Estimating the Cost of Equity Capital:

An Empirical Analysis in the Tunisian Context

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Abstract

The purpose of this article is to look for the suitable model for estimating the cost of equity capital in the Tunisian stock market, using a sample of 26 Tunisian listed firms over the period 2003 to 2010. By conducting a comparative analysis between the CAPM, the three-factor model of Fama and French (1993) and the four-factor pricing model proposed by Carhart (1997), the latter model emerges as one who explains better the returns variations on the Tunisian Stock Exchange. We also conclude to the existence of a growth, small size and contrarian anomalies.

Keywords: Asset pricing models, Market risk premium, Size, Value, Growth, Momentum, Contrarian

1. Introduction

The Capital Asset Pricing Model (CAPM) was originally developed by Treynor (1961, 1962), Sharpe (1964) and Lintner (1965a, b) in the mid 60s. It is the most commonly applied model by practitioners. This may be explained by the simplicity of its implementation, to the extent that it establishes a linear relationship between risk and return. The fact is still that the CAPM raises serious empirical problems which enabled several researchers, such as Fama and French (1993) and Carhart (1997), to propose extensions to the CAPM. The problem of estimating the cost of equity is even more serious in the context of emerging countries as the stock market is known to be inefficient and where little research has examined it.

In the financial literature, the cost of equity capital models can be classified into two groups, the family of ex-post models using historical data and the family of ex-ante models, like those of Claus and Thomas (2001), Gebhardt, Lee, and Swaminathan (2001), Easton (2004) and Ohlson and Juettner-Nauroth (2005), where an implicit risk premium contained in the current share prices is considered. The ex-ante models initially addressed by Fama and French (2002) and recently, by several other authors like Boubakri, Guedhami, Mishra, and Saffar (2012), Hwang, Lee, Lim, and Park (2013) and La Rosa and Liberatore (2014) would be difficult to apply in the context of emerging countries, as predictive databases are unavailable.

The purpose of this paper is to specify which one of the three ex-post models, the CAPM, the three-factor model (TFPM) of Fama and French (1993) and the four-factor model (FFPM) of Carhart (1997), explains better the stocks returns volatility in the Tunisian Stock Exchange. We remind that there are few studies that have addressed this same issue. Among them are those of Ben Naceur and Ghazouani (2007), Chaibi and Ben Naceur (2010) and Hammami and Jilani (2011). Chaibi and Ben Naceur (2010) use a sample of 29 firms over the period 2000-2005, the same as the one used by Ben Naceur and Ghazouani (2007), except that these latter were interested only in the banking sector. We believe usefully complete the work of Chaibi and Ben Naceur (2010) based only on the Akaike information criterion and Schwarz in addition to the adjusted R^2. For our part, we add to these criteria the estimation of linear regressions on adjusted returns of 12 portfolios in order to test the robustness of our results according to each portfolio. We will also use the GRS test of Gibbons, Ross, and Shanken (1989) testing whether the multi-factor model does not contain an evaluation error, thus the selected risk factors are well validated. The study of Hammami and Jilani (2011) aims to test the validity of macroeconomic and fundamental models on the Tunis Stock Exchange. The authors used a rigorous and robust methodological approach. However, we believe that the results could be biased by the composition of the sample which is concentrated on the financial and especially, banking companies. This sector is regulated in terms of capital requirements and the financial sector has a specific behavior to risk just by referring to the latest international crisis of 2007. The banking sector exhibits also a high normal leverage (Fama and French, 1992). This deserves to review the results using a sample that excludes this sector, like the one used by Fama and French (1992, 1993) and Gregory, Tharyan, and Christidis (2013).

The remaining of the paper is organized as follows: Section 2 provides a background description of the main historical models used to estimate the cost of equity; Section 3 presents the sample and the applied methodology; Section 4 discusses the empirical results and the last section concludes.

2. The ex-post models for calculating the cost of equity

We present hereafter, the CAPM model and its main criticisms that have led to its extensions.

2.1 The CAPM and its critics

The CAPM model stipulates that the only source of rewarded risk is the systematic risk measured by the beta. However, despite the basic intuition behind CAPM, the literature calls into question its relevance in estimating the cost of equity, as it poses significant problems for estimating the β coefficient and the risk premium in addition to the other specification problems.

Fama and French (1997) find significant time variation in the beta factor when estimating the cost of equity of 48 US industries for the period July 1968 to December 1994. In fact, the authors found an implicit standard error (note 1) of the beta coefficient greater than zero for five sectors, greater than 0.1 for 28 sectors and more than 0.2 for 9 sectors, thus, an average error of 0.12. The true value of β, is between 0.76 and 1.24 and the net cost of equity capital resulting (Ri-Rf) vary between 3.92% and 6.40% per year. From there, it is clear that the volatility observed at the β generates a significant margin of error in estimating the cost of equity. To alleviate this problem, authors like Kothari, Shanken, and Sloan (1995) suggest calculating an annual rather than a monthly beta. According to these authors, the monthly beta would be more influenced by certain seasonal effects as well as economic events.

Authors such as Gibbons et al. (1989) find that US firms β (grouped by deciles) vary inversely to their size and, for the first deciles; returns are higher than what the CAPM expects. This inverse relationship between β and the size of the company questioned the measure of systematic risk as the only source of risk. Other authors suggest the sensitivity of beta to market conditions as it is up or down, and introduce the concept of downside beta which considers as unwanted volatility that are recorded in down phase of the market. In this sense, a recent study by Tsai, Chen, and Yang (2014) compares the explanatory power of the classical beta to the downside beta. Based on a sample of 23 developed countries, the authors find that the downside beta explains better market returns than the classic beta.

There is in the literature justified criticism about the instability of the equity risk premium when estimated using historical data. Siegel (2002), by breaking the Ibbotson Associates data on the 1801-2001 period in the United States on sub-periods, confirms it. Historical premiums (note 2) have experienced a decline since the end of the Second World War (1946-1965) from 11.2% to 3.8% (1966-1981) and 1.7% (1982-2001). Dimson, Marsh, and Staunton (2002) find a risk premium that varies within the confidence interval [3,7 % to 11.3%] (at a 95% level of confidence). Fama and French (1997) explain the imprecision of sectorial costs of equity by the uncertainty surrounding the risk premium. It was estimated to 5.16% per year over the period 1963-1994, with a standard error of 2.71%. It follows that the true risk premium varies between 0% and 10%. Goetzmann and Jorion (1996) state that, the use of a historical risk premium cannot be done without accepting a wide margin of error. Campbell and Cochrane (1999) present an innovative perspective where risk premiums depend upon the state of the economy.

Other studies have discredited the CAPM by testing certain phenomena commonly called "anomalies" which allow investors to achieve returns in excess of those expected by the CAPM. Among these anomalies, we mention the size effect, the value effect (also called the Book-to-Market) and the momentum effect.

The size effect consists of the existence of a significant negative relationship between market capitalization and equity returns. It would be induced, according to some authors, by the little information available about small companies (Banz, 1981; Reinganum, 1981) or by their lower liquidity (Amihud and Mendelson, 1991), prompting investors to ask to be compensated by higher returns. Abnormal returns on small stocks can also be caused by their important transaction costs. Stoll and Whaley (1983) find that abnormal returns disappear after accounting for transaction costs.

The Book-to-Market effect (*B/M*), for its part, was used by assets managers to build profitable trading strategies as stocks having a high *B/M* ratio (values stocks) tend to generate higher returns than stocks with a low *B/M* ratio (growth stocks). Rosenberg, Reid, and Lanstein (1985), Fama and French (1992) and Davis, Fama, and French (2000) identify the *B/M* ratio as an important factor in explaining returns on the US market. The *B/M* effect was also found in other markets by Chan, Hamao, and Lakonishok (1991), Capaul, Rowley, and Sharpe (1993) and Fama and French (1998). They highlighted the *B/M* effect in 12 financial markets including Japan, Britain, France, Germany, Italy, Netherlands, Belgium, Sweden, Australia, Hong Kong and Singapore. Unlu (2013) confirms, in addition to the presence of the size effect, the existence of a *B/M* effect on the Istanbul stock exchange over the period July 1992 to June 2011.

Two main explanations are proposed. Fama and French (1995) present this value premium as a compensation for the risk omitted by the CAPM. Specifically, the authors argue that higher returns observed in value stocks correspond to a specific financial distress premium for this type of stocks. The latter would have a lower valuation because they would be on average more risky, partly because of their low profitability and a more fragile financial health. The alternative view is related to behavioral finance. Superior returns are due to overreaction of investors in response to the performance of firms displaying a high *B/M* ratio. According to Lakonishok, Shleifer, and Vishny (1994) and Haugen (1995) such a ratio corresponds to companies whose fundamentals (earnings and turnover) are low. Investors react excessively and irrationally to this situation. It follows an overvaluation of companies with high potential and undervaluation of companies with low potential. Thus, the premium related to value stocks is high because the market underestimates them and overestimates growth stocks. When these evaluation errors are corrected, value stocks show a higher return than growth stocks. Daniel and Titman (1997) argue that investors are irrational because they do not like the characteristics of the value stocks. So, they must require a premium to hold them in their portfolios.

Jagadeesh and Titman (1993) identify a profitable trading strategy based on momentum. They show that buying (selling) winners (losers) stocks on the basis of their past performance displayed abnormally positive average returns of about 1% per month over the next 12 months. These results are also corroborated by Fama and French (1996) and Jegadeesh and Titman (2001) in the US and other markets like the Asian ones (Rouwenhorst, 1998; Chui, Wei, & Titman, 2000) and emerging markets (Rouwenhorst, 1999). In the United States, Hammami (2013) shows that the momentum effect exists only for periods characterized by low market premium (good times), while Bornholt (2013) shows that the anomaly disappears when working on sectoral costs of equity capital.

The financial literature posits behavioral explanations of momentum, namely the conservatism (Edwards, 1968) and the representativeness biases (Khaneman and Tversky, 1973). According to the first bias, investors tend to under-react following a series of bad news while according to the second bias they tend to overreact, thinking that an up tendency in prices or profits will persist in the future.

For all the above reasons, the financial literature no longer presents the CAPM as the only model for predicting future returns. Fama and French (1996) construct a Three Factor Pricing Model (TFPM), where in addition to the excess market return, two additional risk factors related to firm size and *B/M* ratio are considered. When the authors compared the ability of the CAPM and TFPM to explain returns, they conclude that most anomalies disappear, except for the persistence of returns over a short period established by Jegadeesh and Titman (1993). Several authors proposed then extensions of the TFPM with a four factors model among them. The first to have proposed a formulation is Carhart (1997).

2.2 Models specifications and empirical results

The required return on equity (k_E) according to the CAPM model is equal to:

$$k_E = R_f + b \times (E(R_m) - R_f) \quad (1)$$

According to this equation, the expected return required by investors is equal to the risk free rate (R_f) additioned to a risk premium ($E(R_m)$-R_f) multiplied by the amount of risk measured (*b*). The risk premium is calculated as the difference between the expected rate of market return and the risk-free rate. The risk-free rate is the one offered by a risk-free asset, such as Treasury bills or government bonds. Beta defines the relationship between the return of a stock and the market portfolio return. It is estimated using a regression model linking stocks returns to those of the market index.

Unless having a forecast of this future return rate, the market premium is usually calculated using historical data. The hypothesis implicitly posed assumes that this premium is roughly stable over time and that the difference observed in the past between these two rates is a good estimator of the anticipated in the future.

The testable form of the CAPM model is:

$$E(R_{i,t}) - R_{f,t} = \alpha_i + b_i \times (R_{m,t} - R_{f,t}) + e_{i,t} \quad (1')$$

The equilibrium relation of Fama and French (1993) TFPM is:

$$E(R_i) - R_f = b_i \times (R_m - R_f) + s_i \times SMB + h_i \times HML \tag{2}$$

The model states that the expected return on a risky asset *i* ($E(R_i)$), in excess of risk-free rate (R_f) is explained by three factors: the market risk premium (R_m-R_f), the difference between the return on a portfolio of small-size stocks , and the return on a portfolio of large-size stocks, *SMB* (small minus big) and the difference between the return on a portfolio of high *B/M* stocks and the return on a portfolio of low *B/M* stocks, *HML* (high minus low). The sensitivities to the three factors or quantities of risk, b_i, s_i and h_i, are the slopes of the following regression model:

$$E(R_{i,t}) - R_{f,t} = \alpha_i + b_i \times (R_{m,t} - R_{f,t}) + s_i \times SMB_{i,t} + h_i \times HML_{i,t} + e_{i,t} \tag{2'}$$

Where:

The coefficient b_i measures the elasticity of the stock return to the market return. The coefficients s_i and h_i have substantially the same interpretation, except they are not normalized to "1", but to zero. Indeed, the amount of risk associated with risk factors related to firm size and *B/M* ratio are negative and positive respectively if the company has a market capitalization and *B/M* ratio greater than those of the market index.

Fama and French (1993) find a coefficient of determination (R^2) greater than 90% in only 2 of 25 portfolios constructed when estimating equation (1’). However, when the empirical model of the TFPM is considered, the R^2 is greater than 90% in 84% of portfolios. In addition, the constant of the regression model is close to zero. The authors conclude that TFPM allows a good approximation of stocks returns in the US market.

In the Tunisian context, Ben Naceur and Ghazouani (2007) test the CAPM and TFPM’s ability to estimate the cost of equity capital of banking firms based on monthly data over the period July 2000 to June 2005. They conclude that TFPM is the most appropriate to calculate the cost of equity of Tunisian banks. Based on a sample of 187 Indian firms over the period June 2004 to June 2009, Taneja (2010) compares the explanatory power of CAPM and TFPM. The author finds that there are significant size and value effects on the Indian market and a better explanatory power of TFPM. Guzeldere and Sarioglu (2012) also show the ability of TFPM to explain future returns of stocks traded on the Istanbul Stock Exchange over the period 1999 to 2011. Hammami and Jilani (2011) conclude that this model is the most suitable to explain the risk-return relationship in the Tunis Stock Exchange over the period July 1992 to December 2004.

To account for the momentum effect, a fourth factor is added to the TFPM, as in Carhart (1997):

$$E(R_{i,t}) - R_{f,t} = \alpha_i + b_i\,(R_m - R_f) + s_i\,SMB + h_i\;HML + w_i\,WML \tag{3}$$

And its testable form is:

$$E(R_{i,t}) - R_{f,t} = \alpha_i + b_i\,(R_{m,t} - R_{f,t}) + s_i\,SMB_t + h_i\;HML_t + w_i\,WML_t + e_{i,t} \tag{3'}$$

Where *WML* is another zero investment portfolio constructed to mimic the risk factor related to the momentum effect in returns. It is calculated as the average return of an equally-weighted portfolio composed of winner stocks minus the average returns on the loser stock portfolios and w_i is the coefficient associated with the risk premium *WML*.

Several empirical studies have focused on testing the validity of this model. Besbes and Bellalah (2006) find that the explanatory power of the FFPM is higher than the TFPM (75.49% vs 70.78%) in the French context. Lam, Lie, and So (2010) confirm the explanatory power of the FFPM factors in the Chinese market for the period July 1981 to June 2001. An adjusted R^2 of around 70% is used by the authors to conclude how well FFPM capture average returns in comparison with the TFPM. Their result does not seem to vary depending on the state of the market (up or down) and contains no seasonal effect. Chaibi and Ben Naceur (2010) confirm the superiority of the FFPM in explaining returns of stocks traded on the Tunis Stock Exchange over the period July 2000 to June 2005.

3. Data and methodology

The purpose of this section is to conclude the most appropriate model to explain the cross-section of expected returns in the Tunisian Stock Exchange (TSE). Next, the sample, the methodology and the empirical results are presented.

3.1 Sample and data source

Monthly returns on non-financial companies, market returns and accounting data are collected from different websites: TSE, financial council market, brokers and companies. The Tunindex Index is used as a proxy of the market return. Similar to Chaibi and Ben Naceur (2010) and Ben Naceur and Ghazouani (2007), the monthly average money market rate is used as a proxy for the risk-free rate and is collected from the website of the Central Bank of Tunisia.

Companies that are delisted are during the study period not deleted from the sample in order to prevent the survivorship bias. We exclude companies that belong to financial sector (banks, insurance companies and leasing companies). All formed portfolio are equally weighted. The book equity measured at the end of the fiscal year (t) is assumed to be available in June of year (t+1), in order to avoid a look ahead-bias. The factors returns are then measured from July (t+1) to June of year (t+2).

The final sample consists of 26 firms listed on the TSE over the period July 2003 to December 2010. We have chosen to stop the study horizon to December 2010 to exclude the post-revolution period in which the Tunisian Stock Exchange reacted significantly (note 3).

It is clear that the limited size of the sample should encourage us to use robust estimation methods of the previous regression models, like the bootstrap method.

3.2 Construction of the four factors

SMB and *HML* factors are constructed in keeping with Fama and French (1993). For each year from July (t-1) to June (t), stocks are ranked on their size and *B/M* ratio of June (t-1) and December (t-2) respectively. We then use this ranking to form two groups of size portfolios depending on whether average returns are above or below the median. Stocks above (below) the median are designated B for Big (S for Small). The second ranking is used to divide stocks into three groups: those above the 70% *B/M* breakpoint are designated H (High), the middle 40% are designated N (Neutral) and the remaining 30% are designated L (Low).

Six equally-weighted portfolios are obtained from the intersection of the above groups: *S/L*, *S/M*, *S/H*, *B/L*, *B/M* and *B/H*. The calculation of *SMB* returns corresponds, monthly, to the difference between the average return of the three portfolios of low market value (SL, SM and SH) and the average return of the three portfolios of high market value (BL, BM and BH):

$$SMB = \left(\frac{S/L+S/M+S/H}{3}\right)-\left(\frac{B/L+B/M+B/H}{3}\right) \tag{4}$$

HML returns correspond, monthly, to the difference between the average return of the two portfolios with a high *B/M* ratio (S/H and B/H) and the average return of the two portfolios with a low *B/M* ratio (S/L and B/L):

$$HML = \left(\frac{S/H+B/H}{2}\right)-\left(\frac{S/L+B/L}{2}\right) \tag{5}$$

According to the contribution of Carhart (1997), a third classification of stocks is needed. It is based on the momentum factor. Thus, referring to several researches such as L'Her, Masmoudi, and Suret (2004), Lam et al. (2010) and Unlu (2013), stocks are ranked based on their past performance between July (t-2) and May (t-1). We then define 30% of the best performing stocks noted W (Winner), the 40% below are noted N (Neutral) and the remaining 30% are noted L (Loser). Six equally-weighted portfolios, *S/L*, *S/N*, *S/W*, *B/L*, *B/N* and *B/W* are then formed as the intersection of size and prior momentum groups.

WML returns are obtained on a monthly basis as the difference between the average return of the two winners portfolios (S/W and B/W) and the average return of the two losers portfolios (S/L and B/L):

$$WML = \left(\frac{S/W+B/W}{2}\right)-\left(\frac{S/L+B/L}{2}\right) \tag{6}$$

The equity risk premium is estimated as the return of the Tunindex (R_m) in excess of the monetary market rate (R_f).

4. Results

We first present descriptive statistics. Then, we discuss the results obtained from the estimation of equations (1'), (2') and (3') via the OLS technique where the estimated coefficients are corrected for autocorrelation and heteroskedasticity problems using Prais Winsten and/or Huber-White sandwich estimators. Moreover, as the dependent variables are not normally distributed (note 4) and because of the narrowness of our study sample, the bootstrap method is applied to obtain efficient estimators. The analysis of results is based on the interpretation of signs and significances of the estimated coefficients as well as the GRS of Gibbons et al. (1989) criterion and the information criterion of Akaike (AIC) and Schwarz (SC). These two criteria will be presented later.

4.1 Descriptive Analysis

Table 1, panel A presents descriptive statistics of market excess returns, *SMB*, *HML* and *WML*. The average annual market risk premium is 15.72% over the period from July 2003 to December 2010. This value is higher than that recorded in developed markets: 6% in the French market over the period July 1992-June 1997 (Molay, 2000) and 5.79% in the US market over the period 1928-2011 (Damodaran, 2012). It is close to that recorded in other emerging markets: 15.3% in India on the period from June 2004 to May 2009 (Taneja, 2010) and 15.25% in Chile over the period 1976-2001 (Damodaran, 2012). It is higher, however, than the negative market risk premiums calculated by Chaibi and Ben Naceur (2010) of (-6.48%) and by Ghazouani and Ben Naceur (2007) (-3.72%) on the Tunisian market over the period from July 2000 to June 2005. Given its low volatility (Standard deviation of 3.56%), the market risk premium is significantly different from zero (at the 1% level). This volatility is less than that found in Chile and higher than that found in the United States and Canada.

Table 1. Descriptive statistics and correlations between the monthly four risk factors (R_m-R_f), *SMB*, *HML* and *WML* (90 months: July 2003 to December 2010)

	R_m-R_f	*SMB*	*HML*	*WML*
Panel A				
Mean (%)	1.31***	0.12	-0.67	-2.48***
Standard deviation (%)	3.56	9.46	14.30	26.93
Min (%)	-10.20	-51.60	-77.06	-241.51
Max (%)	09.58	32.25	30.39	39.07
Median	0.01	0.00	0.02	0.01
Skewness	0.02	-1.35	-2.59	-7.86
Kurtosis	4.30	12.79	13.47	70.61
Panel B				
R_m-R_f	1.00			
SMB	-0.14	1.00		
HML	-0.06	-0.25**	1.00	
WML	0.09	-0.19*	0.11	1.00

R_m-R_f : market risk premium. SMB: size risk premium. HML: value risk premium. WML: momentum risk premium. ***, ** and * denote significance at 1%, 5% and 10% respectively.

The average of annual returns on the *SMB* factor is 1.44% and it is not significantly different from zero compared to a premium of 5.04% found by Ben Naceur and Ghazouani (2007) and -3.6% found by Chaibi and Ben Naceur (2010). The monthly standard deviation (9.46%) is larger than the market premium standard deviation meaning that *SMB* portfolios are riskier.

The average of annual returns on the *HML* factor is -8.04% and is not significantly different from zero, meaning that value stocks don’t show higher returns than growth stocks. This contradicts the result found by Ben Naceur and Ghazouani (2007) and Chaibi and Ben Naceur (2010) who find a positive distress premium. In addition, the average *HML* returns are associated with a higher standard deviation compared to that of *SMB* factor. The *HML* portfolios are therefore more risky than *SMB* portfolios. This result is similar to that of Taneja (2010) conducted in the Indian context and Al-Mwalla (2012) in Amman stock market.

The *WML* premium is very large in absolute terms, -2.48% per month and it is significantly different from zero. There would be no momentum effect on the TSE. Chaibi and Ben Naceur (2010) detect a positive *WML* premium of 0.0074% per month. In a recent study, Cakici, Fabozzi, and Tan (2013) find a negative average monthly *WML* factor in Eastern Europe (-0.25%) with a standard deviation of 13.04%. *WML* portfolios are the most risky (Standard deviation of 26.93%).

The negative average returns of *HML* and *WML* portfolios do not support the presence of value and momentum effects on the Tunisian stock market during the period of the study. More importantly, the TSE seems to exhibit growth and contrarian anomalies.

Panel B of table 1 presents the Spearman correlations between the factors. These coefficients, even when they are significantly different from zero, are low, which is consistent with the approach taken in the construction of the portfolios. In other words, the *SMB* (*HML*) factor provides a measure of the size (*B/M*) which is slightly influenced by the *B/M* (size) effect, with a correlation coefficient of -0.25. It is the same for the *SMB* and *WML* factors that display a correlation coefficient of -0.19.

The low values of correlation coefficients, which are not statistically significant between the market premium and *SMB*, *HML* and *WML* show that the effects associated with these risk factors are not included in the CAPM. Adding them should lead to a better description of returns.

Table 2 presents the descriptive statistics (mean and standard deviation) of the returns of portfolios formed on the basis of the *B/M* ratio, momentum and size. The results of panel A show that the class of small portfolios displays excess higher returns than the class of large portfolios, with the exception of BL portfolio whose performance exceeds that of the SL portfolio. However, it does not seem that small stocks portfolios are riskier than those composed of larger stocks. The same ascertainment is established when examining panel B of table 2.

Table 2. Descriptive statistics of monthly excess returns of the twelve constructed portfolios

(90 months: July 2003 to December 2010)

Panel A: Descriptive statistics of monthly excess returns of the six portfolios classified by size and B/M ratio

	B/M ratio		
	H	*M*	*L*
Size	Mean (%) *(Standard deviation (%))*		
B	0.80 *(9.16)*	0.84 *(6.00)*	4.07 *(22.24)*
S	3.02 *(8.77)*	1.93 *(8.37)*	1.10 *(15.87)*

Panel B: Descriptive statistics of monthly excess returns of the six portfolios classified by momentum and size

	Momentum		
	W	*N*	*L*
Size	Mean (%) *(Standard deviation (%))*		
B	0.67 *(5.18)*	2.75 *(15.94)*	6.20 *(53.56)*
S	1.97 *(12.69)*	2.62 *(7.00)*	1.39 *(7.40)*

SL, SM, SH, BL, BM and BH: six portfolios formed by the intersection of size (S & B) and book-to-market ratio (H, M & L) groups. SL, SN, SW, BL, BN and BW: six portfolios formed by the intersection of size (S & B) and momentum (W, N, L) groups.

Panel A of table 2 also shows that in the class of small stocks, portfolios with high *B/M* ratio have higher returns than portfolios with low *B/M* ratio. This tends to confirm the existence of a value effect.

The momentum effect, for its part, also seems emphasize particularly in the portfolios composed of the smaller stocks with a monthly performance for SW portfolio of 1.97% compared to a monthly return of 1.39% for the SL portfolio.

4.2 Regressions results analysis

The empirical results obtained from the estimation of regression models (1’), (2’) and (3’) are set forth in table 3, respectively in panels A for CAPM, B for TFPM and C for FFPM. They show a statistical significance at the 1% of the β coefficient associated with the market risk premium variable, telling us that the market risk premium is a crucial factor in explaining portfolio returns. In addition, the overall significance of the market risk premium is higher in the FFPM. The coefficient related to the *SMB* factor is significant in at least 4 of the 6 portfolios in the TFPM model and in at least 3 of the 6 portfolios in the FFPM model. The coefficient attached to the *HML* factor is significant, for its part, at best in 50% of portfolios in the TFPM model. This rises to about 80% of the portfolios (5/6) in the FFPM.

Overall, the coefficient *s* is negative and significantly different from zero in the TFPM (t-statistic = 4.40 and 2.55). It is negative and significantly different from zero in the FFPM on portfolios ranked on the basis of size and momentum (t-statistic = 3.43), while it is positive and significantly different from zero (t-statistic=3.29) on *SL*, *SM*, *SH*, *BL*, *BM* and *BH* portfolios.

The average value taken by the coefficient *h* is for its part negative and significantly different from zero in both TFPM and FFPM models meaning that portfolios characterized by a low *B/M* ratio generate significantly superior returns and that the excess return reacts inversely with value risk factor. This result contradicts the Fama and French (1993) theory that value stocks outperform growth stocks.

Furthermore, the explanatory power of the FFPM that displays the highest value (adjusted R^2 = 41% and 44% compared to 40% and 30%) leads us to be in favor of the validation of the FFPM as the best model to explain returns in the Tunisian context compared to CAPM and TFPM models. In this model, the average coefficient attached to the *WML* variable is significant and negative (w = -0.21, t-statistic = 6.00) in portfolios classified by size and momentum criteria. For portfolios formed on the basis of *B/M* and size criteria, this coefficient is negative in five portfolios. It is negative and significantly different from zero in the 2 extreme portfolios *SL* and *BH*.

Table 3. Time series regressions results

Panel A: CAPM

	α	β	Adjusted R^2	F test *(p > F)*	GRS *(p-val)*	AIC	SC
SL	0.00 *(0.22)*	0.61 *(1.36)*	0.01	1.86 *(0.18)*	0.01 (0.99)	-78.73	-73.73
SM	0.01 *(1.13)*	0.70*** *(2.92)*	0.08	8.52 *(0.00)*		-196.36	-191.36
SH	0.02 *(1.64)*	0.97*** *(3.74)*	0.16	8.10 *(0.00)*		-199.69	-194.69
BL	0.02 *(1.04)*	1.40* *(1.87)*	0.04	3.50 *(0.06)*		-16.82	-11.82
BM	-0.00 *(-0.725)*	0.92*** *(4.923)*	0.29	24.24 *(0.00)*		-279.57	-274.57
BH	-0.00 *(-0.07)*	0.66** *(2.57)*	0.05	6.60 *(0.01)*		-177.83	-172.84
Average results	*0.01* *(0.80)*	*0.87**** *(2.9)*	*0.11*			*-158.17*	*-153.17*
SL	0.01 *(0.74)*	0.67*** *(3.48)*	0.09	12.13 *(0.00)*	0.01 (0.99)	-220.12	-215.12
SN	0.02** *(2.19)*	0.41** *(2.08)*	0.04	4.34 *(0.04)*		-229.25	-224.25
SW	0.00 *(0.37)*	1.22*** *(2.96)*	0.11	8.76 *(0.00)*		-124.47	-119.47
BL	0.06 *(0.87)*	0.30 *(0.33)*	-0.01	0.11 *(0.74)*		145.98	150.98
BN	0.01 *(0.94)*	1.58** *(2.09)*	0.12	4.37 *(0.04)*		-84.14	-79.14
BW	-0.00 *(-0.49)*	0.7*** *(5.14)*	0.22	26.46 *(0.00)*		-298.25	-293.25
Average results	*0.02* *(0.93)*	*0.81**** *(2.68)*	0.09			*-135.04*	*-130.04*

Panel B: TFPM

	α	β	s	h	Adjusted R^2	F test *(p > F)*	GRS *(p-val)*	AIC	SC
SL	-0.00	0.69***	1.03***	-0.77***	0.75	92.15		-198.41	-188.41
	(-0.50)	*(2.93)*	*(11.52)*	*(-13.01)*		*(0.00)*			
SM	0.01	0.76***	0.24*	-0.03	0.13	5.02		-199.92	-189.92
	(1.07)	*(3.68)*	*(1.80)*	*(-0.35)*		*(0.00)*			
SH	0.02	0.97***	0.06	-0.02	0.15	6.01		-196.20	-186.20
	(1.47)	*(4.18)*	*(0.67)*	*(-0.28)*		*(0.00)*	0.91		
BL	0.02*	0.9***	-1.27***	-1.02***	0.83	21.74	*(0.49)*	-166.47	-156.47
	(1.98)	*(3.11)*	*(-8.58)*	*(-7.12)*		*(0.00)*			
BM	-0.00	0.89***	-0.11*	-0.00	0.30	9.18		-279.10	-269.10
	(-0.62)	*(4.91)*	*(-1.89)*	*(-0.01)*		*(0.00)*			
BH	0.00	0.62***	-0.30*	0.22*	0.23	3.35		-194.10	-184.10
	(0.20)	*(2.68)*	*(-1.92)*	*(1.96)*		*(0.02)*			
Average results	*0.01*	*0.80****	*-0.06****	*-0.27****	*0.40*			*-205.70*	*-195.70*
	(0.97)	*(3.58)*	*(4.40)*	*(3.79)*					
SL	0.01	0.72***	0.35***	-0.18***	0.36	17.81		-249.82	-239.82
	(0.43)	*(4.08)*	*(5.26)*	*(-3.97)*		*(0.00)*			
SN	0.02**	0.46**	0.18**	0.09*	0.13	5.22		-235.98	-225.98
	(2.30)	*(2.42)*	*(2.50)*	*(1.90)*		*(0.00)*			
SW	0.00	1.23***	0.17	-0.16	0.13	3.91	1.38	-124.80	-114.80
	(0.25)	*(3.20)*	*(0.80)*	*(-1.07)*		*(0.01)*	*(0.23)*		
BL	0.07*	-0.92	-3.07**	-1.87**	0.59	2.66		66.67	76.67
	(1.70)	*(-0.77)*	*(-2.60)*	*(-2.24)*		*(0.05)*			
BN	0.01	1.42**	-0.29	-0.40	0.28	2.93		-100.11	-90.11
	(0.68)	*(2.62)*	*(-0.83)*	*(-1.13)*		*(0.04)*			
BW	-0.00	0.65***	-0.16***	-0.04	0.31	14.59		-307.61	-297.61
	(-0.39)	*(5.04)*	*(-3.32)*	*(-1.25)*		*(0.00)*			
Average results	*0.02*	*0.59****	*-0.47***	*-0.43**	*0.30*			*-158.61*	*-148.61*
	(0.96)	*(3.02)*	*(2.55)*	*(1.93)*					

Panel C: FFPM

	α	β	s	h	w	Adjusted R^2	F test *(p > F)*	GRS *(p-val)*	AIC	SC
SL	-0.01	0.77***	1.13***	-0.69***	-0.08*	0.76	71.51		-199.58	-187.08
	(-0.79)	*(3.25)*	*(10.60)*	*(-9.74)*	*(-1.74)*		*(0.00)*			
SM	0.01	0.82***	0.33	0.03	-0.06	0.14	6.07		-199.98	-187.48
	(0.85)	*(4.66)*	*(1.62)*	*(0.19)*	*(-0.70)*		*(0.00)*			
SH	0.02	1.00***	0.10	0.01	-0.03	0.14	4.59		-194.59	-182.09
	(1.36)	*(4.21)*	*(0.89)*	*(0.12)*	*(-0.60)*		*(0.00)*	0.83		
BL	0.02	0.97***	-1.17***	-0.96***	-0.07	0.84	173.80	*(0.55)*	-166.29	-153.79
	(1.58)	*(4.89)*	*(-3.27)*	*(-3.23)*	*(-0.43)*		*(0.00)*			
BM	-0.00	0.85***	-0.16**	-0.04	0.04**	0.31	9.68		-278.98	-266.49
	(-0.35)	*(4.77)*	*(-2.50)*	*(-1.01)*	*(2.42)*		*(0.00)*			
BH	-0.00	0.76***	-0.13	0.34***	-0.13***	0.29	7.32		-200.54	-188.04
	(-0.34)	*(3.25)*	*(-0.88)*	*(2.94)*	*(-3.13)*		*(0.00)*			
Average results	*0.01*	*0.86****	*0.02****	*-0.22****	*-0.05*	*0.41*			*-206.66*	*-194.16*
	(0.88)	*(4.17)*	*(3.29)*	*(2.87)*	*(1.50)*					
SL	0.00	0.80***	0.45***	-0.11**	-0.073**	0.39	15.18		-252.84	-240.34
	(0.06)	(4.52)	(5.69)	(-2.04)	(-2.21)		*(0.00)*			
SN	0.016*	0.60***	0.38***	0.21***	-0.14***	0.27	9.10		-250.97	-238.47
	(1.94)	(3.43)	(4.70)	(4.12)	(-4.20)		*(0.00)*			
SW	0.01	1.02***	-0.11	-0.35*	0.21*	0.22	3.73	0.94	-133.13	-120.63
	(0.83)	(3.57)	(-0.54)	(-1.93)	(1.83)		*(0.01)*	*(0.47)*		
BL	0.01	0.85**	-0.75***	-0.29***	-1.71***	0.95	432.45		-123.48	-110.98
	(0.55)	(2.36)	(-4.57)	(-2.69)	(-25.18)		*(0.00)*			
BN	0.021*	0.97***	-0.88**	-0.80**	0.43**	0.53	4.42		-138.38	-125.88
	(1.72)	(4.09)	(-2.03)	(-2.04)	(2.04)		*(0.00)*			
BW	-0.00	0.63***	-0.18***	-0.05	0.01	0.31	10.92		-305.90	-293.40
	(-0.30)	(4.82)	(-3.02)	(-1.32)	(0.52)		*(0.00)*			
Average results	*0.01*	*0.81****	*-0.18****	*-0.23***	*-0.21****	*0.44*			*-200.78*	*-188.28*
	(0.90)	*(3.80)*	*(3.43)*	*(2.36)*	*(6.00)*					

SL, SM, SH, BL, BM and BH: six portfolios formed by the intersection of size and book-to-market ratio groups. SL, SN, SW, BL, BN and BW: six portfolios formed by the intersection of size and momentum groups. GRS: the Gibbons et al. (1989) test statistic. AIC and SC: Akaike and Schwarz information criteria. The t-statistics are presented in parenthesis: ***, ** and * denote significance at 1%, 5% and 10% respectively.

As we are interested in the improvements in describing average returns on the different portfolios when adding successively *SMB* and *HML* factors in TFPM and *WML* factor in FFPM, we compare the relative performance of the three models using GRS statistics like Fama and French (2015). According to them, these statistics help us to identify the model that it is the best (and not the perfect) to describe the variation of average returns on different portfolios. Under this test, the acceptance of the null hypothesis in which all α coefficients are zero, means that the selected factors are validated. The results of this test for the three models are reported in table 3.

We notice that the FFPM model produces lower GRS statistics than the TFPM in all portfolios. The average absolute intercepts are also smaller for the FFPM making the four-factor pricing model of Carhart (1997), the model that will allow financial practitioners and academicians to better estimate the cost of equity capital of Tunisian firms.

Most results issued from the regressions analysis and the GRS test are then in favor of the FFPM, except that the coefficients related to the *WML* factor are not, in average, significantly negative through the majority of portfolios formed on the basis of size and *B/M* ratio and the average coefficient related to *SMB* factor is sometimes significantly positive (on portfolios formed as the intersection of size and *B/M* ratio) and sometimes significantly negative (on portfolios formed as the intersection of size and momentum). Nonetheless, results obtained on estimated coefficients are more stable in TFPM. To choose univocally between TFPM and FFPM, we use AIC and SC criteria (note 5) which help to decide in terms of model parsimony. As the lower values of AIC and SC are observed in FFPM, this model is univocally the best for describing average returns in our sample.

The FFPM exhibits a positive relationship between excess returns and market risk premium. We can't however find a consistent pattern between excess returns and size and momentum factors risk. Nonetheless, we tend to express an opinion in favor of a size premium as *s* coefficients are significantly positive for a majority of smallest size portfolios and negative for a majority of biggest size portfolios. The *WML* premium seems to be negative as it so for most portfolios indicating that the TSE may exhibit the contrarian anomaly reported by many authors such as Jegadeesh (1990) and Lehmann (1990), at least for a holding period of 12 months. These results cannot be considered of course a sufficient statistical approval to definitively conclude to the existence of the size and momentum anomalies on the TSE. The significant negative loadings on *HML* factor is in concordance with a growth effect on TSE: stocks with low *B/M* ratio values are riskier than those with high *B/M* perhaps because a low *B/M* ratio may reflect a fundamental dysfunction in the company encouraging investors to ask for a premium. The behavior of a large majority of Tunisian investors who care more about quick large profits and, thus, less about fundamentals can also explain this result.

5. Conclusion

This study has investigated the empirical validity of the three assets pricing models commonly cited in the financial literature, particularly those used by Fama and French (1993, 2012), namely the CAPM, the TFPM of Fama and French (1993) and the FFPM of Carhart (1997) on the TSE.

Overall, the results indicated that the FFPM model is the best to capture the change in portfolio returns during the period July 2003 to December 2010 even though the four factors (Rm-Rf), *SMB*, *HML* and *WML* don't explain the returns of all portfolios. A significant positive relationship is set forth between excess returns and market risk premium. Contrary to Fama and French (1993) results, the *HML* variable stand out on average as being significantly negative which is in favor of a growth effect on the TSE. With regard to *SMB* and *WML* effects, results would lean in favor of a size and contrarian effects.

These results are interesting since they provide new insights to our understanding of the model that largely explains the variations in average returns on the TSE. They also have implications to portfolio managers as results indicate that investing in low *B/M* ratio stocks should be rewarded by generating higher average returns. The small size and contrarian anomalies should be better studied in future researches to conclude clearly about their existence on the TSE.

References

Amihud, Y., & Mendelson, H. (1991). Liquidity, asset Prices and financial policy. *Financial Analysts Journal*, 47(6), 56-66. http://dx.doi.org/10.2469/faj.v47.n6.56

Al-Mwalla, M. (2012). Can book-to-market, size and momentum be extra risk factors that explain the stocks rate of return?: Evidence from emerging market. *Journal of Finance, Accounting and Management*, 3(2), 42-57.

Banz, R. W. (1981). The relationship between return and market value of common stocks. *Journal of Financial Economics*, 9, 3-18. http://dx.doi.org/10.1016/0304-405X(81)90018-0

Ben Naceur, S., & Ghazouani, S. (2007). Asset pricing and cost of equity in the Tunisian banking sector: Panel data evidence. *Economic Notes: Review of Banking, Finance and Monetary Economics*, 36, 89-113. http://dx.doi: 10.1111/j.1468-0300.2007.00175.x

Besbes, L., & Bellalah, M. (2006). L'effet momentum: Application d'un modèle d'évaluation à quatre facteurs sur le marché français. *Euro-Mediterranean Economics and Finance Review*, 1(3), 6-17.

Bornholt, G. (2013). The failure of the capital asset pricing model (CAPM): An update and discussion. *Abacus*, 49, 36-43. http://dx.doi: 10.1111/j.1467-6281.2012.00382.x

Boubakri, N., Guedhami, O., Mishra, D., & Saffar, W. (2012). Political connections and the cost of equity capital. *Journal of Corporate Finance*, 18, 541-559. http://dx.doi.org/10.1016/j.jcorpfin.2012.02.005

Brooks, C. (2008). *Introductory econometrics for finance* (2nd ed.). Cambridge, UK: Cambridge University Press. http://dx.doi.org/10.1017/CBO9780511841644

Cakici, N., Fabozzi, F. J., & Tan, S. (2013). Size, value, and momentum in emerging market stock returns. *Emerging Markets Review*, 16, 46-65. http://dx.doi.org/10.1016/j.ememar.2013.03.001

Campbell, J. Y., & Cochrane, J. H. (1999). By force of habit: A consumption-based explanation of aggregate stock market behavior. *Journal of Political Economy*, 107, 205-251. http://dx.doi.org/10.1086/250059

Capaul, C., Rowley, I., & Sharpe, W. F. (1993). International value and growth stock returns. *Financial Analysts Journal*, 49(1), 27-36. http://dx.doi.org/10.2469/faj.v49.n1.27

Carhart, M. M. (1997). On persistence in mutual fund performance. *The Journal of Finance*, 52, 57-82. http://dx.doi.org/10.1111/j.1540-6261.1997.tb03808.x

Chaibi, H., & Ben Naceur, S. (2010). The best asset pricing model for estimating industry costs of equity in Tunisia. *Review of Middle East Economics and Finance*, 5(3), 63-90. http://dx.doi.org/10.2202/1475-3693.1210

Chan, L. K. C., Hamao, Y., & Lakonishok, J. (1991). Fundamentals and stock returns in Japan. *The Journal of Finance*, 46, 1739-1764. http://dx.doi.org/10.2307/2328571

Chui, A. C. W., Wei, K. C. J., & Titman, S. (2000). Momentum, legal systems and ownership structure: An analysis of Asian stock markets. Working paper. http://dx.doi.org/10.2139/ssrn.265848

Claus, J., & Thomas, J. (2001). Equity premia as low as three percent? Evidence from analysts'earnings forecasts for domestic and international stock markets. *The Journal of Finance,* 56, 1629-1666. http://dx.doi.org/10.1111/0022-1082.00384

Damodaran, A. (2012). Equity risk premiums (ERP): Determinants, estimation and implications – The 2012 Edition. Working paper, New York University. http://dx.doi.org/10.2139/ssrn.2027211

Daniel, K., & Titman, S. (1997). Evidence on the characteristics of cross sectional variation in stock returns. *The Journal of Finance*, 52, 1-33. http://dx.doi.org/10.1111/j.1540-6261.1997.tb03806.x

Davis, J. L., Fama, E. F., & French, K. R. (2000). Characteristics, covariances, and average returns: 1929 to 1997. *The Journal of Finance*, 55, 389-406. http://dx.doi.org/10.1111/0022-1082.00209

Dimson, E., Marsh, P., & Staunton, M. (2002). *Triumph of the optimists: 101 years of global investment returns* (1st ed.). Princeton, NJ: Princeton University Press. http://dx.doi.org/10.1515/9781400829477

Easton, P. (2004). PE ratios, PEG ratios, and estimating the implied expected rate of return on equity capital. *The Accounting Review*, 79, 73-95. http://dx.doi.org/10.2308/accr.2004.79.1.73

Edwards, W. (1968). Conservatism in human information processing. In B. Kleinmuntz (Ed.), *Formal Representation of Human Judgment* (pp. 17-52). New York, NY: Wiley.

Fama, E. F., & French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, 47, 427-465. http://dx.doi: 10.1111/j.1540-6261.1992.tb04398.x

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, 33, 3-56. http://dx.doi.org/10.1016/0304-405X(93)90023-5

Fama, E. F., & French, K. R. (1995). Size and book-to-market factors in earnings and returns. *The Journal of Finance*, 50, 131-155. http://dx.doi: 10.1111/j.1540-6261.1995.tb05169.x

Fama, E. F., & French, K. R. (1996). Multifactor explanations of asset pricing anomalies. *The Journal of Finance*, 51, 55-84. http://dx.doi.org/10.1111/j.1540-6261.1996.tb05202.x

Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, 43, 153-193. http://dx.doi.org/10.1016/s0304-405x(96)00896-3

Fama, E. F., & French, K. R. (1998). Value versus growth: The international evidence. *The Journal of Finance*, 53, 1975-1999. http://dx.doi.org/10.1111/0022-1082.00080

Fama, E. F., & French, K. R. (2002). The equity premium. *The Journal of Finance*, 57, 637-659. http://dx.doi: 10.1111/1540-6261.00437

Fama, E. F., & French, K. R. (2012). Size, value, and momentum in international stock returns. *Journal of Financial Economics*, 105, 457-472. http://dx.doi.org/10.1016/j.jfineco.2012.05.011

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. *Journal of Financial Economics*, 116, 1-22. http://dx.doi.org/10.1016/j.jfineco.2014.10.010

Gebhardt, W. R., Lee, C. M. C., & Swaminathan, B. (2001). Toward an implied cost of capital. *Journal of Accounting Research*, 39, 135-176. http://dx.doi.org/10.1111/1475-679x.00007

Gibbons, M., Ross, S., & Shanken, J. (1989). A test of the efficiency of a given portfolio. *Econometrica*, 57, 1121-1152. http://dx.doi.org/10.2307/1913625

Goetzmann, W., & Jorion, P. (1996). A century of global stock markets. Yale School of Management Working Paper, No. F-55. http://dx.doi.org/10.2139/ssrn.8156

Gregory, A., Tharyan, R., & Christidis, A. (2013). Constructing and testing alternative versions of the Fama–French and Carhart models in the UK. *Journal of Business Finance & Accounting*, 40, 172-214. http://dx.doi: 10.1111/jbfa.12006

Guzeldere, H., & Sarıoglu, S. E. (2012). Validity of Fama-French three-factor model in asset pricing: An application in Istanbul stock exchange. *Business and Economics Research Journal*, 3(2), 1-19.

Hammami, Y., & Jilani, F. (2011). Testing factor pricing models in Tunisia: Macroeconomic factors vs. fundamental factors. *Review of Middle East Economics and Finance*, 7(2), 1-22. http://dx.doi.org/10.2202/1475-3693.1334

Hammami, Y. (2013). Momentum investing across economic states: Evidence of market inefficiency in good times. *Applied Financial Economics*, 23, 51-56. http://dx.doi.org/10.1080/09603107.2012.705426

Haugen, R. A. (1995). *The new finance – The case against efficient markets* (1st ed.). Englewood Cliffs, NJ: Prentice Hall.

Hwang, L. S., Lee, W. J., Lim, S.Y., & Park, K. H. (2013). Does information risk affect the implied cost of equity capital? An analysis of PIN and adjusted PIN. *Journal of Accounting and Economics*, 55, 148-167. http://dx.doi.org/10.1016/j.jacceco.2013.01.005

Jegadeesh, N. (1990). Evidence of predictable behavior of security returns. *The Journal of Finance*, 45, 881-898. http://dx.doi.org/10.1111/j.1540-6261.1990.tb05110.x

Jegadeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *The Journal of Finance*, 48, 65-91. http://dx.doi.org/10.2307/2328882

Jegadeesh, N., & Titman, S. (2001). Profitability of momentum strategies: An evaluation of alternative explanations. *The Journal of Finance*, 56, 699-720. http://dx.doi.org/10.1111/0022-1082.00342

Kahneman, D., & Tversky, A. (1973). On the psychology of prediction. *Psychological Review*, 80, 237-251. http://psycnet.apa.org/doi/10.1037/h0034747

Kothari, S. P., Shanken, J., & Sloan, R. (1995). Another look at the cross-section of expected returns. *The Journal of Finance*, 50, 185-224. http://dx.doi.org/10.1111/j.1540-6261.1995.tb05171.x

Lakonishok, J., Shleifer, A., & Vishny, R. (1994). Contrarian investment, extrapolation, and risk. *The Journal of Finance*, 49, 1541-1578. http://dx.doi.org/10.2307/2329262

Lam, K. S. K., Lie, F. K., & So, S. M. S. (2010). On the validity of the augmented Fama and French's (1993) model: Evidence from the Hong Kong stock market. *Review of Quantitative Finance and Accounting*, 35, 89-111. http://dx.doi.org/10.1007/s11156-009-0151-x

La Rosa, F., & Liberatore, G. (2014). Biopharmaceutical and chemical firms' R&D disclosure, and cost of equity: The impact of the regulatory regime. *European Management Journal*, 32, 806-820. http://dx.doi.org/10.1016/j.emj.2014.01.003

Lehmann, B. N. (1990). Fads, martingales, and market efficiency. *The Quarterly Journal of Economics*, 105, 1-28. http://dx.doi.org/10.2307/2937816

L'Her, J. F., Masmoudi, T., & Suret, J. M. (2004). Evidence to support the four-factor pricing model from the Canadian stock market. *Journal of International Financial Markets, Institutions and Money*, 14, 313-328. http://dx.doi.org/10.1016/j.intfin.2003.09.001

Lintner, J. (1965a). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics*, 47, 13-37. http://dx.doi.org/10.2307/1924119

Lintner, J. (1965b). Security prices, risk and maximal gains from diversification. *The Journal of Finance*, 20, 587-615. http://dx.doi.org/10.1111/j.1540-6261.1965.tb02930.x

Molay, E. (2000). Le modèle de rentabilité à trois facteurs de Fama et French (1993): Une application sur le marché Français. *Revue Banque & Marchés*, 44, 18-28

Ohlson, J. A., & Juettner-Nauroth, B. E. (2005). Expected EPS and EPS growth as determinants of value. *Review of Accounting Studies*, 10, 349-365. http://dx.doi.org/10.1007/s11142-005-1535-3

Reinganum, M. R. (1981). Misspecification of capital asset pricing: Empirical anomalies based on earnings yields and market values. *Journal of Financial Economics*, 9, 19-46. http://dx.doi:10.1016/0304-405X(81)90019-2

Rosenberg, B., Reid, K., & Lanstein, R. (1985). Persuasive evidence of market inefficiency. *Journal of Portfolio Management*, 11(3), 9-16. http://dx.doi.org/10.3905/jpm.1985.409007

Rouwenhorst, K.G. (1998). International Momentum Strategies. *The Journal of Finance*, 53, 267-284. http://dx.doi.org/10.1111/0022-1082.95722

Rouwenhorst, K.G. (1999). Local Return Factors and Turnover in Emerging Stock Markets. *The Journal of Finance*, 54, 1439-1464. http://dx.doi.org/10.1111/0022-1082.00151

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, 19, 425-442. http://dx.doi.org/10.1111/j.1540-6261.1964.tb02865.x

Siegel, J. (2002). *Stocks for the long run* (3rd ed.), New York, NY: McGraw-Hill.

Stoll, H., & Whaley, R. (1983). Transaction costs and the small firm effect. *Journal of Financial Economics*, 12, 57-79. http://dx.doi.org/10.1016/0304-405x(83)90027-2

Taneja, Y. P. (2010). Revisiting Fama French three-factor model in Indian stock market. *Vision: The Journal of Business Perspective*, 14, 267-274. http://dx.doi.org/10.1177/097226291001400403

Treynor, J. L. (1961). Market Value, Time, and Risk. Unpublished manuscript.

Treynor, J. L. (1962). Toward a Theory of Market Value of Risky Assets. Unpublished manuscript. A final version was published in 1999, in Robert A. Korajczyk (Ed.), *Asset Pricing and Portfolio Performance: Models, Strategy and Performance Metric*s (pp. 15-22). London: Risk Books.

Tsai, H. J., Chen, M. C., & Yang, C. Y. (2014). A time-varying perspective on the CAPM and downside betas. *International Review of Economics and Finance*, 29, 440-454. http://dx.doi.org/10.1016/j.iref.2013.07.006

Unlu, U. (2013). Evidence to support multifactor asset pricing models: The case of the Istanbul stock exchange. *Asian Journal of Finance & Accounting*, 5(1), 197-208. http://dx.doi.org/10.5296/ajfa.v5i1.3216

Notes

Note 1. Fama and French (1997) calculate the implicit standard deviation of the β coefficient as the square root of the difference between the chronological variance of the estimated coefficient and the average of the variances of the errors of estimation of this coefficient.

Note 2. This premium was calculated on the basis of bond yields and the calculated average is a geometric mean.

Note 3. Including this period in our empirical tests gave mixed results. These results are available upon request.

Note 4. The Shapiro-Wilk's statistics are calculated. The probability p which is associated, leads us to reject the null hypothesis of normality. These results are available upon request.

Note 5. SC is strongly consistent but inefficient and AIC is not consistent, but is generally more efficient. Thus, no criterion is definitely superior to the other (Brooks, 2008), that's why these two criteria are used jointly.