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Preliminary thesis report

Is the Fama-French three factor model still working after the 1993?

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Preliminary Master Thesis Report

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the 1993?**

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Preliminary thesis

1.0 Introduction to research topic

Financiers and economists have always given a lot of attention to how returns should be calculated for risk bearing assets and a lot of assets pricing model have been developed during the years.

1.1 CAPM model

The first theories related to the asset pricing model were developed by Sharpe (1964), Lintner (1965), and Black (1972). They implied that the expected returns on securities were a positive linear function of the market β s and that this was sufficient in order to calculate the returns, without the need of any other explanatory power. The model expressed the expected return on a portfolio of assets as a function of the market risk. The CAPM allowed to calculate the cost of capital for firms and the performance of portfolios. The model evaluates how to measure risks and what the expected return should be accordingly. In the Sharpe-Lintner equation we can identify the relation between expected return and the beta. Moreover, if the assets are uncorrelated with the market they have an expected return equal to the risk-free rate.

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f)$$

This relation assumes unrestricted free borrowing and lending or unrestricted short selling of risky assets, which does not reflect reality. This is why in 1972, Black proposed a new version of CAPM taking into consideration that borrowing and lending is not risk free.

When evaluating the Sharpe Lintner CAPM, we need to consider that the expected returns on all assets depend linearly to their betas and that their beta premium is positive. By testing the risk premiums, they noticed that the betas are very difficult to estimate for individual assets, creating problems when explaining the average

return. For this reason, Blume (1970) and Black (1972), when estimating the betas, take into consideration portfolios and not individual securities.

Contrary to what the Sharp Lintner model expects, they found that the relation between beta and the average return is much flatter than what it was supposed to be. The findings were in accordance with the Black model of the CAPM, which only expected a positive value for the beta premium.

Both the CAPM version of Lintner and Black consider the beta sufficient enough to describe the expected returns. In their opinion, all the different returns for different securities are motivated by the differences in the market betas. The results supported their view and the Black version of the CAPM was strongly adopted in the subsequent period. Since 1980 pricing anomalies started to emerge and the CAPM model started to be questioned. (Fama & French, 2004)

1.2 Pricing anomalies

Basu (1977) claimed that in order to understand the performance of an investment the price earnings ratio was an important element to consider. Investors' expectations may be biased by the values of P/E, affecting future investment performance. In his research P/E ratios were calculated for different securities, they were ranked, forming five portfolios. In the end, what has been found is that low P/E portfolios tend to have on average higher returns than the one estimated with CAPM. The finding was explained by the author as proof of market inefficiency.

Banz (1981) found misspecification of the CAPM model because the "size effect" (market capitalization) was neglected. In fact, in order to properly price assets, there were other factors to take into consideration. The study was conducted considering the total market value of NYSE common stocks for the period from 1936 to 1975. The result was that big stocks present lower average returns than the ones foreseen by CAPM. Moreover, he also found that P/E values have no impact when size is taken into consideration, but not the reverse. This could be explained by considering P/E as a proxy of size.

Rosenberg, Reid and Lanstein (1985), found that stocks with high book-to-market ratio perform above average, arriving at the conclusion that prices on the New York Stock Exchange are inefficient (Fama & French, 2004).

Fama & French (1992) reviewed all the failures and the contradictions of the CAPM and they studied the role of market β , size, E/P, leverage and book to market equity when calculating the returns. All of these factors taken individually seemed to have an explanatory power and to give information regarding average returns. When considering also size and book to market risk factors, instead, all of the other factors seemed to be irrelevant in predicting stock returns.

1.3 Fama French three factor model

In 1993, they developed their “Fama & French three factor model” by adding two other risk factors two the usual model, taking into consideration both the value and the size effect. The ratio is calculated by considering the historical cost of a company and comparing it with its market value calculated by multiplying the share price and the number of shares outstanding. Stocks with low book to market ratio are defined growth stock while instead stocks with high book to market ratio are recognized as value stock. A company is considered to be overvalued if the market value is higher than the book value, if instead, is the book value to be higher than the market value, the firm is considered to be undervalued. The return on stocks were calculated for the period 1963-1990, and the testing pricing model was completely different from the one used by Fama & French in 1992. The time-series regression approach adopted was the one of Black, Jensen and Scholes (1972) and the model could be represented by this equation:

$$E(R_i) = R_f + \beta_i(E(R_m) - R_f) + s_i SMB + h_i HML$$

In the formula SBM stands for “small minus big” market capitalization risk factor, which indicates the additional return given when investing in companies with small market capitalization. HML is the “high minus low” value premium risk factor, which represents the additional return generated when investing in companies with high book to market values. The Fama and French three factor model was mainly developed using US data and only at a later stage, in 1998, it was confirmed in different international markets.

The study was conducted by creating six different portfolios, combining the size of small and big firms with their low, medium or high book to market ratio.

In order to gather together all kind of US stocks small/large or with high/low book to market ratio, they created two independent rankings.

The problem with that is that size risk factor is correlated with the value risk factor. In order to correct for this correlation bias, Lambert, Fays & Hübner (2013), propose a sequential sorting procedure instead of the independent rankings methodology. Their methodology consisted in considering the momentum effect studied by Jegadeesh and Titman (1993) as risk factor and then considering either size or book to market. In this way, they were able to isolate both of the factors individually, providing the same degree of diversification to all portfolios. Empirical evidence was found suggesting that when size and value effect are separated, we find that size is far less robust than what was studied in the three-factor model, while the contrary happens for the value effect.

Moreover, Jegadeesh and Titman (1993) find that by buying stocks which performed well in the past and by selling looser stocks, abnormal returns could be obtained. The concept is based on the fact that usually stock prices tend to overreact or underreact to information. Huij and Verbeek (2009) find a big value effect but not a size one, stating that the value factor in the Fama French model could have been overestimated. Furthermore, according to a study conducted by Cremers, Petajisto and Zitzewitz (2010), the Fama French model seems to be biased. In fact, the SMB factor gives more weight to stocks with high book to market value especially if they are big. On the other hand, HML factor gives more weight to small stocks, leading to an overestimation of the value premium.

1.4 Fama French five factor model

In the following period, also the real significance of the value risk factor was questioned. After several evidences regarding the inadequacy of the three-factor model to calculate returns, Fama & French (2015) introduced the five-factor model to face all the criticism. They added two factors to the previous model: profitability and investments. The main idea was based on the dividend discount model and on the fact that the value of a stock depends also on the future dividends.

They also claim that the value factor becomes “redundant” when considering profitability and investment factors.

This last model seemed to better explain returns than their previous model, but it fails to properly predict returns for small stocks.

The risk factors of the model have been re-examined over time and over different countries and some anomalies have been found. In New Zealand, for instance, using stock market data from 1994 to 2002, it was found a significant effect for size and a weak effect regarding the book-to-market result. Furthermore, the three-factor model was inappropriate to explain the variation in stock returns (Nartea, Ward & Djajadikerta, 2009). Gaunt (2004), studied the size and value effect in the Australian stock market. He found that risk was greater for smaller firms, but contrary to Fama & French, he found that the β was smaller than 1. Dolinar (2013) tested the Fama French three factor model of stock returns in Croatia. In the research, the size and value factor were not always significant even if they had some explanatory power. Book to market factor was considered to have a stronger impact than the size one. It is important to notice that it is very difficult to apply any specific model when dealing with emerging markets, because they have their own characteristics.

2.0 Research questions and the objectives of the thesis

Some anomalies, especially regarding the book-to-market factor seemed to have been found in the last years in the US stock market. Chou, Chou & Wand (2004) examined the explanatory power of the value and size risk factors considering a time frame subsequent to the one tested in Fama & French (1993). Schwert (2002) claims that the anomalies are due to market inefficiencies and that they tend to weaken over time. If instead, the two risk factors are still found significant in explaining returns in the following period, this will give even more credit to Fama French three factor model. In the paper, it has been adopted the same methodology used in Fama & French (1992) and the period under examination was from July 1963 to December 2001. When considering the overall period, it was found a positive relationship between book to market and return, while a negative relationship between market cap and return.

When taking into examination the period from 1982 to 2001, instead, they find that size effect becomes insignificant. The same happens to the book to market factor risk premium when considering the post 1990 period.

“Is the Fama-French three factor model still working after the 1993?”, there is a big literature gap regarding the topic and the aim of the research and of the thesis is to try to fill this gap by answering to this research question. A lot of papers on the matter just present and sustain the Fama French three factor model. The goal of the thesis is to analyse if the value and size risk factors from the Fama French three factor model are still properly working or if they have been losing significance over the last years in the US context.

Then, the aim should be to identify when these risk factors stopped working and what could be possible explanations for that. A research will be conducted to investigate if there have been changes in capitalization rules and in what ways these could have had an impact on book to market values.

3.0 A plan of data collection and thesis progression

The data will be selected with the same approach used for the Fama French three factor model, but adopting a most recent time frame. Secondary data on firms will be gathered from New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ. Access to the COMPUSTAT database will be used in order to find accounting information.

The study will be conducted by choosing a specific time frame and by taking different US firms according to their size, and then dividing them into two different groups (small and big). Market size will be calculated by multiplying stock prices with the number of shares outstanding. The median will be considered in order to divide the two groups. The companies will also be ordered according to the value of their book-to-market ratio and divided between firms with low, medium and high book-to-market values. Six portfolios will be generated by crossing all the possible combinations:

Small/low = Portfolio with small cap and low B/M

Small/medium = Portfolio with small cap and medium B/M

Small/High = Portfolio with small cap and high B/M

Big/low = Portfolio with big cap and low B/M

Big/medium = Portfolio with big cap and medium B/M

Big/high = Portfolio with big cap and high B/M

Then the returns for each portfolio will be calculated every month. In this way, SMB will be calculated considering the different returns between portfolios with small and big firms when considering the same group for the book to market value. Same concept is valid when calculating the average returns for the different book to market values considering first only the small stocks and then the big one. In this way, HML can be calculated without the influence of the “size effect”.

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