 9.366, while the SMB factor has a a coefficient of 2.827% with a t value of 3.248 and the CMA factor has a lower coefficient of 0.7294. From all factors, the intercept, the market portfolio factor and the SMB and HML are statistically significant.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8925. This value is lower that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 20%. The negative market risk premium is lower than that of the FF6 model, approximately -0.18. The SMB and MGMT factor are positive, but slightly over 0. The t-value for the intercept is 3.438 which is relative adequate. The same holds for the rest of the variables.

The DHS 3 model derives a lower Adjusted R^2 of 0.3814. The intercept tells is very high at 21.5534%, while the coefficient estimate for the market portfolio is negative at -19.4859%. The t -values are for all factors are negative, which does not cause any concern, while the t-value for the intercept is 3.65. In conclusion, the FF6 model outperforms the rest of the models.

Next, in tables 13-16 I proceed with the results for 30 industry portfolios of Kenneth French.

Table 13: Fama-MacBeth Estimates for the Q5 model with 30 industry portfolios

	Const.	Mkt.RF	R_ME	R_IA	R_ROE	R_EG
Coeff.	5.7895	-4.5242	-1.9260	3.2481	-0.398	8.4601
t-value	1.797	-1.418	-0.841	2.806	-0.262	4.739

GMM-t	1.432	-1.190	-0.983	2.643	-0.753	3.895
Adjusted R^2	0.5717					

Table 14: Fama-MacBeth Estimates for the FF6 model with 30 industry portfolios

	Const.	Mkt.RF	SMB	HML	RMW	CMA	MOM
Coeff.	10.602	-9.456	- 7.040	1.993	1.607	-1.826	- 15.701
t-value	2.790	-2.410	-3.592	1.193	1.559	-1.420	-4.116
GMM-t	1.872	-1.452	-3.321	1.016	1.235	-1.321	-3.338
Adjusted R^2	0.5522						

Table 15: Fama-MacBeth Estimates for the M4 model with 30 industry portfolios

	Const.	Mkt.RF	SMB	MGMT	PERF
Coeff.	4.40147	-0.03240	- 0.04949	0.04559	-0.03934
t-value	1.071	-0.788	-2.128	2.708	-1.134
GMM-t	0.646	-0.652	-1.734	2.589	-1.059
Adjusted R^2	0.3813				

Table 16: Fama-MacBeth Estimates for the DHS 3 model with 30 industry portfolios

	Const.	Mkt.RF	PEAD	FIN
Coeff.	-0.15087	1.18646	- 0.17472	0.29936
t-value	-1.266	43.222	-3.044	5.237
GMM-t	-0.527	25.099	-0.856	9.356
Adjusted R^2	0.8023			

5.3 Fit and Coefficients for tables 13-16

For the 30 industry portfolios of Fama- French in tables 13-16, it can be observed that the Q^5model presents an Adjusted R^2 of 0.5717, which it means that the model can explain asset returns adequately. The factor Investment Assets, the factor for the expected growth is statistical significant, while the rest are statistically insignificant. The intercept shows a positive intercept of 5.7895%, which means that the investors can capitalize by studying the assets as industries. Finally, the market portfolio shows a negative -4.5242% risk premium. The factor R_ME, although it is statistically insignificant it shows a negative coefficient of -1.9260 %.

The FF6 model displays an Adjusted $R^2$with a value 0.5522, which is relatively high. The interesting point here, is that the MOM factor displays a value of -15.701% which is means that premium based on momentum fades, which is reasonable as the dataset involves industry portfolios. In other words, momentum plays a minor role on the 30 industry portfolios returns. Finally, the market portfolio shows a -9.456% value which means that market portfolio factor does not compensate the investor adequately. The intercept has a coefficient of 10.602% with a t-value of 2.948, while the SMB factor has a coefficient of -7.040% with a t value of -3.294and the CMA factor has a lower coefficient of -1. 028.From all factors, the intercept, the market portfolio factor and the SMB and MOM are statistically significant.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8925. This value is lower that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 20%. The negative market risk premium is lower than that of the FF6 model, approximately -0.18. The SMB and MGMT factor are positive, but slightly over 0. The t-value for the intercept is 3.438 which is relative adequate. The same holds for the rest of the variables.

The DHS 3 model derives a lower Adjusted R^2 of 0.8023. The intercept is negative at -0.15087%, while the coefficient estimate for the market portfolio is positive at 1.18646. The t -values are for all factors are negative, which does not cause any concern, except for the market portfolio factor and the FIN factor are positive. All factors are statistically significant. In conclusion, the DHS 3 model outperforms the rest of the models.

Next, in tables 17-20 I proceed with the results for 25 short-term portfolios of Kenneth French.

Table 17: Fama-MacBeth Estimates for the Q5 model with 25 short-term portfolios

	Const.	Mkt.RF	R_ME	R_IA	R_ROE	R_EG
Coeff.	18.8021	-16.9859	-0.7458	-0.1802	-3.9688	-5.3443
t-value	2.922	-2.695	-0.638	-0.062	-1.646	-1.189

GMM-t	2.561	-2.214	-0.414	-0.011	-1.521	-0.914
Adjusted R^2	0.4255					

Table 18: Fama-MacBeth Estimates for the FF6 model with 25 short-term portfolios

	Const.	Mkt.RF	SMB	HML	RMW	CMA	MOM
Coeff.	17.1537	-15.4447	0.1461	3.3460	-2.2846	-1.1796	-3.3262
t-value	3.111	-2.931	0.165	0.436	-0.497	-0.279	-0.606
GMM-t	2.752	-2.462	0.082	0.157	-0.388	-0.199	-0.384
Adjusted R^2	0.3886						

Table 19: Fama-MacBeth Estimates for the M4 model with 25 short-term portfolios

	Const.	Mkt.RF	SMB	MGMT	PERF
Coeff.	26.202319	-0.240738	0.011702	- 0.021092	0.003367
t-value	11.298	-10.685	1.108	-2.676	0.091
GMM-t	9.781	-9.314	0.788	-2.412	0.004
Adjusted R^2	0.8514				

Table 20: Fama-MacBeth Estimates for the DHS 3 model with 25 short-term portfolios

	Const.	Mkt.RF	PEAD	FIN
Coeff.	-0.38276	0.95410	0.36780	-0.03302
t-value	-3.370	36.485	6.726	-1.083
GMM-t	-2.983	24.913	5.455	-0.789
Adjusted R^2	0.7777			

5.4 Fit and Coefficients for tables 17-20

For the 25 short-term portfolios of Fama- French in tables 17-20, it can be observed that the Q^5 model presents an Adjusted R^2 of 0.455, which it means that the model can explain asset returns adequately. The intercept and, the factor for the market portfolio is statistically significant, while the rest are statistically insignificant. The market portfolio shows a negative value of -16.9859%, which means that the investors will have less benefit if they take into account the market portfolio. Finally, the intercept shows a value of 18.8021%. The factor R_ME, although it is statistically insignificant it shows a coefficient of -0.7458%. Furthermore, it needs to be outlined that only the intercept and the market portfolio factor is statistically significant, while the rest of the factor statistically insignificant.

The FF6 model displays an Adjusted $R^2$with a value 0.3886, which is relatively low. The interesting point here, is that the MOM factor displays a value of -3.3262% which is higher than in other datasets meaning that the premium based on momentum fades slowly, which is reasonable as the dataset involves a short-term horizon. In other words, momentum plays a more important role on the 25 short-term portfolios returns. Finally, the market portfolio shows a - -15.4447% value which means that market portfolio factor does not compensate the investor. The intercept has a coefficient of 17.1537 % with a t-value of 3.111, while the SMB factor has a coefficient of 0.1461% with a t value of 0.165and the CMA factor has a lower coefficient of -1.1796. From all factors, only the intercept and the market portfolio factor are statistically significant.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8514. This value is lower than that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 20%. The negative market risk premium is higher than that of the FF6 model, approximately -0.24. The SMB and MGMT factor are positive, but slightly over 0. The t-value for the intercept is 11.298which is relative adequate. The same holds for the rest of the variables. Only the intercept, the market portfolio factor and the MGMT factor are statistically significant.

The DHS 3 model derives a lower Adjusted R^2 of 0.7777. The intercept has a value of -0.38276, which is statistically significant, while the coefficient estimate for the market portfolio is positive at 0.95410 %., meaning that the market risk premium contributes to the return that investors are seeking. The t -values are negative for the intercept and the FIN factor, which does not cause any concern. In conclusion, the M4 mispricing model outperforms the rest of the models.

Next, in tables 21 I proceed with the results for the portfolios formed on BE-ME.

Table 21: Fama-MacBeth Estimates for the 4 models with portfolios formed on BE-ME

		Q5 model					
	Const	R_MKT	R_ME	R_IA	R_ROE	R_EG	
Coeff.	-4.7550	6.8962	-8.6733	1.1176	-8.4992	21.9733	
t-value	-0.717	1.057	-2.622	1.152	-3.083	2.003	
GMM-t	-0.563	0.813	-2.557	1.114	-2.924	1.756	
Adjusted R^2	0.7864						
		FF6 model					
	Const	MKT-RF	SMB	HML	RMW	CMA	MOM
Coeff.	-31.332	33.701	-13.956	3.479	-8.099	1.493	-13.158
t-value	-2.039	2.207	2.592	2.745	-2.014	0.654	-1.086
GMM-t	-1.809	-1.928	2.343	1.871	-1.743	0.544	-1.052
Adjusted R^2	0.769						
		M4 model					
	Const	MKTRF	SMB	MGMT	PERF		
Coeff.	-37.20139	0.38956	-0.10688	0.01512	-0.17784		
t-value	-2.214	2.340	-2.598	0.611	-2.564		
GMM-t	-2.195	2.215	-2.322	0.235	-2.436		
Adjusted R^2	0.6715						
		DHS 3 model					
	Const	MKTRF	PEAD	FIN			
Coeff.	0.27399	1.01376	-0.18873	0.18781			
t-value	2.397	38.524	-3.429	6.123	-		
GMM-t	2.235	33.251	-3.156	5.854			
Adjusted R^2	0.7718						

5.5 Fit and Coefficients for table 21

For the portfolios of Fama- French sorted on size in tables 21 it can be observed that the Q5 model presents an Adjusted R^2 of 0.7864, which it means that the model can explain asset returns adequately. The factor R_ME, and the R_ROE are statistically significant, while the rest of the factors are statistically insignificant. The market portfolio factor shows a positive value of 6.8962%, which means that the investors will get a beneficial market risk premium. Finally, the intercept shows a -4.7550 negative returns. The factors R_ME,R_ROE although they are statistically significant they have negative coefficients.

The FF6 model displays an Adjusted $R^2$with a value 0.769, which is relatively high. The interesting point here, is that the MOM factor displays a value of -13.158% which is means that premium based on momentum fades, which is reasonable as the dataset involves test portfolios sorted on size. In other words, momentum plays a minor on such dataset. Finally, the market portfolio shows a high market risk premium with a value 33.701 which means that market portfolio factor does compensate the investor. The intercept has a negative coefficient of -31.332 % with a t-value of -2.039, while the SMB factor has a coefficient of -13.956% with a t value of -2.592and the CMA factor has a lower coefficient of 1.493. All factors are statistically significant, except for CMA and MOM.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.6715. This value is lower that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 20%. The market risk premium is lower than that of the FF6 model, but remains positive at approximately 0.38. The SMB is negative and the MGMT factor remains postive, but slightly over 0.01. The t-value for the intercept is -2.214, which is not important. The same holds for the rest of the variables.

The DHS 3 model derives an Adjusted R^2 of 0.7718. The intercept tells us that it is very low at 0.27399 %, while the coefficient estimate for the market portfolio is positive at 1.01376 %. The t -values are for all factors are positive except for the PEAD factor, which does not cause any concern, while the t-value for the intercept is 2.397. Furthermore, all factors along with the intercept are statistically significant. In conclusion, the Q5 model outperforms the rest of the models.

Next on table 22, I present the results for the test portfolios that are sorted on Investment performance.

Table 22: Fama-MacBeth Estimates for the 4 models with portfolios formed on INV

		Q5 model					
	Const	R_MKT	R_ME	R_IA	R_ROE	R_EG	
Coeff.	8.1480	-6.2172	-1.2787	0.5659	2.4772	-5.3798	
t-value	4.589	-3.553	-0.953	3.238	2.086	-3.147	
GMM-t	4.333	-3.135	-0.762	2.816	1.539	-2.695	
Adjusted R^2	0.9173						
		FF6 model					
	Const	MKT-RF	SMB	HML	RMW	CMA	MOM
Coeff.	10.7282	-8.9852	0.2413	0.4519	2.0293	0.5361	1.2681
t-value	1.281	-1.067	0.053	0.147	0.657	1.647	0.518
GMM-t	1.189	-0.971	0.028	0.122	0.541	1.326	0.298
Adjusted R^2	0.8658						
		M4 model					
	Const	MKTRF	SMB	MGMT	PERF		
Coeff.	7.568651	-0.057800	-0.018930	0.015519	0.013950		
t-value	3.004	-2.321	-1.837	5.120	0.659		
GMM-t	2.820	-2.138	-1.790	4.109	0.306		
Adjusted R^2	0.8863						
		DHS 3 model					
	Const	MKTRF	PEAD	FIN			
Coeff.	0.05269	1.07046	0.06892	-0.18152			
t-value	0.617	54.437	1.676	-7.920	-		
GMM-t	0.534	49.451	1.518	-6.980			
Adjusted R^2	0.8985						

5.6 Fit and Coefficients for table 22

For the portfolios of Fama- French sorted on investments in table 22 it can be observed that the Q5 model presents an Adjusted R^2 of 0.9173 which it means that the model can explain asset returns adequately. The factor R_IA, the factor for the market portfolio, the intercept and the factor for the expected growth (R_EG) are statistically significant, while the rest are statistically insignificant. The market portfolio factor shows a negative value of -6.2172%, which means that the investors will have no benefits from the market risk premium. Finally, intercept has a value of 8.1480, meaning that the investors has the opportunity to capitalize on arbitrage.

The FF6 model displays an Adjusted $R^2$with a value 0.8658, which is relatively high. The interesting point here, is that the MOM factor displays a value of 1.2681% which is means that premium based on momentum lasts, which is reasonable as the dataset involves data related with investment performance. In other words, momentum plays a role on the sorted portfolios by investment performance. Finally, the market portfolio shows a -8.9852% value which means that market portfolio factor does not compensate the investor. The intercept has a coefficient of 10.7282 % with a t-value of 1.281, while the SMB factor has a coefficient of 0.2413% with a t value of 0.053and the CMA factor has a higher coefficient of 0. 5361.All factors are statistically insignificant.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8863. This value is lower that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 7%. The negative market risk premium is higher than that of the FF6 model, approximately -0.05. The SMB is negative and the MGMT factor is positive, but slightly over 0. The t-value for the intercept is 2.51 which is relative adequate. I also find that the intercept, along all factors (Except the PERF factor) are statistically significant.

The DHS 3 model derives an Adjusted R^2 of 0.8985. The intercept tells is at a normal height at 0.05269 %, while the coefficient estimate for the market portfolio is negative at 1.07046%.The t -values are for all factors are positive, except for the factor FIN, which does not cause any concern, while the t-value for the intercept is 0.67. In conclusion, the Q5 model outperforms the rest of the models.

Table 23: Fama-MacBeth Estimates for the 4 models with portfolios formed on ME

		Q5 model					
	Const	R_MKT	R_ME	R_IA	R_ROE	R_EG	
Coeff.	0.9311	1.1210	0.1748	-11.1938	-7.6825	2.8546	
t-value	0.119	0.144	0.123	-1.276	-1.269	0.302	
GMM-t	0.092	0.118	0.072	-1.912	-1.121	-0.179	
Adjusted R^2	0.6652						
		FF6 model					
	Const	MKT-RF	SMB	HML	RMW	CMA	MOM
Coeff.	21.64127	-19.93990	6.13960	-3.59950	6.16989	0.05148	2.14001
t-value	2.843	-2.604	1.481	-1.302	2.237	0.193	0.772
GMM-t	2.586	-1.888	1.363	-1.212	0.541	0.172	0.535
Adjusted R^2	0.8219						
		M4 model					
	Const	MKTRF	SMB	MGMT	PERF		
Coeff.	8.314523	-0.064180	-0.016433	0.011102	0.002096		
t-value	2.626	-2.048	-1.267	3.333	0.080		
GMM-t	2.145	-1.912	-1.146	2.583	0.042		
Adjusted R^2	0.8177						
		DHS 3 model					
	Const	MKTRF	PEAD	FIN			
Coeff.	0.075047	1.013582	0.002211	0.008391			
t-value	1.438	84.331	0.088	0.599	-		
GMM-t	1.362	79.451	0.042	0.286			
Adjusted R^2	0.9478						

5.7 Fit and Coefficients for table 23

For the portfolios of Fama- French sorted on book to market in table 3 it can be observed that the Q5 model presents an Adjusted R^2 of 0.6652, which it means that the model can explain asset returns adequately. All factors are statistically insignificant. The market portfolio factor shows a positive value of 1.1210%, which means that the investors will have more benefit from the market portfolio. Finally, the intercept shows a negative 0.9311. The factor R_ME, although it is statistically insignificant it shows a coefficient of 0.1748%.

The FF6 model displays an Adjusted $R^2$with a value 0.8925, which is relatively high. The interesting point here, is that the MOM factor displays a value of -2.4143% which is means that premium based on momentum fades, which is reasonable as the dataset involves a long-term horizon. In other words, momentum plays a minor on the 25 long-term portfolios returns. Finally, the market portfolio shows a -25.5512% value which means that market portfolio factor does not compensate the investor. The intercept has a coefficient of 28.2251% with a t-value of 9.366, while the SMB factor has a a coefficient of 2.827% with a t value of 3.248 and the CMA factor has a lower coefficient of 0.7294. From all factors, the intercept, the market portfolio factor and the SMB and HML are statistically significant.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8177. This value is higher than that of the abovementioned models. It can be seen again that the intercept is too high, specifically over 8.3%. The negative market risk premium is lower than that of the FF6 model, approximately -0.064. The SMB is negative, while the MGMT factor is positive, but slightly over 0. The t-value for the intercept is 2.626 which is relative adequate. The same holds for the rest of the variables.

The DHS 3 model derives a higher Adjusted R^2 of 0.9478 The intercept tells us it is very low at 0.075%, while the coefficient estimate for the market portfolio is positive at 1.013582%. The t -values are for all factors are positive, which does not cause any concern, while the t-value for the intercept is 1.438. In conclusion, the DHS 3 model outperforms the rest of the models.

Table 24: Fama-MacBeth Estimates for the 4 models with portfolios formed on OP

		Q5 model					
	Const	R_MKT	R_ME	R_IA	R_ROE	R_EG	
Coeff.	6.142	-4.771	-9.441	7.518	-5.734	8.374	
t-value	0.586	-0.464	-2.055	3.453	-1.381	2.028	
GMM-t	0.465	-0.388	-1.892	3.214	-1.121	2.012	
Adjusted R^2	0.8619						
		FF6 model					
	Const	MKT-RF	SMB	HML	RMW	CMA	MOM
Coeff.	7.2673	-5.9920	-7.9989	-7.7136	0.2191	4.5469	-3.2065
t-value	0.605	-0.507	-1.923	2.476	0.132	1.609	-0.415
GMM-t	2.586	-1.888	1.363	-1.212	0.541	0.172	0.535
Adjusted R^2	0.8794						
		M4 model					
	Const	MKTRF	SMB	MGMT	PERF		
Coeff.	-0.14726	0.01435	-0.04882	0.10328	-0.07010		
t-value	-0.016	0.154	-1.693	5.188	-2.330		
GMM-t	-0.034	0.091	-1.543	4.972	-2.092		
Adjusted R^2	0.8792						
		DHS 3 model					
	Const	MKTRF	PEAD	FIN			
Coeff.	0.182050	1.051561	-0.004143	-0.082236			
t-value	2.697	67.650	- 0.127	-4.539	-		
GMM-t	2.482	48.321	-0.079	-4.343			
Adjusted R^2	0.9265						

5.8 Fit and Coefficients for table 24

For the 25 long-term portfolios of Fama- French in table 24, it can be observed that the Q5 model presents an Adjusted R^2 of 0.8619, which it means that the model can explain asset returns adequately. The factor Investment Assets, and the R_ME are statistically significant. The market portfolio factor shows a negative value of -4.77125.1863%, which means that the investors will have less benefits if someone takes into consideration the market portfolio. Finally, the intercept shows a positive 6.142 % risk premium. The factor R_ME, although it is statistically significant it shows a coefficient of -9.441.

The FF6 model displays an Adjusted $R^2$with a value 0.8794, which is relatively high. The interesting point here, is that the MOM factor displays a value of --3.2065% which is means that premium based on momentum fades, which is reasonable as the dataset involves the operational profitability. In other words, momentum plays a minor role on the 25 portfolios sorted on operation profitability. Finally, the market portfolio shows a value of - 5.9920, which means that market portfolio factor does not compensate the investor. The intercept has a coefficient of 7.2673with a t-value of 0.605, while the SMB factor has a coefficient of -7.9989with a t value of -1.923and the CMA factor has a lower coefficient of 4.5469. Finally, the RMW factor shows a positive value at 0.2191.

The Stambaugh and Yuan model shows an Adjusted R^2 of 0.8792. This value is higher than that of the abovementioned models. It can be seen again that the intercept is stable low, specifically at -0.14726. The positive market risk premium is lower than that of the FF6 model, approximately 0. 01435.The SMB is negative and the MGMT factor is at 0.10328. The t-value for the intercept is -0.016 which is relative adequate. The same holds for the rest of the variables.

The DHS 3 model derives a lower Adjusted R^2 of 0.9265. The intercept tells is low at 0.182050, while the coefficient estimate for the market portfolio is positive at 1.051561. The t - values are for the intercept, and market portfolio are positive, while for the rest factors are negative. This does not cause any concern, while the t-value for the intercept is 3.65. In conclusion, the DHS 3 model outperforms the rest of the models.

6. Conclusion

The Fama French 3 factor model (1993) made promises for a more robust estimation of the abnormal returns and that the 3 factors (Market portfolio, SMB, HML) were enough to price any asset. However, later work on the literature proved that a different mix of factors could give more precise predictions. These models (Q5, FF6, M4, DH3) use the same intuition with the FF3 model, but structure different factors with different intuition.

I use the above-mentioned models to consider the cross sectionality differences in the unconditional mean returns. Despite, each model has its weaknesses, all models at most datasets show an R^2 over 40%, which is a relative robust value. FF6 seems to outperform the rest in all datasets.

To sum up, each model outperforms the rest in each dataset. Therefore, a logical conclusion is that there have been major steps in the literature to explain the equity premium puzzle. However, these models do not account for factors such as liquidity or more generally the role of money. For instance, interest rates that a central bank sets or money supply, would be interesting additions to check whether the factor of liquidity can help explain asset returns.

The Fama and French (2018) 6-factor model is the best in most datasets. The model is not a perfect on describing the cross sectionality and variations of asset returns, but it manages to capture most aspects. It can also be used as benchmark model during an investment decision making process. On the other hand, the model cannot be implemented for all markets, as the factors are country specific. Thus, to operate as such, it is needed to be calibrated for a specific market. Still, no model is formulated to be for all markets.

7. Implications for practitioners and academics

My thesis proposed the testing of 4 models with different Kenneth French's datasets for testing the asset returns. It can be observed that each model has a different mix of factors. The findings that for each dataset, different model outperforms the rest is a helpful guide for investors to understand the relation of risk and return on the market. In the same direction, the risk-averse investors would be able to make the necessary strategies to choose the optimum portfolio. The findings of my paper show that the practitioners should explore the underlying risks in a volatile market instead of focusing and make iterations from the value of beta risk.

Though the scope of the study is the Kenneth French's datasets, the findings of my thesis can be used as a model for other developed markets for example, European Stocks, due to the openness of the financial markets and promotion of shareholders' rights. Therefore, the results of my work have implications for policymakers, as it can be a helpful drive during periods of volatility on which factor affects investors' preferences.

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