

# **IMPLEMENTING THE THREE FACTOR MODEL OF FAMA AND FRENCH ON KUWAIT'S EQUITY MARKET**

**by**

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A thesis submitted in partial fulfillment of the  
requirements for the degree of

MSc. Finance and Banking

**Faculty of Business**

December 2009

## **ACKNOWLEDGMENTS**

I would like to express my thanks to all of those who gave me the chance to complete this thesis. I would like to thank my family and friends for always supporting me throughout my educational life. They truly made me value every step taken throughout all of these years.

I'm deeply thankful to my supervisor Dr. Kostas Giannopoulos from the Finance and Banking Department, whose help, suggestions, and encouragement helped me in all the time of research and writing of this thesis.

## Executive Summary

Asset Pricing Theory addresses the relationship of security return with security risk which is caused by the unknown possibility of returns. Determining the correct and accurate expected returns has been the major concern surrounding Asset Pricing Theory.

For almost half a century, the Capital Asset Pricing Model, Sharpe (1964), Linter (1965) and Mossin (1966), has been the corner stone for determining the asset risk/return relationship. It relies on beta known as the systematic risk in determining returns. However in the 1980's, criticism arose, which caused empirical researchers and financial practitioners to move away from the so known model. Miller (1999) and many professionals came to agree that the CAPM is no longer a sufficient model to explain the cross section of average returns. A recent alternative was introduced by the work of Fama and French (1993) who brought around two additional risk proxies not shown in the CAPM, one is the small size factor, indicating that smaller firms on average earned more than bigger firms and second book to market equity, demonstrating that firms with higher book to market ratios earn more than firms with lower book to market ratios. The two factors experienced abnormal returns that were not captured by CAPM's beta.

Looking briefly at some of the literature of Fama and French, their (1992) paper proved that security risk is associated with firm size as well as book to market equity. In 1993, they examined a time series approach to their work that was not apparent in their earlier paper. In 1995, their work confirms that book to market equity and size proxy for the sensitivity of the risk factor that explains stocks returns, and secondly that size and book to market equity are explained by profitability and the earnings behavior. In 1996, Fama and French prove that many of CAPM's anomalies disappear when using their multi index model. Fama and French (1998) discovered that value and small cap stocks earn higher returns for the majority countries under their examination.

In this study the Fama and French (1993) model is tested in Kuwait's market from years 2000-2007. There are two main objectives, first to extend the Fama and French model internationally, to Kuwait, to see whether or not the additional factors of book to market equity and size proxy for risk that help explain stocks returns. Secondly, this study addresses Fama and French's main controversies. It aims to address the vast majority of practitioners that believe beta alone is sufficed in explaining security returns. In addition, aims from the need to expand Fama and French's work internationally as most of their work is conducted in the U.S. Moreover, there is an important need to provide investors a clearer understanding of asset pricing anomalies that can exist. The anomalies discovered by Fama and French defies the whole generation of investors that believe in efficient markets and that asset returns are a result of volatility. Finally, this study aims at shedding more light into the area of asset pricing models in Kuwait; its importance serves many functions such as capital budgeting, security evaluations and investment performance and evaluations.

Four portfolios were constructed, (S/L) small cap stocks along with low book to market firms, (S/H) firms that are small in size with high book to market firms, (B/L) big firms with low book to market firms, and (B/H) big firms with high book to market ratios. The returns of the above portfolios are regressed on the market portfolio, a mimicking portfolio capturing the average difference between returns of small firms and the return of big firms and third a mimicking

portfolio which captures an equally weighted long position in high book to market portfolio and an equally weighted short position on low book to market ratio.

Kuwait's results indicated that the Fama and French model added a marginal effect in pricing securities and especially for those securities that are in the S/L and S/H categories. In addition to finding premiums for small and high book to market firms, our results dismiss most of Fama and French's controversies. Lakonishok and Vishny (1994) theory has been disproved since our findings confirm that high book to market premium is not a result of an arbitrage opportunity. We also responded to the 'Survivorship Bias' argument by Kothari, Shanken and Sloan (1995) by testing both the firms that failed as well as firms that survived, unlike Fama and French where only the surviving firms were tested, our results thus do not support the 'Survivorship Bias' theory. Responding to the 'Datasnooping' argument by Lo Mackinlay (1988), Black (1993) and Mackinlay (1995) also took place when testing in an out of sample test as in our example, Kuwait. The only controversy of Fama and French that could not be tested was Daniel and Titman (1997) since we were limited with data to construct portfolios with many different variations in characteristics and factor loadings. Results in Kuwait refute the Efficient Market Theory Hypothesis since our findings confirm that returns are not related to volatility and secondly that Multi Factor Minimum Variance MMV portfolios were discovered that negates the market factor as the only Minimum Variance Efficient MVE portfolio.

Overall Kuwait's results proved that a multifactor model is more explanatory than the CAPM's beta. This of course has many implications especially in calculating cost of capital and in evaluating portfolio managers. Results though were not as powerful as the model exhibited in the U.S and in some international markets. Reasons might be because of the smaller time period of study in Kuwait, 8 years in comparison to 70 years in the U.S. A second reason might be because of the many new joining companies in years 2003-2004 in Kuwait; which negates the possibility of revealing a small and book to market premiums, as these need more time to become obvious.

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# **Chapter 1**

## **Introduction**

Determining the precise asset pricing model has been a major concern for so many years. There are quite a number of models that tried coming up with a precise asset pricing model. The most well known one is the Capital Asset Pricing Model discovered by Sharpe (1964), Linter (1956), and Mossin (1966). Due to its many limitations though, many researchers have looked into the Multi Index Model Phenomena in explaining returns. The area of research is still growing, and many researchers are still experimenting on what the right and most precise asset pricing model could be. Of course implementing the multi index model phenomena has been developed and tested in many parts of the world, and due to its high significance its has also been developed and passed on to some emerging markets. The aim of this paper is to test and build on previous literature by applying and testing the multi index three factor model of Fama and French (1993) in the emerging market of Kuwait.

For almost 40 years the CAPM dominated asset pricing theory in the world. However, in the 1980's, many of CAPM's criticisms started coming up, such as the failure of beta to predict security returns. The world market portfolio no longer is the only determining risk factor.

Fama and French in the 1993, discovered two additional risk proxies in explaining security returns which are the size factor, resulting in higher associated returns for smaller firms and secondly book to market ratio, which shows that firms with high book to market ratio exhibit higher returns.

Looking at some of the literature, Fama and French (1992) experimented on the combined roles of beta, size (ME), E/P ratio, leverage, and book to market (BE/ME) ratios in explaining the cross section of average stock returns for NYSE and NASDAQ over the period of 1963-1990. They found that beta alone has no explanatory power in past returns and that both size and book to market factors added the explanatory power that is not captured by the CAPM beta. This falls back on realizing that small firms on average earn more than bigger firms and that firms with higher book to market ratios also earn more than low book to market ratio firms. The rationale behind the size and book to market effect has been interpreted differently by many, such as Chan and Chen (1991) who related the high book to market firm's returns on the markets perspective that high book to market firms are poorer prospects, believing they are underpriced in comparison to low book to market firms. Fama and French related the small size firm effect to their observations that stocks of small firms are less liquid and secondly stocks of smaller firms tend to be associated with higher transaction and monitoring costs.

Fama and French (1993) extended their earlier work by applying a time series regression approach. Their time series approach works well for both stocks and bonds. They regressed monthly returns on both stocks and bonds over a five factor model which were the returns on a market portfolio, a portfolio mimicking the size effect, a portfolio mimicking the book to market effect, a term premium and a default premium. The first three are used for stock regressions along with the last two which were conducted on bond regressions. Results showed that the two factors, size and book to market equity, casts a significant amount of explanatory return power. However, when the market index is added to the regressions, results indicated that the three factors together provide a much higher explanation of average returns.

Previous studies showed that average returns on stocks are related to many factors such as firm size, book to market equity, earnings/price, cash flow/price, long term past return, past sales growth, and short term past return. These return explanatory factors are considered anomalies, since the conventional CAPM does not explain them. The work of Fama and French (1996) however illustrates that most of these return related factors disappear when using their three factor model.

Fama and French's model has been tested globally in many developed and some emerging countries. Results indicated that firms with higher book to market ratios earned more than low book to market firms and also those firms smaller in size earned higher returns than those of bigger firms.

Though Fama and French's model resulted in premiums towards small and high book to market firms, the result of the premiums are argued differently by three main explanations. The first is a rational model that justifies that the two factors of size and book to market equity proxy for systematic risk, as Fama and French suggested. The second interpretation for the premiums of small and high book to market firms states that the three factor model for Fama and French does capture security returns however they're due to investor irrationality and inefficiencies in the market, Lakonishok, Shleifer and Vishny (1994) and Daniel and Titman (1997). The third interpretation states that the premiums inherent are a result of i) Survivorship Bias ii) Datasnooping, Lo Mackinlay (1988), Black (1993) and Mackinlay (1995) and Kothari, Shanken and Sloan (1995).

Lakonishok and Vishny (1994), Haugan (1995) argue that the premium apparent in high book to market is quiet big to be explained by rational pricing. He concludes that premiums associated are so close to an arbitrage opportunity. Fama and French's tests in the U.S disprove Lakonishok



and Vishnay (1994), Haugan (1995) by showing that arbitrage opportunity cannot exist when standard deviations on book to market risk factor (HML) are high. A second area of controversy was laid down by Daniel and Titman (1997) who argue that it's the characteristic rather than the covariance structure of returns that explain the extra returns apparent in small and high book to market firms. Daniel and Titman (1997) rejected Fama and French theory on believing that firm size and book to market are what proxy for risk.. Fama and French (2000) address Daniel and Titman (1997) and came to the result that the three factor model outperforms Daniel and Titman (1997) characteristic model. However Daniel and Titman (1997) explored the test in Japan, and found that the characteristic model outperformed Fama and French three factor model. Exploring this area of controversy is quiet difficult because researchers would require a large sample of security returns to create a well constructed portfolio with many different variations in characteristics and factor loadings such is in the U.S and Japan . There is an everlasting debate on this area, as to whether or not the premiums of small and high book to market firms are priced through their covariance structure of returns or are a result of security's own characteristics. The third area of economic interpretation against the premiums of Fama and French is stated by Kothari, Shanken and Sloan (1995) who claim the high relative distress is a result of 'Survivorship Bias'. They claim that the high returns on high book to market securities are due to the use of COMPUSTAT which only includes distressed firms that survive and leaves out distressed firms that fail. The fourth biggest argument against Fama and French is related to 'Datasnooping' by Lo Mackinlay (1988), Black (1993) and Mackinlay (1995) who argue that the results of Fama and French higher return on small and high book to market portfolios are sample specific, they claim that premiums for small and high book to market firms only exist in the U.S market and will not exist in international markets. They claim that if out of sample tests

(international test) are conducted, SMB and HML, the risk factors for small and high book to market portfolios will no longer proxy for risk and no longer will there be any premiums on small and high book to market firms. One way to test whether or not the 'Datanoooping' argument by Lo Mackinlay (1988), Black (1993) and Mackinlay (1995) holds, is to test Fama and French in international markets (non-U.S).

In light of the above, the motivation of this study is three fold, first to extend the test internationally to Kuwait. This motivation comes from the fact that most of the available research is in the U.S only and so little has been experimented in international markets. The second motivation is to respond back to the major controversies of Fama and French, this brings more light into the area of whether or not the premiums of small and high book to market equity in Kuwait are rationally priced as Fama and French indicated or are those premiums a result of the arguments set forward by any of the above mentioned opponents. Thirdly, this research provides a better understanding to investors on the area of asset pricing anomalies that can exist in Kuwait

The first controversy that this study addresses is Lakonishok and Vishany (1994) and Haugan (1995). The study examines whether Fama and French's results are rationally priced or are a result of an arbitrage opportunity in Kuwait. This study also responds to the 'Survivorship Bias' of Kothari, Shanken and Sloan (1995) controversy by testing both distressed firms that failed as well as distressed firms that survived unlike Fama and French were tests of the surviving firms only took place. The study also addresses Mackinaly (1995) who found that the Fama and French Model will not be universally accepted up until new international tests of Fama and French (out of sample) come forward, they believe that Fama and French's premiums on small and high book to market firms are only relevant in the U.S (Datanoooping). By experimenting Fama and

French's model internationally, we can have a more thorough understanding as to whether the success of Fama and French's three factor model is a result of 'Datsnooping' or not. Daniel and Titman argument however could not be tested since our data is limited to construct portfolios with many variations in characteristics and factor loading.

Moreover, the study examines if Fama and French's anomalies of small size and high book to market premiums exist in Kuwait. If those anomalies do exist, are they related to stock volatility or are they related to inherent security risks. Fama and French's work defies efficient market believers when finding that the outperformance of small and high book to market is not related to volatility. Actually their U.S results showed that small and high book to market firms are less volatile than the market and thus small and high book to market firms are not related to volatility. The study addresses the vast majority of investor generation that believes in efficient markets. This research is highly important to investors when looking at how the cost of equity can be different when we take other factors to proxy for systematic risk and not only the market portfolio and also changes portfolio manager's evaluation that are usually judged on beating the market only.

The study is organized as follow. The next chapter reviews the background literature. Chapter three describes the model, chapter four describes the methodology and data used, chapter five describes the results and a summary and a conclusion are done in chapter six.

## **Chapter 2**

### **Literature Review**

#### **2.1 The Arbitrage Pricing Theory**

Ross (1976) was the first to develop and introduce the Arbitrage Pricing Theory. His findings set the path for many more research in the area such as the work of Chen (1983) who assumes a five factor structure that change over time, Connor and Korajczyk (1988) who developed the statistical methodology of extracting return explanatory variables and lately the work of Fama and French (1992) who developed and contributed significantly with their multi index models in explaining both stock and bond returns. His work had two major advantages in comparison to the CAPM, first it had less hypothesis on investors risk and return choice and secondly its uncomplicated experimentation in empirical grounds.

It's worthy to briefly look at Ross's framework to better understand the work of Fama and French. Fama and French follow the Arbitrage pricing theory with some differences that will be discussed shortly.

Ross's work sprung from the many unrealistic assumptions of the Capital Asset Model, the foundational asset pricing model that was and is still greatly used today. The assumptions are many such as no taxes, homogenous expectations in regards to the future's distribution of returns, the same investor's holding period, no transaction costs and so on. However, most importantly his theory tackles some more important assumptions such as;

- 1) In the CAPM investors care only about the mean and variance of distribution of one period portfolio returns

- 2) The CAPM leaves out how returns co vary with other economic or fundamental variables and relies only on the world market portfolio in explaining returns
- 3) The extreme difficulty of constructing a world market portfolio that includes all of the world's assets
- 4) Beta by itself cannot explain security returns.

The APT was introduced by Ross (1976). It's a pricing model whereby a number of variables more known as (factors) help to explain the expected returns on assets. The expected return on assets is modeled linearly on the various factors. Unlike the CAPM where only one factor (market portfolio return) explains asset returns, the APT model allows its asset expected return to be explained by a number of different factors, some of which are fundamental, macroeconomic or purely statistical factors.

The idea behind the APT is different than the CAPM. The CAPM is based on optimizing mean variance investors who all have the same beliefs. However the APT relies on removing all risk free arbitrage profits when reaching equilibrium returns. Thus under the no arbitrage assumption investors will bring mispriced assets back into line with its own expected price.

Ross (1976) does not specify the number of risk factors used nor does his theory specify the nature of the risk factors. His theory holds the following assumptions;

- 1) The asset expected returns are linearly related to the risk factors.
- 2) No arbitrage opportunity in capital markets
- 3) The number of securities in the market is infinite or so large

4) The nature of the factors is either known in advance as the case with macroeconomic variables or fundamental variables or they can be estimated statistically by using factor or principle component analysis

5) Perfectly competitive and frictionless markets.

One major drawback of the APT is that it gives no direction concerning the choice of the relevant risk factors. This is why there are a number of different theories and research experiments that came up straight afterwards, one of which is the work of Fama and French that will be discussed in the next section. The APT is defined as below;

$$R_A = ER_A + b_{A1}F_1 + \dots + b_{AK}F_K + e_A \quad (2.1)$$

$$ER_A = \lambda_0 + \lambda_1 b_{A1} + \dots + \lambda_k b_{AK} \quad (2.2)$$

Where  $R_A$ : is the actual return on stock  $A$

$ER_A$ : is equilibrium return on the stocks

$b_{A1}$ : is the sensitivity of asset  $A$  on risk factor  $F_1$

$b_{AK}$ : is the sensitivity of asset  $A$  on risk factor  $F_K$

$F$ : are the risk factors

$\lambda_0$ : the risk free rate

$\lambda_1$ : the impact of beta risk for factor  $F_1$  on expected returns

$\lambda_k$ : the impact of beta risk for factor  $F_K$  on expected returns

$e_A$ : is the error term

A brief summary of the different multi factor models would give and intuitive background in this area of research. Conner (1995) identified three ways to extract the risk factors: (Table 2.1)

- 1) Using macroeconomic variables
- 2) Using fundamental variables
- 3) Using statistical techniques

**Table 2.1: The three methods used by Connor (1995)**

Second Model	First Model		
	Macroeconomic	Statistical	Fundamental
Total explanatory Power	10.9%	39.0%	42.6%
Macroeconomic	-----	38.2%	42.4%
Statistical	31.0%	-----	44.8%
Fundamental	43.0%	45.6%	-----

*Source: Conner (1995)*

His findings confirm that statistical models and fundamental models outperform macroeconomic ones. Macroeconomic variables are related to inflation, the percentage change in industrial production, excess return to long term bonds and realized return premium of low grade bonds. The main drawback for this model is how to find out what macroeconomic variables are needed exactly to fully explain returns.

Statistical methods on the other hand use principle component and factor based analysis procedures on the cross sectional time series returns in order to identify the factors. Factors are purely mathematical.

The fundamental factor model rely on company characteristics such as firm size, book to market equity, and industry factors like the work of Fama and French.

The three methods used by Conner (1995) were applied on U.S data return for over 700 highly capitalized U.S equities for the period of January 1985 through to December 1995 yielded

different explanatory results for each. When each technique is used alone, both the fundamental factor model and the statistical model generated higher explanatory factors than the macroeconomic model. The fundamental model tops all of the models in their explanatory power. However, tests can be jointly used to see how much each factor model can add marginal explanatory power to the other. For an example, a test can be used to see whether the statistical factor model can explain all asset returns not captured by another factor model such as the macroeconomic one. All models can be applied to one another to see how much they can collectively capture together.

Table 2.1 indicates the marginal explanatory power for each model. The first row shows how much each factor model captures on its own. The next three rows indicate how much each model adds marginally to the other.

This study will follow the work of Fama and French that sprung up from Ross's work on the APT.

## **2.2 The Three Factor Model for Fama and French**

The work of Fama and French evolved and came after the increasing evidence that the CAPM acted poorly in explaining returns. The CAPM uses a single factor model, whereby all the security returns co vary with the market portfolio only. But more generally other factors can be added to give a more concise security return explanation. The well known approach is the three factor model developed by Fama and French.

Fama and French's studies found that two sets of stocks tend to outperform others. First, small cap stocks and second, stocks with a high book to market value. They added the two factors to



the market portfolio that's apparent in the CAPM and found that security returns do vary more with all the three factors together.

Prior to the findings of Fama and French, both the work of Black, Jensen and Scholes (1972) and Fama and Macbeth (1973) find a positive relationship between stock returns and beta during the period prior to 1969. However later examples for Ross (1980), Fama and French (1992), Freguson and Shockley (2003) and many more argue that the CAPM finds no significant linear relationship between beta and average returns. Banz (1981) discovered a size effect apparent in return explanation as well as Bhandari (1988) who reveals that leverage is apparent in security return explanation.

In Fama and French (1992), joint roles of beta, size, E/P ratio, leverage, book to market ratio are used in the cross section of average stock returns for NYSE and NASDAQ over the period 1963-1990. They found out that beta on its own has no explanatory power in returns, and that size (ME) and book to market equity (BE/ME) provides a powerful explanation of average stock returns for the period 1963-1990. They found out that the return for smaller firms are on average higher than bigger firm. The book to market (BE/ME) is the second factor in explaining returns, which is in fact a more powerful risk factor than the size effect. When both size and book to market factors come together the leverage and E/P effect gets absorbed. Their conclusion thus notes that both size and book to market factors are proxies for risk.

Fama and French (1993) build upon Fama and French (1992) by using a time series regression approach. Monthly returns on both stocks and bonds are regressed over a five factor model, returns on a market portfolio, a portfolio mimicking the size effect, a portfolio mimicking the book to market effect, a term premium and a default premium. The first three portfolios are used

on stock regressions and the last two portfolios are used on bond regressions. For stock regressions, they found out that the three factor model captures most of the cross section of average returns in U.S stocks. The model indicates that the expected return on a portfolio in excess of the risk free rate is captured by a value weighted market portfolio in excess of the risk free rate, a mimicking portfolio that captures the average difference between the returns of small firms and the returns on big firms, and the difference in returns between an equally weighted long position in the high BE/ME portfolio and an equally weighted short position on low BE/ME portfolios. It is defined as below,

$$R_{pt} = R_f + \beta_p(R_{mt} - R_f) + sp(SMB) + hp(HML) + e_{pt} \quad (2.3)$$

Where;  $R_{pt}$ : is the weighted return on portfolio P at time t

$R_f$ : is the risk free rate

$\beta_p$ : is the risk coefficient on the excess return on a market portfolio

$sp$ : the coefficient on the excess return on the difference between small firms and big firms

$hp$ : the coefficient on the excess return on the difference between high BE/ME and low BE/ME stocks.

$e_{pt}$ : error term

Fama and French (1993) found that both ME (size) and BE/ME are great proxies for risk and are significantly related to economic fundamentals. The small size effect points that small firms exhibit higher average returns than big firms. Lower earnings on assets are apparent in smaller firms. This relates back to the 1980's recession period which extended into a long earnings downturn for small firms. For some reason, when the economic conditions started doing better again, small firms did not rise in profitability like the rest did. This fact helps to point out the risk

factor that is apparent in small firms and brings about an explanation of the negative relationship between size and average return. They also believe that stocks of small firms encounter an illiquidity factor, higher transactions costs and high monitoring cost, so constructing portfolios on small stocks would generally cost more than on big stocks.

The second economic fundamental is the book to market equity factor. A value premium appears in high book to market firms, these firms tend to have low earnings on assets that stay for five years before and five years after book to market equity ratios are evaluated. The market perceives these firms as weak prospects, so the relative profitability of these firms is what brings about a second risk factor in returns, which indicates the positive relationship between high book to market equity firms and average returns.

Regressions were conducted on the market only, the two risk factors related to size and book to market equity, and the three factors together. Empirical tests found that the two risk factors related to size and book to equity casts explanatory power alone, however the model is more explanatory when the three factors are regressed together. Results on R squared, intercepts, slopes all indicated that the model is well justified. Intercepts were observed at '0', this purely indicates that the three factor model captures the entire cross section of average returns. When regressing on the market alone, R square values are higher when regressing on big stock and low BE/ME stocks, and lower on small stocks and high BE/ME stocks, indicating that the market factor explains less when regressing on small firms and high BE/ME , thus leaving it to the size and BE/ME risk proxies to explain their returns. Results also cast light on slopes, which are higher on small portfolios and lower on big sized portfolios. Slopes are also higher on high BE/ME firms and lower on low BE/ME firms. All of the results indicate that there is a small size

effect as well as a value premium and that the three factors explain the cross section of average returns.

Fama and French (1995) examine features of firms with high BE/ME and low BE/ME ratios. They concluded that high BE/ME firms are usually persistently distressed securities in comparison to low BE/ME firms. They indicated that high BE/ME stocks are less profitable than low BE/ME stocks, and high BE/ME have higher average returns because earnings growth are higher than expected. Overall their work confirms that book to market equity and size proxy for the sensitivity of risk factors that explains stocks returns, and secondly that size and book to market equity are explained by profitability and the behavior of earnings.

Fama and French (1996) argue that many of CAPM's anomalies disappear when using the three risk factor model. Their work shows that average returns are affected by firm size, earning/price ratio, cash flow/price, book to market equity, past sales growth, long term growth and short term growth. For all but for the continuation of short term returns, the three factor model does exceptionally well. The above mentioned factors are not explained by the CAPM and hence are called anomalies.

Portfolios relating to E/P, C/P and sales growth are all captured by the three factor model. They found that sound and strong firms with low E/P, low C/P and strong sales load negatively on HML (the book to market risk factor in regressions), which thus implies lower expected returns. On the other hand a premium in expected return is clear for those firms which encounter high E/P, high C/P and weak sales, these are distressed firms where the market expects an extra premium for the risk they undertake, and these firms tend to load positively on the HML risk factor.

The work of Fama and French tends to capture the reversal of long term return patterns that was documented by Debondt and Thaler (1985). They indicate that stocks with low long term returns (distressed securities) tend to have higher future returns. These firms have positive slopes on Fama and French's HML factor. On the other hand the opposite holds true, stocks with strong past returns end up experiencing low future returns, which then load negatively on Fama and French's book to market risk factor.

However, Jagadeesh and Hitman (1993) observed that unlike the reversal of long term returns, short term returns tend to continue as they are without reversing even after portfolio formation. Stocks with high returns in the past 12 month tend to continue with higher future returns. This relationship is not captured by either the CAPM or the three factor model for Fama and French.

A global test of the model was exhibited by Fama and French (1998). They discovered that value stocks earn higher returns for twelve of the thirteen major markets. The value premium of high value stocks over low value stocks is 7.68% per year. Empirical summary comes to note that global value stocks are around 3.07% to 5.16% higher than the average market portfolio. The global value portfolio is around 5.56% to 7.68% higher than the average growth portfolio. When testing on a single factor model (market portfolio), results indicate that the market portfolio is not sufficient in estimating returns since slopes on value portfolios were less than one, and greater than one for growth portfolios.

Tests were also conducted on emerging countries, and like developed countries there was a value premium apparent. The average difference between returns on high and low BE/ME is 16.91%. In addition there was a size effect clear between the return on small and big stocks at around 14.89%.

The explanations of Fama and French (1993) that small and high book to market equity firms generate higher returns as a response for bearing on risk has been argued by many researchers around. Like Fama and French, Reinganum (1981) revealed the there is a size effect apparent for U.S stocks used from 1962 to 1975. He sorted all stocks into ten different sized portfolios, and concluded that smaller firms on average earned more than big firms. Roll (1981), however argued against Reinganum (1981) and reasoned that small firms earn more on average because their trading infrequency brings about a positive autocorrelation and thus wrongly assesses the risk attributes associated with them.. Reinganum (1982), indicate that the magnitude of Roll (1981) bias is too small to explain the firm size effect.

Lakonishok, Sheleifer and Vishnay (1994), Haugen (1995) both argue that size and book to market equity are due to investor overreaction rather than a compensation for bearing risk. They indicate that investors over react to news, thus naturally smaller firms would be underpriced and bigger firms would be overpriced. Others like Berk (1995) argue that small firms and high BE/ME firms will earn higher returns regardless of their mispricing concept or the economic risk that they hold. In addition, Daniel and Hitman (1997) disregarded Fama and French because they found out that firm attributes better explain returns than the factor loadings introduced by Fama and French. They discovered that the extra returns apparent in small firms and high book to market firms are not because of their covariance structure in returns but rather are due to their own return characteristic. He argues that investors like growth stocks, firms that are strong and dislike value stocks which results in a value premium associated with high book to market firms that is not the result of risk. This is what they call the characteristic based model. They point out that the return behavior occurs from the asset's own characteristic rather than the assets covariance with the risk factors.

However as mentioned earlier, Fama and French (1998) further examined the work of Berk (1995) and Daniel Hitman (1997) by using international data. They concluded that there should be one set of risk factors to explain expected returns in all countries, and results indicated the using a two factor model with a world market portfolio such as the CAPM and a world book to market portfolio lowered intercepts to zero and increased R squared when compared to using a market portfolio only. In addition the work of Fama and French (2000) also addresses Daniel and Hitman's characteristic model theory, they came to the conclusion however that there is a value premium apparent in U.S stocks and also notes that the three factor model of Fama and French outperforms the characteristic model suggested and laid down by Daniel and Hitman.

Others like Kothari, Shanken and Sloan (1995) argue that Fama and French's results are due to the survivorship bias hypothesis, where the surviving distressed firms are the ones used in tests, leaving out distressed firms that failed. They have conducted their research from the S&P 500 index from 1947-1987 and found evidence that book to market equity is a weak explanatory return variable. Their work has been opposed by many.

The Fama and French Model need more empirical investigation for it to become a more credible model. This is why there are so many that are pursuing the work of Fama and French in international markets, and this is why we experimented its creditability in an emerging market such as Kuwait.

## Chapter 3

### Empirical Investigation

#### 3.1 Model

The multifactor model for Fama and French is a model whereby three risk factors explain stocks expected returns. It assumes that the systematic factors are related to the market index, firm size and book to market equity characteristics.

The motivation of size and book to market equity came after the increasing evidence of experiencing higher average returns for both small sized firms and high book to market equity firms. The two factors proxy for risk that is not captured by the beta of the CAPM.

As discussed in the literature review section, Fama and French's model tests whether portfolios that mimic size (ME) and book to market (BE/ME) capture strong variations in returns. Fama and French (1992) and (1993) came to the conclusion that both ME and BE/ME are strong risk factors that provide a strong relationship in explaining returns.

The model indicates that the expected return on a portfolio in excess of the risk free rate is captured by a value weighted market portfolio in excess of the risk free rate, a mimicking portfolio that captures the average difference between the returns of small firms and the returns on big firms, and the difference in returns between an equally weighted long position in the high book to market portfolio and an equally weighted short position on low book to market portfolios.

$$R_{pt} - R_f = \alpha + \beta_p (R_{mt} - R_f) + \beta_{sp} (SMB) + \beta_{hp} (HML) + e_{pt} \quad (3.1)$$

Where;  $R_{pt}$ : is the weighted return on portfolio P at time t



$R_f$ : is the risk free rate

$\alpha$ : is the intercept for the portfolio

$\beta_p$ : is the risk coefficient on the excess return on a market portfolio

$(R_{mt}-R_f)$ : is the market portfolio which is the return of the market minus the risk free rate

$s_p$ : the coefficient on the excess return on the difference between small firms and big firms

(SMB): is small size firm risk factor which is the return difference between small sized firms and big sized firms

$h_p$ : the coefficient on the excess return on the difference between high BE/ME and low BE/ME stocks.

(HML): is the book to market risk factors that indicates the difference in returns between high book to market firms and low book to market firms

$e_{pt}$ : error term

Here  $R_{pt}$  is the average monthly return on the portfolios used by Fama and French (S/L, S/M, S/H, B/L, B/M, and B/H) and  $R_{ft}$  is the risk free rate.

The definition of the portfolios is as follows. The S/L portfolio includes firms that are much smaller in size and high in book to market ratios. The S/M portfolios consist of firms that are small in size with medium book to market ratios. The S/H are firms that are small and high in their book to market ratio. The B/L portfolio consists of firms that are big with low book to market ratios. The B/M portfolio consists of firms that are big in size and medium in book to market ratios and B/H are the firms that are big in size with high book to market ratios.

As noted in equation 3.1, the three portfolios used in our regressions are  $(R_{mt}-R_f)$  which is the monthly return of the market minus the risk free rate, the size factor SMB which is the monthly

return difference between small sized firms and big sized firms, and HML which is the book to market risk factors that indicates the monthly difference in returns between high book to market firms and low book to market firms. The factor loadings are  $\beta_p$ ,  $s_p$ , and  $h_p$  which are the slopes on the market portfolio ( $R_{mt}-R_f$ ), (SMB) and (HML) respectively in the regressions,  $\alpha$  is the intercept and  $e_{pt}$  is the error term for the portfolio.

In our study we use four portfolios instead of six which are (S/L, S/M, B/L and B/H) since Kuwait companies are much fewer than the U.S companies used by Fama and French. At the end of each year, stocks are broken down into size and book to market categories. For the size factor, stocks are broken down into either the small or big category and for the book to market factor, stocks are broken down to either low or high book to market equity category. The measure of size is indicated by ME (closing prices times shares outstanding). The book to market is a measure of the book to market equity ratio. For the size related factor, stocks are broken down to either small or big, stocks that are below the median are considered small firms whilst the ones above the median are considered big firms.

The three explanatory return variables considered as risk related factors are  $R_m-R_f$ , SMB, and HML are defined as follows.  $R_m-R_f$  is defined as the sum of the returns each month of all the stocks that are available in the four portfolios minus the risk free rate. SMB is defined as the difference in returns each month between an equally weighted long position in the two small firm portfolios and an equally weighted short position in the big portfolios. The third risk factor HML is defined as the difference in returns each month between an equally weighted long position in high book to market portfolios and an equally weighted short position in low book to market portfolios.

After all, each month the returns of the four portfolios (S/L, S/H, B/L and B/H) are regressed against the three risk factors to find results on how much proximity the risk factors add in explaining returns.

The earlier work of Fama and French (1992) uses the cross section regressions of Fama and Macbeth to test this relationship. This study of tests the Fama and French's model by using the Black, Jensen and Scholes approach (1972), whereby excess monthly returns on portfolios are regressed on the returns to a market portfolio of stocks, and mimicking portfolios that are related to ME and BE/ME. Results of the slopes, intercepts, and R squared will show whether the mimicking portfolios related to size and BE/ME show common variation in portfolio returns.

The study implements Fama and French (1993) model in Kuwait's market. However, implementing the study on Kuwait's market differs marginally that the original work of Fama and French. The tenor period is 8 years (96 months), starts at the beginning of year 2000 and ends in year 2007. Because the market listed companies in Kuwait's market are fewer than the listed companies in the U.S, four portfolios are constructed each year instead of six portfolios that are used by Fama and French (1993),

## Chapter 4

### Data and Methodology

#### 4.1 Data

The necessary data for the 142 companies listed on Kuwait's stock exchange were obtained from Kuwait's Stock Exchange, The research Unit Institute, and the Central Bank of Kuwait. Firstly, Kuwait's stock exchange provided the daily prices for all the companies listed from 01/01/2000 to 31/12/2007, total of (96 months) 8 years. All of the company's monthly returns had to be calculated manually by taking monthly holding period returns as below;

$$R_{it} = (P_2 - P_1) / (P_1) \quad (4.1)$$

The two financial indicators which are the market capitalization (stock prices times' number of shares) and the book-to-market equity (the ratio of the book value of a firm's common stock, BE to its market value ME) were obtained from the research unit institute of the banking studies in Kuwait. This institute provides comprehensive and well structured financial information regarding the financial condition, performance and trends in Kuwait's market. As for the risk free rate, the monthly return on a 1 month Kuwaiti Treasury bill is obtained from the Central Bank of Kuwait for the period under study. The market return numbers could not be downloaded from Kuwait's stock exchange because it is price weighted index and our study requires value weighted returns. The model requires the returns to be calculated by considering company values (weights). So for every year, the value weighted market return is computed by first summing up all of the companies market capital each year and then finding the relevant weights for each company when dividing its respective market capital by the total market capital. After finding the weights, value weighted returns are derived by multiplying each of the

company's weights by the monthly returns for that particular year, and the same occurs for each year till year 2007.

## **4.2 Portfolio Construction**

### **Classification by Size**

Each year throughout our holding period, the companies that are listed are sorted to find the median ME (shares outstanding times price of shares). All of the companies that are less than the median are considered small companies, and all of the companies that are above the median ME, are considered large companies.

### **Classification by (BE/ME) Book to Market**

We also break the companies every year according to their book to market ratio. Fama and French (1993), uses three breakpoints, the bottom 30% (low BE/ME) companies, 40% (Middle BE/ME) companies and top 30 % ( high BE/ME) companies.. Because Kuwait's market holds less companies, so the use of key points can be cut down to two, which are low BE/ME companies, ones less than the median, and high (BE/ME) companies those of which are above the median. Fama and French define BE (book common equity) as the value of stockholders equity plus balance sheet deferred taxes minus the book value of preferred stocks. BE/ME is book common equity for the fiscal year ending t-1 divided by market equity for fiscal year ending t-1.

### **Constructing Portfolios**

After finding out the small and large companies and low (BE/ME) and high (BE/ME) companies, four different portfolios are sorted out every year. These four portfolios are classified

as (S/L, S/H, B/L, B/H). For an example the S/L portfolio contains all the companies that are in the small (ME) and low (BE/ME) category. The B/H portfolio contains all the companies that are big along with the stocks that are high in their BE/ME ratios. The four portfolios (S/L, S/H, B/L, B/H), are sorted out every year, as every year market capital and book to market ratios change. The number of companies changes as well year on year.

Monthly weighted returns on the four portfolios are calculated throughout the period from year 2000-2007. For an example, to find the value weighted returns for S/L portfolio for year 2000, all the stocks that are small in (ME) and low in (BE/ME) come together. The weights are calculated by dividing single stock's market capital by the total market capital of the whole portfolio. The weight for every company in within the S/L portfolio is then multiplied by the respective monthly returns till the end of year 2000. The sum of all the value weighted returns is added up every single month, thus having monthly weighted returns. The same process would be done for the S/L 2001-2007 and B/L 2000-2007, B/H 2000-2007, and finally B/H 2000-2007.

### **Small minus Big Risk Factor (SMB)**

For each year the size premium is made from the difference each month between the average of returns of small firms and the average of returns of large firms. So this equation would bring us to an equally weighted long position in the two small firms and an equally weighted short position in the two large firms. The difference between the two, small and large firms would be free from BE/ME influence and rather focuses on the size effect. The theory holds that small firms on average produce returns that are higher than big firms. Fama and French (1992) show clear evidence that in the Fama and Macbeth's regressions the size factor is positively correlated with returns.

$$\text{SMB} = 1/2(\text{S/L} + \text{S/H}) - 1/2(\text{B/L} + \text{B/H}) \quad (4.2)$$

### **High minus Low Risk Factor (HML)**

The HML (High Minus low) risk factor would be made similarly to the SMB risk factor. However, HML is the difference each month between the average of returns on the two high BE/ME portfolios and the simple average of the returns between the two low BE/ME portfolios. The difference between the two should be free of the size effect and focuses more on the return differences between high and low BE/ME portfolios. The theory behind this specifies that high BE/ME firms usually earn more than low BE/ME Chan and Chen (1991).

$$\text{HML} = 1/2(\text{S/H} + \text{B/H}) - 1/2(\text{S/L} + \text{B/L}) \quad (4.3)$$

### **Market Returns and Risk Free Rates**

The final factor in our model is the usual factor that was also used earlier in the CAPM which is the excess market return ( $R_m - R_f$ ), return of the market minus the risk free rate. The return of the market had to be conducted manually by using the value weighted returns on all stocks that are available each year from 2000-2007.

The risk free rate was taken from Kuwait's central bank as the return of a one month Treasury Bill for the period used.

After finding out market excess returns ( $R_m - R_f$ ), SMB, and HML risk loadings for every month between the years 2000-2007, the significance of the risk factors is then discovered by doing the following steps:

#### **1) Regressions that use the excess market return to explain portfolio returns;**

$$(R_{pt})=a +\beta_p [(R_{mt}-R_f)] +e_{pt} \quad (4.4)$$

Where:  $(R_{pt})$ : is the weighted return on portfolio  $P$  in period  $t$

$a$ : is known as alpha where it's the stock's expected return if the market is neutral, that is when  $(R_{mt}-R_f)$  is 0.

$\beta_p$ : is the coefficient loading for excess return of the market portfolio

$R_{mt}$ : is the value weighted market return

$R_f$ : is the risk free rate

$e_{pt}$ : is the unexpected component due to unexpected events that are relevant only to firm specific risk

## **2) Regressions that use the SMB and HML, the risk factors that resemble returns that are related to size and BE/ME**

$$(R_{pt})=a+sp(SMB)+hp(HML)+e_{(pt)} \quad (4.5)$$

Where:  $(R_{pt})$  is the weighted return on portfolio  $P$  in period  $t$

$a$ : is known as alpha where it's the stock's expected return if the market is neutral, that is when  $(R_{mt}-R_f)$  is 0.

$sp$  and  $hp$ : are the factor loadings that are relevant to both the size factor portfolios and the BE/ME factors respectively.

SMB: is the size premium made from the difference each month between the average returns of small firms and the average of returns of large firms.



HML: is the BE/ME premium made from the difference each month between the average of returns of high BE/ME firms and low BE/ME firms.

### 3) Regressions that use $R_{mt}-R_f$ , SMB and HML risk factors.

$$(R_{pt})=a+ \beta_p (R_{mt}-R_f)+sp(SMB)+hp(HML)+e_{(pt)} \quad (4.6)$$

Where:  $(R_{pt})$ : is the weighted return on portfolio  $P$  in period  $t$

$a$ : is known as alpha where it's the stock's expected return if the market is neutral, that is when  $(R_{mt}-R_f)$  is 0.

$\beta_p$ : is the coefficient loading for excess return of the market portfolio

$R_{mt}$ : is the value weighted market return

$R_f$ : is the risk free rate

$sp$  and  $hp$ : are the factor loadings that are relevant to both the size factor portfolios and the BE/ME factors respectively.

SMB: is the size premium made from the difference each month between the average returns of small firms and the average of returns of large firms.

HML: is the BE/ME premium made from the difference each month between the average of returns of high BE/ME firms and low BE/ME firms.

According to Fama and French's theory, the intercept (alpha) should be zero, meaning if all the loadings typically have zero factor loadings (slopes), this should make an expected excess return of zero for all portfolios.

Regressions are conducted on the four sets of different portfolios (S/L, S/H, B/L, B/H), typically the value weighted excess return over the risk free rate of the portfolios act as dependent variables in the regressions. This means that for every one of the portfolios, the regressions mentioned above runs on them. The purpose of the regressions will be to examine intercepts, factor loadings (slopes), and R squared. Results will help examine how the risk factors capture common variations in stock returns. Results will be discussed in detail in the following chapter.

As discussed earlier intercepts in Fama and French's work should typically be zero, since the three factor model explains most of the portfolio's excess return. According to Fama and French slopes on the SMB should decrease as the portfolios move from small portfolios to large portfolios e.g. from S/L to B/L. On the other hand slopes on HML should increase when portfolios move from small BE/ME to high BE/ME. Details of the results will be examined in the next chapter.

If the theory holds true, adding SMB and HML as risk factors, should increase R squared in comparison to regressing on a one factor model such the CAPM (market portfolio). Rsquared determines how much variation of the dependent variable can be explained and accounted by the independent variables in the regression analysis.

## Chapter 5

### Empirical Results

Table 5.1 indicates the number of companies apparent in the four different portfolios (S/L, S/H, B/L, and B/H) for the period of 2000-2007 in Kuwait's stock market.

**Table 5.1 Number of Companies in the portfolios**

Year	S/L	S/H	B/L	B/H
2000	52	46	49	54
2001	55	46	48	57
2002	54	54	54	57
2003	65	57	60	70
2004	85	65	67	85
2005	92	73	75	91
2006	100	79	83	105
2007	103	79	82	106

The number of companies in S/L portfolio varies from 52 companies to 103 companies in year 2007. For the S/H portfolio the number of companies increased from 46 companies to 79 companies at the end of the period. In the B/L portfolio, the number of companies increased from 49 in year 2000 to 82 in year 2007. Lastly in the B/H portfolio companies increased from 54 companies to 100 in year 2007.

As discussed earlier, companies every year are sorted into their respective categories. The small firms category are those firms that fall below the median value of firms and big firms are the ones that are above the median value. On the other hand, low book value stocks are those that are below the median value of all firms and high book to market firms are those that lie above the median value of all firms. Table 5.2 and 5.3 indicates what constitutes the medium value year on year for both the size and book to market factors.

**Table 5.2 Split values for the size factor (ME)**

<b>Year</b>	<b>Median(ME), Millions</b>	<b>Small Companies</b>	<b>Large Companies</b>
2000	34.5	< 34.5	>34.5
2001	36	< 36	>36
2002	50	<50	>50
2003	79.7	<79.5	>79.5
2004	83.5	<83.5	>83.5
2005	111.49	<111.49	>111.49
2006	97	<97	>97
2007	104.8	<104.8	>104.8

**Table 5.3 Split values for the book to market factor (BE/ME)**

<b>Year</b>	<b>Median (BE/ME) ratio</b>	<b>Small Companies</b>	<b>Large Companies</b>
2000	0.869	<0.869	>0.869
2001	0.7866	<0.7866	>0.7866
2002	0.647	<0.647	>0.647
2003	0.458	<0.458	>0.458
2004	0.44	<0.44	>0.44
2005	0.465	<0.465	>0.465
2006	0.54	<0.54	>0.54
2007	0.62	<0.62	>0.62

In the time series regression, slopes of the coefficients, R squared values and intercepts provide strong evidence whether the different risk factors capture strong and common variations in stock returns in Kuwait's stock market.

In the first regression test, the excess stock (portfolio) returns are regressed on the excess market return. Table 5.4 indicates intercepts, coefficients, and R squared values.

**Table 5.4 Results on the regression of excess portfolio returns on the excess stock market return,  $R_m - R_f$  January 2000 to December 2007**

$(R_{pt}) = a + \beta_p [(R_{mt} - R_{ft})] + e_{pt}$					
Portfolio Excess Returns	a Coefficient	$\beta$ Coefficient	R Squared	Adjusted R Squared	t-Statistic a, $\beta$
S/L	-0.0142	1.3211	0.8937	0.8937	(-0.09), (28.27)
S/H	-0.3171	1.3126	0.6513	0.6513	(-0.94), (13.36)
B/L	-0.0242	1.32626	0.9377	0.937	(-0.19), (37.60)
B/H	-0.0671	1.3575	0.9359	0.9352	(-0.54), (37.045)

R square values are 0.8937 for the S/L (small and low) portfolio, 0.6513 for the S/H (small and high), 0.9377 for B/L (big and low), and finally 0.9359 for B/H (big and high) portfolio. This leaves to say that for the small and high portfolios the market index explains less than for the big portfolios.

When regressing the excess stock (portfolio) returns on the excess market return, SMB, and HML risk factors, R square results confirm the theory that adding the size (SMB) and book to market (HML) factor would do a better job in explaining returns than when just using the single index model of CAPM, or in other words when regressing only on the excess market return ( $R_m - R_f$ ). Table 5.5 indicates intercepts, coefficients for the market, the size factor, and the book to market factor as well as R squared values.

**Table 5.5 Results on regressions of excess stock (portfolio) returns on the excess market ( $R_m-R_f$ ) and the mimicking returns for size (SMB) and book to market factor (HML) for January 2000 to December 2007**

$R_{pt} = \alpha + \beta_p (R_{mt} - R_{ft}) + sp(SMB) + hp(HML) + e_{pt}$							
Portfolio Excess Returns	$\alpha$ Coefficient	$\beta$ Coefficient	$sp$ Coefficient	$hp$ Coefficient	R Squared	Adjusted R Squared	t-Statistic ( $\alpha$ ), ( $\beta$ ), ( $sp$ ), ( $hp$ )
S/L	-0.041	1.359	1.038	-0.8732	0.938	0.936	(-0.33), (37.14), (7.78), (-7.23)
S/H	-0.0128	1.3626	0.9878	1.0741	0.9535	0.951	(-0.1), (36.98), (7.38), (8.84)
B/L	-0.0128	1.326	-0.0122	0.0741	0.938	0.9362	(-0.10), (36.98), (-0.09), (0.61)
B/H	-0.041	1.3598	0.0348	0.1268	0.9386	0.9366	(-0.33), (37.14), (0.26), (1.05)

In portfolio S/L, regressing on the market alone ( $R_m-R_f$ ) yielded 0.89 R squared in comparison to 0.94 R squared when regressing on the three factors of Fama and French ( $R_m-R_f$ ), SMB, and HML . In S/H portfolio which is the portfolio that has small stocks and high book to market stocks provided an excellent indication that regressing on the market alone yielded a much lower R squared 0.6513 in comparison to 0.951 when regressing on all the three factors. This strongly indicates that this portfolio leaves both SMB and HML to explain most of the returns. Table 5.6 looks at the regressions on both the SMB and HML risk factors only.

**Table 5.6 Results on regressions of excess stock (portfolio) returns on the mimicking returns for size (SMB) and book to market factor (HML) factors for January 2000 to December 2007**

$R_{pt} = a + sp(SMB) + hp(HML) + e_{pt}$						
Portfolio Excess Returns	a Coefficient	$sp$ Coefficient	$hp$ Coefficient	R Squared	Adjusted R Squared	t-Statistic ( $a$ ), ( $sp$ ), ( $hp$ )
S/L	1.3384	0.3471	-0.4285	0.0086	0	(2.94), (0.66), (-0.89)
S/H	1.4195	0.2987	1.5197	0.2614	0.2455	(3.0), (0.56), (3.17)
B/L	1.4195	-0.7013	0.5197	0.0189	0	(3.0), (-1.33), (1.08)
B/H	1.33884	-0.6529	0.5715	0.0178	0	(2.94), (-1.24), (1.03)

When Regressing S/H portfolio on SMB and HML alone R squared yielded 0.2614, meaning that size and book to market has a great effect in small and high book to market portfolios. In B/L portfolio where big stocks and low book to market stocks come together, the market excess return ( $R_m - R_f$ ) does most of the return explanation, since SMB and HML have no marginal power in big and low book to market stocks

Fama and French, and others observe that small and high book to market equity firms have positive slopes on SMB and HML, whereas big and low book to market equity firms load negatively on SMB and HML. Looking at, S/L portfolio provides a positive slope on its SMB 1.0348, t(s) 7.84, while its HML slope is -0.8732 t(s) -7.2339. This provides clear evidence that the size risk factor SMB helps in explaining portfolio S/L excess returns. The HML slope is negative here because S/L portfolio does not include high book to market firms. In S/H portfolio, both the slopes on SMB and HML are positive. The slope on SMB is 0.99, t(s) 7.3841 and the slope on HML is 1.071 t(s) 8.8417. This clearly indicates that both the SMB and HML factors help in explaining the portfolio's excess return. In B/L portfolio the SMB factor yielded -0.0122, though not statistically significant. HML's slope is also negative at -0.0741 which also shows that the average premium of high book to market ratios does not hold here since this portfolio is free of high book to market firms. Our last portfolio B/H has a slope of 0.0348 on SMB showing that there is no small size effect premium. HML here is positive at 0.1268 but not very significant in explaining the portfolio excess return.

Results show that in the B/L and B/H portfolios the size and book to market risk factors have no significant return explanations, the market index does most of the explanations. However, for the S/L and S/H portfolios the two risk factors SMB and HML have somewhat a significant explanation.

Metron (1973) and Ross (1976), indicate that intercepts in the regressions should be around '0'. This means when regressing on the  $(R_m - R_f)$ , SMB and HML, these factors should be suffice in explaining the average returns for the portfolios.

When SMB and HML are used alone as risk factors, intercepts range from 1.33 to 1.4. However when the market excess return is added to the regressions, intercepts all fall down to numbers that are very close to zero. This basically says that the three factor regression does a good job in explaining the cross section of average returns. When regressing on the market excess return alone, intercepts provide a good approximation of average returns however; the three factor model still provides a better explanation.

Conclusively, Fama and French's model does add a marginal effect to pricing securities, and especially for those securities that are in the S/L and S/H category. Implementing Fama and French in Kuwait's market might not be as powerful as the model exhibited in other international markets around the world. Investors should always have more alternatives in assessing prices, as using the Fama and French's three factor model alone could bring out risky results.



## **Chapter 6**

### **Conclusion**

This study examined the multi factor model developed by Fama and French (1993) in Kuwait's Equity Market for period January 2000-January 2008. Fama and French showed that asset returns are explained by a multi factor component; a market portfolio, a portfolio mimicking the size related factor found from the difference in returns between small and big firms, and a portfolio mimicking the value premium found between the difference of high book to market and low book to market firms. Unlike the U.S where Fama and French's work have been extensively tested and proven effective, there is little evidence on its effectiveness outside the U.S market. This study is the first of its kind in Kuwait. We show that there is a small and book to market effect in Kuwait, we also responded to the major areas of controversies and critics that believe Fama and French's small firm and high book to market premium are not a result of rational pricing but are due to market and investor irrationality. In addition we brought more insight and answers on efficient market believers that claim no anomalies can be found as returns are only explained by the market portfolio.

When testing Fama and French's three factor model in Kuwait's market, the results indicated that using the size and book to market as risk factors added a marginal explanatory power than when using the market portfolio alone. R squared values increased when regressing on the three risk factors together, intercepts were close to '0' indicating the strong power of the risk factors, and slopes were higher on small sized firms and high book to market equity and low for big and low book to market firms. However in the big portfolio (B/L and B/H) the size and book to market risk factors added no explanatory power in returns, as most of the returns were explained by the market index. On the other hand the risk factors (SMB and HML) added marginal

explanation in the two small portfolios (S/L and S/H) and especially the small and high (S/H) book to market portfolio.

We found that the work of Lakonishok and Vishnay (1994) is dismissed. Our results for high book to market premium does not support his argument on believing that high book to market equity is a result of an arbitrage opportunity in the market place, since the standard deviation on the book to market loading is clear at 13% as with the market that stands at 12% annually. Fama and French (1996) mentioned that if results are truly because of an arbitrage opportunity then standard deviations should be small, or else one should also be suspicious of the market as a proxy for systematic risk. Our research results also disregarded the ‘Datanooing’ argument set forth by Lo and Mackinlay (1988), Black (1993) that predicts in out of sample tests (international testing) high book to market premiums should not appear. A value premium did appear at 0.3% monthly. This shows that the three factor model does not reduce to the CAPM, and thus shows that the argument of ‘Datanooing’ has not been effective. Our results also negated that argument of ‘ Survivorship Bias’ by Kothari, Shanken, and Sloan (1995) who asserted that the premiums are a result of eliminating distressed firms that failed from testing. We have tested both firms that survived as well as firms that failed and still found a value premium associated with high book to market firms. The characteristic theory of Daneil and Titman (1997) could not be tested as our data was very limited to construct portfolios with many different variations in characteristics and factor loadings.

Our results also disprove a vast majority of investors that believe markets are efficient without any anomalies. We confirm a small firm and high book to market effect at 0.4% and 0.3% respectively. We coincide with the finding of Fama and French that the extra returns apparent are not the result of volatility but rather due to some unknown inherent risk attribute, which some

claim as the perceived chance for those firms going broke. The average monthly return of small firms and high book to market firms is 1.4% and 1.2% respectively higher than the average monthly return of market that is at 1.07%. Average monthly volatilities for the small and high book to market firms are at 3.26% and 4.56% respectively in comparison to the market which stands at 5.55%. In another area our results also challenged the Efficient Market Theory when we found that the market portfolio on its own is not mean-variance efficient (MVE), rather other multifactor minimum variance portfolios (MMV) are extracted to provide optimal portfolios. The closer regressions provide intercepts closer to 0, and R squared closer to '1', the more it's understood that multifactor efficient portfolios should be added to explain portfolio returns. Our results indicated that loadings on size and high book to market helped explain returns for the portfolios, in S/L (small and low book to market), and S/H (small and high book to market), R squared increased from 0.89 and 0.65 to 0.94 and 0.95 respectively as well as intercepts reducing to 0 when the loadings of small and high book to market were added.

In sum, this paper provides evidence that a multifactor model is more explanatory than CAPM's beta only. Although the market alone provided a big explanation in returns, adding the risk factors however brought more explanatory power in portfolio returns. These results should have implication on cost of capital used in Kuwait's market. In addition portfolio managers should not only be evaluated by the market only as a benchmark, but should be evaluated by using portfolios that embody similar security size and book to market characteristics.

Our results on the other hand were not as powerful as the model exhibited in other parts of the world such as in the U.S. This might be because of several reasons, our time period under study was for only 8 years in comparison to Fama and French U.S results were the data was analyzed from 1930's to date. Secondly, a huge part of our sample included new companies that joined in

years 2003-2004, thus undermining the possibility of those firms to exhibit a small firm or more importantly a distress premium. As Fama and French indicated that those premiums can quiet become irrelevant in the first years of company operation but rather becomes more significant over the companies life period.

The question of whether or not the premiums of small and high book to market are being associated with risk or price inefficiencies is till today debated over. We have looked at addressing some of Fama and French's critics who claim that the premiums are a result of inefficiency and irrationality in the market such as Lakonishok and Vishnay (1994), Lo and Mackinlay (1988), Black (1993), and Kothari, Shanken, and Sloan (1995). Kuwait's test refuted all of these controversies and proved that Fama and French's model overcomes these claims.

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